



THE EFFECT OF TRAINING ON FIRST-AID KNOWLEDGE, EMERGENCY  
MANAGEMENT SKILLS, AND LEARNING RETENTION RATE OF SECONDARY  
SCHOOL STUDENTS IN DELTA STATE NIGERIA

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## Abstract

THE EFFECT OF TRAINING ON FIRST-AID KNOWLEDGE, EMERGENCY  
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The thesis investigates the impact of first aid (FA) training on secondary school students' knowledge, emergency management skills, and learning retention rate in Delta State, Nigeria, amidst rising injuries and illnesses among children. The study highlights the urgent need for effective FA management to reduce health impacts and fatalities, as previous research indicates inadequate FA skills and training evaluations.

Utilising a quantitative experimental design, the research involved 200 secondary school students selected through a 4-stage Solomon approach to ensure random allocation and control for biases. Participants were drawn from three geographical regions of Delta State, with a comprehensive 33-item questionnaire assessing demographics, FA knowledge, and learning retention rate for various conditions, including choking, wounds, and CPR. An observational checklist documented participants' FA-management skills and retention. Ethical approvals were obtained from the relevant committees (UREC & MOHREC), and informed consent was received from guardians and participants. The training programme was developed using the ADDIE and PRECEDE-PROCEED models, employing a multi-sensory approach. A 50% benchmark was set to categorise knowledge levels as adequate or inadequate. Data analysis was conducted using SPSS 21.0, employing descriptive statistics, chi-square tests, binary logistic-regression, ANCOVA, and t-tests, with a significance level of  $p < 0.05$ .

Results indicated a significant improvement in post-intervention knowledge ( $t = -7.233$ ,  $p = 0.000$ ) compared to the control group, with pre-intervention scores below 50%. The trained participants are approximately four times ( $AOR = 4.131$ ) more knowledgeable in first aid than untrained individuals. FA management skills improved from a pre-intervention score of  $2.26 \pm 0.93$  (45.16%) to  $3.20 \pm 0.83$  (63.98%) post-intervention. However, the retention score for emergency management skills declined after one month to  $2.38 \pm 0.93$  (47.65%), leaving the overall retention rate for emergency management skills at 69.17%. Previous FA knowledge ( $t = 3.423$ ,  $p = 0.001$ ) and FA banners ( $t = 5.221$ ,  $p = 0.000$ ) significantly influenced post-intervention knowledge.

The findings underscore the importance of FA training, mainly using multisensory methods and ongoing refresher courses, to enhance students' knowledge retention and emergency management skills. The study advocates for governmental and educational stakeholder support in promoting comprehensive FA training initiatives.

### Declaration

I declare that this thesis has been composed solely by myself and has not been submitted to any previous application for a degree, in whole or in part. The work presented is entirely my own except where this is stated otherwise by reference or acknowledgement.

### Artificial Intelligence Acknowledgement

This thesis utilises insights from artificial intelligence (AI) tools such as Grammarly (<https://app.grammarly.com>) and MS office editor to enhance the clarity of writing. While the concepts, ideas and final content reflect my analysis and conclusions, I acknowledge the minimal support of AI technologies in this academic endeavour. Prompts used include 'check grammar and punctuation'. The action was completed 09/10/2024.

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### Dedication

This work is dedicated to God Almighty and His son Jesus Christ for their protection and love throughout the trying and fruitful times. It is but for His mercies that we are not consumed. To my beloved, inspiring & wonderful husband (Joshua Barry) and children (Joshua, Rachael & Neriah) for their understanding and sacrifice in aiding the completion of the PhD. With great love and satisfaction, I wish to also dedicate this work to my parent Mr Philip Ataekiru and the Late Mrs Janet Ataekiru, my beloved mum, for her care, encouragement, and prayers till her demise. It would have been a lovely moment for her to see her last daughter be called a Dr, which was her desire. However, she died just before I could wrap up my studies.

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## TABLE OF CONTENTS

List of Tables .....	xvi
List of Figures .....	xviii
CHAPTER 1: INTRODUCTION .....	19
Statement of the Problem.....	25
Purpose of the Study, Research Aims, and Objectives .....	29
Research Questions and Research Hypotheses .....	33
Hypotheses .....	34
Nature and Significance of the Study .....	35
Nature of the study .....	35
Significance of the study .....	36
CHAPTER 2: LITERATURE REVIEW .....	38
Theoretical Framework .....	40
The PRECEDE-PROCEED Model in the Context of FA Training.....	41
The ADDIE model .....	46
Concept of first aid.....	50
Law and regulations of First aid .....	54
First aid in school.....	58
Relevance of first aid to Health .....	60
Decolonisation of the first aid curriculum .....	63
Principle of basic emergency care .....	68
Attitude, knowledge and management of first aid in schools .....	72
The relationship between knowledge and attitude of FA management skills.....	75

The association between knowledge or attitude & the provision of FA management .....	78
The interaction of other external factors & the effective provision of FA management .....	81
Presentation and prevalence of some popular health conditions in schools needing first aid. ....	85
Emergency/ first aid management techniques .....	91
Epileptic seizure .....	94
Bleeding and wounds .....	96
Foreign Object .....	98
CPR (Cardiopulmonary Resuscitation).....	102
Asthma .....	107
Sprains and strains .....	111
Shock.....	115
Choking.....	117
Bone fracture.....	120
Convulsion .....	124
Fainting (Syncope).....	124
Burns .....	129
Snakes/ poisonous bites/ stings .....	133
Diabetes.....	137
Avulsed or broken tooth.....	143
Demographics, first aid training and level of retention .....	145

Impact of FA training in schools .....	149
Link to Global Learning Outcome and Global perspective of the first aid training: empirical studies .....	152
Appraisal of the literature .....	157
CHAPTER 3: RESEARCH METHOD .....	160
Research Approach and Design .....	163
Population and Sample of the Research Study .....	170
Materials/Instrumentation of Research Tools .....	175
Operational Definition of Variables.....	198
Study Procedures and Ethical Assurances .....	202
Ethical Assurances .....	205
Data Collection and Analysis.....	208
Summary .....	214
CHAPTER 4: FINDINGS .....	216
Trustworthiness of Data.....	218
Reliability and validity of data.....	222
Results of findings, including graphical illustrations .....	223
Demographic data .....	223
Research Question 1/Inferences:.....	225
Research Question 2a/Inferences: .....	227
Research Question 2b/Inferences:.....	229
Research Question 3/Inferences:.....	232
Research Question 4a/Inferences: .....	233

Research Question 4b/Inferences:.....	235
Research Question 5a/Inferences: .....	237
Research Question 5b/Inferences:.....	239
Restating the hypothesis: .....	241
Evaluation of Findings .....	247
Participant's pre-intervention knowledge of first aid .....	247
Effect of training intervention on FA Knowledge of Participants .....	249
Intervening factors on the outcome of the training intervention.....	251
FA knowledge retention rate of participants.....	253
4.4.5 Interaction of demographic factors with retention rates of Participants ....	254
Effect of training intervention and other demographic factors on FA Knowledge	255
Post-intervention knowledge between control and experimental groups .....	256
Knowledge levels before and after the intervention of experimental groups' .....	257
Differences in the pre and post-intervention FA management skillset.....	257
The retention rate for participants' FA emergency management skillset.....	258
Summary of the section .....	259
CHAPTER 5: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS.....	265
Introduction of the section .....	265
Implications.....	267
Multi-sensory FA training approach is impactful: .....	268
Duration of training affects the level of comprehension.....	270
Retention is affected by the duration of time and class of study .....	271
Students retain knowledge more often than management skills. ....	272

Previous knowledge on first aid moderate outcome of a training intervention .....	272
CPR, choke, seizure, and burns require special training and attention. ....	273
Recommendations for application .....	275
Training and Development of students and staff in secondary schools .....	275
Inclusion of first aid in the school curriculum .....	275
The need for an awareness campaign on first aid and its importance to the rural and local populace .....	277
Extending first aid training to drivers, churches, universities campuses and employers .....	278
Recommendations for future research .....	279
Conclusions .....	282
REFERENCES .....	295
APPENDICES .....	364
Appendix A: Data collection instrument .....	364
Appendix B1: UREC decision 1 .....	376
Appendix B2: UREC decision 2 .....	377
Appendix B3: MOHREC decision.....	378
Appendix C: Sample of guardian informed consent form .....	379
Appendix D1: Gate keeper form.....	381
Appendix D2: Gate keeper form.....	382
Appendix D3: Gate keeper form.....	383
Appendix D4: Gate keeper form.....	384
Appendix E1: Letter of Authorisation .....	385

Appendix E2: Letter of Authorisation .....	386
Appendix E3: Letter of Authorisation .....	387
Appendix E4: Letter of Authorisation .....	388
Appendix E5: Variable Definitions for the Research Topic .....	389

## List of Tables

Table 3.1. Study Design and Approach: Solomon-4 Stage Group Design .....	170
Table 3.2 Sample Size Calculation .....	172
Table 3.3 Population and Sample for the Study .....	173
Table 3.4 Learning Content and Summary of Resources for Day-1 of the FA training.....	193
Table 3.5 Learning Content and Summary of Resources for Day-2 of the FA Training .....	194
Table 3.6 Learning Content and Summary of Resources for Day-3 of the FA Training .....	195
Table 3.7 Constructs for the Study .....	199
Table 3.8 The Study Procedure Detailing the Application of Solomon Four Stage.....	205
Table 3.9 The Grid Displaying the Summary Education Material Provided to Learners.....	210
Demographic Information of Participants .....	224
Table 4.2 Basline knowledge of first among Secondary School Students in Delta State.....	226
Table 4.3 Post-intervention Knowledge of First Aid among Secondary School Students .....	228
Table 4.4 Change in FA Management Skillset among Secondary School Students in Delta State .....	231
Table 4.5 Intervening/ Demographic Factors and Their Influence on the Knowledge Scores of Participants Immediately After the First Aid Training .....	232
Table 4.6 Retention Rate for First Aid Knowledge One Month After the Intervention among Secondary School Students in Delta State .....	233
Table 4.7 Retention of FA Emergency Management Skills among Secondary School Students in Delta State .....	236
Table 4.8 Interactive Factors Moderating Retention Rates After FA Training Intervention.....	238

Table 4.9 The Overall Contribution of Independent Variables on The Knowledge of FA among Participants.....	239
Table 4.10 T-Test Analysis on Significant Differences in The Treatment Group for FA Knowledge .....	241
Table 4.11 T-test Analysis on the ‘Significant Difference Between Pre and Post-intervention for FA Knowledge’ .....	242
Table 4.12 ‘Multiple Regression Analysis’ on The Significant Impact of The Demographic Variables of The Participants on Outcome of FA Training .....	243
Table 4.13 T-test Analysis on the Significant Difference Between Posttest and Learning Retention for FA Knowledge .....	245

## List of Figures

<b>Figure 2.1</b> “Applying the PRECEDE-PROCEED Model to the Outcome of FA Instruction among Students in Secondary Schools” .....	45
<b>Figure 2.2</b> “Applying the ADDIE model to the Effect of FA Instruction Amongst Secondary School Pupils.” .....	48
<b>Figure 3.1</b> “Application of the stratified random sampling technique” .....	174
<b>Figure 4.1</b> Participant's FA Management Skillset in the Experimental Group Before and After Intervention .....	230
<b>Figure 4.2</b> The Retention Rate of Participant's FA Management Skillset after One Month of Intervention .....	237
<b>Figure 4.3</b> The Predictors of FA Knowledge among Secondary School Students Enrolled on the Experimental Group in Delta State Nigeria .....	240
<b>Figure 4.4</b> Participant's Retention Pattern After One Month of Training Intervention .....	246

## CHAPTER 1: INTRODUCTION

Injuries have been identified as a major contributor to death and illness on a global scale, according to Kapoor et al. (2017). Among the affected population, school pupils are especially vulnerable to injuries, particularly during recreational activities. Injuries are the primary cause of death worldwide, often affect young people and can lead to long-term disabilities, as stated by Curry et al. (2011). Recent statistics indicate that the incidence of people being injured is expected to increase to 20% by the year 2020. In developing nations, such as Nigeria, injuries have become a significant epidemic, resulting in approximately five million deaths each year. This figure is almost equal to the combined fatalities caused by sexually transmitted HIV/AIDS, Malaria, and Tuberculosis (Gosselin et al., 2009). One recent news release by the World Health Organization (WHO) (2022) revealed that about 12000 lives each day are taken as a result of injuries and violence; this corresponds to 1 in 12 deaths globally. Besides the burden of injury worldwide, the report has also revealed that acutely ill people increasingly need care every day. The report also highlighted that injury-related death is rated among the top five issues that cause death among persons aged 5 to 29 years worldwide.

A global study by Global Burden of Diseases (GBD) (2020) has estimated the occurrence, number of cases, death rate, 'years of life lost (YLLs), years lived with disability (YLDs), and disability-adjusted life years (DALYs)' for around 369 different diseases and injuries in 204 nations and territories, considering both males and females. The study used the Ensemble model to identify the cause of death and a process involving the spatiotemporal Gaussian regression to compute the specific cause mortality rates and cause proportions. The particular causes of death were modified to eliminate the impact of confounding variables and to match the total number of deaths from all causes computed as a component of the estimates of the overall burden of disease population globally, including fertility rate and mortality.

However, the result revealed that the DALY rate for global age-standardised value has been declining since 2010, especially in age categories for individuals who are under 50 years old, where a majority of the annual rate of decline could be observed among the population group of 0-9 years. Infections affecting the lower respiratory tracts, illnesses such as diarrhoea, parasites such as malaria, inflammation of the meninges, pertussis, and diseases that are transmitted through sexual intercourse (with congenital syphilis accounting for all occurrences in this age group) were the leading causes of disability-adjusted life years in 2019 among children under ten years old (Global Burden of Diseases, 2020).

In contrast, injuries accounted for the main factors contributing to the burden of DALYs among adolescents between 10 to 24 years of age: the three injury causes, namely road injuries, self-harm, and interpersonal violence, were among the leading causes of DALYs. This age grouping is similar to those observed in the current study. For individuals aged 10–24, five out of the top ten causes were also found in the top ten list for individuals aged 25–49, of which road injuries were the first in the ranking list (Global Burden of Diseases, 2020).

The playing ground equipment, furniture design, poor awareness level of risk of falling and other chronic diseases are all part of the determinants or risk factors for injuries caused by falls. WHO's (2009) report showed that more than 90% of deaths occurred due to an absence of first aid care in developing nations with limited financial resources and no adequate and organised pre-hospital care system. The condition of the emergency service in developing countries has not made much improvement to date, as supported by more recent findings (WHO, 2022; Suryanto & Boyle, 2017)

In 2004, the International Federation of Red Cross and Red Crescent Societies (IFRCS) declared September 12 as World First Aid Day. Since then, the IFRCS has been promoting this tradition to raise awareness about the importance of first aid. It has been estimated that individuals who have received first aid training save over ten million lives every year (IFRCS,

2016). Undoubtedly, first-aid-trained people become more aware of their environment and make an active effort to ensure that the environment is safe for themselves and others. Hence, educators and students who have gained some competency and knowledge of first aid are likely to act and respond to assist others when the need arises (First aid for Schools, 2020). According to IFRCS (2012), the average time for a professional medical team to reach an accident site is estimated to be 10 minutes in Singapore, 15 minutes in Europe, and around three hours in Nepal. However, determining the response time in East and West Africa is challenging (Geetha, 2016). Due to the lack of emergency ambulances in countries like Nigeria (Ojomoyela et al., 2016; Nwauwa, 2017), it has become crucial to prioritize skills for providing first aid in our daily lives. Financial constraints and insufficient workforce were identified as the most common issues faced by the emergency medical system in low-middle-income nations. In most cases, ambulance services defeat their purpose as they are often used for non-emergency medical care transport/ functions rather than medical care purposes (Suryanto & Boyle, 2017) to bridge the time gap in which a casualty receives help from a professional.

Time, which is one of the crucial factors in estimating the efficiency and functionality of emergency health services, seems to be deteriorating with an increasing number of hours spent to get to a casualty as the year goes by. And yet, the shorter the time of response, the greater the casualty chances of recovering and survival, which is known as the golden hour (Rathore et al., 2022). This situation is not common to only low-middle-income countries; developed countries face similar problems in responding to casualties in good time (Usoro et al., 2021; Rathore et al., 2022). Studies from the UK reveal that the waiting time for the arrival of an ambulance service is almost a 5<sup>th</sup> longer than what was obtainable in 2018/2019, while casualty of less severe cases has to wait for an average of 3 hours due to demand and increase service need (The Health Foundation, 2022). This proof suggests the need for improved and

adequate first aid knowledge and skills for the populace, especially young people whose data have revealed a higher chance of injury exposure resulting in increased fatality or death.

First aid refers to the immediate assistance given to an injured individual before trained medical professionals arrive. Emergency medical care, on the other hand, is the aid given to someone who suddenly falls ill or gets injured with the aim of preserving their life, preventing their condition from getting worse, or helping them recover. According to Kapoor et al. (2017), first aid refers to the evaluation and intervention conducted by a bystander to mitigate the impact of an accident or injury before receiving appropriate medical attention. The process involves quickly assessing the situation and handling it calmly, especially in life-threatening situations (Raje et al., 2017). However, some people have reported refraining from taking the appropriate course of action in an emergency due to a lack of knowledge or fear that legal action may be taken against them if something goes wrong during or after assisting the victim in need (Hogan, 2023). This is why the Good Samaritan law was introduced to safeguard members of the public from possible claims of negligence (IFRC et al., 2020). With the resulting situation of the emergency services worldwide and delays or substandard medical emergency service delivery by some countries, it has become significantly necessary for the majority of the population to possess adequate first aid skills to minimize the effect of the resulting outcome of accident or illness among casualties.

Swiftly implementing effective emergency management strategies can have life-saving consequences. This makes first aid one of the most important components of pre-hospital care systems. First aid training is designed to empower individuals of all ages, socio-economic backgrounds, ethnicities, and cultures with the understanding and skills relevant to handling health emergencies until trained professionals arrive. This is especially crucial in settings such as schools, where immediate access to high-quality healthcare facilities and skilled

professionals may not always be possible. Moreover, hazard exposure is yet to be ruled out, irrespective of recent modifications to infrastructural facilities.

School stakeholders and users of the facilities, such as the teachers, asserted that these facilities are built without proper care and consideration for standards and, as such, may collapse while in use and, on other occasions, go back to the same poor condition in no time (The Guardian, 2021; Maiyeri et al., 2022). A Guardian reporter noted that even though the state government made a recent effort to build a primary school, the community members are still waiting for weeks and months, expecting furniture and other learning equipment to no avail (The Guardian, 2021).

School-related emergencies may vary from region to region, country to country and the population group involved. The threat of a bomb, a fire outbreak, an electrical fault, flooding, medical emergencies such as difficulty in breathing, asthma, epilepsy, hyperglycemia or hypoglycemia, allergies, temperatures exceeding normal due to faulty boilers or inadequate ventilation, etc., are just some examples from developed countries like in the UK (National Education Union, 2019a; Department for Education, 2022). In some developing countries, Students may be exposed to the hazards identified above, including snake bites and foreign objects in the eyes, ears and nose. Fractures resulting from playing football and skin contact with sharp objects in the field, such as broken bottles, nails, and other hazardous materials, are commonly reported in schools (Okandeji-Barry et al., 2016; The Guardian, 2021). Hence, education providers must be aware of these emergencies because, without identifying these school-related emergencies, they would find it challenging to put appropriate measures in place to eliminate or minimise their effects on the school population or prevent them from happening.

The provision of healthcare services in schools is often neglected in many developing countries, indicating a lack of knowledge and education on first aid (Karadag & Yildirim, 2017). In Nigeria, most school environments are characterized by outdated facilities and

equipment, which increases the likelihood of emergencies that require immediate first aid response (Okandeji-Barry et al., 2016). Little is yet to be achieved as a recent report reveals that most public schools are in reprehensible condition and in most cases, the available facilities are not suitable for use in a learning environment, there are deterioration or nonfunctioning public or private latrines and as such students are forced to ease themselves in nearby bushes (The Guardian, 2021) which in fact exposes them to greater risk of hazards such as snake bites, stings, cuts, etc. It is widely recognized that school children are more physically active, neuro-sensitive, and prone to motor agitation, which can help them learn and understand new information quickly. However, Geetha (2016) highlighted that these behaviours can also lead to unexpected accidents that require immediate intervention. Therefore, first aid training is essential for students to learn how to respond effectively to emergency health situations, such as respiratory problems, choking, fractures, strains, sprains, nosebleeds, and cardiac arrest. Numerous studies have highlighted the significance of first aid knowledge and training in preserving lives and empowering students to become advocates for positive change within their school, home, and community (Okandeji-Barry et al., 2016; Onyeaso & Onyeaso, 2017; Giginyu, 2018). This study aims to examine the effect of training on first-aid knowledge emergency management abilities and the retention rate of secondary school students in the southern region of Nigeria.

The research focuses on the impact of a training intervention on first-aid knowledge and emergency management skills. It measures the post-intervention knowledge, post-intervention emergency management skills, and retention of these skills, which are the dependent variables. The training intervention is the primary independent variable, which includes notes, explanations, instructions, and simulated activities designed to improve knowledge and management skills. The baseline knowledge and management skills are participants' initial knowledge and skills before the intervention.

Demographic factors such as gender, class, age, and prior knowledge of first aid may moderate the effectiveness of the training intervention on post-intervention knowledge and management skills. Control variables are held constant to ensure the results are due to the training intervention. The control group, consisting of students from Obiaruku Grammar School and Abraka Grammar School, serves as a comparison group to evaluate the effect of the training. The experimental group, on the other hand, receives the training intervention and is compared against the control group. The interactive effect refers to the combined influence of multiple variables on the dependent variables. The study assesses if the interaction between training intervention, banner presence, previous knowledge, participant's class, age, school type, and gender affects the post-intervention knowledge or retention of first-aid skills. The main effect of the training intervention alone on post-intervention knowledge and emergency management skills is assessed through questionnaires and observation checklists.

The research examines how the training intervention impacts first-aid knowledge, emergency management skills, and learning retention rate, considering demographic factors and interaction effects (see Appendix E5 for deeper insight into the classification of variables for this study).

### **Statement of the Problem**

First aid knowledge and emergency management skills are critical competencies for individuals, particularly students, who are often first responders in emergencies. In secondary schools, the ability to promptly and effectively handle emergency situations such as injuries, sudden illnesses, and accidents can be life-saving. However, studies (Adesegun et al., 2019; Bosede et al., 2023) suggest that first aid knowledge and emergency management skills among

secondary school students, particularly in developing regions like Delta State, Nigeria, are limited and inadequately addressed in formal education systems.

In Nigeria, where accident rates and health emergencies are prevalent in schools, many students are left unprepared to respond effectively. According to a study by Adesegun et al. (2019), a significant proportion of students in Nigerian secondary schools lack the basic knowledge required to administer first aid, with fair knowledge accounting for 68.4% and 59.9% having poor practice due to poor form of training and absence of enabling factors such as despite the positive attitude recorded. This gap in knowledge increases the risk of fatalities and severe injuries that could otherwise be mitigated with basic first-aid intervention. Another study by Nwankwo and Eze (2019) found that fewer than 25% of students in Delta State reported any confidence in their ability to manage common emergencies such as burns, cuts, and fractures, highlighting the low extent of skill acquisition in emergency management. Similarly, another study reported that only a few teachers (19.6%) have knowledge of FA (Gharsan & Alarfaj, 2019), showcasing the extent to which FA knowledge is essential for students, as they are a good source of support to their peers. Studies from other African countries reported poor knowledge for 87.6% of their participants, who are predominantly secondary school students (Mutale. 2021).

The frequency of emergencies in schools, such as falls, sports injuries, and medical crises like asthma attacks, underscores the urgency of this issue. Studies indicate that school environments are hotspots for minor but recurring emergencies, with over 60% of teachers witnessing such incidents at least once a term (Sanni et al., 2022; Okandeji-Barry et al., 2016). This is because school students are vulnerable to emergencies due to increased physical and cognitive development activities. Supporting evidence suggest that teenagers and children of secondary school age, synonymous with high-school students, are more prone to experiencing

serious crises and accidents with severe outcomes (Afili et al., 2015; WHO, 2023). This may be attributed to their heightened inclination towards engaging in harmful physical activities and aggressive behaviours. Childhood injury continues to be one of the key factors contributing to illness and death in children (Krug et al., 2000; WHO, 2022). School health services assessment carried out by Sanni et al. (2022) in Nigeria reveals that none of the schools had either a sick bay or access to ambulance services in the event of an emergency. Despite this, the manifestation of the problem is such that first aid training is either sporadic or non-existent, and where training exists, retention of knowledge and skills tends to diminish over time without reinforcement (Eze et al., 2015; Onyeaso & Onyeaso, 2017).

Emergency services meant to be the best alternative for responding to emergencies in the community are not available, and reports have shown deficiencies in meeting the needs and expectations of the population. Irrespective of the economic growth in developing countries like Nigeria, emergency care services are under-resourced and not in operation in most states within the country, while in states where ambulance services are functional, there is evidence of continued delay in the emergencies system (Mac et al., 2019; Dacosta et al., 2020; Usoro et al., 2021). Furthermore, Suryanto et al. (2017) drawn from their review that these services are used for other non-emergency tasks instead of serving the purpose of providing a prompt and effective response to victims of injury, accidents, or ill health, largely due to underdeveloped emergency care structure, lack of funding and poor workforce. Adequate and correct delivery of first aid has become paramount, especially with the failure and delays of the emergency response system. Yet, studies have recorded poor knowledge and practice of first aid (Abuelqomsan et al., 2017; Awad et al., 2017; Ganfure et al., 2018; Habeeb & Alarfaj, 2020). Moreover, these results from a lack of training, or others may have evidence of first aid training but have received this training from improperly planned educational training methods and

techniques, which result in poor knowledge, practice, and attitude towards first aid. The high failure rate was partly attributed to the teaching methods, lack of adequate learning resources and the use of unqualified teaching or training staff (Mupa & Chinooneka, 2015; Ghoshal et al., 2018).

The lack of adequate first aid training among students and staff in Nigeria has led to ineffective handling of emergency health situations (Eze et al., 2015; Onyiaso & Onyiaso, 2017). Children and adolescents spend a substantial part of their time in educational institutions, but secondary schools have overlooked health services, resulting in insufficient awareness or education on emergency health conditions within schools (Masih et al., 2014; Bhatia et al., 2011). Unfortunately, the level of first aid management skills in secondary schools in Delta State is still unknown (Nigerian Red Cross Society Delta State Chapter, 2018). Therefore, providing students with proper training in first aid is crucial. A fundamental training plan can be effective for peer education focused on acquiring skills. By sharing information with the community, students can help raise awareness about school and community emergencies, ultimately reducing the number of fatalities associated with such incidents. Consequently, it is essential to mandate teaching basic first aid skills in all educational institutions, as indicated by various studies (Afili et al., 2015; Hoque et al., 2017; Mirza et al., 2017).

The implications of this problem are severe. Students without the necessary first aid skills are less likely to intervene in emergencies, leading to delayed care and increased morbidity. Additionally, as schools are increasingly seen as institutions responsible for the holistic development of students, including their safety and well-being, the lack of training in emergency management skills reflects a gap in the education system's preparedness to protect students. The failure to integrate comprehensive first aid training also leaves students vulnerable outside of the school environment, where such skills are equally crucial.

Therefore, it is necessary to examine the effects of structured first aid training on students' knowledge, emergency management skills, and learning retention. Exploring the knowledge of first aid-related incidents and the extent to which training impacts skill acquisition and retention can inform educational policies and interventions aimed at improving school safety and student preparedness in Delta State, Nigeria.

### **Purpose of the Study, Research Aims, and Objectives**

This quantitative study aims to investigate the impact of training on the first-aid knowledge, emergency management skills and learning retention rate of secondary school students in Delta state Nigeria.

It is widely recognised that the assistance given to victims in the first few minutes of an emergency situation is crucial, as it can significantly impact their future health and quality of life. This has been supported by various studies over time, including Peterson et al. (1999) and Afili et al. (2015). The physical fitness of the individual can determine the quality of life of individual, the ability to think, reason and procure solutions to problems, how individuals interact with their social environment, and other comorbidities are all factors that may affect the quality of life. Significant time could go by before the ambulance and trained rescue personnel arrive in emergencies. Time and the correct practice are both critical factors that promote recovery and prevent complications in delivering first aid. It is crucial for bystanders and the public to possess the confidence and expertise to offer initial medical assistance accurately to those in need (Jaskiewicz et al., 2022; Hussain & Redmond, 1997; Goniewicz et al., 2002).

In relation to the School Health Programme (SHP) in Nigeria, it was observed that over 50% of the schools exhibited substandard performance in the provision of health services. The assessment of school health services was conducted by evaluating the presence of a clinic

located on the school premises or within a 15-minute distance by foot, the availability of transportation options to facilitate the referral of extremely unwell or injured students, and the presence of a properly stocked first aid box. The findings revealed that only 40.5% of the educational institutions possessed on-site school clinics or clinics within a 15-minute distance of walking. Additionally, a minimal proportion of schools (7.1%) demonstrated indications of having transport options readily available for emergency situations (Bosede et al., 2023).

Similarly, risk awareness is essential for everyone intending to administer first aid. However, lack of knowledge has created barriers to assessing risk before providing first aid. Administering first aid requires careful evaluation of the situation before intervention. If someone is in a life-threatening situation, like an accident scene, it's crucial to immediately call the country's corresponding emergency number, like 911. Contact with blood and bodily fluids can transmit viruses and bacteria, including HIV and hepatitis C. In attempting to reduce exposure to potential danger and minimise the spread of disease, it's recommended to use latex gloves (Alic & Mertz, 2020). While rescue breathing should be performed with a mouth-to-mouth barrier device, it may not fully protect the first aid responder from infection (Alic & Mertz, 2020; Idland et al., 2023). Although latex gloves were recommended, more recent findings have shown that this may cause further skin irritation or allergy (Odle & Allhoff, 2020). These main knowledge and awareness areas can be developed through training or research. While previous research has examined the impact of first aid training in both Nigeria and other countries (Bollig et al., 2009; Bollig et al., 2011; Wafik & Tork, 2013), there is a limited amount of research specifically focused on Southern Nigeria. Yet several empirical studies have reported that the confidence level to respond to emergencies significantly improved after first aid training and hands-on practice (Manuel et al., 2022; Jaskiewicz et al., 2022). This highlights the importance of conducting this study.

Also, most of the studies in this area have explored the use of methods such as cross-sectional study, quasi-experimental study design and specific experimental study design, all of which are limited in overcoming pre-test sensitization, which occurs when the post-test score of participants are influenced due to exposure to pre-test questions (Frey, 2018). None of these studies has considered the use of the Solomon-four stage as their design of choice to eliminate possible pre-test sensitization. Moreover, some of the studies reviewed have no clear explanation of the model used in the design of the first aid intervention. Hence, with the rising need for research in these areas, there is a need to provide extensive insight into the effect of employing a more robust methodology and its impact on first aid.

The study aims to evaluate how well participants understand first aid and to provide training that focuses on the fundamental principles and goals of first aid. The training also covers the necessary skills needed to handle specific emergencies commonly encountered in school settings. These emergencies include wounds or injuries, unconsciousness, presence of foreign bodies in the eyes, nose, ears or mouth, fracture, choking, epilepsy, and other disorders such as convulsions, snake bites, and stings. In addition, previous studies have shown that training significantly enhances knowledge (Ibrahim et al., 2016). Therefore, this training is expected to improve the participants' comprehension of first aid. The research aims to measure the impact of the training on the participants' knowledge, attitude, and practice in providing first aid. The approach explored further identifies the specific section of the first aid training module that demonstrates a notable increase or decrease in knowledge. The World Bank (2019; 2018) express their discontentment with children's learning outcomes worldwide, with the theme "Being in school is not the same as learning". They emphasised that education or training that is well-delivered benefits individuals and society by enhancing long-term economic growth, innovation, and poverty reduction, knowing that an effective education turns aspiration into reality. Therefore, the methods used and the different resources for supporting and aiding

learning and retention were assessed for their effectiveness and suitability for the level of learners. Whether training resources are better when combined with other methods or when used singularly was drawn and assessed based on the evaluation of the outcomes. Based on the assignment of the schools following the Solomon Four Stage design, this assessment was done before, immediately after, and subsequently over one month, depending on the schools and the assigned categories.

Therefore, an outline of the aim and objectives of the study is highlighted below.

### **Aim**

‘To investigate the effect of training on the first-aid knowledge, emergency management skills and learning retention rate of secondary school students in Delta State, Nigeria.’

### **Research Objectives**

The study objectives are to;

1. Assess the baseline knowledge of first aid among secondary school students in Delta State, Nigeria.
2. Evaluate the effect of first-aid training on the immediate knowledge acquisition and FA emergency management skillset of secondary school students in Delta State, Nigeria
3. Examine the influence of intervening factors or demographic characteristics, such as age, gender, and prior exposure to first-aid situations or instructional methods, on the immediate knowledge of secondary school students following first-aid training in Delta State.
4. Assess the learning retention rate of secondary school students in first aid for emergencies (knowledge level and emergency management skills) one month after the training.

5. Ascertain the factors that have an interactive effect on the post-intervention and learning retention rate of first aid skills among secondary school students in Delta State

Note: variables considered include training intervention, presence of a banner, previous knowledge, participant's class of study, age, and gender.

## **Research Questions and Research Hypotheses**

The research questions (RQ) outlined below guided the study.

RQ1. What is the pre-intervention (also referred to as baseline) knowledge of first aid among students in secondary school in Delta State, Nigeria?

RQ2a. How does first-aid training influence the immediate knowledge acquisition of secondary school students in Delta State, Nigeria, compared to those who have not received training?

RQ2b. Does first-aid training improve FA emergency management skillset of secondary school students in Delta State, Nigeria?

RQ3: Which intervening factors or demographic characteristics (such as age, gender, and prior exposure to first aid situations) influence the immediate knowledge of secondary school students following first aid training in Delta State?

RQ4a. What is the learning retention rate of secondary school students towards first aid for emergencies one month after the training?

RQ4b. What is the difference between participants' first-aid emergency management skills immediately after the intervention and one month after the training?

RQ5a. What factors have an interactive effect on the post-intervention and learning retention rate of first aid skills among secondary school students in Delta State?

RQ5b. What is the magnitude of improving the FA knowledge of experimental participants through varied instructional methods, as determined by binary logistic regression analysis?

### ***Hypotheses***

The following null ( $H_0$ ) and alternative ( $H_a$ ) hypotheses were developed based on the above-proposed research questions.

$H_{01}$ . After the training, no significant differences existed between the experimental and control groups' knowledge scores on First Aid for emergencies.

$H_{a1}$ . A significant difference was observed in the experimental and control groups' knowledge scores on First Aid for emergencies after the training.

$H_{02}$ . The difference between the experimental group's pre-intervention and post-intervention scores was insignificant.

$H_{a2}$ . There is a significant difference in the experimental group's scores before and after the intervention

$H_{03}$  The demographic variables (i.e. age, class, gender, prior knowledge) of the participants do not significantly affect the outcome of FA training in Delta State, Nigeria.

$H_{a3}$  The demographic variables (i.e. age, class, gender, prior knowledge) of the participants significantly affect the outcome of FA training in Delta State, Nigeria.

$H_{04}$ . There are no significant differences between participant learning retention rates immediately after the training and one month after the FA training.

$H_{a4}$ . There are differences between participant learning retention rates after the training and one month after the FA training.

## **Nature and Significance of the Study**

### ***Nature of the study***

The study employs a quantitative research approach that uses a four-stage Solomon approach: an experimental study design. The design is used to control the likely threat to internal and external validity that may result from using a pre and post-test method (Allen, 2017). The technique that was used to select participants for the study was the stratified random sampling technique; it involves the division of the entire population into subgroups known as strata, and thenceforth, random selection is used to select subjects from the different strata (Latham, 2007).

Consequently, the sample size calculator was used to determine the number of samples (sample size) collected through the above sampling technique as acknowledged (ClinCalc.com, 2017; Rosner, 2011) for a randomized control trial. This technique aims to ascertain the minimum number of subjects and ensure adequate study power. Adjustment for the dropout rate ensures that each hypothesis fulfils the desired statistical significance.

Afterwards, data were collected through the questionnaire and observation method to ensure that the study adequately covered all forms of the practical and theoretical aspects of first-aid understanding because the knowledge of first aid entails some practical demonstration and might be challenging to measure by using a single method. Triangulation between instruments strengthens quantitative research and provides an advantage in reducing the weaknesses and biases that may result from using one instrument (Yeasmin & Raham, 2012). Similarly, providing first-aid requires appropriate action. Hence, observing participants when providing first-aid for victims gives the principal investigator in-depth analyses of the participant's proficiency in providing first aid, which can enhance clearer and more reliable results. Meanwhile, before administering the instrument, the study follows the ethical principles guiding the use of human participants in research. The school authority and

participants were adequately educated on the objective/ benefits of the research, and consent was sought. Also, reliability is ensured by pre-testing the instrument in 10% of a population with similar characteristics to the study population, while experts in the field of study critically examine and scrutinise the instruments for face and content validity.

Moreover, data (quantitative) collected from the participants were analysed by utilising the 'Statistical Package for Social Services (SPSS) version 20' for descriptive and inferential statistics set at a p-value of  $<0.05$ . All variables were initially analysed for descriptive statistics such as frequency, percentage distribution, standard deviation and means. Inferential statistics such as independent t-tests, paired t-tests and chi-square tests were used to draw inferences based on the set hypothesis. Content analyses for quantitative purposes are used to code some of the information observed by identifying the respective characteristics of the text/ observed management skills. It further classifies data from observations and systematically places them into different categories to highlight essential findings. In support of these analytical methods, Coe and Scacco (2017) discuss the importance of careful utilisation to ensure researchers or observers of specific studies consistently and adequately represent specific observations.

### ***Significance of the study***

The study is intended to add value to the student's participation in health care in secondary schools. In case of a medical emergency, it is essential to provide immediate care or treatment before professional medical assistance arrives. This is referred to as first aid and can involve treating minor injuries or conditions or even performing lifesaving CPR. It may be necessary to stop bleeding or stabilize an injured person until help arrives. Children are particularly susceptible to injuries and emergencies, so having a well-stocked first-aid kit in every house, car, nursery, and school is essential. Everyone should be trained in providing first aid and CPR to ensure prompt medical attention is given in an emergency. Prompt and adequate medical attention can save lives, prevent infections, and speed up healing (Alic & Mertz, 2020),

which is why the study seeks to address the lack of knowledge of first aid documented in previous studies by assessing the knowledge of the study target population, provide training intervention targeted at secondary school population in Nigeria following a well-designed training procedure and assess the outcome of the training on the knowledge and learning retention of the students.

For example, the training will enhance students' understanding of physical and health education and give them a better experience of the relevance of managing first aid. Also, the findings from the survey will inform policies and educational practices in the ministries of education at both state and federal levels to promote activities that will reduce the incidence of death of school students due to lack of prompt medical attention. Likewise, the parents of students will be assured of their children's survival, especially the ones with critical conditions like a seizure, heart attack, or fracture, when emergency events unfold in school playgrounds, even when health facilities are not nearby. Besides the benefit for the parents and students, non-governmental organisations like the Red Cross Society will benefit from having more excellent coverage of the training and expanding awareness of the importance of first aid among students in Delta State.

Moreover, trained students can further exercise their knowledge even at home or in their communities to help save a life when faced with situations needing first aid care. Also, much attention has been given to first aid for road accidents and disasters. Very little attention is paid to schools (primary and secondary) where bone fracture, seizure, bleeding, and other health complications occur co-incidentally from playing ground. Therefore, training students in first aid can help reduce the fatality and severity of these complications and, in the long run, save lives in the schools and community at large.

## **CHAPTER 2: LITERATURE REVIEW**

First aid is a vital lifesaving technique for preventing and promoting societal health (Pie et al., 2019; Ekaprasertia et al., 2018). It is essential in developing countries like Nigeria, where the emergency care system is still underdeveloped (Adesegun, 2019; Nwauwa, 2017). The development of Nigeria does not transit in meeting the primary and necessary infrastructure required for a nation which is considered the largest black country in Africa, with over two hundred million population situated in west Africa (Awoyemi, 2019; Adesegun et al., 2019; Mac et al., 2019). Even in developed countries where there are stable ambulance services, the significance of FA understanding among the general population can again not be undermined because the care provided within the first few minutes of accidents can help save lives and reduce possible complications (Hammett, 2016, 2018; Rogers et al., 2015). In most cases, an ambulance service may not have access to the victim within the first few minutes. However, persons around the victims are often the first rescue assistants, and this is why the benefit of FA training and adequate knowledge on handling an emergency cannot be overestimated. The current section reviews varied and relevant literature to develop a theory and conceptual framework on which the effect of FA was based.

The concept of FA encompasses its occurrence and need in school settings, including basic principles of emergency care. Also, the attitude, knowledge and management of FA in schools were discussed by reviewing varied and current pieces of literature for relevant content. After that, the section explored the presentation and prevalence of some of the most common conditions requiring FA in schools. Based on the incidents identified, an appropriate outline of the specific emergency skills to correctly manage injuries and common illnesses in schools was described, considering the evidence from the literature. These may include epileptic seizures, bleeding, CPR, sprain, choke, shock, and others like bone fracture, convulsion, snakebite,

diabetes, and the avulsed tooth, respectively. Besides, the level of retention, FA training and impact, plus the relationship between these factors and other sociodemographic characteristics, were delved into through critical analysis of the various literature reviews. The last session of the review looks at the global perspective of FA training in schools and an appraisal/ summary of all the discussed content.

The databases MEDLINE, PubMed, MEDLINE, CINAHL, Elsevier, EMBASE, ERIC, ScienceDirect, EBSCO, Google Scholar, Google, ResearchGate, and PsycINFO were searched to identify relevant publications. PEO (population, exposure & outcome)/PICO (population/patient, intervention, comparison & outcome) framework was used to generate appropriate and relevant search terms to ease the retrieval of valuable resources as supporting evidence for this review. The C in the PICO framework stands for comparison, which considers the different interventions by invariably adjusting for the absence of this in the PEO framework, which is more bent on looking at the exposure of a particular experience, as opined by Heaslip and Lindsay (2019). Included are searches describing management for FA, attitude, practice, training, retention, emergency preparedness and assessment among university students, secondary school students, primary school students, bystanders, and the general population.

Also, individual emergency FA cases commonly encountered in schools were singled out in some instances and merged with other searched terms with the use of appropriate Boolean operators. The emergencies included shocks, choking, burns, fractures, avulsed teeth, cardiac arrest or difficulty breathing, bleeding, seizure, asthma, etc. The literature included a five-year specification from the date of the search. However, a few relevant studies are included as part of the literature, even though they do not fall within the indicated range within the last five years. The selected research possesses specific critical criteria that are most informative to start the basis of significant research in FA. More than 91% of the consideration is given to

peer-reviewed articles. At the same time, the other percentage is allocated to non-peer-reviewed but relevant articles on the topic of discussion. It was validated for currency and reliability using supported peer-reviewed works of literature.

## **Theoretical Framework**

According to scholars, the essence of theories is to improve descriptive control of research concerns, exemplifying characteristics of incidence in an innovative form to provide value for predictive actions (Thomas, 2017; Henderikus, 2007). Consequently, a proper selection of theory aids in describing the possible outcome of First Aid (FA) training, attributing the occurrence, and predicting the result of the training among the study population. The term training does not have a clear-cut definition. Still, in a broad context and within the confines of this study and in accordance with Tharenou et al. (2007), it is the systematic gain and promotion of knowledge, skillset or attitude towards a concept to effectively perform a task to improve performance. It is a deliberately planned process to modify behaviours to achieve optimum results. Training is carried out with the view that participants have higher individual participation performance. Among the priority action areas for promoting health, as highlighted by the Ottawa Charter, are “strengthen community action for health and to develop personal skills” (WHO, 2020).

Given the above priority action, studies have shown gaps in the emergency response services in Nigeria (Nwauwa, 2017), and yet there is an inadequate level of first aid management among the community members and in secondary schools (Onyeaso & Onyeaso, 2017; Dumeier et al., 2017; Eze et al., 2015). Therefore, there is a growing need to strengthen community action and personal skills by providing first aid training. In this light, the study adopted the PRECEDE-PROCEED health promotion and education model and the ADDIE

training model. The selected models are adapted to explain the need for the delivery of first aid and provide measures for intervention and means to appraise the success of the training effect of FA amongst students in selected secondary schools in the Southern region of Nigeria while embedding a multisensory approach in both models. The Precede-proceed model, Aldie model and multisensory approach integrate variables from the understudied research with the established knowledge drawn from the existing theoretical frameworks to aid the interpretation of the findings. It assists the researcher in establishing the parameters of the necessary data, recognises deficiencies in understanding, formulates research enquiries, hypotheses, and procedures, and finally, uses this knowledge to direct the examination and elucidation of results.

### ***The PRECEDE-PROCEED Model in the Context of FA Training***

The utilisation of the PRECEDE-PROCEED model in understanding the outcome of FA instruction amongst secondary school pupils gained its ground from its innovative design. It is a planning paradigm for delivering programmes, policies, and health education health promotion (Green & Kreuter, 1992). The PRECEDE-PROCEED Framework for health programme planning and evaluation has been developed on a consistent foundation laid by Dr. Lawrence Green and his colleagues, students, postdoctoral fellows, and collaborators over the past 50 years. The theory expresses valued methods for predicting the action of the plan through careful procedures to organise, execute, and evaluate programmes and policies related to training in FA. According to research, the term PRECEDE means “Predisposing, Reinforcing, and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation” (Kim et al., 2022; Green et al., 1994; Whitehead, 2009). It is worth noting that this aspect of the model identifies the provision of first aid training through an adequate multisensory teaching approach (Syahputri, 2019; Alwaqassi, 2017; Ashbaugh, 2016) as an educational factor that influences

change in the community. Accordingly, the outcome from the empirical study of Boardman (2019), carried out among teachers in secondary and primary schools, revealed that embedding a multisensory approach to teaching offers enormous value for the entire teaching process, including the individual learners.

Similarly, studies have shown that after a successful multisensory approach to teaching, the memory is triggered more quickly the next time there is contact, whether through a multisensory or unisensory stimulus. Multisensory methods capitalise on the significance of kinesthetic (body-based) motions and the influence of the senses on the learning process. Using more than one sense to form mental representations of things, concepts, or phenomena help pupils in schools engage with them more deeply, improving long-term retention (Ferreira & Vasconcelos, 2020). A mixed method-research approach looked at how using many senses can help children in a primary school in Porto, Portugal, learn about geosciences. Pre- and post-tests were used to evaluate learning outcomes, while a confidential survey gathered data on motivation and other attitudes. Students who attended multisensory sessions had significantly higher mean post-test scores with strong motivation levels. As a result, multisensory instruction benefits geoscience learning and motivation, and the researchers proposed that appropriate measures should be taken to advance its full and optimal utilisation in educational settings (Ferreira & Vasconcelos, 2020). Hence, the current study follows and acknowledges relevant evidence-based practice that promotes effective learning and retention by integrating the multisensory approach into the underpinning health promotion models (PRECEDE-PROCEED) and educational instructional guide (ADDIE) for the study.

The “PROCEED indicate Policy, Regulatory, and Organizational Construct in Education and Environmental Development” (Whitehead, 2009). The process includes a pilot

study to examine and improve the first aid training and assessment strategies, implement the procedure, and test the effectiveness under an experimental condition. The leading research is intended to evaluate the intervention process, the time frame for retention and the effect on the attitude and outcome relating to the quality of life of the study population. Research evidence has shown that the concept of PRECEDE-PROCEED is useful in organising, executing, and evaluating health programmes (Johnson, 2016; Binkley & Johnson, 2014).

Moreso, a systemic review and meta-analysis conducted by Kim et al. (2022), which aimed at reviewing the effectiveness of the precede proceed model on intervention studies, shows that studies that have applied this model revealed a significant improvement in knowledge. Based on the review, the study reported that most of the intervention providers were healthcare professionals, and the time allocated for the intervention was between 20 to 240 minutes per session. Also, 42.3% of the reviewed articles included studies where care and educational programmes were offered. The study suggested that a health promotion model such as the precede-proceed model is very effective in improving the knowledge of the participant. Since the model allows for evidence-based practice in promoting health through intervention, the current study has applied this renowned model as a guide to planning, implementing, and evaluating First aid intervention in secondary schools.

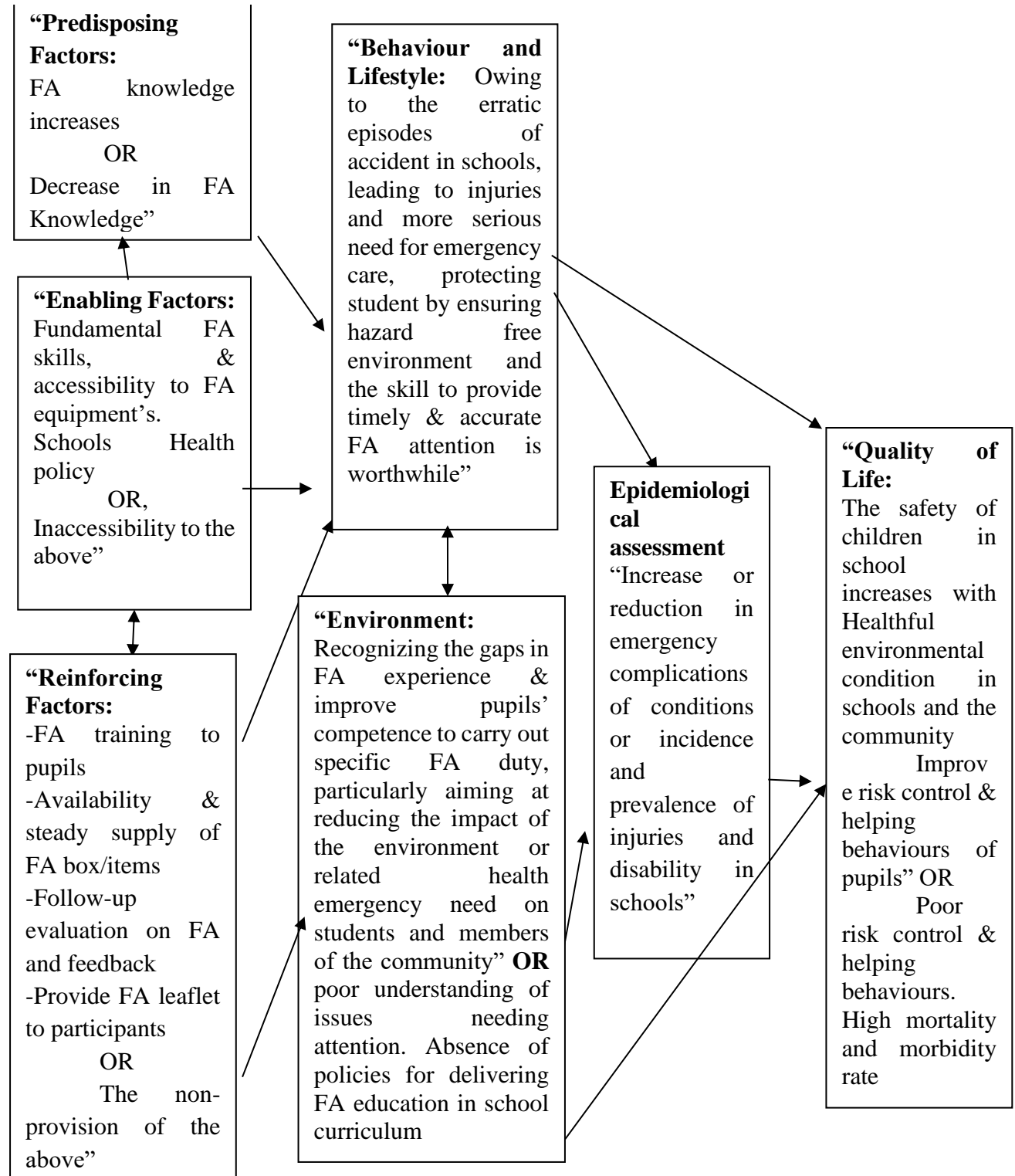
***Described below are three significant steps of the model.***

The first step is the review of epidemiological factors, which describes elements of recorded transmission/control of health problems and the general attributes of the identified at-risk groups. As a result, data such as morbidity records and factors hampering FA's knowledge and the provision of basic care for emergencies among pupils in secondary schools are collated as a component of the information under review.

The second step involves the behavioural and environmental assessment phase of the planning. The stage requires documentation of issues that are linked with the provision of care for FA. For individual risk factors, there is a changing rate for Behavioural and environmental objectives. Following these changes, the number of expected alterations for the risk factors is standard practice. Also, the attitude towards the provision of FA and the pupils' vulnerability to threats from the physical environment, which are aspects of the environmental factors, are recognised.

In the third step, the predisposing factors are precursors to behaviour that are motivated by actions. Perceived needs, abilities and knowledge are examples of these factors. At the same time, environmental situations that facilitate individual or organisational performance are referred to as enabling factors. People are motivated because the enabling factors present the opportunity for individuals to act in a specific manner. Some of the aspects included in this phase are availability or accessibility to resources, supportive policies, and current skills vital to modifying behaviour and adapting to environmental conditions. Another point of the third step is the reinforcing factors that provide a reward system or incentives for the behaviour to continue. The reinforcing element includes support from the community and significant influence from personnel such as professionals in health care, students, close relatives/guardians, teachers, and the government. It may also include physical or social benefits. A critical review of the steps identified in the model shows that the several predisposing, enabling, and reinforcing components are likely to act as impediments or facilitators to the process (see Fig 2.1 for details).

**Figure 2.1** “Applying the PRECEDE-PROCEED Model to the Outcome of FA Instruction among Students in Secondary Schools”



### ***The ADDIE model.***

Apart from the “PRECEDE-PROCEED model,” the ADDIE model was found useful because of its relevance in developing training in the Instructional Systems Design (ISD), the basis for which the ADDIE model is hinged. First aid training in this study is to be carried out through an instructional process aligning with the concept of ADDIE. The idea of ADDIE originated in 1975 at Florida State University's Centre for Educational Technology, thereafter, the model was adapted for use by the United States Army (Branson et al., 1975 as cited in Bouchrika, 2024; Muruganantham, 2015). It is a generic process in ISD. Researchers conducted a meta-analysis study using 58 articles that reference the ADDIE model. However, only 23 of these articles were deemed suitable for their analysis. The findings suggest that the ADDIE model is suitable for all online educational environments, regardless of the instructional requirements. Effective teaching practices include multimedia presentations, feedback, interactive exercises, individual and adopting strategies that are collaborative focused learning, and the responsibility of the educator (Spatioti et al., 2022).

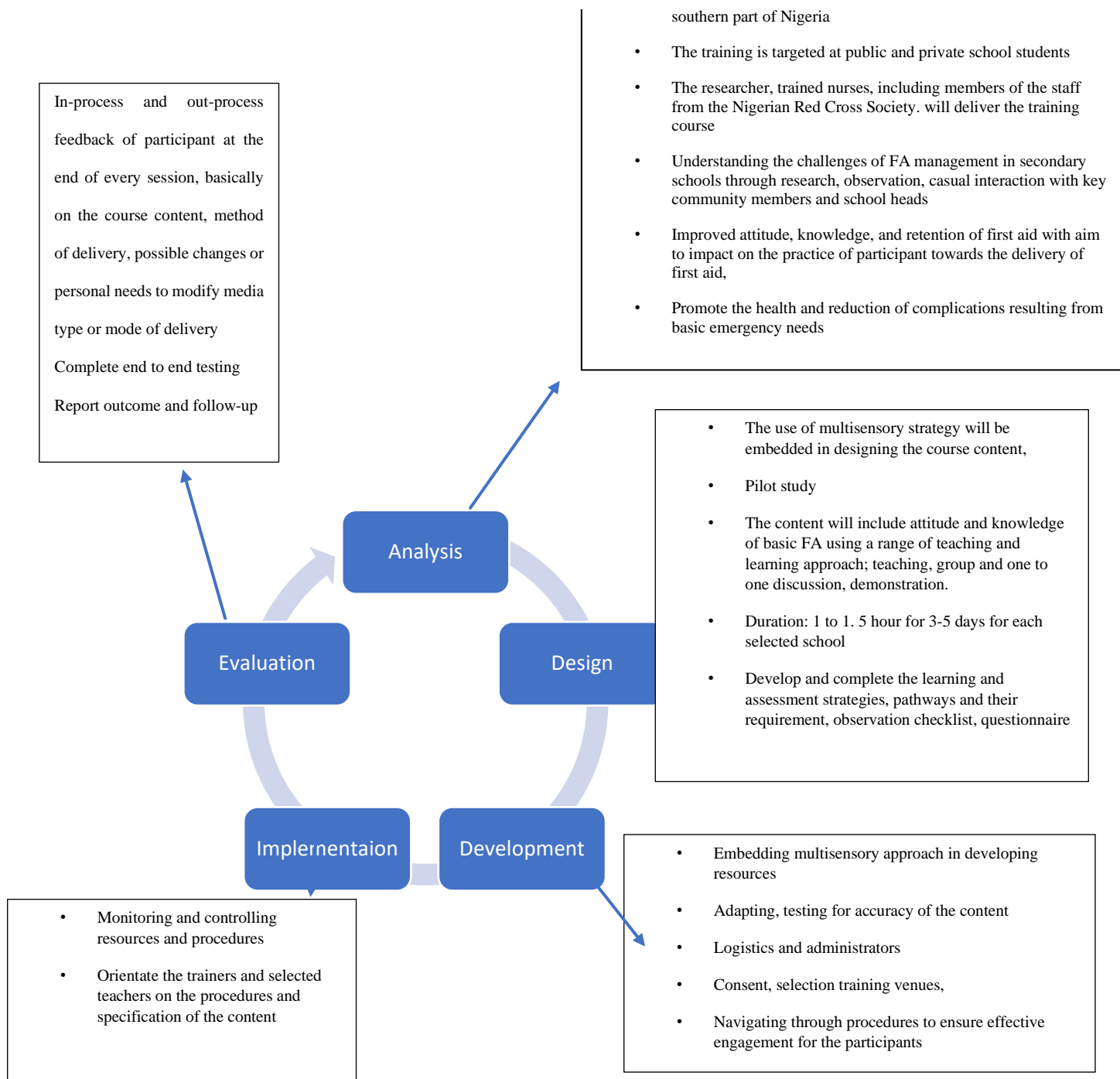
In distance education an asynchronous approach was preferred. Teaching methods are greatly affected by the conditions in which they occur and can be classified as either excellent or poor (Spatioti et al., 2022). Good teaching practices involve teaching that is tailored to each individual's needs, encourages collaboration, and sets high standards. It should use instruction that is interactive, practical, authentic, and engaging. Learner engagement is also influenced by the course characteristics, thoroughly designed, taught by highly qualified instructors, and supported by reliable technology. When planning education, it is essential to consider learners' sociocultural context, motivation, and curriculum expectations (Trust & Pektas, 2018; Turker, 2016).

The ADDIE model, a well-structured process for various educational environments, has a rigid linear and hierarchical structure that may limit creativity (Abernathy, 2019). Success in

each stage is a prerequisite for the next, and strict adherence to a methodology can be limiting. The model's adaptability and simplicity make it popular, inspiring those building a different design. The examined model has faced criticism in recent years for not meeting modern requirements, but some researchers have suggested adapting existing models like ADDIE for virtual reality environments (Van Rooij, 2010; Draper-Rodi, et al., 2018; Ali et al., 2021). This adaptation allows for a methodical assessment of student behaviour, followed by providing accurate feedback to improve their performance (Yu et al., 2021). It also creates innovative and useful online spaces, enhancing academic performance, motivation, and involvement (Salas-Rueda et al., 2020). Additionally, this model is designed to generate learning outcomes that steer towards improved levels of knowledge, which is crucial for improving the learning process (Hadullo, 2021). Higher cognitive demand levels are required, making learning a creative process and emphasizing the importance of creativity in knowledge construction. Learners with higher proficiency in skills are increasingly important in the contemporary competitive landscape (Puzziferro & Shelton, 2008; Adamantia et al., 2022).

Overall, the ADDIE model is widely judged as a valuable tool for instructional design as it outlines effective educational techniques (Adamantia et al., 2022). It represents the five words, analyse, design, develop, implement, and evaluate, in the flow chart presented in Figure 2.2. As stated below, Reiser and Dempsey (2012) explained the model in the five phases, while the researcher linked it to first aid training, as shown in Figure 2.2.

**Figure 2.2** “Applying the ADDIE model to the Effect of FA Instruction Amongst Secondary School Pupils.”



Source: Adapted from Reiser and Dempsey (2012) with modification and application to this study

Apart from the “PRECEDE-PROCEED model,” the other model was found useful because of its relevance in developing training in the Instructional Systems Design (ISD), the basis for which the ADDIE model is hinged. First aid training in this study is to be carried through an instructional process aligning with the concept of ADDIE. The ADDIE model was designed by McGriff (2012). It is a generic process in ISD. Researchers conducted a meta-analysis study using 58 articles that reference the ADDIE model. However, only 23 of these articles were deemed suitable for their analysis. The findings suggest that the ADDIE model is suitable for all online educational environments, regardless of the instructional requirements. Effective teaching practices include multimedia presentations, feedback, interactive exercises, individual and collaborative learning strategies, and the role of the educator. The provision of well-structured courses, access to qualified instructors, and dependable technology all have an impact on student involvement (Trust & Pektas, 2018). The sociocultural environment of learners, their motivation, and the expectations of the curriculum must all be taken into account while creating an educational programme (Turker, 2016).

The ADDIE model, a well-structured process for various educational environments, has a rigid linear and hierarchical structure that may limit creativity (Abernathy, 2019). Success in each stage is a prerequisite for the next, and strict adherence to a methodology can be limiting. The model's adaptability and simplicity make it popular, even inspiring others attempting to make a difference in the design. The examined model has faced criticism in recent years for not meeting modern requirements, but some researchers have suggested adapting existing models like ADDIE for virtual reality environments (Van Rooij, 2010; Draper-Rodi, et al., 2018; Ali et al., 2021). This adaptation allows for practical analysis of student behaviours and targeted responses for improvement (Yu et al., 2021). It also creates innovative and useful online spaces, enhancing academic performance, motivation, and involvement (Salas-Rueda et

al., 2020). Additionally, this model is capable of designing learning outcomes that encompass higher levels of knowledge, which is crucial for improving the learning process (Hadullo, 2021). Higher cognitive demand levels are required, making learning a creative process and emphasizing the importance of creativity in knowledge construction. In today's competitive environment, having advanced skills has become increasingly valuable for learners (Puzziferro & Shelton, 2008; Adamantia et al., 2022).

Overall, the ADDIE model is widely recognized as a valuable tool for instructional design as it outlines effective educational techniques (Adamantia et al., 2022; Spatioti et al., 2022). It represents the five words; analyse, design, develop, implement and evaluate in the flow chart as presented in Figure 2.2. As stated below, Reiser and Dempsey (2012) explained the model in the five phases, while the researcher linked it to first aid training, as shown in Figure 2.2.

### **Concept of first aid**

Often, delay in receiving the required medical treatment or care can lead to the death of injured victims, which can be avoided by resuscitating the individual; this action is also called FA. First aid is well-described as the earliest care offered to provide aid to an individual who has been involved in an accident, suffered an injury, or experienced a sudden illness preceding when qualified medical personnel arrive (Bandyopadhyay et al., 2017). First aid involves a series of simple techniques that are lifesaving. And which individuals with little or no paramedical knowledge can execute with or without minimal paraphernalia (Singletary et al., 2015; Markenson et al., 2011). The intervention and assessment performed by a bystander or even the victim in the absence of medical equipment to save a life, make the victim more

comfortable or reduce bleeding or pain is noted as first aid (Markenson et al., 2012). IFRCS (2009, 2010) believes strongly that first aid is a useful life-preservation mechanism at schools. It is the helping behaviour or care provided initially for a chronic or enduring condition resulting from injury or disease. (Bandyopadhyay et al., 2017). Today, FA is offered across a broad spectrum of people, including suicidal-depressed persons (Jorm et al., 2018).

Similarly, Karys et al. (2015) opined that FA involves simple rescue procedures and activities performed by any individual at the place of the accident targeted at maintaining the basic vital parameters of life before the paramedic's arrival. It includes the use of available or nearby medicals or therapeutics. This period between maintenance of emergency and attendance by medics is termed the “*golden hour*”. The hour is golden because it is a crucial aspect of FA as it largely determines the survival or criticality of the individual health afterwards. Accordingly, research conducted in Australia shows that out-of-hospital cardiac arrest is 9%, and it is far below 56% and 37 % recorded in Seattle & London, respectively. The research concluded that the number of people trained to administer prompt and adequate CPR in these areas is higher than in the study area (Australia Mine Safety Journal, 2014). The assumption that the Golden Hour is hinged on is that victims who received care within 60 minutes of exposure to hazards or ill health are likely to recover with reduced complications (Rogers et al., 2015).

On the contrary, after this period, morbidity and mortality are likely to increase. The time specification for the golden hour varies depending on the emergency or injury. For instance, the time frame needed to address victims of traumatic psychological injuries like mental health trauma should be within 30 days of the disaster (World Health Organisation, 2011) as opposed to the 60 minutes or less required for physical injuries (Rogers et al., 2015). Administering first aid is a moral and legal obligation of bystanders at an accident scene. First

aid includes psycho-social support for emotionally stressed persons from traumatic events or injuries that may have occurred in the past (IFRCS, 2012).

Furthermore, it encompasses a set of trained manoeuvres or skills that are provided to an injured person before the intervention of medics (Singletary et al., 2015) and can be done by any person from any location (Schunemann et al., 2013). It can involve performing procedures like CPR, stopping bleeding using an evaluation and pressure method, and dealing with an unconscious patient by understanding the importance of placing them in a recovery position to prevent choking and ensure their airway is clear. Once the patient is in a safe position, calling for medical assistance as soon as possible, i.e., informing ambulance services to move the injured individual to the hospital, is crucial. The first aider can be described as the primary contact that provides the first aid measure, recognises the challenge, assesses and prioritises the most critical condition, avoids mistakes at all costs, and has previous FA training (Behairy & Al-Batanony, 2016). The first aider uses his/her discretion to perform additional measures, if necessary, before the arrival of a professional medic.

First aid was mentioned for the first time in 1099 when the religious order of knights was given training of medical treatment to people wounded during the crusades. Not earlier than 1878, Ducan and Shepherd, who were military officers, established the concept of FA teaching to non-military personnel. They penned a comprehensive teaching note for the training, and the first course on first aid was carried out with a medical doctor in a church in Woolwich, London, in 1878 (Castro, 2010). In Nigeria, the Red Cross Society is the primary charity organisation that fosters FA activities among residents of the country. The society started its operations way back in 1917 when funds were raised to give relief to soldiers returning from World War 1. The Nigeria branch of the Red Cross sprung up from the British Red Cross and was opened in Lagos in 1951. However, in February 1961, the Nigeria Red

Cross Society became independent and was listed as “the 86<sup>th</sup> member nation of the International Red Cross and Red Crescent Committee” (Nigeria Red Cross, 2018). Unofficially, in antiquity, first aid concerning warfare has been recorded as a practice for centuries, where bandaging of wounded soldiers on the battleground is engraved in Classical Greek pottery from *ca.* 500 BCE (Singletary et al., 2015). The Bible mentioned its first aid for the first time in the case of the Good Samaritan, who offered assistance to a robbery victim by dressing or binding wounds from the brutality (Pearn, 1994).

In England, first aid training of laypersons started over 120 years ago (Mobarak et al., 2015) using simple but specified medical equipment that is arranged in a kit to facilitate the provision of FA. The FA kit is a compilation of materials and a selection of equipment, including bandages for managing bleeding or equipment for personal protection like gloves, scissors, methylated spirit, and cotton wool (National Health Service UK, 2016). First aid is needed for anaphylaxis, bone fracture, burns, cardiac arrest, choking, cramps, bleeding, joint dislocation, poisoning, muscle strain, stroke, seizure, convulsion and wounds. Thus, the first aid kit has no specific number of contents universally accepted because the nature of work, environment and emergency differs from person to person and place to place; however, according to the British Standard 8599 and Omagbemi (2013), some of the necessary materials that should be available in an FA kit are listed below;

- Information leaflet
- Analgesics, e.g. paracetamol, aspirin, oral rehydration solutions, and phensic
- Medium or large “sterile dressing.”
- “Triangular dressing.”
- Safety pins
- Plasters such as elastic adhesive plaster or “waterproof dressing.”

- “Sterile wet wipes.”
- Micro porous tapes
- “Nitrile gloves.”
- Burn dressings
- Conforming bandages like crepe, triangular, roller, and caveat bandages
- Clothing shears
- Others may include razor blades, scissors, Robb, calamine lotion, penicillin ointment, and earache drops. Cotton wool, ice bags, and syringes may also be included.

### ***Law and regulations of First aid***

The provision of first aid can be linked with several laws or legislations which indirectly or directly influence bystanders or witnesses of an emergency incident. A researcher expresses dissatisfaction in considering the differences between morality and law because there are several views of society that are considered immoral, but yet laws are yet to be passed to address them. As described by the researcher (Mayden, 2017), the objection to rescue is an area where moral disapproval is not seen or perceived as legal disapproval; for this reason and many others, the research argues that it is morally and legally important that the rescuer should be protected towards liability to the emergency victim or their family. Some witnesses of accident scenes may prefer not to provide any assistance or help to an injured person/ victim of an emergency situation, which is commonly due to the fear of facing any persecution of any type if the condition worsens or if death occurs.

However, laws such as the Good Samaritan Law make provisions for persons who are trying to provide help to save lives. The qualifying characteristics under the Good Samaritan law include that the person providing first aid must have asked for permission. However, this

permission is considered to be granted for a victim who is unconscious and not able to reply. Also, the provider must act within the capacity of their training and should have voluntarily provided help without consideration for personal gains or financial reward of any kind (IFRC et al., 2020).

On the contrary, the Good Samaritan law does not cover providers who intentionally act above their training. For instance, if a bystander without the knowledge or appropriate certification provides surgery or tries to set a broken casualty leg, the casualty has adequate grounds to sue such a person. Bystanders are legally obligated to give aid to a casualty in countries such as Quebec, Canada, France and Germany. In the US, the law demands that reasonable help be provided to persons in danger; failure to do so attracts a penalty fine in some US states, e.g., Vermont (Emergency First Response, 2021). Contrary to the examples given, Hogan (2023) reported in the article titled Good Samaritan Law that countries like China are recognised for penalising people who, out of their goodwill, provide emergency rescue for victims if it results in complications or death. This is consistent with one of the moral principles, Utilitarianism, which is oriented by the consequences of moral choices (Zheng et al., 2023). Nevertheless, the principle assumes that the outcome of an action may result in significant pain, but it can still be considered the right action (Boatright, 2013).

A similar law to the 'Good Samaritan Law' is that of the Naloxone Access Law. However, this law is applicable in the management of opioid drug-related overdose. Opioids belong to the class of medicine which relieve pain and are sometimes prescribed to persons who have a long need for pain relief (Rees et al., 2019). Examples of these medications may include codeine, morphine or tramadol. Medication in this category has a high risk of addiction (Gov. uk, 2020). Studies have recorded drug overdose since the 2000s, with the recorded level of death of which 60% are due to prescription drugs like heroin and pain relievers (Rudd et al., 2016). As such, the intervention of bystanders with access to Naloxone can help counteract the

effect of an overdose, preventing death until medical help is sought. Because of fear of prosecution, only a few cases seek further medical attention once the effect is reduced; however, the introduction of the Naloxone access law and the Good Samaritan law provides immunity against prosecution of a layperson (and including the user) after administration or distribution of such drug, so long this was done in good faith (Rees et al., 2019; Hogan, 2023). Though there are several criticisms of the application of the law to drug overdose, some government feels this will result in high use of drugs among addicts and also hinder the efforts made by law enforcement (Tesfaye, 2016; Rees et al., 2019).

In contrast, the Good Samaritan law, which is also meant to protect first aid providers against possible forms of protection against legal sanctions as a result of their actions or any consequences of the potential outcome of such assistance, is not applicable in Nigeria. Bystanders and the general public have no legal obligation to assist someone in need or an accident victim by law (Health Emergency Initiative, 2020). This does not suggest that citizens of the country do not help one another when the need arises. However, it causes hesitancy from those likely to render such assistance due to the fear of being harassed by the police or sued if the resulting outcome becomes negative. Similar to the example given, China penalizes its Good Samaritan in the event of any unfavourable outcome; this causes people to relent in providing assistance to people who are in need due to the fear of receiving a penalty because of their goodwill (Hogan, 2023).

A report from The Nations (2021, February 2<sup>nd</sup>) revealed that bystanders are reluctant to provide assistance to an accident victim because of the fear of facing harassment from the police and sometimes being falsely accused depending on the situation leading to such an accident. Moreso, it highlighted the hospital's refusal to accept accident victims from individuals without any duty of care proof as a registered doctor or nurse. Therefore, the report recommended that the Government authorize and implement relevant laws and legislation

guiding the provision of first aid by bystanders and also include free training for all non-medical aiders (The Nations 2021, February 2<sup>nd</sup>).

A first aider who is appointed at their respective workplace has a duty of care to provide adequate first aid to someone in need under the Health and Safety Act (1978; 1981), whereas the bystander or first aid personnel who was present at an accident scene falls under no obligation to provide assistance, so long the emergency was not caused as a result of their action. Hence, treatment can only be given if the patient is willing and capable of doing so. However, they may be liable if other reasonable help, which may include placing a call to the emergency unit, is overlooked. In the UK, a man who was present at the scene of an accident was jailed for not providing any form of assistance to a 17-year teenager who fell into the sea and drowned (BBC News, 2017). Similar to the Health and Safety Act is the Workplace Safety and Health (First Aid) Regulation, which came into operation on the 1<sup>st</sup> of March 2006 in Nigeria; the act provides guidance to employers regarding the requirement for safety at the workplace, including a directive for first aid in the workplace. Based on this law, a first aider is liable to conviction or a fine of not more than five thousand dollars if a specific section of the regulation is breached: failing to keep a record of the treatment they offered when on duty. This suggests that different jurisdictions have their own liability for negligence and the duty of care; however, this has not been made clear with the specific and uniform standard. The resulting effect of this unclarity and lack of standards poses a threat to delivering first aid by bystanders and the public in an emergency.

One of the major ways to address first aid training is by providing first aid training in schools so that young children have the confidence and skills needed to provide first aid in an emergency from a very young age. Countries such as Norway have identified the necessity and importance of knowledge of basic medical procedures that can aid in providing immediate assistance during emergencies. As a result, they have included first aid training in their national

curriculum; secondary schools in Denmark have a similar structure, while in Columbia, it is mandatory for students to possess CPR skills as part of their graduation requirement in high school (IFRC et al., 2020). In Nigeria, action is yet to be taken in relation to a nationally standardized curriculum in primary and secondary schools that includes first aid training, even though several recommendations have been made by researchers and other relevant such as the Red Cross Society (The Nation, 2020; Nigeria Red Cross Society, 2018; Onyeaso & Onyeaso, 2017a).

### ***First aid in school***

The availability of FA equipment in schools promotes the effective delivery of FA. It helps to stabilize the health and well-being of pupils in schools, which is paramount to their academic achievement. The WHO Global School Health Initiative was launched to ensure that schools around the world fulfil the standards for health-promoting schools (WHO, 2020). To meet this criterion, every school needs to continue improving its ability as a “healthy setting for living, learning, and working (WHO, 2020)”. In developed countries, school health services are well-prioritised and given due attention. However, this is not the case in developing countries where low standards and safety are rated (Adebayo et al., 2020; Qureshi et al., 2018; Yusuf & Ahmed, 2016). Leaving the fight against diseases, injuries, and ill health is not feasible only for physicians and medical professionals. The population has a serious role to play in promoting health and decreasing the impact of diseases and injuries. The school community are a significant part of the people who can foster this goal because whatever is learned at school goes back to the community through the students. This is because students show enthusiasm to teach and debate about their learnings with their friends, families, and other members of the population they interact with (Bandyopadhyay et al., 2017; Priyangika & Hettiarachhi, 2015). Many schools in Nigeria have no medical care centres or school nurses to

attend to emergencies. Yet, studies have shown that delays in accessing care and poor knowledge of treatment often result in death or complications (Bandyopadhyay et al., 2017).

A cross-sectional research undertaken by Qureshi et al. (2018) in Karachi revealed that sickbays were absent in all the participating schools. Yet, another research shows that an estimated number of 2400 children die from injury and violence every day, more require medical intervention, and others are disabled as a result of encountered injuries or violence (Agbo et al., 2015). In support, a comparative research design carried out in Nigeria to measure the quality of execution of school-health programmes in Nigeria reveals that 66.7% and 20.7% of the participating public and private schools' FA boxes were empty, which explains a poor operation of the National School Health Policy in Nigeria (Adebayo et al., 2020). Besides, the result shows the disparity between public and private schools regarding quality implementation.

The lack of FA boxes, sickbay, or trained FA personnel in most Nigerian schools indicates that students are at risk due to gaps in emergency (Agbo et al., 2015). In contrast to the devastating condition of FA in developing countries like Nigeria, it is way better and standardised in developed countries. Using the UK as an example, the minimum provision of FA in schools revealed that FA containers must be suitably stocked with the appropriate arrangement and information available to employees on FA. This includes the availability of appointed personnel who take charge of schools' FA. Moreover, policies are reviewed continuously to ensure that the safety of pupils, workers, and all school personnel is met, considering the present and future health needs (Hammett, 2018). Some of this includes passing the Bill that provides a clause to have emergency FA education as an aspect of the National Curriculum at key-stage three and four, including pupils from eleven to fourteen and 14 to 16 years, respectively (Foster, 2015). The report does not suggest that there are no gaps or a need to promote better FA care in developed countries. A study by Hammett (2018) reported that

the survival rate of hospital discharge of victims with cardiac arrest is <1:10 in the UK as compared to countries with similar status like Norway (25%), North Holland (21%) and Seattle (20%). Due to this lag, the author suggests the need to equip more people with skills and confidence to assist in delivering FA.

### ***Relevance of first aid to Health***

Adequate knowledge of FA is essential for teachers and students of every age in schools (Al-Samghan et al., 2015; Baser, 2007). Risky physical behaviour, violent activities and strenuous play are some reasons why first aid training in schools is desirable. Knowledge of lifesaving pre-hospital treatments for unexpected illnesses and injuries is essential at every age and time. Pre-hospital services could be described as a continuum of services at an injury site before a qualified hospital staff or team arrives to manage the situation, especially in areas where the transportation system is underdeveloped and disorganised (Mpombo & Mwanakasale, 2017). IFRCS (2009) reported that over three million are injured yearly in schools in the United Kingdom as they visit the Emergency Departments of the schools. Poor emergency provision of first aid can lead to complications and severity of the situation, endangering the victim's life where this is meant to be promoted. This is usually due to a lack of knowledge and awareness on correctly responding to emergencies requiring first aid. Whereas schools are accountable for ensuring that both staff and students within the school environment are kept safe, and most countries have formalised educational legislation to support the safety of students and staff within the school environment (Wilks & Pendergast, 2017). Part of the methods through which this duty of care can be achieved is adequate preparedness, which may include keeping the school safe and free from hazards and, at the same time, equipping staff and students with critical skills to respond to emergencies in the event of one.

Baser et al. (2007) and Ali et al. (2012) advocated the compulsory introduction of FA training as part of the curriculum for schools: this is because injuries are becoming persistent in children of secondary schools (WHO, 2009). Secondary schools are predominantly populated with teens (children, not adults) with distinct anatomical, psychological and physiological developments. These groups of individuals are also usually characterised by exposure to injuries and sudden illnesses more than their adult counterparts, who are presumably more stable (Wafik & Tork, 2014). The undeveloped physical and mental abilities of children predispose them to the inability to protect and carefully oversee their health, thus sustaining injuries more frequently than adults. Providing immediate care for pupils when they are injured or have severe health challenges is pertinent to their survival and improved learning in School (Ekaprasetya et al., 2018; American Safety & Health Institute, 2008).

In Hungary and the United States of America, approximately 750,000 and 25,000 out-of-hospital cardiac arrests occurred yearly, respectively. In Hungary, it is now mandatory that drivers acquire first aid skills before a license is issued to them (Banfai, 2017). In fact, in 2012 in Hungarian schools, CPR skills were also made compulsory “by the WHO, International Liaison Committee on Resuscitation (ILCOR), European Patient Safety Foundation (EuPSF), World Federation of Societies of Anaesthesiologists and the European Resuscitation Council (ERC) (Bottiger & Van Aken, 2015).” A similar scenario is carried out in Canada and the United States, although implementation has been slow (Banfai, 2017).

The extension of policies to incorporate first aid training into school curricula worldwide, especially for developing countries, will be of great benefit in reducing the prevalence and incidence of injuries and illness in schools worldwide. However, the content and extent to which this is taught should be determined by the environment and the common incidents experienced by the population in a specific location. Hence, the curriculum should provide flexibility for providers to adapt it to their settings. Several researchers with a keen

interest in promoting the incorporation of first aid into the curriculum have proposed areas that are critical to safety in schools. For instance, De Buck et al. (2015) proposed that the curriculum for first aid in schools should include wounds to the skin, burns, choking, procedures to call for help, bleeding, and poisoning, besides the provision of CPR, which has constantly gained attention from renowned health organisation like the world health organisation, the resuscitation council etc. in their effort to reduce sudden death from cardiac arrest (Bottiger et al., 2016 cited in Wilks & Pendergast, 2017).

Similar to the recommendation by De Buck et al. (2015), an earlier report by the British Red Cross Society identified the essential areas of first aid that are important and should be an area of learning for young persons. This included the ability to deal with accidents, responding to unconscious victims and providing resuscitation, choking, scalds and burns, certain illnesses and injuries and finally, the social and emotional dimensions of providing help to others (British Red Cross, 2006). The first aid training areas and approaches outlined are practical and well-linked to the types of emergencies and incidents commonly reported by young persons in the school environment. For instance, studies have reported an increased rate of falls in schools resulting from contact with playing ground equipment or other sports activities with peers during break hours (Okandeji-Barry et al., 2016; Gupta et al., 2021; Ogordi et al., 2021). Findings from a systematic review also agree that the content should be relevant to the target group when embedding first aid training into the curriculum. So far, several kinds of literature agree with the need to align the essential information regarding first aid in the curriculum with the settings and needs of the students. This should also be appropriate to the age of the students. However, there are certain skills that must be taught across all age groups or environmental contexts, and this involves the basic principles of emergency (Wilks & Pendergast, 2017). Teaching students how to stay calm and assess the scene for danger before proceeding with

any form of help is crucial in the chain of emergency delivery, and it can be taught across all age ranges.

### ***Decolonisation of the first aid curriculum***

Decolonisation of the curriculum is a term that is often used by educators when there is a need to restructure the curriculum through an effective examination of the current curriculum, identifying some of the limitations that exist within the curriculum and notions or biases of the curriculum. It is worth noting that the process of decolonizing the curriculum is not about the removal of the already existing knowledge; however, it is the ability of educator providers and designers to embrace changes that may occur outside what is already known to have existed. It involves the critical analysis that determines the limitations or areas that have consistently been ignored due to a lack of acceptance and fear to reject or modify what has already been known from the historical perspective of the Western world, even when the obvious does not currently fit in or tackle the current situation that exists in these countries.

According to Charles (2019), the subject of the curriculum has always been discussed in the context of education in several ways, using different methods and terminology. One of the main topics in the 1990s was the concept of the 'inclusive curriculum'. Meanwhile, the concept of decolonizing the university has been in vogue since at least 2011, following on from the Malaysian conference on this topic, where the focus was on finding non-Eurocentric paradigms (Claude & Shad, 2014). As a result of the Malaysian conference on this in 2011, which called for non-Eurocentric paradigms, the concept of 'decolonizing the university' has gained currency since 2011, following the focus on a 'multicultural curriculum' in the 1990s. It is clear from the recent prominent movement that curriculum decolonization originated at the University of Cape Town, South Africa, and is a continuation of this movement. It became known as the Rhodes Must Fall movement when students at that university began calling for his statue to be removed for the symbolic and historical significance that he represents in a

place of education. Students engaged in what became known as the Rhodes Must Fall movement began demanding the removal of Cecil Rhodes' statue (Amit, 2016).

Throughout 2015, the drive for decolonizing the curriculum began to spread in the UK, and to date, there has been a growing movement in which institutions are rapidly reviewing their curricula, with the lens of decolonization serving as a tool for this purpose. A theme that has been raised by the National Union of Students includes questions like “Why is my curriculum white”? Hence, the campaign is the question of what message is being communicated by the voices that are represented in that curriculum and those that are not (Charles, 2019). In light of the definition provided by the university of Keele (2019), curriculum decolonization is about how all cultures and knowledge systems are conceived and envisioned in the curriculum and how all educators and their respective stakeholders interact about what is taught and how it shapes the world (Keele University, 2019). It means creating space and resources for institutional members to dialogue. The curriculum decolonization effort involves a comprehensive assessment of institutional norms and practices. Educators should also focus on incorporating this ideology into their training programmes. On a broader scope, there exists a necessity to broaden the range of perspectives incorporated in the curriculum and among its instructors while also striving for greater inclusivity based on merit rather than as a superficial or perfunctory measure (Charles, 2019).

This is most important when referring to medical practices that involve human and the outcome of their health. Medical professionals in the West were overwhelmingly White, male, heterosexual, and from rich origins, leading to a historical impression of medicine as unrepresentative, inaccessible, and privileged (LeBlanc et al., 2020). This is also reflected in medical textbooks, where all diagrams and visual representatives of humans and the anatomical and physiological portraits of the human body were primarily represented in White skin. In contemporary times, the worldwide transformation in the political, economic, and

technological spheres has resulted in the need for healthcare professionals to consider the populations they cater to reflect the ethnic and cultural diversity of present-day civilization. The demographic changes observed in the population have resulted in a corresponding evolution in the multifaceted healthcare requirements. Consequently, to ensure the provision of efficient healthcare services, medical education should align with these societal transformations and cultural heterogeneity (LeBlanc et al., 2020, cited by Mbaki et al., 2021). In the context of first aid provision, few innovations have been observed in this area, and this includes the recent invention of dark-skin Leardal Training Manikins used by trainers to enhance engagement and application of learning. Similarly, most physicians and educators share the same opinion of seeing diversity in the medical curriculum and emergency services.

A study by Louie and Wilkes (2018) reported in their research involving an analysis of four thousand one hundred and forty six images for race and different skin tone illustrated in chapters of books, topics and the entire textbook from different publishers and clinical communication. The result reveals that racial representation is somewhat in line with the U.S. population (62.5 per cent White, 20.4 per cent Black, and 17.0 per cent Person of Colour). However, their portrayal of skin tone is not. There is also a lack of diversity in terms of skin tone at the level of chapters and topics. While the ethnic diversity of patients is generally represented proportionally in medical texts, this is not the case for skin colour (Louie & Wilkes, 2018). For instance, a Nigerian-born aspiring neurosurgeon began working on images and illustrations of humans in medical textbooks and noticed that the underrepresentation of people of colour in medical books is indicative of more significant problems with healthcare disparities aimed at people of colour. The aspiring neurosurgeon from Nigeria began teaching himself to draw in an effort to redress this disparity, depicting patients and doctors with Black complexion (Limm, 2022).

A curriculum is a method for determining which skills and information are essential. It organises the language and thought processes we are exposed to as children and adults. The popular belief that European culture is the source of the best ideas and methods of education has been questioned by communities as the world has grown more interconnected through education. When we approach our studies from a decolonising lens, we are forced to think about them in new ways. It highlights how students are typically solely exposed to a male, white, European perspective on the globe. It's not enough to just swap out old material for new; we also need time and room to reflect on our own values and the values of those around us. Through decolonising education, we may see how colonialism has formed our world and work to change it. Our professional habits are also called into question. It's a method that takes into account local traditions and practices, encouraging students to understand more about who they are and what they value (Ferguson et al., 2019). For instance, in the context of first aid provision, it is commonly required to wait or call for an ambulance in the event of certain health emergencies.

However, disregarding the need to contextualise the area of first aid provision may lead to more deaths than better health outcomes. This is because, for countries with poor ambulance services, first aiders would be better off organising transport systems to take the victim to the hospital rather than waiting for an ambulance that would never turn up. Another example is the outcome of wound appearance based on skin tone. Most skin tone colours presented in first aid training courses are reflective of white skin, with minimal consideration of symptoms presented for other skin tones. An accurate and comprehensive evaluation is necessary for effective wound treatment and preventative care. This assessment leads to a diagnosis, which in turn initiates an action that is individualised to the specific patient, their skin, and their wound. The skin should be examined carefully during the evaluation process, and the patient's baseline skin tone should be determined. This is crucial for keeping an eye on the patient's dermis, also

known as skin, and seeing any changes as soon as possible. The failure to recognise skin changes in a timely manner can lead to serious complications, including the breakdown and destruction of skin and other tissues. Correct diagnosis is essential for maintaining treatment. The patient's skin, general health, and medical history, as well as the wound itself, should all be inspected with skin tone in mind to ensure that treatment is as individualised as possible (Wounds U.K., 2021).

It is clear that immediate action is required to address the systemic biases that contribute to healthcare inequities (Limb, 2021). Accurate assessment and diagnosis in wound care necessitate familiarity with symptoms across skin tones to provide optimal care for each patient (Mukwende, 2020). Even though patients with higher levels of melanin in their skin are more prone to be diagnosed with higher-stage pressure ulcers (PUs) due to a lack of accurate assessment and early identification, research on the topic of skin tones in wound care is limited (Gunowa et al., 2021). According to studies, there is a 10% higher potential for significant lower limb amputation or mortality among Medicare recipients of the population residing in the United States, primarily individuals who self-identify as Black and (or) who reside in rural regions (Brennan et al., 2022; Fanaroff et al., 2022).

In the US, Black nursing home residents are more likely to get pressure ulcers/injuries, which tend to be more serious and take longer (above 90 days) to heal than those of White residents (Bliss et al., 2017). These disproportionately bad wound outcomes have a variety of causes. The inability of healthcare practitioners to recognise pathognomonic skin variations signalling wound onset and progression is a contributing factor, as is the fact that disadvantaged individuals have greater disparities in social determinants of health (Cole, 2022). Erythema illustrates this phenomenon well because its appearance varies with skin tone. Training on recognising erythema in skin that is highly pigmented is starting to make its way into PU/PI-

specific guidelines (Johnson et al., 2023), but it seems that there is a shortage of similar guidance available for different wound types and diseases (such as infection).

Similarly, other studies support that clinical manifestations and indications of infections (CSS, also referred to as the clinical signs and symptoms) are perceived differently depending on the skin tone of patients, so Johnson et al. (2023) performed a post hoc analysis. The study examined three hundred and fifty persistent wounds from a prospective clinical trial conducted at fourteen sites. The aim was to see whether fluorescence imaging may offer a more accurate and unbiased diagnosis approach. The FSPC scale, which stands for Fitzpatrick Skin Phototype Classification, divided participants into three categories based on their skin tone (fair, medium, and dark). The study compared the sensitivity of CSS alone and in combination with fluorescence imaging to detect TBL  $>10^4$  CFU/g across FSPC groups and CSS and TBL. Although bacterial burdens (median =  $1.8 \times 10^6$  CFU/g) were similar across FSPC scores, erythema reports decreased significantly at a p-value of ' $<0.05$  from 13.4% (low) to 7.2%' (middle) to 2.3% (high). Compared to the low ( $p = 0.003$ ) and medium ( $p = 0.04$ ) groups, CSS sensitivity had a 4.8% drop in the high group. With CSS alone, fluorescence imaging demonstrated 12 times more effective at detecting the highest bacterial burden in the high group. These findings highlight the potential for racial disparities in health outcomes related to wound care. Delayed treatment of harmful bacteria and infections can increase the likelihood of complications and unfavourable results. To some extent, fluorescence imaging can replace this void by providing a more objective and consistent measure of wound microorganisms (Johnson et al., 2023).

### ***Principle of basic emergency care***

In economies with lower to moderate levels of income, certain characteristics can be observed. The absence of organised emergency care often leads to more burden for the victims and sometimes contributes to the victims' death (Balhara et al., 2018). Thus, in low-income

countries, traumatic injuries are the primary cause of both illness and mortality globally (Gallagher et al., 2020). Currently, the state of the emergency management system in a country like Nigeria lacks adequate standards for managing or responding to emergencies (Kannan et al., 2020). Nwauwa (2017) describes these services as a political benchmark rather than a health necessity because the sustainability of the services after several implementation attempts have failed due to a weak maintenance system. Since the emergency response system is deficient in low/middle-income countries, most cases reveal the absence of readily available ambulance services for assessing the emergency site. The burden rests on laypersons or bystanders present during an emergency to assist and transport individuals to the hospital. Some of these persons include family members, of which students or pupils in secondary schools belong to a family and are therefore classed as family members; others are the police, bus, or taxi drivers (Balhara et al., 2018). A systematic study led by Balhara et al. (2018) shows that bystanders helped above 94% of victims needing first aid in low/middle-income countries. Similarly, results from research conducted in a developed (US) country revealed 71.4% intervention from bystanders before the emergency medical services arrived at the site of the incident (Faul, Aikman & Sasser, 2016).

The three P's describe the main aim of FA: to preserve, protect from any additional harm and promote the recovery of the victims (Frust, 2015). Although actions are meant to be quick, they should be carried out under the guidance of the three P's. Unfortunately, not every layperson can achieve this. As such, studies have reported unnecessary death and serious injuries resulting from a timid response and inadequate consideration for the main aim of FA (Kannan et al., 2020; Balhara et al., 2018; Frust, 2015). According to a review by Thomas (2020), assessing an emergency scene quickly and calmly involves a safety check to determine if any issues can create danger for self or the victims needing help. Also, it includes a quick scan of the environment for possible causes of the incident or availability of other causalities,

including the number and ages of persons involved. In addition, it is required to protect oneself and then the victims from danger, if appropriate, to do so. The victims should be only moved from the scene. If leaving them in the same position may endanger them before an ambulance or a trained medical professional arrives.

In opposition, the above advice of leaving the victim at the scene till an ambulance arrives in low or middle-income countries like Nigeria may pose greater issues for victims in most areas where ambulance services are not available because of neglect and poorly structured system for emergency response (Awoyemi, 2019; Nwauwa, 2017). Surprisingly, if this approach is adopted in some rural and urban areas of low or middle-income countries, victims might end up dying while they await a response team that may never show up. Therefore, the bystanders in most incidents scene arrange for the transport system to take victims to the nearest health or medical centres. In agreement, an electronic Delphi study was carried out among experts representing twenty-one low-middle-income countries in Africa, and it was conducted by Whitaker et al. (2020). The study revealed that barriers to seeking care, reaching and receiving care, and the failure to modify these barriers are the major obstacles to attaining standard trauma care in these areas. Besides, the study concluded that the majority of avoidable death and disability are the result of delayed care in these areas (Whitaker et al., 2020; Kannan et al., 2020).

The results from a qualitative report evaluated Nigeria's system for delivery of emergency care as rudimentary, weak, and lacking integration, encompassing the provision of care in the prehospital setting, delivery of treatment within hospitals, and governance of health systems. The main areas of focus at the prehospital care level include recognition of emergency and response, ambulance and healthcare frontline personnel, and cultural beliefs and values. At healthcare institutions, concerns have been raised about the adequacy of healthcare staff, clinical skills, hospital capacity, and financial obligation. The primary focus of the health

system is to guarantee access to healthcare and funding. Potential for enhancement in the emergency care system were identified and explored at each level of its components.

In providing further explanation to the overarching theme describing the Nigerian Health care System as rudimentary, the respondents from the study identified that lack of resources can lead to high mortality rates among patients who require assistance, even if help could potentially be provided. The study's first participant, identified as FG1, highlights this issue (Usono et al., 2021). Similarly, another respondent suggested that it is crucial for individuals to possess the necessary expertise and abilities required for performing cardiopulmonary resuscitation (CPR) to effectively respond to sudden cardiac arrests. This can prevent ineffective and possibly harmful actions such as panicking, pouring water or screaming. Instead, individuals can promptly initiate appropriate measures such as administering CPR and seeking professional medical help (Usono et al., 2021). For ambulance services and front-line providers, respondents' experience suggests it cannot be guaranteed that first responders will arrive on time, provide necessary assistance, or transport the individual to the hospital in a timely manner. Traffic conditions cannot be predicted. Given the many challenges faced, one seems to prefer avoiding involvement. Law enforcement officials can also stop the ambulance and inquire about its destination, causing delays even if a patient is on board. Participant eight is identified as FG 3 (Usono et al., 2021).

Upon assessing the medical services in local areas, some victims are transferred from the first visited care setting to others due to the shortage of trained staff or facilities to sustain victims. The scenario is even worse because of the direct and indirect transfer of victims, leading to delays in receiving treatment and more complications (Boschini et al., 2016). Similarly, a study conducted in sub-Saharan Africa to investigate both the direct and indirect effect of the transfer status of trauma mortality reveals significant survival benefits for the direct transfer of trauma patients to tertiary centres compared to indirect transfer (Boschini et

al., 2016). The study concluded that proper development and strengthening of pre-hospital care and the timely transfer of victims would reduce the mortality rate of resource-poor-setting.

### **Attitude, knowledge and management of first aid in schools**

The knowledge of Basic FA training will equip pupils with the required skills to deliver prompt and accurate initial care that can protect the lives of victims from severe illness or injuries. Examples of these health situations include “respiratory disorder, choking, fracture of the bone, strains, sprains, bleeding from the nose and broken skin, cardiac arrest, amongst others (Kapoor et al., 2017).” Appropriate knowledge and training on managing wounds and ailments are crucial in protecting lives and preparing students to become change agents and compassionate individuals who will be ready at all times to render FA in the school setting, at home and in society. According to WHO (2012), 875,000 children under 18 years, supposedly in primary and secondary schools, die from unintentional injury yearly. And there seems to be an inadequate working knowledge of safety and health in school environments during injuries. Different kinds of first aid education have been recommended in schools. Following this recommendation, training on cardiopulmonary resuscitation (CPR) in educational sectors received unaltered and unidirectional attention, including the use of long-term strategies to educate the concerned students (Hamasu et al., 2009; Onyeaso & Onyeaso, 2017a). Baser et al. (2007) averred that the extent of physiological damage caused by injuries and illnesses could be minimised if children have adequate and essential knowledge and skills of FA.

An in-depth analysis was carried out on a sample of 146 Nigerian schools. Of these, 95 schools, accounting for 65.1% of the sample, reported a shortage of health workers. Almost all of the schools, 129 in total, accounting for 88.4% of the sample, provided first aid services in the event of medical emergencies. All schools sent children with contagious diseases home. None of the public schools evaluated had ambulances or sickbays. Out of the total number of schools surveyed, only 44 schools, 30.1% of the sample, scored the minimum acceptable score

of 19 for school health services. Of these schools, 8 (20.0%) were public institutions, while 36 (34.0%) were private institutions. Private and public schools had similar average scores for school health services, with  $16.31 \pm 3.96$  SD and  $16.23 \pm 2.87$  SD, respectively, on a scale with a maximum possible score of 45 ( $t=0.145$ ,  $p=0.885$ ) (Sanni et al., 2022).

Employing a cross-sectional study, Joseph et al. (2014) measured the rate of knowledge of 152 medical students in Mangalore city of south India, providing first aid for shock, gastro-oesophageal reflux, nose bleeding and foreign bodies in the eye. The research showed that 11.2% of the participant had previous knowledge of FA, “good knowledge (13.8%), moderate knowledge (68.4%) and 17. 8% had poor knowledge of FA respectively.” They found inadequate knowledge regarding FA for shock and gastro-oesophageal reflux (21%), nose bleeding, and foreign body in the eye (20%). They recommended that first aid skills should be taught in school. Besides, Kapoor et al. (2017) investigated the influence of FA instruction on the knowledge and attitude of pupils towards managing emergency health situations in schools. A sample of 300 students from two schools was used with a pre-test-post-test assessment on some specific first aid skills, including a demonstration of the skills through simulated action. The study revealed that participants' initial understanding of various aspects of first aid was low, with an average of only 36% and a range of 7.66% to 63.3%. This, however, increased to a scale of 39 – 92.3% after the training. Students became very knowledgeable on the management of wounds, and there was an increase in a significant difference in the student's knowledge and attitude towards FA management in schools.

Secondary schools have not been left out in the first aid education campaign in Asian countries. Accordingly, Mirza et al. (2017) investigated the outcome of FA training among 220 students selected using a multistage sampling technique from a secondary school in Mekkah City of Saudi Arabia. The age of the participants varies between 16 to 18 years. The results indicated that the behaviour of respondents concerning FA drastically improved from 9.5 to

95% and knowledge from 72.3 to 83.6%. Similarly, Jamaludin et al. (2018) assessed the rate of knowledge, awareness, and attitude of 348 Islamic university health science students in first aid in Malaysia. The results showed that 90.8% were aware and positive in their attitude; 42.8 % of the participants had moderate knowledge of FA. Also, the results reveal a significant effect of gender and year of study on FA training experience. The learners had good awareness and attitude; however, implementing a regular educational programme with a well-defined module may promote their skills and practice of first aid in the schools.

In Poland, cardiovascular diseases are one of the primary causes of death, and the intervention of bystanders could enhance the possibility of survival. Hence, Czyzewski et al. (2017) assessed the knowledge and practice of FA of 200 non-health students and those in the medical field at Collegium Mazovia Innovative University located in Siedlce using three areas of study: medical, financial and construction. The results uncovered that there were significant ( $p < 0.001$ ) differences between the level of knowledge of self-assessment and the training conducted after that about first aid. It was also found that the average knowledge differs for the field of study, with the medical students performing better. Based on their education programme, those who had very good knowledge before training were 38%, 7% and 8%, which increased to 51%, 37% vs 24% respectively after training. Also, the percentage of those who lack knowledge was displayed at 0%, 7% and 4%, respectively.

In Staszow County, Poland, the research investigated the knowledge of FA among drivers in an attempt to decipher their prevention strategies for road accidents. The study involved 80 participants who are active drivers in state organisations in eliciting information using a questionnaire. They found that the drivers capable of taking prompt first aid actions in cases of emergency were few, and only 10% of them could even make attempts to save lives. Knowledge of cardiopulmonary resuscitation techniques was not found in 43.75% of them. Most participants did not know the road traffic alarm contacts and were also unaware of their

legal obligation to save lives through first aid administration. They recommended that, apart from the issuance of a driving license, drivers should be tested on essential lifesaving and FA management. Among the secondary schools in Taif, Saudi Arabia, Mobarak et al. (2015) investigated both knowledge and attitude among 360 students on FA and BLS. The study showed that the mean knowledge of participants after training was 64.8% and was better than their untrained counterparts, whose mean was 53.7%. Age was also found to be a determinant of their performance during the training, with the younger ones performing better. They also found that 37.2% of the schools had incorporated first aid into their school curriculum.

### ***The relationship between knowledge and attitude of FA management skills***

Incorporating FA into the school curriculum is a way forward, as the current environment around the globe puts individuals at risk of needing emergency services. The inquisitive nature of researchers has led to several studies conducted to understand people's knowledge and attitudes towards FA. The cross-sectional survey performed in the United Arab Emirates reported that more than half of the population included in the research had insufficient FA knowledge, and yet, the attitude towards FA was positive, with a willingness to undertake future training in FA. The study also reported that necessary FA skills were highly associated with participants' educational background with an increased level of education compared to respondents with a decreased level of schooling (Midani et al., 2019). The study, however, uses the convenient sampling method, which reduces the generalisability of the result (Jager et al., 2017). In a study conducted among kindergarten instructors in Ethiopia, only 40% of the participants demonstrated a satisfactory understanding of FA, consistent with the findings reported by Midana et al. in 2019. However, a positive attitude was recorded among 75% of the participants, while experience in teaching, knowledge of FA and exposure to kids needing FA were some of the factors that positively influenced the attitude toward FA (Ganfure et al., 2018).

A Palestine study carried out amongst teachers recorded high knowledge of FA with a mean score of 71.1%. Although the respondents showed high knowledge of FA care for bleeding, fracture and trauma, their knowledge of CPR was moderate (Amro & Qtait, 2017). Similarly, research conducted in India reported that only eight teachers out of the 146 participating teachers could perform correct CPR. Nevertheless, the study reported a right attitude towards FA as participants indicated their willingness to provide FA for victims if trained (Joseph et al., 2015). Evaluating the characteristic of the study participants with poor and good knowledge of FA recorded above, the scores among students in the health field will be expected to be high. However, this is not the case in another study carried out on a total of 475 nursing students enrolled at a university in China. A report from the survey reveals that FA knowledge among this student was unsatisfactory. Surprisingly, students who received training in FA show less willingness to provide FA care than others who were not part of the training. The researchers concluded that FA training with inadequate sustainability measures in place negatively impacted the participants towards the provision of FA (Pei et al., 2019). On the contrary, the result reported by Pei et al. (2019), an earlier study conducted in Karachi among 446 students revealed that medical students with FA training responded correctly to the assessment with a mean of  $11.2 \pm 2.9$  as against  $7.2 \pm 3.43$  of students in non-medical programmes (Khan et al., 2010).

Furthermore, the outcome of a survey of 375 secondary school students shows that the knowledge of students significantly influenced their attitude towards FA in the cross-sectional study conducted in Kutan, Puhang & Malaysia (Sharif et al., 2016). Due to the amount of play by young children, either through physical or sports activities, students often face severe falls on the football pitch, relay games, and other active motion activities. All these sporting activities and violence leading to peer fighting may cause dental injury or avulsed teeth. Yet many FA studies in schools have overlooked this aspect of dental trauma in school. A survey

conducted among teachers in Nigeria secondary schools on the management of Avulsed teeth reveals that 42% of teachers are not aware they can replant an avulsed permanent tooth. Also, teachers' general knowledge regarding an avulsed tooth is poor (84%) (Olatosie et al., 2013). In India, a study among teachers shows an overall deficit in knowledge and management of dental injury. Only a few teachers tried to search for an avulsed tooth because they thought it was necessary, and only 7% of the teachers were aware that the “fallen tooth can be replaced into the root of the teeth (Shamarao et al., 2014).”

The result among teachers is not unusual as studies conducted among medical professionals, including physicians and nurses in the emergency department, reveal a dearth of knowledge and confidence in handling dental emergencies relating to an avulsed tooth (Iyer, Panigrahi & Sharma, 2017). Similarly, a study conducted in Saudi Arabia shows limited dental trauma FA care knowledge among health professionals. The study further reported that prior education on dental FA significantly impinges on knowledge. At the same time, the only factor that significantly influences attitude is witnessing trauma-related injuries (Pani & Alhazmi, 2015). Further findings have also reported a similarly low level of knowledge among physicians and other health professionals regarding the correct care for an avulsed tooth. More participants indicate interest in receiving information about the management of dental injury (Bahammam, 2018). Apart from health professionals, a study conducted among parents in Kuwait shows that parents have insufficient knowledge about FA care for an avulsed tooth (Alyahya et al., 2018).

In contrast to the low knowledge of avulsed tooth recorded among teachers, students and health professionals, the case is different for diabetes care, where a study conducted among teachers reveals a high (77.3%) knowledge of the management of hypoglycemia (Amro & Qtait, 2017). This result is comparable to the study of Joseph (2015). However, understanding the management process for diabetes only assessed general questions on diabetes care but did

not ascertain the knowledge for the administration of insulin during a crisis. A report by Bratina et al. (2018) suggested that appointed school personnel need to be trained on how to administer insulin as a management strategy for diabetes. The interventional study conducted among parents and professionals in schools revealed that the educational intervention positively impacted the confidence and attitude towards the provision of diabetes care (Bechara et al., 2018).

### ***The association between knowledge or attitude & the provision of FA management***

The knowledge and practice of respondents are critical factors that are essential to comprehending the future effect of education and training on the traditions of the population towards an adequate FA provision for victims. A study in Nigeria conducted among 304 secondary school students revealed fair knowledge and a positive attitude towards providing FA. However, more than half (56.9%) of the participant's practices of FA were rated poor (Adesegun et al., 2019). The result is quite similar to the qualitative study by Neto et al. (2018), whose documented theme from participants revealed a lack of preparation for providing FA care in emergencies. Similarly, a study conducted among taxi drivers in Ethiopia revealed a highly positive attitude (80%) towards FA, with slightly more than half the population knowing some essential aspects of FA. However, this does not influence the practices, which shows the inadequacy of the respondent in handling emergencies (Teshale & Alemu, 2017). In Nigeria, a study carried out among undergraduate students reveals that respondents who, on one or more occasions, have been faced with the challenges of handling casualties possessed a positive attitude towards FA practice. Yet, the knowledge was rated fair (Mbada et al., 2018). The reviewed study, however, has used non-probability convenience sampling techniques with high dissimilarity in the sex ratio. Jager et al. (2017) propose the need to use homogeneous convenience sampling in situations where researchers are limited to convenience sampling

methods. The authors stated that this promotes clearer and better generalizability as opposed to non-homogeneous convenience techniques.

The majority of the study design of FA reviewed was cross-sectional. However, a study deviated from this common trend by systematically reviewing existing FA literature (Jones et al., 2017). The authors observed the systematic study design to include 54 studies, of which some cross-sectional and intervention studies were selected based on their quality of assessment. The results from the review identified a common trend of insufficient knowledge and negative attitudes of respondents regarding FA in schools. Also, the opinions of respondents towards providing FA for epileptic conditions during school activities and the knowledge of seizure management were limited. The study also highlighted that the attitude towards epileptic FA was comparatively poor when compared to FA care for other emergency conditions (Jones et al., 2017). Agreeing to the study carried out by Thapa et al. (2017) among high school students in Nepal reveals poor knowledge, attitude, and practice towards epileptic conditions. Concerning the intervention studies reviewed by the authors, contrasting views from those of the cross-sectional studies were presented. There was an increment in the knowledge and attitude of the participating teachers towards FA for epilepsy (Jones et al., 2017).

Moreover, results from 500 undergraduate students in Saudi Arabia show that only 8% had a good attitude toward FA, yet over 50% of the participants had a good awareness of FA. A statistical significance was found among those who previously attended a FA course and the increased awareness, knowledge and practice of FA (Alsayali et al., 2019). Still, in Saudi Arabia, research conducted among 390 parents in a primary health care centre revealed that the knowledge of FA care for diabetes mellitus was satisfactory. The knowledge begins to deteriorate when assessed for epilepsy (49.7%) and injuries/fractures (36.7%), which reveals the need for training in these areas (Al-Johani et al., 2018). Similarly, no significant

relationship was observed in the knowledge score of teachers and instructors who in the past, have received FA training compared to those without any formal FA training. Most teachers responded inappropriately to emergency scenarios (Alyahya et al., 2019). In agreement, a study which used a self-administered survey to collect information from 150 school teachers reported a similar increase in the management skills for diabetic patients at 77.3% (Amro & Qtaity, 2017), although higher than the rate (68.8%) recorded by Al-Johani et al., (2018).

In considering the knowledge of burns, the assessment of 408 caregivers shows that less than half of the population uses cold water to manage burns-related emergencies. Still, almost all the respondents were unaware of the duration of time required to use running water. Moreover, it was reported by the authors that 32% use natural and traditional remedies to treat burns, some of which include tomato paste, tea, honey, toothpaste, and slices of potatoes. Also, there was a statistical significance between the previous training and the knowledge of burns (Almar et al., 2016). For dental trauma, Kaul et al. (2017) revealed that teachers had an adequate understanding of traumatic dental injuries but lacked the awareness of the steps required to be taken by them to manage and reduce the impact of complications. However, there was a record of positive attitude towards management and possible training. In the Emirates of Sharjah & Dubai, a study among 292 teachers reported inadequate knowledge of tooth avulsion, and the training of FA had no association with providing the right response for managing avulsed teeth (AlHammadi et al., 2017). Above half (64%) of the participants in a study conducted in South India were aware of the meaning of avulsed tooth but were unsure of the management procedures, which calls for training in this area (Venkataramana et al., 2015).

Furthermore, a study conducted among teachers reveals that the knowledge of asthma was not significantly associated with the age of the participants. However, a strong correlation was observed between the level of knowledge and the year of experience, the level and attainment of education and finally, the contact with an asthmatic patient when in crisis

(Alkhamis & Hashim, 2019). In southwest Nigeria, a study conducted among secondary school students reveals that the attitude towards FA was good for almost all the respondents (98%). Still, the result shows that over half of the population (56.9%) had poor FA practices (Adesegun et al., 2019).

The critical assessment of pieces of literature regarding the association of analysis of knowledge, attitude, and practice indicates that the majority of the report showed poor to fair knowledge of FA (Neto et al., 2018; AlHammadi et al., 2017; Kaul et al., 2017) but this has not impacted on their practices. Moreso, the attitude reported towards the provision of emergencies was good, but still, it had no significant effect on the methods (Adesegun et al., 2019; Mbada et al., 2018; Jamaludin et al., 2018). On the contrary, a significant increase has been recorded in various studies as a result of training, personal experience and encounters with specific emergency needs (Alyahya et al., 2019; Jamaludin et al., 2018; Amro & Qtaity, 2017; Jones et al., 2017; Joseph et al., 2015).

### ***The interaction of other external factors & the effective provision of FA management***

In statistics and regression analysis, moderation and interaction are methods to investigate how a third variable influences the connection between two other variables. Moderation, often referred to as effect modification, transpires when a third variable, known as the moderator, influences the relationship between two other variables. The moderator may be categorical (e.g., gender, ethnicity, class) or continuous (e.g., age, reward level). Moderation effects can amplify, diminish, or alter the direction of the predictor's influence on the result (Fairchild & McQuillin, 2010). Interaction is a broader phrase than moderation, referring to the scenario in which two variables influence the outcome variable in conjunction. For instance, when X and Z influence Y, the

roles of X and Z are indistinct (Cohen et al., 2003, as cited in Andersson et al., 2014). For instance, researchers may wish to ascertain how the impact of an intervention on student performance differs by gender or prior knowledge. In this scenario, gender or past knowledge would serve as the moderating variable. Therefore, examining mediator variables can improve evidence-based interventions by explaining how an intervention works or fails (Fairchild & McQuillin, 2010).

According to various studies (Davis et al., 2014; Hashmi et al., 2022; Oliver et al., 2017), training the general public in bleeding control can lower the number of trauma-related deaths. When investigating these issues, researchers should consider other moderating variables like how performance, the environment (especially in cases involving bleeding injuries, and mental conditions like workload and stress) could interact. For instance, Friberg et al. (2021) conducted experimental simulation research to assess the impact of stress on the effectiveness of tourniquet application and cardiopulmonary resuscitation. They discovered that stress had no bearing on how well people applied tourniquets but had a negative impact on how well they performed CPR. The external pain threat (paintball fire) utilised in the experiment to produce a stress reaction may have reduced ecological validity, which is a weakness of the study. It stands to reason that the presence of blood at the scene of a potentially life-threatening bleeding event would be a particularly potent and ecologically valid stimulus. Compared to films and images of threats, blood and visuals of gore and severe injuries elicit different cardiovascular and attentional responses (Palomba et al., 2000; Brodin et al., 2022).

Video responses to graphic violence reveal individual differences in attention and predisposition or sensitivity to the stimulus. Neural P-100 activity, for instance, has demonstrated that those with a fear of blood prioritise the processing of visual cues involving

blood regardless of context. Leutgeb et al. (2018) found evidence to support the hypothesis that humans have heightened visual acuity for blood. Humans' extreme reactions to external infections like blood have been explained, at least in part, by the behavioural immune system (BIS) (Schaller, 2016). It is hypothesised that the presence of possible pathogens in the immediate vicinity of the body elicits a psychological response from the behavioural immune system. Schaller and Park (2011) and Lieberman and Patrick (2014) both agree that emotions like disgust are either a vital part of or the same thing as the behavioural immune system. Helping behaviours of many kinds can be understood in light of our sensitivity to disgust. According to research by Laakasuo et al. (2018), people with intense disgust sensitivity are more likely to send money donations than human relief workers to cholera-affected neighbourhoods.

Similarly, Millar et al. (2023) discovered that disgust sensitivity negatively mediates readiness to assist when a perceived fear of disease is associated with the recipient being someone not part of a certain group or community. Blood-borne illnesses are also known to discourage first responders from performing CPR and other life-saving measures (Bouland et al., 2017). However, the research of Coons and Guy (2009) suggested that the risk of infection is reduced when the intended primary care or aid is provided to a friend or relative rather than a stranger.

In conclusion, rendering first aid is a dynamic activity influenced by internal and external factors, especially when blood is involved. However, the impact of an individual's susceptibility to disgust and medical anxiety on their ability to effectively conduct first aid procedures for bleeding wounds has not been thoroughly investigated. Therefore, part of the purpose of their research (Miller et al., 2023) is to examine through observation how the

presence of blood influences the performance of haemorrhage control tasks by medical laypeople in a simulated environment. Research participants' disgust sensitivity and medical dread were also measured to see if they may be used as predictors of their ability to control bleeding; using volunteers to mimic scenarios will help to record a truer picture of a participant's response. Other studies, like Brodin et al. (2022), investigate how a person's sensitivity to disgust and fear of blood can affect their ability to perform first aid skills, scenarios involving leveraging the use of a tourniquet and wrapping a wound. The results show that individuals without medical training may take longer to perform these tasks when there is blood present, but this does not affect the quality of care provided. The study found that when blood is present, a person's disgust sensitivity can increase the time it takes to pack a wound, but not for applying a tourniquet.

One issue that needs addressing is the insensitivity of checklists to subtle variations in performance and their unsuitability for use in non-bleeding situations. When simulating a task without the presence of bleeding, the crucial question is whether first-aid interventions to stop bleeding can be evaluated effectively. While there are limitations to the experiment that must be addressed in studies carried out in the future, the results are useful in understanding how the blood presence can impact someone without medical training when administering or providing first aid (Brodin et al., 2022). The action used was straightforward to understand in terms of injury severity and location, creating a clinical context rather than a 'chaotic injury' scene of a significant trauma episode. The authors have recommended that in future investigations of persons without medical knowledge, a reaction to such scenarios will be that blood and supplementary artificial tissue may be distributed at the scene of the injury to create the impression that the injured person was actively moving around (Brodin et al., 2022). In an effort to achieve a more realistic representation of an accident scene, the manikin can be replaced with a human actor portraying the character of an injured victim, and more blood and

synthetic tissue can be used. This approach can encourage participants to behave in ways more indicative of their responses at a real-world accident scene, such as increasing their empathy for conscious victims who have experienced harm (Mulet et al., 2021).

The data obtained in the study of Broden et al. (2022) may be skewed towards people with mild to moderate levels of nausea from medical procedures and disgust sensitivity. Although the current data on disgust sensitivity was slightly higher than documented in prior research findings, the current data on medical fear had a mean lower than other data using a similar scale. Self-selection bias, which may account for the absence of people with high medical anxiety or phobia and disgust sensitivity scores, given that the study information made it plain to potential participants that swine blood would be used. Increased sensitivity to the haematological (blood) stimulus may significantly affect the participants' capability to complete the first aid activities because prolonged exposure to stress heightens the chance of dynamic instability in adapting to the stressor. Therefore, the results of the research can only apply to other groups whose members also have low disgust sensitivity levels and medical phobia. Hence, the authors identified that more research with a wider variety of participants on these measures would be helpful in order to determine the levels at which the participant intends to provide emergency FA care but is incapable of doing so because of their response to BIS (Broden et al., 2022).

### **Presentation and prevalence of some popular health conditions in schools needing first aid.**

Developing student knowledge of FA is a crucial aspect of preparing for emergencies because the occurrence and incidence of accidents in school cannot be predicted. Therefore, school personnel are expected to be fully equipped to meet the need for unforeseen circumstances that may occur and lead to serious health issues (National Association of School Nurses, 2019). Some of these issues may include injuries, incidents of mass casualties resulting

from extreme cold or hot temperatures and other problems arising from using hazardous materials such as those from the laboratory used during learning. This may vary from gasses, chemicals, glassware, irons, etc. (Cowel & McDonald, 2018; Kalekas, 2017). In support, research reveals that school physical activities caused 88% of the injuries recorded during school hours. (Spinks et al., 2006, as cited in Adib-Hajbaghery & Kamrava, 2019). Also, a news reporter from Health and Medicine Week in 2017 discusses the findings from injury research in Cairo, Egypt. The research uses a cross-sectional design to ascertain the prevalence of injuries sustained in the past 12 months and the factors that are associated with sustaining them in secondary schools in Cairo. The study reported an overall prevalence of 68.5% injuries among secondary school students, with falls (50%) and burns (38.69%) as the most common recorded injuries. Smoking, the use of alcohol, quarrelling behaviours, possession of a weapon or being strengthened by a weapon was reported to be some of the significantly associated risk factors for injuries among secondary school students in Cairo.

In Viet Nam, a school-based global health survey was conducted in 2019. The survey, which samples about 7690 students between the age group of 13 to 17 years, reported 14.5% violence-related injuries and 21.4% non-fatal-related injuries. Similar to the associated factors found in Cairo, Egypt, the study reported that smoking cigarettes, alcohol consumption, mental health illness and truancy had higher odds of violence and non-fatal injuries for both males and females (Le et al., 2022). Findings from the study also show that students whose parents monitored showed lower odds of experiencing violence, while respect for parents was found to be a protective factor against violence-related injuries and non-violence-related injuries (Le et al., 2022). Evidence from a study conducted in Nigeria establishes that over half (50.9%) of the schoolchildren experienced falls, and the majority (70.8%) of the injuries were recorded during break hours (Okandeji-Barry et al., 2016). Furthermore, 13.5% of injuries were recorded among high-school students in research conducted in Egypt, and this occurred during school

time (Wahdan et al., 2016). Similarly, a study which used an observation instrument to observe the physical conditions of the school environment in Nigeria recorded 93.3% of sharp objects and 90% of potholes/stones as part of the physical hazards present in the schools.

The school environment presents many exciting opportunities for school-aged children, and physical activities are one of them because they are considered a critical factor in promoting healthy growth while preventing chronic diseases in later stages of life. Despite these benefits, there have been reported cases of high-risk of injuries that are associated with engaging in physical activities. A study conducted by Sollerhed et al. (2020) among 1011 adolescents investigated the prevalence of injuries in school physical education. The study's findings reveal a higher (65%) prevalence of injuries during leisure time than in physical education (52%). However, those who were very active during physical education or leisure time sports reported an injury rate of 26% compared to those who were inactive (18%), and adolescents who were task-oriented were more prone to injury.

Another type of injury associated with school children, which is cause for concern, is traumatic dental injuries as the incidence of this type of injury is noted to be increasing over the years, and this causes a debilitating effect that could be life-long. A cross-sectional study carried out among 1000 randomly selected school-aged children in both public and private schools in Mathura City in India reported a prevalence of 8.9% traumatic injury among students and boys (67.4%) and girls (32.6%) recorded history of trauma. Falls experienced in the school playgrounds (46.0%) were the main cause of trauma, and 65.2% reported that this happened because they were pushed by another student (Gupta et al., 2021). A similar study was conducted in Nigeria, where a multi-stage sampling technique was utilised to select 1352 school-aged children attending paramilitary and non-paramilitary schools in Benin City. A total of 11.4% of the students had a prior history of traumatic dental injury, of which 6.2% were students attending a paramilitary school, and the other 5.2% attended non-paramilitary

schools. Again, falls and play were the most prevalent causes of traumatic dental injury, most of which occurred in the school environment (Ogordi et al., 2021).

Apart from injuries, other illnesses that affect pupils in schools include epilepsy, a disorder that causes recurring seizures. The Centre for Disease Control (CDC.) recounted that about 6 out of 1000 students would have epilepsy, and the effect reveals that students with epilepsy within the age range of 16-17 years are more likely to be absent from schools at least 11 times or more in the past years (CDC, 2019). Moreover, other studies like Pastor et al. (2015) and Russ et al. (2012) revealed that students who are experiencing epilepsy are likely to encounter difficulties in school; they engage in minimal activity in sports when compared to pupils with other medical conditions. Seizures happen when children are away from home, and out of one in six children will report seizures that occurred while in the school environment, as opined by Knight et al. 2013 (as cited in Domeier et al., 2017). It is said that over half a million people in the United Kingdom are diagnosed with epilepsy. Besides, the majority of persons who have epilepsy encounter their first seizures prior to 20 years of age.

Moreover, the report further stated that 80% of children with epilepsy go to mainstream schools, meaning that most of the teachers in these schools provide educational support for these children (Nation Education Union, 2019). Also, Canpolat et al. (2014) studied the prevalence of epilepsy among children in a school located in Turkey. The researchers revealed that the frequency of students who are still being monitored for epilepsy conditions in the schools was 83 in number. Moreover, the prevalence of emergency for epileptic conditions are one, nine and eight per one thousand each for a female, male, and mixed group, respectively. The risk of epilepsy increases by 15.1 times because of the condition of febrile convulsion. A further study shows that the prevalence of febrile convulsion was 4.2% and 4.3% in girls and boys, respectively, while 25.4% of cases showed recurrent febrile convulsion (Canpolat et al., 2018).

On the other hand, asthma is another chronic condition that has been reported to significantly impact the disease rate and increase the rate of absenteeism in schools (Cicutto et al., 2014). However, there are an absence of data from Nigerian studies concerning the link between asthma in schools and the absenteeism of the victim (Adeyeye et al., 2018). Besides, most students with an asthma condition experience its symptoms during physical activities at school, which results in obtaining or introducing self-care by quickly using the relief inhaler. Nevertheless, a study revealed that students had reported restrictions in engaging in physical activity because of the lack of adequate care plan for asthma and self-concern over stigma relating to the symptoms and use of inhalers in the presence of their peers (Hanson et al., 2013). Studies around the world reveal that knowledge of teachers with relation to asthma falls between moderate to low, and communities in the disadvantaged part of the world still record poor knowledge of asthma (Adeyeye et al., 2018; Aqeel et al., 2015). In schools, resources for asthma and the knowledge of asthma were not thoroughly evaluated in Nigeria until 2018, when Adeyeye et al. (2018) conducted a cross-sectional study among teachers to measure their knowledge of asthma and possible facilities in place for dealing with the emergencies in schools. A more recent study conducted in Nigeria shows the prevalence of different categories of asthma, such as physically diagnosed asthma (2.5%), clinical asthma at 6.4% and wheezing at 9.0%. Most particular to this study is the prevalence of clinical asthma among the age range of 6-17 years, and this was 3.1%. The study reported that about thirteen million people in Nigeria have clinical asthma, and the country's figure may likely be rated as the highest in Africa (Ozoh et al., 2019). The urbanization and development of the economy are attributed to the increase in this region (Ozoh et al., 2019; Soriano et al., 2017).

Choking is the 4<sup>th</sup> leading cause of unintentional death from injury. The incidence of choking happens in most cases because of food, resulting in difficulty swallowing (National Safety Council, 2020). In the United States, it was recorded that in a period of five days, at

least one child will die from food choking, and thousands (12000) of children were rushed to the emergency department each year for injuries resulting from food choking (Department of Health, 2017). Data collected from One of the largest registers in the world shows that the data relating to foreign bodies collected from 0-14 years old revealed that approximately 40% of injuries resulting from food intake occurred as a result of the non-supervision of children during mealtime. The other 60% occurred during the consumption of unappreciated food despite the supervision of an adult (Lorenzoni et al., 2018; Group et al., 2012). In support, Mojadam and Abdullatif-Khafaic (2018) reported choking as one of the significant health injuries that affect young children, and it results from the ingestion of the external body into the airway, which leads to poor respiratory access.

An Iranian study reported choking-related death at 2.9% (Mojadam & Abdullatif-Khafaic, 2018). The pieces of literature observed have shown more records of choking among younger children than older children. And this is because their airways are still very much underdeveloped, so light food particles or smaller toys are most likely to easily obstruct oxygen from reaching the brain (Hasa et al., 2016). Lack of oxygen to the brain for some time can lead to death or brain damage, and as a result, a report by the National Safety Council (2015) shows that a substantial amount of children die each year from choking. This death applies to all ages because, in 2011, choking was reported to be the 4<sup>th</sup> leading cause of death that is classed as unintentional death (National Safety Council, 2015)

The high incidence and prevalence of emergencies in schools are due to unsafe practices, inadequate training and poor environmental conditions (Ekaprasetya et al., 2018). About 9.7% of injuries were reported among children in Indonesia, of which choking, falling, and burning are part of the varied causes (Badan et al., 2013, as cited in Ekaprasetya et al., 2018). In Nigeria, burn injuries are common (Oladele & Olanbanji, 2010), and this is a result of the country's inadequate condition of the economy. Poor storage and altered or tampered

fuel products sold to the public for power supply and ignorance and poor practices of handling flammable compounds (Ahachi et al., 2017) are all risk factors for burn injuries. A one-year prospective study conducted in Nigeria revealed that burns were prevalent in the majority of the young persons who are at their productive age and are most common in socioeconomic groups that are classed as poor (Ahachi et al., 2017).

A cross-sectional study conducted among children and adolescents reports a mean age of  $7.2 \pm 5.3$  years and 45.2% causes of burns were due to scalding injuries with a mean length of hospital stay as  $30 \pm 59$  days and then going back to school time after an incidence of the burn was  $8.4 \pm 8.7$  weeks (Michael et al., 2019). Furthermore, the study shows that hand burns accounted for 50% of children who sustained burns (Weeks, Kasdan, & Wilhelmi, 2016; Abubaker et al., 2018). Over two hundred and fifty thousand deaths and eighteen million disabilities are recorded every year as a result of burns, and most importantly, low, and middle-income countries account for above 90% of this figure (Rybarczyk et al., 2016; WHO, 2018, 2017), of which Nigeria is included.

However, most of the burn-related studies revealed that most incidents occurred at home (Abubaker et al., 2018; Rybarczyk et al., 2016; Weeks et al., 2016). Nevertheless, training students on FA care for burns will help promote the safety and quick response to a burn-related emergency at home, in society and even at school.

### **Emergency/ first aid management techniques**

A first aider is all the time expected to be available on school premises (WHO & ICRC, 2018; Dempsey, 2003). This is important because first aid personnel in a school give immediate help to victims of injuries and other health problems arising from hazards in the school and make necessary provisions for the arrival of an ambulance or medical help team. Secondary school students enjoy playing football during their free periods and break times. First aid training in schools is expected to cover accidents related to football, such as bone fractures,

muscle cramps, strains, and sprains. In rural and local areas, snake and poisonous insect bites are common, as breathing disorders, seizures, asthma, dental trauma, wound care, which involves bandaging and bleeding, especially from the nose and broken skin and C.P.R. in extreme cases of cardiovascular disorder (Timonen & Da-Silva, 2018; Olatosi et al., 2013). Students' training must revolve around the care of students who sustain injuries while playing football in the field; this is critical because a study conducted in south-west Nigeria reported that 83.3% of the schools observed were highly hazardous (Okandeji-Barry et al., 2016). For muscle cramps, which are caused by lack of fluid intake, overuse of the muscle and exhaustion during exercise or football playing, stretching the affected muscle to loosen and relax it and gentle massage can help to relieve the cramping while proper management of avulsed tooth can promote the good dental health of the victim (Alyahya et al., 2018).

A study in Nigeria disclosed that only 10% of the population had good asthma knowledge, where personal experience significantly influences participants' knowledge (Adeyeye et al., 2018). The percentage is lesser than the study conducted among secondary school teachers in Saudi Arabia, which reported 19.4% of high knowledge concerning sports and asthma. This low percentage of knowledge on the management of asthma emergencies suggests that there is a crucial need for the school community to understand the management procedure of asthma (Alkhamis & Hashim, 2019). Similarly, a study conducted in Nigerian schools reported a lack of school clinics and the availability of trained medical personnel in the schools that were observed. It further recorded that only (16%) had a school clinic, and 7.4% had nurses' stations to respond to emergencies from all the observed schools.

Moreover, none of the schools observed had nebulizer, which is useful for responding to asthma emergencies (Adeyeye et al., 2018). Studies have revealed that when rescue medications are administered to victims of seizures, it reduces the number of persons who will be administered in the hospitals (National Education Union, 2019b; Shah et al., 2016; Stelzer

et al., 2015). It was reported by Dumeir (2017) that teachers and other school personnel, including the students, are most often the first point of contact when such an emergency need arises. Despite the critical roles the people in the school play as the first point of contact, it has been reported that preschool teachers are not sure about the necessary steps to respond to emergencies (Dumeir et al., 2017). And yet, the first 15 minutes of care by administering medication to the seizure-related crisis is crucial for the survival of the victims (Stelzer et al., 2015). Besides, other studies revealed that participant is scared because of the fear of administering the wrong medication and the possible effect of the drug on the patient's health or the perceived consequences, such as adverse legal interrogation if something terrible happens to the victims as a result of the medication (Klimach, 2009 as cited in Dumeir et al., 2017).

The emergency skills of the population require major improvement. A study conducted in the United States revealed that only a few teachers passed FA training. At the same time, in a majority of the other schools assessed, all staff reported that they have never been equipped with the appropriate skills of FA (Adib-Hajbaghery & Kamrava, 2019). Moreover, a comparative study conducted across schools in the United States over a while (from 2006 to 2016) showed no significant increase in emergency preparedness plans (Kriger et al., 2018). Teachers and other school personnel are yet to update their knowledge of emergency preparedness. A Saudi Arabia study among teachers reveals that only 31% had adequate knowledge of FA care for poisoning (Adib-Hajbaghery & Kamrava, 2019). Besides, a survey conducted among secondary school teachers revealed poor emergency knowledge of the treatment of an avulsed tooth (Abuelqomsan et al., 2017). Only 11% (Prasanna et al., 2011) and 6% (Awad et al., 2017) know the correct media for transporting tooth or were able to manage the situation of an avulsed tooth by replanting the tooth (Adib-Hajbaghery & Kamrava, 2019).

In relation to choking, a finding reported poor knowledge of choking-related hazards among caregivers (Group, 2012). And yet, data from epidemiological studies reveal the need for preventive strategies concerning choking (Lorenzoni et al., 2018). The survey outcome was prompted by the review of previous and current studies, which shows that choking is among the principal causes of death resulting from unintentional injuries among young children (Passal et al., 2015; Lorenzoni et al., 2018). Research carried out among parents in Saudi Arabia shows that only a few (69%) participants have an acceptable level of awareness towards FA for choking and burns. Incorrect practices towards managing these injuries were prevalent, and the majority (79%) of the participants think that adding subjects relating to FA to the school curriculum will significantly improve the practice of the community (Habeeb & Alarfaj, 2020).

### ***Epileptic seizure***

About 1.2% of the population suffers from epilepsy. Epilepsy affects around 3.4 million persons in the United States and 50 million people worldwide. The United States recorded the fourth most frequent neurological condition as epilepsy. According to the Epilepsy Foundation, approximately 30% of the 200,000 new cases diagnosed yearly begin in childhood, primarily in early childhood and around adolescence. However, symptoms can emerge at any age (Letcher et al., 2021). A metal analysis research approach conducted in Nigeria (Owolabi et al., 2019) assessed the burden of epilepsy in Nigeria using data from community-based door-to-door surveys conducted in different parts of the country. The study investigates the extent to which the prevalence of epilepsy in Nigeria varies across different geopolitical regions and settlement settings. Observational studies documenting the prevalence of epilepsy in Nigeria were included in a random-effects meta-analysis to provide prevalence estimates. The burden of epilepsy in Nigeria was calculated by multiplying the prevalence estimate by the country's total population. The finding from the study revealed that epilepsy was shown to have an overall prevalence of 8 per 1000 people, with a 95% confidence interval of 6-10. The rate was

highest in the southwest (11% per 1000) of the country. Similarly, the rate was fifteen times greater in rural areas than in urban ones. The estimated prevalence of epilepsy in Nigeria was 1,280,000 people (95% CI: 960,000-1,600,000).

Epilepsy is a chronic (ongoing) nervous system disorder. This disorder is characterized by recurrent seizures caused by abnormal electrical activity in the brain. Seizures are any anomalous physiological functions or activities that are controlled by the neurological system. An epileptic seizure is characterised by a brief (short) period of aberrant electrical activity in the brain. Many nerve cells within a given region of the brain may begin to activate at the same time during a seizure. This activity could then spread to other areas of the brain. Seizures can cause feelings ranging from fear, hatred, and rage to joy or happiness, in addition to strange physical symptoms. Patients may experience disorientation, spontaneous experiences of sounds, odours, visions, and altered visual perception—such as deformed things and places—while having a seizure. Seizures can also cause brain cell damage and destruction, with scar tissue potentially accumulating in the area of brain tissue where seizures start (Letcher et al., 2021).

It is important to remain calm and composed when assisting someone experiencing an epileptic seizure. This type of seizure can also be referred to as a tonic-clonic epileptic seizure, epileptic convulsion or epilepsy. To prevent further harm, placing a pillow or soft object behind their head is necessary. It is also essential to ensure that the individual's mouth is free from any solid or liquid substances to avoid respiratory obstruction (Schachter & Schafer, 2019; CDC, 2019). After the seizure, it is recommended to 'place the person in' a recovery position to maintain an unobstructed airway and allow for proper breathing and the expulsion of any unwanted fluids. The recovery position involves placing the individual on their side and lowering the knee of the upper leg to the floor. The hand on the upper side is placed beneath the head to provide support. Gently extending the head from the chin will help to keep the

airway open (Wheless & Sirven, 2014). In addition, if a healthcare professional prescribes a rescue drug, it may be administered to the individual (Schachter & Schafer, 2019).

### ***Bleeding and wounds***

Wound care is the term used to maintain a wound in a healthy condition. Any time the continuity of cells that make up a body tissue is broken, we get a wound. Surgery, injury, illness, or burns are all examples of disruptions that can lead to the separation of normally linked cells. Wounds of varied depths can affect the deeper layers of skin. A partial thickness injury is one that does not extend into the deeper layers of skin (the dermis) and hence does not affect the superficial blood vessels. Regeneration of the skin's outer layers is the key to successful healing. A full-thickness injury causes the dermis to be lost, reaches into deeper layers of tissue, and damages blood vessels. Healing and avoiding infection are the two main goals of wound care. If left untreated, wounds can lead to a variety of dangerous consequences, like a sympathetic stress response, blood loss, bacterial contamination, cell death, and organ failure. Prevention of infection, which can be achieved through the use of oral and topical antibiotics and by employing sterile practices while treating and dressing a wound, is the most significant aspect in mitigating these consequences and ensuring good wound care (Jackson & Culvert, 2020).

Nonviable tissue, such as necrotic tissue, slough, foreign debris, or residual material from soiled dressings, must be removed as the first step in wound care. Debridement refers to the removal of dead tissue, while cleanliness refers to the removal of foreign substances. Bacteria commonly invade chronic wounds; however, this does not always indicate infection. In support, Sudharsanan et al. (2017 cited in Li et al., 2021) report that Microbes in small quantities have little effect on the regular processes of wound healing and inflammation. However, wound colonisation results from microbial reproduction. The

invasion of a wound occurs when a wound contains a small number of germs that are not harmful to the healing process. When the host's immune system is unable to keep up with the number of bacteria present in a wound, the wound becomes infected. Swelling, pus-containing discharge, a putrid odour, and redness of the skin around the lesion are all clinical indicators of infection (Li et al., 2021).

A wound can be in the form of blisters, scrapes, punctures, lacerations or arterial wounds. It can be easily infested, and the healing process can be delayed. Wounds require immediate attention and first aid intervention. The wound is cleaned of debris using clean or sterilised water; also, a dressing may be applied using a bandage depending on how deep or big the wound is; this helps avoid further entry of debris and excessive bleeding. For a severe case of bleeding, sterile gauze is placed on top of the wound (Florida Health, 2016). Jackson and Culvet (2020) also reported that keeping the wound in a moist environment is the second step in wound care. Research shows that this helps skin grow and mend. When wounds are left exposed to air, the surface dries out, which can slow the healing process. This environment can be created with the use of wet-to-dry dressings, which are gauze dressings that are kept moist in the wound. A sterile gauze dressing soaked in saline is placed loosely over the wound, and another gauze dressing is placed on top to keep the wound from drying out or becoming contaminated. It facilitates the body's own debridement, eliminates bacteria when changed and absorbs exudate.

The third premise of wound care is to prevent further harm. In order to deal with chronic wounds, it is essential to minimise or eliminate the underlying factors that caused the wound to appear. These factors may include decreased mobility, changes in mental status, sensory impairments, and circulatory deficiencies. Proper positioning of patients is necessary to alleviate ongoing pressure on the chronic wound. Pressure-relieving items such as mattresses,

cushions, orthopaedic boots, foam wedges, and custom-fitted shoes can be used to reduce pressure on wounds. In the case of a nosebleed, the person should sit down and lean their head forward. They should then apply pressure to the lower part of their nose for about 10 minutes until the bleeding stops. Placing ice packs at the back of the neck can also help by constricting the blood vessels, also called vasoconstriction (Timonen & Silva, 2018).

### ***Foreign Object***

Foreign refers to things that originated elsewhere or "on the outside of the body. Foreign items or objects, often known as foreign bodies, commonly become trapped in human eyes, ears, nose, airways, and rectum. Boys are slightly more likely than girls (53%–47%) to ingest foreign items when they are younger. Males are far more likely than girls to ingest foreign bodies or introduce them into the rectum as teenagers. Other younger aged children may accidentally swallow or introduce foreign objects into their bodies while playing or exploring their surroundings. Adolescents have a greater tendency than adults to intentionally ingest or insert foreign objects as a form of risk-taking behaviour. They may also do it as a means to seek attention or while under the influence of drugs or alcohol. A small number of young individuals who engage in self-harming behaviours by consuming or inserting objects into their bodies exhibit symptoms of schizophrenia or another psychotic disorder. Foreign things becoming lodged in the bodies of both children and adults pose issues (Gulli, 2018; Polsdorfer & Finley, 2020).

Children have a natural curiosity and might intentionally swallow shiny objects like coins or button batteries. They also enjoy putting things inside their nostrils or ears as part of curiosity, experimentation or copying others. Adults might accidentally inhale a foreign object or swallow something non-edible, which can get stuck in their throat. Even if an object like a toothpick manages to pass through the food pipe and reach the stomach, it can still get stuck in

the rectum. People of all ages can have airborne particles lodged in their eyes. Foreign objects have the potential to become lodged in hollow organs or tissues, such as batteries or bullets that are accidentally ingested. These objects can remain dormant or cause discomfort. If they become inflamed, they can cause swelling and scarring. Additionally, they can introduce or spread infection and can be difficult to detect by the immune system. They can also obstruct pathways due to their size or the formation of scar tissue. Some are poisonous (Gulli, 2018; Polsdorfer & Finley, 2020).

The symptoms may include:

**Eyes:** The eyes can sometimes get irritated and red due to exposure to dust, dirt, sand, or other airborne particles. If an object with a hard or pointed nature gets into the cornea or conjunctiva, which are the protective membranes of the eyes, it can cause more severe damage. This can result in ocular inflammation, redness, bleeding from the surface of blood vessels, sensitivity to light, and sudden visual problems. These are known as ocular foreign bodies.

**Nose and ears:** Sometimes children might put small objects like beans, popcorn kernels, raisins, and beads into their nose, ears, or other body parts. Insects can also fly into ears and noses on rare occasions. The presence of foreign objects in the body, i.e. when an object gets stuck in the ear, it can cause discomfort, hearing problems, and the feeling of having something blocking the ear. Similarly, if something gets lodged in the nasal cavity, it can result in a bad smell and bloody discharge from one nostril.

**The lungs and the stomach:** Children of a certain age will eat anything. It has been found that children have swallowed various objects such as chicken bones, fish bones, coins, beads, rocks, plastic toys, pins, keys, marbles, round stones, nails, rings, batteries, ball bearings, screws, staples, washers, a heart pendant, a clothespin spring, and a toy soldier (Gulli, 2018; Polsdorfer

& Finley, 2020). Some of these objects simply flow through and out the other end. Metal detectors have effectively tracked the movement of metal objects. However, certain objects, such as sharp bones, possess the capability to become lodged and cause further complications. Batteries are corrosive and must be removed as soon as possible. Unintentionally, some things can be breathed in. Peanuts are most likely the most regularly inhaled object. An insect and a pencil were discovered in a child's windpipes. These objects can cause consistent symptoms, like dysphagia and regurgitation of saliva. Children may not even notice them during treatment for asthma or recurrent pneumonia. Adults are not immune to strange edibles. Dental instruments are frequently swallowed. Adults suffering from mental illness. Treatment and first aid response may involve;

Eyes: Small particles, like sand, can usually be removed from the eye without medical intervention. However, urgent emergency care is necessary if the particle is not visible or cannot be reached easily. Eye injuries can lead to vision problems, so it's important to be careful. Before trying to remove anything from the eye, move to a well-lit area to make it easier to see what is being done. The victim is advised to clean their hands thoroughly before touching their eye and try to use sterile objects if possible. If the particle is very small, an alternative procedure is to try blinking or moving the eyelids to dislodge it. The first aider can also use a clean cloth to remove the particles. After removing the particle, proper hygiene care should be followed by rinsing the eye with fresh, lukewarm water or an ophthalmic solution. (Polsdorfer & Finley, 2020)

Cover the eye softly with sterile gauze to prevent rubbing in case a foreign object cannot be removed from the eye at home, a physician will use a luminous light, and specialized eye drops to locate it. Surgical tweezers are usually effective for removing foreign objects from the eye. After removal, the physician may apply an aseptic antibiotic ointment and dressing. However,

if the foreign object has penetrated the deeper layers of the eye, immediate treatment by an ocular surgeon will be necessary.

Nose and ears: Various innovative extraction procedures have been developed to eliminate foreign objects from the nose and ears. For example, if a bead gets stuck in one nostril, you can try to remove it by forcefully exhaling through the mouth while keeping the other nostril closed. In case an insect gets inside the ear canal, either the first aider or the victim can pour warm mineral oil, olive oil, or baby oil to make the insect float out. However, if an object gets lodged deep inside the ear canal, it can cause harm to the eardrum; therefore, it is important to seek medical assistance from a qualified physician as quickly as possible (Polsdorfer & Finley, 2020). The Heimlich manoeuvre is used to relieve mechanical obstruction of the airways, such as when food becomes stuck in the throat. The greatest approach to keep harmful substances from entering the body is to use common sense and take appropriate safety measures. Parents and carers need to make their homes safe for toddlers. Keep batteries in a secure location and dispose of them safely when they are no longer needed. Parents shouldn't let their kids eat and run, play, or do anything else when there's a risk of choking. Adults should take their time chewing their food and should not chat at the same time. Wearing safety glasses when working with tools can help prevent many eye injuries (Polsdorfer & Finley, 2020).

Hyphema is one of the other injuries that can affect the eyes; an anterior chamber hyphema is a collection of blood at the front of the eye. Blunt eye damage is the typical culprit of hyphema. The AC is the space behind the cornea at the back of the eye. A fluid known as aqueous humour is used to cool the interior of the AC. This fluid not only acts as a cushion for the eye but also as a vital pathway for the passage of nutrients and waste. Local blood vessel tearing can be caused by contusive stresses from high-velocity projectiles such as rock, crab apples, ice balls, badminton birds, or bungee cords (34% of emergency room patients). About

62% of cases can be attributed to blunt impact from a basketball or racketball. When a tiny blood vessel in the eye is torn, blood leaks into the AC through an exposed layer, giving the affected individual a red eye (Gulli, 2018). A hyphema occurs when blood accumulates in the front portion of the eye. This is usually caused by a blunt injury to the eye, with explosions accounting for about 4% of cases. These injuries result in a blood vessel tear in the eye, leading to blood entering the front chamber. Symptoms include blurred vision, pain, high eye pressure, and vomiting. Patients may present with red eye and a history of recent trauma. After 3-5 days, there is an increased risk of bleeding. Treatment usually involves outpatient medical management, with the patient's eye covered but not patched. The doctor may advise bed rest with the head elevated at a 45-degree angle to divert blood flow away from the front chamber and reduce bleeding risk (Gulli et al., 2020).

### ***CPR (Cardiopulmonary Resuscitation)***

C.P.R. is the acronym for the word cardiopulmonary resuscitation. It is a blend of rescue breaths and chest compression expected to resuscitate normal cardiac functions or blood circulation for cardiac arrest victims. It is a Basic-Life-Support (B.L.S.) process for victims of accidents with breathing failure or absence of a pulse. The Paris Academy of Science in the year 1740 introduced a resuscitation technique using mouth-to-mouth for drowning victims (Castro, 2010). While Dr Friedrich Maass in 1891 carryout and documented the first observed chest compression in two patients who had a cardiac arrest from chloroform anaesthesia (American Heart Association, 2007). This phenomenon is estimated to have caused the death of 17.5 million people yearly, more frequently in low-income and developing countries (Onyeaso & Onyeaso, 2017a). CPR is done to get oxygenation and circulation of blood to vital organs such as the heart, brain, and other crucial bodily tissue after someone has stopped

breathing or their respiration has stopped. Infants, children, adolescents, and adults can all benefit from CPR, which untrained bystanders or medical professionals can administer.

In the event that an individual is unresponsive and not exhibiting any signs of respiration, CPR should be administered. Allergies, irregular pulse, asphyxiation, and restricted airways may be possible triggers for respiratory and cardiac arrest, including asphyxiation, drowning, adverse reactions to drugs or excessive doses, shock, hypothermia, extreme emotional distress, and physical injury. Sudden infant death syndrome (SIDS) and airway blockage, typically caused by inhaling a foreign object, are potential risks, infection, neurologic illness, and drowning are all categorized as the leading causes of cardiac arrest in infants. The most prevalent causes of cardiac arrest in children older than a year are trauma-related shock and respiratory failure (Culvert et al., 2021). There is a global campaign to train and teach C.P.R. to students in primary and secondary schools (Hamasu et al., 2009; Campbell, 2012; Lee et al., 2012; Miro et al., 2012; Onyeaso, 2014, Onyeaso & Imogie, 2014, Onyeaso & Onyeaso, 2017a, b). Cardiac arrest occurs in adults, infants, and children and sometimes happens in newborns.

CPR is an essential aspect of the emergency cardiac care system. Early CPR, defibrillation (in which a brief electric shock is delivered to the heart in an attempt to stimulate it to beat normally), and advanced cardiac life support measures can save many lives if performed soon after the diagnosis of cardiopulmonary arrest and notification of the emergency medical system (EMS). Until professional medical help arrives, bystanders can help keep a person alive by performing cardiopulmonary resuscitation (CPR). When carried out by medical professionals, it complements other forms of basic and advanced life support (Culvert et al., 2021). When a person stops breathing, they only have four to six minutes before brain damage or may result in an event of death, hence a quick response before the minutes elapse is necessary by attempting rescue breathing which provides oxygen to the lungs while chest compressions

circulate blood from the heart and to the body's important organs. However, even performing merely chest compressions (hands-only CPR) is beneficial (Culvert et al., 2021). CPR procedures for infants and children who are eight years or below differs from those used on older children and adults due to their smaller upper and lower airways and higher heart rhythms. When it comes to administering cardiopulmonary resuscitation (CPR) and basic life support, children and adolescents aged eight and over eight years are considered adults because of their increased physical maturity. After checking on the person and calling for help, CPR is always initiated. In addition to chest compressions, automated external defibrillators (AEDs) should be utilised in cases of cardiac arrest. If the heart stops beating or begins beating too quickly, an AED can help get it going again. In a perfect world, one person would administer CPR while another person retrieved and attached the AED (Culvert et al., 2021).

The process of infant cardiopulmonary resuscitation involves opening the airway with a chin lift, jaw thrust, or another gentle manoeuvre; the rescuer places their mouth directly over the mouth and nose of the infant and breathes in gently, causing the chest to rise with each breath. During chest compressions, two fingers of one hand are placed over the infant's lower half of the sternum, just below the nipple line, and the hand is pressed down roughly 1.5 in. (38 mm). After a cycle of 30 gentle compressions at 100 compressions per minute, the rescuer gives two rescue breaths. A tight seal should be made between the rescuer's mouth and the baby's nose and mouth, and each breath should be given for nearly a minute (Culvert et al., 2021).

The procedure differs slightly from that of an infant. Compression and breathing rates for a 1-8-year-old should be the same as an infant's when performing CPR. A mouth-to-mouth seal is used during rescue breathing rather than a mouth-to-mouth and nasal seal. For each compression, the heel of one hand is placed over the lower half of the sternum, and the hand is

depressed by about 2 inches (50 millimetres). Meanwhile, for children aged eight or older, the heel of one 'hand is placed on the lower half of the sternum', and the heel of the second hand should be placed on top of the other hand. Each compression is at least 2-2.4 inches (50-60 mm) deep in the chest. A mouth-to-mouth seal is used to administer rescue breaths. The first aid personnel delivered 30-compression to two-breath cycles; the compression rate is 100-120 per minute (Culvert et al., 2021). These procedures are essential for the victims' survival. Other muscle tissues can regenerate, but oxygen deprivation in the brain can cause brain damage. The differences noted in the procedures for delivering CPR for infants, children and adults are because the anatomical and physiological make up of children differs from that of an adult (Alkhafaji et al., 2021).

Automated External Defibrillators (AED) are used for unresponsive victims if the school has this equipment available and accessible. Unfortunately, schools in Nigeria have no record of such advanced equipment. Therefore, in the absence of AED, it is recommended that CPR procedures be initiated immediately (Florida Health, 2016). Before starting CPR, the responsiveness to speaking or touch must be ascertained (Timonen & Da-Silva, 2018). The necessary steps include the following but are not exclusive, as stated below by Markenson et al. (2010).

1. The person must lie on his/her back with the head tilted backwards, chin lifted, and nasal airways opened up.
2. All airway obstructions must be checked and removed, if any. If all airflow and obstructions are removed, blow five air into the mouth at the same time the nose is pinched to avoid air escaping from the nostril. The air blown into the nose must be strong enough to create an up-and-down movement of the chest.

3. Chest compression must be quickly done if breathing does not revive the person by placing the palm heel on the centre of the victim's chest (one armrest above the other with fingers interlocked). This can be done 30 times, and two blows of breath are to be given to promote and facilitate responds.

4. The process is continued in a 30:2 ratio until help arrives

It is important to note that improving people's chances of surviving cardiac arrest is a top priority. Therefore, high-quality CPR plays a vital role in determining the survival rate. The effects of effective CPR appeared to persist for some time after cardiac arrest had been reversed. Chest compression depth, release force, compression rate, and duty cycle are what make or break CPR (Alkhafaji et al., 2021). The largest apparent sternal displacements measure compression depths of the chest. It is crucial to cardiopulmonary resuscitation (CPR) because it increases blood flow to the cerebral (brain) and all other essential organs. It's possible that rescuers know they need to compress to a certain depth. They might not be able to put in the necessary work and get as deep as they need to (Alkhafaji et al., 2021). When doing cardiopulmonary resuscitation, chest release force refers to the full release of the chest. By increasing intrathoracic pressure, leaning on the chest reduces coronary perfusion pressure and prevents full release. Since this affects the survival rate from cardiac arrest, it is the most common complication during CPR performance. On the other hand, if the compression was completely removed, the intrathoracic pressure would drop, improving the patient's hemodynamic status. According to European Resuscitation Council recommendations, rescuers should let the chest wall fully relax between compressions (Biarent et al., 2010).

When performing chest compressions, the compression rate is the number of compressions performed in a certain amount of time (per minute). To improve the likelihood of a successful resuscitation, it must be taken into account when doing high-quality CPR.

Compression rates for babies should range from 100 to 120 cycles per minute, as recommended by European resuscitation guidelines (Biarent et al., 2010). In order to improve the chances of survival and carry out effective CPR, it is essential to achieve a sufficient pace of compressions. It's the ratio of tension to relaxation. Time spent actively compressing the chest is the definition. The area under the curve of chest compression divided by the product of chest compression depth and cycle time gives a rough estimate of the compression duty cycle. Infants' coronary and cerebral perfusion pressures may be optimally maintained between 30% and 50% at duty cycles. It is essential to achieve a duty cycle rate in that range, as recommended by the European resuscitation guidelines (De Caen et al., 2010). Achieving a duty cycle of 50% is actually rather simple. In contrast, maintaining the compression-to-release ratio during CPR is challenging, leading to a longer duty cycle and a lower survival rate (Alkhafaji et al., 2021).

## ***Asthma***

Asthma is a respiratory tract (breathing) disorder where a person finds it difficult to breathe. Inflammation of the airways is the primary symptom of asthma, which is a chronic (ongoing) condition. People living with asthma experience recurrent episodes of wheezing and shortness of breath due to inflammation of the airways. As a result, a person who has asthma will need to wheeze or gasp for air. Chronic inflammation results in the airways becoming overly reactive to stimuli, including cold air, exercise, dust mites, air pollutants, and stress/anxiety, and can persist even without the obstruction of air passage (Cramer & Bullard, 2021). Earlier studies reported asthma as an illness that affects the lungs of millions of people across the globe. The disease is characterised by lung inflammation and constriction in the bronchi, and certain substances may trigger difficulty breathing. Exercise, cold air, allergens, irritants, dust, smoke, aspirin medications and perfumes are good examples of triggers (American Red Cross, 2011). Omagbemi (2013) described it as a paroxysmal airway

obstruction caused by the narrowing of the bronchi, which reverses spontaneously or through inhaler administration. Infection of the tract, allergens, weather changes, irritating fumes, hormonal changes, and hereditary factors may predispose one to the illness (American Red Cross, 2011). During an asthma attack, the muscles surrounding the bronchi contract, and the airway lining becomes inflamed, leading to the production of mucus. This makes it difficult for the patient to breathe. Both of these activities result in bronchoconstriction, which is a narrowing of the bronchial tubes. Consequently, a person with asthma needs to exert significantly more effort both while taking in air and when exhaling it (Cramer & Bullard, 2021).

Mast cells, which are found in the walls of the bronchi, are responsible for releasing certain chemicals that cause the bronchial muscles to contract and promote the production of mucus. Moreover, they play an important function in the inflammatory response by helping to attract white blood cells to the affected area. These compounds, which include the chemical histamine and a collection of molecules referred to as leukotrienes, also deliver histamine to the area. Many people with asthma have developed an immune response to allergens, defined as foreign particles that cause an immune reaction. Common allergens include pollen, dust mites, and animal dander (Cramer & Bullard, 2021). The onset of Childhood asthma is commonly related to genetic reasons; hence, children with high genetic factors have a higher risk of developing an allergy to widespread environmental allergens (an atopic person). These children create an antibody designed to engulf and kill the foreign elements when exposure to dust mites, animal proteins (such as animal hair or dander), mould, or other possible allergens can cause allergies (Cramer & Bullard, 2021). This occurs when young people are exposed to dust mites, mould, or other possible allergies. The result is that the cells lining the airways become hypersensitive to certain substances. The asthmatic reaction might come quite quickly if the exposure is continued.

Atopy is a common condition that affects a significant portion, ranging from one-third to potentially one-half, of the population (Cramer & Bullard, 2021). Similarly, when adults develop asthma, exposure to certain allergens in their workplace, such as plastics, solvents, wood particles, or wood dust, may contribute to asthma development. There is a possibility that some additional individuals are hypersensitive to aspirin, nonsteroidal anti-inflammatory medicines (NSAIDs) like ibuprofen, or other drugs. Adult-onset asthma is typically characterised by a more continuous course of symptoms, in contrast to childhood asthma, which is frequently characterised by asthmatic episodes that are followed by asthma-free periods of time. Aerobic activity can also trigger an asthmatic reaction in certain people, leading to a condition known as exercise-induced asthma or exercise-induced bronchoconstriction (EIB). These episodes can go on for numerous minutes, leaving the person breathless and struggling to speak. It has been claimed that rates of exercise-induced asthma range from 30 percent to 90 percent among those with allergies or a history of asthma, while the prevalence among non-allergic Americans is estimated at 12 to 15 percent. Exercise-induced asthma attacks are common in those sensitive to the condition and exposed to cold air, engage in aerobic activity for longer than ten minutes or engage in shorter bouts of very heavy aerobic activity. Air pollution and other chemicals (such as chlorine in pools or herbicides on a pitch) have been linked to a variety of health problems (Cramer & Bullard, 2021; Klain et al., 2022). Similarly, research reveals that EIB is seen in anywhere from 40 to 90 percent of children who have asthma, most frequently in those who have severe asthma that is not managed by medication (Lin et al., 2019). In addition, EIB is common among athletes who participate in endurance activities, and its incidence among athletes who participate in winter sports reaches 55% (Klain et al., 2022).

Inhaling tobacco smoke can irritate the airways and provoke an asthma attack, whether through smoking or being around smokers. Wood smoke and other air contaminants can have

a similar effect. In addition, the following three factors, such as cold air inhalation (cold-induced asthma), exercise-induced asthma anxiety or an elevated degree of stress, frequently cause asthmatic attacks and occasionally can be the primary factor responsible for symptoms. The use of a stethoscope by physicians to examine the heart rate helps to validate the presence of mild asthma attacks. Wheezing is a condition that is usually easily noticeable. The individual might experience coughing and/or chest congestion, along with wheezing and shortness of breath. The intensity of wheezing is most pronounced during exhalation as the individual tries to expel air through the narrowed air passages. Some individuals with asthma are symptom-free in most instances but may occasionally experience shortness of breath. Others suffer from chronic wheezing or frequent episodes of breathlessness until they undergo the treatment prescription. Emotional responses such as crying or laughter can trigger an episode. Viral respiratory tract infections and high concentrations of allergens or irritants can cause severe asthma attacks. The duration of asthma attacks can vary from a few minutes to several hours or even days (also known as acute severe asthma or status asthmaticus) (Chung et al., 2019; Cramer & Bullard, 2021).

Shortness of breath can cause visible anxiety; sitting up, leaning forward, and aiding with respiration are recommended, as well as practising this technique using the neck and chest muscles. When speaking, the individual can only manage a few syllables before pausing and inhaling. If the oxygen levels drop too low, the person may become confused, and their skin may turn blue, in which case emergency medical attention is required immediately. In the case of a severe and prolonged attack, it is possible for air sacs in the lungs to rupture, causing air to collect in the thorax. This makes it more difficult for the lungs to exchange sufficient oxygen. Several genes may also increase an individual's susceptibility to asthma. It is possible that allergen-responsive genes cause airways to react intensely to specific substances. The affected alleles likely vary between individuals. In rare instances, sulfites, a type of food preservative,

can induce asthma. This preservative is utilised in wines, ales, frozen potatoes, frozen prawns and certain pharmaceutical products, such as asthma and allergy medications (Chung et al., 2019; Cramer & Bullard, 2021).

A person with asthma has a 1 in 20 to 1 in 100 chances of being sensitive to sulfites, whereas those without asthma have a much lower probability. Infrequently, thunderstorms have also been linked to asthma cases. The first documented case of thunderstorm asthma occurred in Birmingham, England, in 1983. In 2016, a storm impacted Melbourne, Australia, spreading rye grass pollen throughout the city. Storm conditions caused pollen to fragment into extremely fine particulates, resulting in over 8,000 asthma attacks. For thunderstorm asthma to develop, the storm must occur on a day with a high pollen count, and the pollen grains must be drawn into the clouds, where they can absorb water and break apart into fine particles. After falling to the ground, these particles are readily inhaled and primarily cause problems for people who already have asthma or are allergic to the allergen (Percy, 2018; Cramer & Bullard, 2021).

The necessary steps taken to respond are simple.

1. Calm down the person
2. Loosen any tightened clothing on him or her
3. Place the victim in a near sitting position with his hands rested on both knees
4. Give medication as soon as possible, if any and available to lessen the disorder
5. Lastly, call for help

### ***Sprains and strains***

A sprain occurs when ligaments or a joint capsule tear, while a strain results from muscle injury or tearing. When a joint is subjected to excessive force, the ligaments holding the bones together may rupture or damage. The severity of a sprain depends on the extent of the ligament tear. Sprains can occur in any ligament, but ankle, knee, and finger joints are most commonly affected. Muscle strains are fractures within the muscle. Muscle strains, also known

as strained muscles, typically occur when a muscle has insufficient flexibility, strength, or tolerance to execute a specific action. The preponderance of strains occurs at the tendon-muscle junction but can also occur in the central part of a muscle.

Individuals who are younger than eight years old have a lower probability of experiencing sprains compared to adults. Children have stiffer ligaments, and their bones are more likely to fracture before a ligament ruptures. Athletes are more susceptible to strains and sprains than inactive individuals. Recurring sprains of a particular joint diminish its stability and increase its vulnerability to subsequent sprains. Additionally, previously injured muscles are more susceptible to muscle strains (Lowe & Smith, 2020). Strains, like sprains, are categorised into three distinct groups.

Grade I pathogens are regarded as benign. They are characterised by a small amount of localised oedema and the absence of significant muscle-tendon unit disruption. Muscle contraction or stretching may be excruciating. Some disruption of the muscle-tendon unit characterises grade II strains, resulting in muscle weakness and limited range of motion, but not a complete impairment of the muscle. Strains of third-degree or Grade III injuries involve complete rupture of the muscle-tendon unit and are often accompanied by a loud popping or snapping sound, resulting in severe pain. The location of the injury tends to be easily noticeable, and a substantial muscle gap can be detected by touching it with the fingertips. Also, the Grade III strain of a muscle is frequently accompanied by severe discolouration. Sprains and strains of grade I are typically self-diagnosed. In the case of grades II and III sprains, a physician may perform an x-ray to distinguish between a sprain and other severe joint injuries. Since muscles are not visible on an X-ray, Grade II and Grade III muscle strains are typically diagnosed through a physical examination (Lowe & Smith, 2020; Davidson, 2020).

The prevalence of strain or sprain in secondary schools could be attributed to students engaging in various sports activities that expose them or increase their risk of torn ligaments or muscles. It accounts for over 85% of the injuries associated with football players. It affects the muscles, joints or ligaments of the leg. The thigh muscle can be torn or over-stretched too fast or hard to cause sprains and strains: this could also affect the ankle or knee during fast-paced sports (Timonen & Da-Silva, 2018). It occurs either due to knee twisting, kicking off the leg, or overuse of muscles or tendons (Burger & Fine, 2010). The basic first aid applicable in this case includes the elevation of the limb to avoid build-up of excessive fluid, placement of cold ice packs on the affected area as a vaso-constrictor to reduce blood flow to the extremity, raising the area up and use of compression to increase the pressure in the tissue which helps to decrease perfusion in the soft tissue. It reduces pain, swelling or inflammation, recovers time and protects from further damage (Topke, 2011; Orthoinfo, 2015). Although the primary issue with sprains and strains is a ruptured or damaged ligament or muscle fibre, swelling and immobilisation of the injured area can lead to additional complications. Other researchers proposed that to prevent the worsening of these complications; alternative practitioners advocate. The RICE method involves **resting** the injured part, using **ice** for 48 hours, **compressing** the affected area, wrapped in an elastic bandage, and **elevating** the sprain or strain above the level of the heart (Lowe & Smith, 2020; Davidson, 2020).

Nutritional therapists recommend incorporating vitamin C and bioflavonoids alongside diets that are rich in whole grains, fruits, and vegetables, which can be beneficial. Bromelain, a proteolytic enzyme extracted from pineapples and turmeric (*Curcuma longa*), may also provide advantages. For initial treatment, Arnica (*Arnica montana*) can be used briefly, followed by Rhus tox (*Rhus toxicodendron*) for injuries associated with joints or Ruta rutagraveolens for injuries related to muscles. Arnica gel or ointment, such as Traumeel, or a

homoeopathic mixture of arnica and other treatments, has been found to be effective in the therapy of certain joint disorders (Lowe & Smith, 2020; Davidson, 2020). Sprains and strains have been effectively treated with traditional Chinese medicine. Acupuncture is used as a remedy to treat pain and accelerate the regeneration of damaged tissues by removing energy blockages. Moxibustion's radiant heat can also be used to enhance the healing response of wounded tissues. Diverse practitioners may employ massage and soft tissue manipulation techniques with a specialised focus. Massage significantly improves local circulation, fosters earlier mobility, and accelerates tissue healing response. Typically, it will be used in conjunction with other techniques, such as stretching and range of motion exercises (Malanga, 2017; Davidson, 2020; Jacobsson et al., 2020).

To prevent sprains and strains, one has to take time in practice to make the muscles accustomed to the new kind of exercise. Low and Smith (2020), in support, provided some preventive measures for sprain and strain; warming up before exercise, using proper lifting techniques, putting on shoes that fit properly, and taping or bracing the joint can prevent sprains and strains. Sprains and strains are common injuries, especially among active youngsters, and parents should be aware of this. In most cases, the discomfort from a sprain will be felt right away. Possible symptoms include bone-like discomfort and swelling. Pain from a strain can present itself quickly or not until hours later. It is recommended that a medical practitioner examine the injuries in order to identify the best course of therapy. Sprains and strains are not the same as fractures, but they are serious injuries that need treatment. Healing time varies but is typically between one and four weeks. The child needs to rest and let the injuries heal before returning to normal activities (Davidson & Caputo, 2021).

## **Shock**

Shock is an emergency medical condition in which the body's organs and tissues do not receive an appropriate supply of blood. This syndrome deprives organs and tissues of oxygen (delivered in the blood) and permits waste products to accumulate. Shock can cause major bodily harm or even death (Carson-Dewitt & Finley, 2020). Shock has four levels, and Grade 1, results in a loss of up to 15% of effective blood volume, or roughly 750 mL on the average adult; On the other hand, Grade 2 is twice what is obtainable in Grade 1, which results in a loss of blood volume of between 15 and 30%, or roughly 1500 to 2000 mL; Grade 3, which results in a loss of blood volume of between 30 and 40%, and the failure of compensatory mechanisms, hypotension, tachycardia, and low urine output. Last but not least, Grade 4 results in a 40–50% decrease in blood volume, or 2000–2500 mL, the development of profound hypotension, and, if left untreated, could result in catastrophic organ damage and death (Carson-Dewitt & Finley, 2020). Shock occurs after an accident, injury or illness which was accompanied by pain. It is caused by physical violence to the body or depression of vital centres in the medulla oblongata as a function of depletion in the supply of oxygen. Shock may be primary or secondary, and the location and origin of shock could be neurogenic, oligæmic, cardiac or toxic (Omagbemi 2013). Similarly, shock can be triggered by three types of difficulties: cardiogenic (problems with the heart's functioning); hypovolemic (low total volume of blood available to circulate); and septic shock (induced by an uncontrollable infection, typically brought about by bacteria) (Carson-Dewitt & Finley, 2020).

Apart from the grade discussed above, shock has three stages. Stage I, also known as compensated or nonprogressive, Stage II, is also referred to as decompensated or progressive, and Stage III, often known as irreversible, are the various stages of shock. A number of systems are activated in Stage I of shock when decreased blood flow (perfusion) is initially noticed in order to maintain and/or restore perfusion. The heart beats more quickly, and as a result, the

blood arteries throughout the body have smaller diameters, and the kidney works harder to keep fluid in the circulatory system. All of these adjustments maximise blood flow to the body's most vital organs and systems. Very few symptoms characterise the patient at this stage of shock, and treatment can totally stop any progression. These compensatory strategies start to fall short during Stage II of shock. The patient's symptoms demonstrate that the body's processes can no longer increase perfusion. Cardiac ischemia (Impairment of the cardiac muscle's ability to circulate blood can lead to a myocardial infarction resulting from an abrupt and intense obstruction of one of the coronary arteries) can cause chest pain, known as angina. At the same time, cerebral hypoxia (Hypoxia is, a condition characterised by insufficient oxygen supply to the brain) can lead to confusion and cognitive impairment in patients. This stage of shock can be reversed with prompt and effective therapy. The duration of the poor perfusion starts to permanently damage the body's organs and tissues in Stage III of shock. The kidneys typically fully shut down, and the heart's performance keeps deteriorating. The body's organs and tissues are damaged by dying cells. The patient's death results from Stage III shock (Carson-Dewitt & Finley, 2020).

Shock is typically diagnosed based on the patient's symptoms and indications, which can include a significant decrease in blood pressure, abnormally low urine output, and blood tests revealing very acidic blood with a low proportion of circulating carbon dioxide. Additional tests may be conducted to determine the underlying cause of the individual's shock. The primary goals of shock treatment are to quickly assess the patient's condition, promptly intervene to address the underlying cause (such as stopping bleeding, restoring cardiac activity, administering antibiotics to combat infection, etc.), manage any resulting complications (such as hypoxia, acidosis, and coagulation reactivation), and optimize essential physiological functions such as blood pressure, urine output, and cardiac performance. Treatment may involve elevating the patient's legs and lowering the head to improve cerebral blood flow,

administering fluids or blood transfusions via intravenous injection if necessary, providing supplemental oxygen for respiration, and prescribing drugs to enhance cardiac function. Moreso, further assessment must identify and treat the root cause of the illness that caused shock (Carson-Dewitt & Finley, 2020).

According to Omagbemi (2013), essential first aid management is highlighted below.

1. Lay the victim on the position where the shock occurred with the lower part of the
6. body in a prone position to increase blood flow.
2. Keep the patient warm without offering stimulants.
3. Untie tight clothing initially worn by the victim and keep the victim still
4. Stop bleeding, provide relief if observed, and then call for help from medics.

Dehydration during infections with severe vomiting or diarrhoea causes the most preventable type of shock. Shock can be avoided by recognising that patients who are unable to drink must be given fluids intravenously (through a needle inserted into a vein, the procedure should be carried out only by a trained medical professional) to replace lost fluids. Other forms of shock are avoidable if associated illnesses are treated or monitored to keep them from progressing to a state where shock may occur (Fallon & Davidson, 2018; Massaro, 2018).

### **Choking**

Choking is the inability to breathe due to a blocked, constricted, or enlarged trachea. The causes of choking result from the lodging of an indigestible sizeable foreign object in the respiratory tract of the throat, blocking the free movement of air. It causes cough, discomfort and splutters in an attempt to dislodge it (British Red Cross, 2019). In a medical emergency such as choking, the inflow of air into the lungs is restricted while a person is choking. If difficulties in clearing the airways persist, it will result in death. The leading cause of choking in children is an obstruction of air passage caused by food or a foreign item that prevents air

from passing through. When an illness causes the throat tissue to bulge shut, people choke. Allergic responses can cause the throat to become swollen and shut as well. Anaphylactic reactions are severe allergic reactions that can be lethal. Strangulation applies external pressure to the trachea, resulting in another type of choking. Finally, obstructive sleep apnea can cause people to choke. This is a disorder in which bodily tissues clog the airways while sleeping. Obese men who sleep on their backs are more likely to suffer from sleep apnea. Smoking, excessive alcohol use, lung disorders such as emphysema, and an inherent proclivity for a narrower airway and throat all enhance the risk of choking while sleeping (Davidson & Bullard, 2021).

Anybody can choke; however, children are more likely to choke than adults. Choking is one of the leading causes of accidental mortality in young toddlers, who habitually put toys or coins in their mouths and inhale them unintentionally. However, food is the most prevalent cause of choking in children. Choking is the fourth among the primary causes of death in children below five years. Every year, it results in about 10,000 emergency room visits relating to children (Archambault & Licia, 2019). People choke for three causes, which are as follows: Mechanical blockage, tissue swelling, and tracheal crushing. Choking due to mechanical obstruction is simple to diagnose because the symptoms are visible even to untrained personnel. In relation to choking caused by infection, the child will have a temperature and other symptoms of the disease. If the choking is caused by a reaction to allergies from medication or insect stings, the earlobes and face of the victim will swell, indicating that swelling is also taking place internally. Choking caused by sleep apnea is typically diagnosed based on symptoms reported by the person's sleep partner. Alarm gadgets are now available to identify the development of sleep apnea. Sleep may eventually be disrupted, often resulting in daytime tiredness (Davidson & Bullard, 2021).

Except in the case of sleep apnea, choking is a medical emergency. If choking is caused by a reaction to an allergen or infection, call 911 or go to the nearest emergency room for professional assistance. If clogged airways cause choking, execute the Heimlich manoeuvre (an emergency technique in which a person is held from behind in an effort to forcefully remove the obstruction) promptly. In severe situations, a tracheostomy (surgery into the trachea via the neck below the larynx by trained and qualified medical personnel) is required. Patients suffering from sleep airway blockage can be treated using a device similar to an oxygen mask that provides positive airway pressure and administers a mixture of oxygen and air (Archambault & Licia, 2019; Davidson & Bullard, 2021). The primary management techniques include (British Red Cross, 2019);

1. The victim should be firmly-hit on the back between the shoulder blades by giving five blows. This action is expected to dislodge the object; however, if this does not work, then initiate the step 2 procedure. A blow in the back generates an energetic pulsation and pressure in the airway, which helps to remove any object obstructing the airway.
2. The first aider should provide five thrusts in the abdomen by holding the victim around the waistline, pulling both inward and upward abdominal thrusts: hold the child around the waist and pull in and up directly over the button located in the belly.

The essence of the action of the abdominal thrusts is that it squeezes out the air from the lungs and, in most cases, dislodges the blockage.

3. Call the emergency service if the obstruction is not cleared up or dislodged.

The phases of blowing the back and abdominal thrusts may be repeated in alternate forms till help arrives or the child becomes responsive. If you cannot call the emergency service, get someone else to do it.

A significant number of individuals who suffer from choking are successfully treated and do not experience any lasting effects. However, if the treatment is unsuccessful, the individual

may suffer or could die from hypoxia. If the airway becomes functional after the critical period, there is a risk of lasting brain injury.

Keeping a close eye on vulnerable children to prevent them from placing strange things in their mouths and avoiding giving young children foods like raisins, round slices of hot dogs, and grapes can help lessen the risk of choking. Additionally, children must be educated to refrain from laughing while eating. Avoiding alcohol, tobacco smoking, tranquilizers, and sedatives before bed can lower the chance of obstructive sleep apnea choking (Davidson & Bullard, 2021).

### ***Bone fracture***

The partial or complete break in a bone of a person is termed a bone fracture. Students who are involved in sports or exercise activities and older persons are at a greater risk of fractures and delayed bone repair. An increase in age will make our bones more vulnerable and may take longer to heal after a fracture (Odler, 2021). According to certain studies, the average person has two bone fractures over their lifetime. Bone fractures are somewhat more common in children and older adults. Young people are more likely to suffer from bone fractures because they are more active and participate in the types of physical activities that cause bone fractures. Furthermore, their bones may not be fully grown and may lack adult-level strength, leaving them more vulnerable to fracture. Bone fractures are also more common in the elderly, partly because they are less active and hence less healthy and partly because their bones lose calcium, becoming more brittle and prone to breaking. Males have a higher probability than females to record the occurrence of fractures before age 50 because they are more physically active. Women are more likely than men to develop fractures after age 50 because they lose bone mass faster (Newton, 2017).

Osteoporosis, injuries from sports, and accidents constitute the three most common causes of bone fracture. Osteoporosis is a disorder that causes bones to lose protein and mineral

content, particularly calcium. As this happens, bones become increasingly weak and prone to breaking. An individual with osteoporosis can easily break a hip, knee, or other bone merely by falling, which is considerably less likely in the absence of osteoporosis. Fractures sustained during sporting activity may occur in a variety of ways. For starters, a collision with another individual, a stationary object (such as doors, goalposts, or walls), or a piece of equipment (such as a baseball bat) can result in a bone fracture. Second, fractures can happen from overuse. When a person performs the same motion repeatedly, such as a tennis player or golfer, the bones and muscles in that area of the body may weaken, and a bone may shatter due to overuse. According to the American Academy of Orthopaedic Surgeons, fractures of one form or another account for around 5% of all sports injuries each year. Accidents are another common cause of fractures. A bone fracture is possible when a person falls from a ladder, is struck by a falling object, or is involved in a vehicle accident (Newton, 2017). All of which can occur in the school surrounding.

A bone can break completely or develop a small crack while remaining intact. The severity of the fracture depends on the bone and the force behind it. Fractures can take many forms, with some being more serious than others. Fractures could be stable, compound, transverse, oblique, comminute or compression. A stable fracture means that the two ends of the bone where the break occurred are aligned properly and will heal with time. On the other hand, a compound fracture happens when the broken bone pierces the skin, causing damage. A transverse fracture occurs when the bone breaks horizontally, while an oblique fracture happens at an angle. A comminuted fracture is when the bone breaks into multiple fragments. Lastly, a compression fracture occurs in the spine when a portion of a vertebra collapses (Odle, 2021). Typically, a violent injury to the bones that disrupts or breaks the continuity of bone tissues or bony cartilage is what causes fractures. Similar to Odler (2021), a study by Fallon and Mazzie (2021) identified that there are four types of fractures: simple, complex, incomplete, and complete. Simple fractures (also known as "closed") are not visible since the outer layer has not been punctured and remains unbroken. Compound fractures (sometimes known as "open" fractures) tear the skin, revealing bone, and could lead to further soft tissue

injury and infection. A single fracture occurs when just one fracture occurs; multiple fractures occur when more than one fracture occurs in the same bone. Complete fractures occur when the break extends fully through the bone. If the fracture occurs partially across a bone shaft, it is referred to as an incomplete or "greenstick" fracture. This sort of fracture is frequently caused by bending or crushing forces applied to a bone.

Pain in the damaged region is among a fracture's most prevalent acute symptoms. The pain worsens with the passage of time and is typically accompanied by oedema at the site of damage. A bulge or other visible abnormality, as well as pale skin, may be present. In the case of a complex fracture, a part of the broken bone might be visible, protruding through the skin. Feelings of loss and tingling sensations in the fracture area are also possible. It may be difficult to stand, walk, or maintain equilibrium, depending on where the break is. A fracture may also cause bleeding, nausea, and vomiting. A major fracture requires emergency medical attention if there is a loss of consciousness, an indication of a compound fracture, excessive bleeding, or loss of vision (Newton, 2021). When bone fractures occur, first aiders look out for swellings, loss of strength, reduced, twisted, or bent limbs of a shorter length and unusual difficulty in moving (St. John Ambulance, 2018). It is a crack or damage to a bone usually found under the skin (closed fracture) or a bit of bone through the skin surface (open fracture). The victim is treated for shock, and there might be internal bleeding from a closed fracture. Ice is placed to reduce or relieve the pain for closed fractures with swollen evidence. The following are some easy steps to administer first aid for critical fractures.

1. The wound is covered by bandages for open fractures since it is not professional to push the sticking bone in alignment.
2. if bleeding is noticed, pressure is applied to the stop to control or reduce the bleeding,
3. the injured body part is temporarily stopped from movement to prevent further damage.
4. the assistance of medical personnel is sought after by dialling the emergency lines while the first aider keeps checking for signs of changes.

Immobilisation of the damaged area is used as first aid for a bone fracture to prevent further harm. The simplest way to immobilise is to wrap two boards around the fracture to restrict additional movement of the bones and muscles in the area. In addition, the fracture

ought to be elevated to limit the flow of blood to the area, and ice should be used to minimise inflammation. Once under the guidance of a medical or healthcare professional, the next step is to effectively immobilise the area of injury with splints made of wood or plastic. Splints do not entirely wrap a fractured arm, leg, finger, or other bone because oedema may still be present. The splints are left in place until there is no more swelling. At this point, they are replaced by plaster of Paris or plastic cast that completely encircles and immobilises the afflicted area. The cast is left on until the damaged bone heals fully. Some severe fractures may necessitate surgery. Before a cast is put on, a technique known as a reduction may be required to restore bones to their correct position and relationship. Under anaesthetic, reduction surgery consists of physically manipulating broken bones into their normal position, followed by a cast insertion. Fracture surgery may also necessitate the need to utilise devices such as screws and pins to keep bones in the correct position until they align or are entirely healed (Newton, 2017; Fallon & Mazzei).

Apart from the treatment and first aid procedure taken to minimise the effect of fracture, schools and communities need to think about prevention rather than the efforts spent reacting when the incidence of fracture occurs. Calcium is essential for developing strong bones and may assist in reducing the incidence of fractures. Calcium supplements can help those who fail to get sufficient amounts of calcium through their diets. Regular exercise can improve bone health by increasing bone density and reducing the chances of fractures caused by falls. According to a study carried out by the University of Southern California, older persons who exercise for at least one hour daily have a 50% lower risk of experiencing hip fractures compared to those who exercise for less than thirty minutes a day or others who do not engage in any form of exercise at all. In preventing fractures, it's important to take safety precautions seriously. This includes using vehicle seat belts or protective sports equipment during sports activities (Minkowitz et al., 2019; Egol et al., 2019).

## ***Convulsion***

Like epilepsy, convulsion is also a type of seizure, and FA management aims to safeguard the sufferer from further injury until they regain consciousness. This condition may be frightening; staying calm is suggested since it usually lasts a few minutes (Alli, 2017). During a seizure, performing less intervention on the person is better. The following can also be done.

1. ease the person to the floor,
2. move any hard, sharp, or hot object with the potential of causing wounds away from the victim
3. the head and body of the victim are protected from injury
4. every tight cloth or wear is loosened, especially around the neck
5. no object should be inserted into the mouth, and no attempt should be made to open the mouth of the person as it may break the teeth
6. Once symptoms have subsided, roll the person sideways to enable saliva flow without obstruction.

## ***Fainting (Syncope)***

Fainting, also known as syncope, is a sudden loss of consciousness caused by a drop in blood pressure. This automatic response happens when the brain doesn't receive enough oxygen due to low blood pressure. Individuals may feel weak and recline or even lose consciousness and fall. The prone position facilitates blood circulation and restores oxygen delivery to the brain. Once blood circulation is restored, the individual typically wakes up from the syncope. Unlike seizures, which cause stiffness, those who faint become flaccid. Fainting is common among individuals of all ages, with more than half of all Americans expected to experience it at least once in their lifetime. While syncope is not necessarily dangerous, it can be a sign of a severe underlying condition, and caution should be taken to determine if such a

condition exists. Injuries sustained during fainting can range from minor bumps and bruises to severe injuries, especially if the victim was driving or operating machinery (Ungvarsky & Broussard, 2021). Fainting is a prevalent occurrence among individuals of all ages. According to the 2015 Physician's Desk Reference, more than fifty per cent of all Americans will collapse at least once in their lifetime. While syncope on its own is not necessarily dangerous, it can be a symptom of a severe underlying condition, and steps should be taken to determine if such a condition exists.

In addition, 16–35% of those who fainted sustained secondary injuries as a result of the episode. These injuries can range from minor bumps and bruises during a faint-related fall to severe injuries if the victim is driving a vehicle or operating large machinery (Kanjwal et al., 2015; Ungvarsky & Broussard, 2021). In Nigeria, some of these injuries are caused by poor first aid practices. These include pouring water on the victim, forcing food or glucose down the mouth, and even slapping and hitting the victim to bring them back to consciousness. All these attempts take place in an enclosed environment, limiting the victim's air intake. In support, Consultant surgeon, Prof. Andrew Ugboro, warns that certain methods used to revive a collapsed person, such as using a fan, foot slapping, or pouring water, may cause aspiration. He also cautions against forcing liquids like glucose drinks and water down the patient's esophagus during resuscitation as it could worsen their condition. Ugboro emphasizes that the government is responsible for educating the public on Basic Trauma Life Support to prevent poor and potentially dangerous practices. He stresses that avoiding anything that could cause aspiration is crucial, which is when fluid enters the lungs instead of the stomach and exacerbates the problem. Ugboro believes that everyone in the country should be taught Basic Trauma Life Support, but unfortunately, this is not happening (Folunronsho-Francis, 2020).

According to a study by Friedman and Alaxander (2014) and Bhalla et al. (2021), up to 15% of adolescents had encountered at least one instance of syncope by the time they became

adults. When undifferentiated pediatric patients with syncope symptoms visit the emergency department, most of them have either vasovagal syncope (VVS) or syncope due to orthostatic hypotension (OH). Only 2% show the symptoms of cardiac syncope (CS), while around 9% have neurological disorders. Syncope is typically categorized into three types: VVS, syncope due to OH, and CS, as explained by Brignole et al. (2018). The common cause of syncope is a temporary decrease in cerebral blood flow because of low blood pressure resulting from cardiac output and peripheral vascular resistance.

Similarly, earlier researchers reported that the cumulative lifetime incidence of fainting (syncope) is 35%. Females had a higher syncope occurrence than their male counterparts (41% compared to 28%;  $P = 0.003$ ). The occurrence of syncope reached its highest point around the age of 15 In both males and females, according to Ganzeboom et al. (2006). While syncope is primarily harmless, certain patients experiencing an episode face an elevated risk of unexpected death or syncope-related unintended bodily harm. These incidents can substantially influence the well-being of children (either physical or mental) and their overall standard of life (Ungvarsky & Broussard, 2021). A variety of disorders can lead to syncope in children and adolescents, with autonomic neutrally driven syncope accounting for 70-80% of cases (Chen et al., 2014). These include conditions such as ‘vasovagal syncope (VVS), postural tachycardia syndrome, orthostatic hypotension, and orthostatic hypertension’ (Ungvarsky & Broussard, 2021; Kovalchuk & Boyarchuk, 2023). Most causes can be identified by standardizing the diagnostic procedure and developing guidelines for diagnosing and treating syncope in children and teenagers.

An investigation was conducted recently, which involved a cross-sectional study on the incidence of syncope in Changsha's 2–18-year-old infants and adolescents. The study, conducted from March to November 2018, selected 4,352 children and teenagers aged 2 to 18

from nine educational institutions in Changsha (6 primary/ secondary; 3 kindergartens). There were 4,916 standard questionnaires distributed, of which 4,352 (88.53%) were recovered as valid. The findings indicated that 17.37% of young people between the ages of 2 and 18 experienced at least one episode of syncope; adolescence had a higher incidence (28.85%) than school-aged children (8.32%) and preschoolers (2.71%) ( $P < 0.01$ ).  $13.9 \pm 3.1$  years old at onset, with the highest age of 16. A higher incidence was recorded among female than male adolescents (31.72 vs 26.25 %,  $P < 0.05$ ). Also, the outcome of inducements revealed an increase in rates for females than males in a hot environment. Contrastingly, a higher rate was observed for males than females regarding excretion. Females experienced more vertigo, nausea, perspiration, and facial pallor during presyncope than males ( $P < 0.05$ ). Changsha recorded an incidence of 17.37% syncope among children and adolescents ages 2 to 18. In various age groups, there is variation in the occurrence of syncope and presyncope between males and females. Additionally, there are disparities in the factors that cause syncope according to gender (Erlin et al., 2021).

People with seizures may lose consciousness, but seizures and syncope are not synonymous. Seizures and syncope differ in both cause and symptoms. For example, those who faint become flaccid, whereas stiffness is the typical characteristic for those experiencing a seizure. In addition, children who experience seizures are frequently confused afterwards and appear to have trouble concentrating on people. Typically, children who faint appear to be awakening from a state of slumber with little or no confusion. Fainting is prevalent among individuals of all ages. According to the 2015 Physicians' Desk Reference, about 3% of all emergency room visits and 6% of all hospitalisations in the United States are related to syncope. In addition, the Cleveland Clinic reports that one hundred thousand people of all ages consult a doctor annually due to fainting and that one to three per cent of all emergency room visits by children are due to a fainting episode (Ungvarsky & Broussard, 2021).

Most fainting episodes in minors are not life-threatening and are caused by simple factors. Frequent causes of fainting include a drop in blood pressure that prevents oxygen-rich blood from reaching the brain. Simply standing up too rapidly can cause a child's blood pressure to drop and cause them to faint. Fainting is caused by a reaction of the vagus nerve, a large nerve that runs from the brain through the neck and reaches many areas of the body, including the heart, blood vessels, epidermis, and digestive system. When the nerve is stimulated, blood vessels dilate (expand), resulting in rapid blood flow away from the brain. The vagus nerve can be stimulated by a variety of stimuli, including extreme heat, physical pressure on or near the nerve's location (as in coughing), and upsetting images or experiences. Not all stimuli that stimulate the vagus nerve will result in fainting in a specific infant or adolescent (Ungvarsky & Broussard, 2021). Fainting, or syncope, can be caused by a variety of influences, including prolonged standing, hunger, dehydration, and hormonal fluctuations. Not drinking enough water is the most rated cause of fainting in young children. Skipping meals due to a lack of food availability, intentional dieting, or fasting can also cause fainting, especially among adolescents. Fainting can also be induced by experiencing something stressful or frightening, such as performing in front of an audience, delivering a speech, or undergoing a medical procedure. In some cases, fainting can be caused by more severe conditions such as heart disease or anaemia. The symptoms of syncope can include lightheadedness, dizziness, pounding pulse, slowing heart rate, feeling hot or cold, nausea, spotting, buzzing in the ears, and pale colouring. If a child faints, it is important to consult a doctor to rule out any underlying conditions (Ungvarsky & Broussard, 2021).

Furthermore, if a child faints, they will become limp and fall over. This is different from a seizure, which causes stiffness. Infants who faint usually regain consciousness within seconds once blood flow to the brain is restored. If a parent is present, they can catch and lower the child to prevent injuries and observe the child to ensure they are still breathing. If there are

any signs of distress or impaired breathing, seek immediate medical assistance. After regaining consciousness, a doctor should be contacted to determine if further medical attention is required. In most cases, no treatment is necessary. The main objective in treating a child who has collapsed is to identify and avoid potential triggers of fainting, such as hunger or stress. Encouraging the child to eat and drink regularly can prevent future episodes. If the child experiences symptoms before fainting, they can be instructed to lie down with their head at or below heart level to increase blood flow to the brain. Any underlying conditions, such as a cardiac condition, should be treated to prevent future fainting (Ungvarsky & Broussard, 2021).

Parents should be aware of dangerous games like intentionally fainting, which can cause serious harm or even death. Signs of this game include marks on the neck, and parents should have conversations with their children about the dangers of such games.

## ***Burns***

Burns can be caused by chemicals, electricity, radiation, heat, and friction, all of which can damage tissue. The extent of tissue damage determines the degree of burn intensity. A first-degree burn results in erythema and oedema of the epidermis (literally referred to redness & swelling respectively), while a second-degree burn affects both the top and bottom layers which indicate a condition that involves multiple layers of skin and results in redness, swelling, and the development of blisters. Third-degree burns are the most severe, penetrating all layers of skin, as well as underlying tissues such as fat, muscle, and bone (Thivierge & Hodgkins, 2020). The percentage of total body surface area (BSA) affected is another factor in determining burn severity. The "rule of nines" is used to estimate BSA in patients over the age of nine. This involves assigning nine percent to the head and neck, eighteen percent to each arm and hand,

eighteen percent to the front of the torso, eighteen percent to the back, and one percent to the genital area. The palm of a patient's hand is used as a measure of a 1% area, as this rule is not applicable to the body proportions of a small child. The degree of the burn determines the appropriate treatment and facility. Minor burns affecting less than 15% BSA in adults or 10% BSA in children can be treated at home. Hospitalization is necessary for moderate burns affecting between '15%-25% of adults or 10%-20% of a child's body'. Severe burns that cover the face, hands, feet, ears, eyes, or genitalia, or when an adult or child has first or second-degree burns covering above 25% of their body or third-degree burns covering over 10% of their body surface area, they require the medical attention of a hospital's dedicated burn unit. The severity of care required is also influenced by factors such as secondary injuries, preexisting conditions, and history of physical abuse. Children and the elderly require special attention due to their increased risk of complications from burn injuries (Thivierge & Hodgkins, 2020).

Exposure to temperatures higher than 120 degrees Fahrenheit (49 degrees Celsius) can cause burns, even if it's brief. Burns can be caused by various sources such as the 'sun, liquids, steam, fire, electricity, or friction', leading to different types of burns, including sunburns, rug burns, rope burns, and chemical burns. Burns are usually characterized by redness, swelling, and discomfort in the impacted region. Serious burns can result in blisters, numbness, flaking, white or black skin, and charring, along with a high body temperature and a headache. Severe burns can cause shock, which manifests as dizziness, weakness, a racing heart, quick breathing, and cold and clammy skin with bluish lips and fingernails. Pain management, infection prevention, and replacement of lost fluids, electrolytes, and calories are all part of the healing process following a burn injury. Managing chemical or electrical burns differs slightly from managing thermal burns (Thivierge & Hodgkins, 2020).

The first step to consider when initiating the treatment of a thermal burn, also considered as the foremost action, is to promptly halt (stop) the burning process. The affected area can be cooled by allowing cool water to run over it or immersing it in cool (not cold) water. Applying cool (not cold) moist compresses to tiny portions of first and second-degree burns may provide some pain relief. However, never put ice on a burn, and avoid putting anything on the burn that contains butter, shortening, or egg whites, as doing so can spread infection. If the burn isn't severe, washing it off with soap and water is usually enough. Popping blisters should be avoided. A burn that has not split the skin should not be covered rather, it should be exposed to the air to speed up the process of healing if there is no risk of increased irritation from pressure or friction. However, research suggests that to treat the burned area, first, apply a thin layer of antibiotic ointment and then cover it with a sterile gauze bandage if the skin is fractured or likely to be disturbed. In reducing pain and inflammation, medication such as 'ibuprofen (Advil), acetaminophen (Tylenol), naproxen (Aleve)', and aspirin can all be used. Signs of infection include an increase in temperature, redness, discomfort, or swelling; symptoms of the condition include the discharge of pus or similar fluid from the lesion, swollen lymph nodes, and red streaks from the burn radiating outward (Thivierge & Hodgkins, 2020).

In the case of moderate to severe burns, calling for emergency medical help is more important than treating the burns themselves. A person who has suffered severe burns and has stopped breathing; for example, If someone is not breathing, you can provide immediate help by administering prompt artificial respiration. This is also known as mouth-to-mouth resuscitation or rescue breathing. A person whose body surface area has been burned by more than 12% is recommended to be placed flat with their feet elevated by about 12 inches (30 centimetres) to reduce the risk of shock. Elevating the arms and hands that have sustained burns over the individual's heart is also recommended. A blanket can be utilised to extinguish flames

while rescuing and safely removing a person from danger. The individual whose clothes are lit with fire should promptly execute the "stop, drop, and roll" technique or be helped to assume a prone position by lying flat on the ground and rolling in order to extinguish the flames. Only garments or items of clothing that can be readily detached upon combustion or being burned should be removed/ taken off, and anything lodged in the burn should be left alone. To extinguish a fire, remove all flammable clothing and cover the victim with a thin, refreshing, damp or moist material, such as a bedsheet, avoiding the use of a blanket or towel (Thivierge & Hodgkins, 2020).

In case of chemical burns, it's important to rinse the affected area immediately with cool water and flush out any chemicals from the eyes. Lime and other dry chemicals should be brushed off before cleaning to avoid painful burns. Clothes worn at the time of exposure should be discarded, and a sterile gauze pad should be used to cover the burn before transferring the patient to the hospital. A doctor will treat the chemical burn similarly to a severe thermal burn after neutralizing the chemical. For electrical burns, turn off the power source and move the patient away from it before administering any treatment. Ensure that the patient can breathe properly before beginning burn therapy. Use sterile gauze pads to wrap the burn and transfer the patient to the hospital. The severity and location of the burn, damage to vital organs, other injuries, and the time taken to seek medical attention determine the prognosis. Minor burns can heal in 5-10 days, a moderate burn can potentially leave permanent scars within 10 to 14 days, and major burns take longer to heal. Physical therapy can improve mobility despite scar tissue; in some cases, additional surgery may be required to remove scars and restore appearance (Thivierge & Hodgkins, 2020).

Before using any hot water, whether for school or home activities, it's important to ensure the water temperature is within a safe range to prevent scalding or burns from hot water

or other liquids. To prevent young children from accidentally touching stove handles, rotate them out of their reach. It's also recommended to keep the water heater thermostat set-up to a maximum of 120 degrees Fahrenheit (or 49 degrees Celsius). When removing covers from hot food prepared in a microwave or other source, be cautious. Common sources of thermal burns include electrical appliances like stoves, space heaters, It's important to handle these items with care to avoid injury. In the case of sunburn, use a sunscreen with an opaque active component like zinc oxide or titanium dioxide, or a nonopaque active ingredient like PABA or benzophenone. It's also recommended to wear protective clothing like a hat or loose-fitting clothing or use an umbrella when the sun's UV radiation is the strongest and this is usually between the hours of 10 am and 3 pm to reduce the risk of electrical burns, secure electrical outlets with safety plugs and keep cords out of reach of children who may want to chew on them due to their developmental characteristic. During a storm, it's safest to stay indoors to avoid lightning strikes. To protect against chemical burns, it's important to wear protective gear like gloves and goggles. Chemical agents should be securely stored per the manufacturer's guidelines while not being used (Thivierge & Hodgkins, 2020).

### ***Snakes/ poisonous bites/ stings***

A bite is an injury to the skin that an animal, such as a dog, snake, or spider, causes, whereas stings, Stings are wounds that result from a skin puncture caused by insects or marine animals. In addition to physical harm, bites and stings often carry the risk of infection from toxins or venom (Paradox & Hodgkins, 2020). Virtually any animal has the ability to bite, and bites typically happen when an animal perceives a person as a threat. Domestic pets, like dogs and cats, will bite if they are scared or stressed. In similar conditions, wild animals like spiders and snakes will bite, and others, such as rats, will bite to determine whether something is edible or not (they frequently bite sleeping people). Humans will bite as well; in the United States,

over 70,000 annual incidents of bites were documented and humans as perpetrators. According to the US Centres for Disease Control (CDC), approximately 800,000 Americans seek medical treatment for dog bites annually. Children are more prone to being bitten compared to adults, and children under ten years, especially males, are particularly vulnerable (Paradox & Hodgkins, 2020).

Ticks, bedbugs, fleas, mosquitoes, black flies, fire ants, and spiders are common invertebrates that bite, whereas bees, wasps, and scorpions can sting. Many of these animals' bites elicit modest reactions or can spread disease, but the bites of the black widow and brown recluse spiders and the scorpion's sting may contain venom. Ticks are small arthropods that cling to the skin of animals and feed on their blood; their bites can spread Lyme disease (Frey, 2017). Animal bites can cause lacerations, punctures, rips or crushing injuries. Cat bites are usually around the arms and hands, resulting in profound puncture wounds that have the potential to harm muscles, tendons, and bones, although dog bites can also occur on the face and neck, especially in children. Fights, sexual activities, seizures, and maltreatment all result in human bites. Children habitually bite each other, but these bites rarely cause serious harm. However, human bites can transmit serious illnesses like hepatitis B, syphilis, and tuberculosis. A spider bite does not necessarily cause pain. Most spider bites cause very modest symptoms, and the initial, the only potential sign of a bite is a slight inflammation in the affected area, accompanied by prick marks or blisters. The affected skin area may possibly show signs of discomfort, itchiness, or discolouration. If someone gets a bite or a sting from a black widow or brown recluse spider, they may experience symptoms such as sweating, nausea, vomiting, headache, fever, chills, swelling, and dizziness. The bite of a brown spider can cause necrotic arachnidism, a condition where the tissue surrounding the bite dies, resulting in a persistent

open sore that may take additional years to ultimately heal. Respiratory, visual, and speech impairments can also occur. (Paradox & Hodgkins, 2020).

If you happen to get stung by a bee or wasp, you may experience pain, swelling, redness, and irritation at the site of the sting. In case of multiple stings or an allergic reaction, the symptoms can be severe, leading to ‘nausea, chest pain, abdominal cramps, diarrhoea, and difficulty in swallowing or breathing’. Moreover, the venom from some stings can result in weakness, excessive salivation, vomiting, erratic behaviour, and even paralysis of nerves. This can cause blurred vision, difficulty with speaking and swallowing, and breathing issues. Therefore, if you encounter any of the aforementioned symptoms, it is highly recommended to seek emergency medical attention immediately (Paradox & Hodgkins, 2020). Snake bites from venomous pit vipers, and during a span of 10 minutes, the region experiences a rapid increase in size and can be unpleasant. Other symptoms of infected wounds include ‘swelling at the wound site, skin blisters, discolouration, weakness, sweating, nausea, faintness, dizziness, bruising, and painful lymph nodes’(Paradox & Hodgkins, 2020). Tingling feelings, muscle contractions, a raised heart rate, quick breathing, substantial reductions in the temperature of the victim and blood pressure, blood vomiting, and coma can all result from severe poisoning. Coral snake bites can cause tingling, weakness, nausea, vomiting, excessive salivation, and erratic behaviour due to venom. Nerves might become paralysed, resulting in blurry vision, speaking and swallowing difficulties, and breathing issues (Frey, 2017; Paradox & Hodgkins, 2020).

Snake venoms are one of the most complex substances known to man in nature. It contains a complex of proteins, metals, polypeptides, lipids, biogenic amines, and enzymes (Omagbemi, 2013). Other venomous insects (scorpions, centipedes, or millipedes) also release

poisonous substances when they bite or sting, as the case may be. Taking these steps is crucial in saving a life when venomous animals bite or sting a person.

1. The first aider must find out the type of snake or insect that bites the person to aid the emergency staff in knowing what kind of poison (for venomous animals) was injected. Usually, the symptom for non-poisonous bites is only a reddish swollen appearance at the site of the bite, while the other is characterised by dizziness, vomiting, itchiness at the site of the bite and unconsciousness for some cases (St. John Ambulance, 2018; Florida Health, 2016).
2. The victim must be moved away from the vicinity of the snake or animal to avoid a second bite or endangering the first aider.
3. If it is at the leg or hand, tie the region can be bandaged with an elastic bandage.
4. He/she should be laid down with a wound below the heart.
5. Keep the victim calm and at rest to prevent the venom from spreading quickly.
6. Remove any jewellery, bracelet, shoes, or aesthetic material from the area of the bite.
7. Attempt to suck out the venom.
8. Give the person caffeine, carbonated drink, or alcohol and call for support.

A study by Frey (2017) recommended that if one gets bitten by a spider, it is important to quickly apply a cold compress or ice pack. Severe spider bites require the use of ‘muscle relaxants, antihistamines, antibiotics, analgesics and sometimes tetanus vaccination’. Fortunately, most insect bites and stings can be treated with home remedies. To remove a stinger, you can use a razor blade, a fingernail, a credit card or a rigid piece of paper to scrape it away. Avoid using tweezers because they can inject more venom into the wound during the process of squeezing it. Afterwards, clean the affected area and apply ice. The victim can take aspirin or other pain relievers, antihistamines, and calamine lotion to alleviate symptoms. If you have a history of allergic reactions to stings, seek medical assistance immediately and

always keep an epinephrine injector on hand. To safely remove ticks at home, use tweezers and be careful not to leave the tick's head buried in the skin or crush the tick during removal. If you experience symptoms like fever, redness (rash), or post-tick bite discomfort, immediately see a doctor. Even though most snake bites are not dangerous, seeking treatment at a hospital immediately is essential. Clean the wound with soap and water and immobilize the affected area, keeping it lower than the heart if possible. It's crucial to get to the hospital as soon as possible. Until receiving evaluation and treatment, avoid eating or drinking anything, especially alcohol or caffeinated beverages (Fallon & Davidson, 2021).

As a preventative measure, research recommended that to avoid bug bites and stings, insect repellents should be used. There are many types available, such as those containing DEET, citronella, or catnip oil. Some can repel both mosquitos and ticks, and those with higher amounts of DEET last longer. Wearing light-colored clothing can provide additional protection against insect bites and stings. Similarly, socks and trousers can act as protective wear against insect bites. When exploring wilderness areas, it's important to be cautious and take precautions before swimming. Avoid handling unknown animals or those that are dead or dying, as they may still be dangerous. When faced with a suspected attack from a dog, it is advisable to stay motionless. If being attacked is inevitable, adopting a prone position with hands and forearms shielding vulnerable regions can offer the most effective protection. If there is a significant likelihood of being exposed to rabies as a result of work or travel, it is advisable to consider getting a rabies vaccine as a preventive measure (Frey, 2017; Paradox & Hodgkins).

## ***Diabetes***

Diabetes mellitus is a metabolic disorder that occurs as a result of the pancreas producing insufficient insulin or when cells don't respond appropriately. This prevents the absorption of glucose by cells for energy. Diabetes is categorized into three types: Type 1 diabetes is a condition where the pancreas does not produce insulin at all. On the other hand, Type 2 diabetes is a condition where the pancreas generates less insulin, and the body cells become less sensitive to insulin. Additionally, some form of diabetes occurs or develops during

pregnancy and goes away after childbirth; this is referred to as gestational diabetes (Edgren et al., 2021). Diabetes mellitus is a persistent (chronic) medical condition that can cause severe health problems, like renal failure, cardiovascular disease, stroke, and vision loss. In 2018, approximately 30.3 million people in the United States were diagnosed with diabetes. Type 2 diabetes makes up 95% of cases, but only 23.1 million people are aware of their condition. Additionally, 7.2 million individuals have high blood sugar levels that indicate diabetes but haven't been tested or treated. Globally, an estimated 425 million adults (or one in eleven) were affected by type 2 diabetes in 2018 (Edgren et al., 2021). The prevalence of prediabetes in Nigeria, using the ADA criteria, stands at 15.8 million, accounting for 35% of the total adult Africans with IGT in 2019. This implies that one in every three Africans suffers from prediabetes (International Diabetes Federation, 2019). In Nigeria, the reported incidence of type II diabetes is at 5.7%, resulting in a total prevalence of dysglycemia ranging from 16.1% to 18.9% under WHO and ADA criteria, respectively. Thus, one out of every five adult Nigerians has dysglycemia, which poses a high risk of cardiovascular problems, further burdening the already overburdened healthcare system in the country (Adeloye et al., 2017; Uloko et al., 2018; Ukoli et al., 2018; Bashir et al., 2021).

Diabetes mellitus is characterized by a deficiency of insulin (Agofure et al., 2020). Every cell in the human body requires energy to operate, and glucose is the main energy source. Glucose is a simple sugar produced by the breakdown of carbohydrates (sugars and starches). When we consume food, glucose from digested meals is transported in the body fluid (blood). Insulin is a hormone that the pancreas (this organ of the body is situated around the upper left region of the body behind the stomach) produces in beta cells. Insulin is present in the bloodstream and mixes with certain receptor cell sites, creating a pathway for glucose to enter. Organs such as the liver, muscle, and fat cells have the ability to transform glucose into glycogen, which is stored in the body and used when the glucose level in the blood is low. In

cases where insulin synthesis is insufficient, or the glucose receptors on cells are nonfunctional in responding to insulin, glucose persists and remains in the bloodstream rather than being transported into the cells. When glucose levels are too high in the blood, known as hyperglycemia, the body tries to dilute it by pulling water from the cells and transferring it into the bloodstream for circulation, which leads to increased urination and thirst. Undiagnosed diabetes can cause excessive thirst and urination due to the body's effort to eliminate excess glucose. The body also sends signals to eat more food because cells are starving for glucose. Lipids and proteins can also be converted into glucose to provide energy to starved cells. Ketones are acid molecules formed during the breakdown of lipids and proteins for energy. As ketones accumulate in the blood, the acidity level rises, leading to a condition known as ketoacidosis, which can be fatal. Ketoacidosis can result in coma and death if left untreated because several metabolic systems within the body are responsive to changes in blood acidity, also known as pH lesser than 7. (Bashir et al., 2021; Edgren et al., 2020).

Diabetes is categorized into type-1 and type-2, and insulin-dependent and non-insulin-dependent diabetes, respectively (Thomas, 2019; Agofure et al., 2020). Type 1 diabetes, alternatively referred to as juvenile diabetes or insulin-dependent diabetes, requires individuals with this condition to receive daily insulin injections to survive. It typically manifests during childhood or adolescence; however, it is possible for certain adults to acquire a variant of type 1 diabetes known as latent autoimmune diabetes. People with type 1 diabetes cannot produce insulin independently, so they must rely on insulin made in a laboratory, originally derived from pigs or cattle. Type 1 diabetes is an autoimmune disorder that occurs when the immune system of the body malfunctions, leading to the destruction of the beta cells that produce insulin in the pancreas. Symptoms of type 1 diabetes can appear suddenly, with ketoacidosis being a medical emergency that can occur in children (International Diabetes Federation, 2019; Bashir

et al., 2021). The condition is more prevalent in populations with Northern European ancestry, such as Finland, Scotland, and Scandinavia, and less common in those with Southern European or Middle Eastern ancestry (Bashir et al., 2021; Edgren et al., 2020). Asians have a notably low prevalence of type 1 diabetes. Brittle diabetics are a fragment of persons with type 1 diabetes who frequently and rapidly suffer variations in their blood glucose levels between hyperglycemia and hypoglycemia. They often have difficulty regulating their diabetes and require multiple insulin injections throughout the day to maintain normal blood sugar levels. Type 2 diabetes develops gradually over several years, with the individual often unaware they have the condition. It can be controlled with dietary adjustments, and the use of oral medicines, and just a small percentage of people require daily insulin injections. However, uncontrolled and untreated type 2 diabetes can have severe consequences and affect many areas of the body (Adeloye et al., 2017; Edgren et al., 2020; Bashir et al., 2020).

Gestational diabetes is a form or temporary form of diabetes that arises during pregnancy and typically improves/ or is eliminated after giving birth. It is closely linked to ethnicity and culture, with higher rates occurring in African American, Asian, and Latina women compared to those of European origin. The management of gestational diabetes is likened to that of type 2 diabetes. Women who develop gestational diabetes during pregnancy face an increased risk of developing type 2 diabetes within five to ten years. Both inherited genetic factors and behaviour contribute to the development of diabetes mellitus. In 2018, it was believed that type 1 diabetes was caused by a viral infection in patients with specific genetic abnormalities. Antibiotics in the body are generated by the immune system to combat or fight the virus, but in type 1 diabetes, the immune system attacks and defeats the beta cells that produce insulin. The main hypotheses for the virus that triggers this response are the

mumps virus, Coxsackie B viruses, rotaviruses, CMV (called cytomegalovirus), and the rubella-causing virus. In type 2 diabetes, the pancreas ensures the continuation of insulin production, but body cells become resistant to it, leading to high blood sugar levels that can damage organs (Adeloye et al., 2017; Edgren et al., 2020; Rowland & Blake, 2020)

The symptoms experienced in type 2 diabetes can be subtle and develop gradually, with early warning signs including lethargy, excessive thirst (also referred to as polydipsia), and frequent urination (polyuria). Additional symptoms encompass delayed ‘wound healing, urinary tract infections, periodontal issues (gum problems) and impaired vision (blurry vision)’. It is rare for type 2 diabetes to be diagnosed during a doctor's visit for another health issue caused by undiagnosed diabetes. Sudden symptoms may be recorded for type 1 diabetes and can occur suddenly in previously asymptomatic children or adolescents, or they can manifest gradually in persons with excess body weight, typically after reaching the age of 40, but not always. The typical signs consist of tiredness and sickness, frequent urination (Polyuria), excessive thirst (Polydipsia), excessive appetite (Polyphagia), and, in the case of type 1, weight loss (Edgren et al., 2020; Rowland & Blake, 2020).

Several complications are associated with diabetes, which include a feeling of dissatisfaction, personality change, shaky, the deduction of consciousness, a sense of confusion and fast breathing (Agofure et al., 2020; Florida Health, 2016) and in males, it may result in loss of sexual function (Agofure et al., 2020). Emergency response for diabetes care should include giving the students some fruit juice containing about 6-8 ounces, candy, two packets or two teaspoons of sugar. However, students or school-designated FA provider who has a monitor should check the level of blood sugar, and if the level of sugar is lower than 70, then similar care should be administered. However, when the blood sugar level is high, also known

as hyperglycaemia, the school authority, parent or guardian should be contacted while monitoring the student for improvement. The monitoring should include the check of breath, the pulse and possible response to the person delivering the care (Thomas, 2020). In the situation where there is no improvement, then the emergency service should be contacted immediately (Florida Health, 2016) or in developed countries where there is inadequate emergency response, a designated adult should take the child to the hospital while awaiting the parent or guardian. Also, CPR should be administered if, while monitoring, the victims become unresponsive (Thomas, 2019).

Diabetes is a chronic condition that cannot be cured with medication alone, but it can be effectively managed with a focus on three key goals: lowering insulin resistance, maintaining optimal blood glucose levels and minimising the risk of enduring consequences. The care and treatment of diabetes entail a synergistic approach involving dietary modifications and consistent physical activity, medication, and observing and regulating blood glucose levels, which can significantly improve patients' quality of life. Seeking medical care and adhering to a diabetes management plan is critical, as uncontrolled diabetes can result in serious health complications and even death (Duarte et al., 2018; Agofure et al., 2020). Studies have shown that dietary changes can be crucial in reversing type 2 diabetes. This includes reducing processed carbohydrate intake, prioritizing whole plant-based foods such as vegetables and legumes, increasing plant fibre, and avoiding foods that are deficient in fibre and high in saturated fats. Omega-3 fatty acids from sources such as flaxseed and walnuts, as well as increasing antioxidant intake, may also be beneficial. Consumption of whole grains and fibre-rich foods can help regulate glucose levels in the blood and minimize surges in patients with type 2 diabetes. It is advisable to consult with a nutritionist or dietician for a personalized food plan, and the food exchange system can assist diabetics in losing weight and improving their overall health (Rowland & Blake, 2020; Agofure et al., 2020).

Both traditional and alternative medical professionals concur that engaging in moderate exercise, in addition to a healthy diet, is crucial for effective diabetes management. Weight loss is a crucial objective for persons who are overweight or obese and have type 2 diabetes since it aids in managing the levels of glucose in the blood. An optimal, nourishing diet should consist of calories that are within 50% to 60% from whole grains, legumes, and vegetables, 10% of the total calorie intake should come from protein, while the calorie intake from fat should be kept below 30% (Rowland & Blake, 2020). Calorie intake should be distributed evenly throughout the day to minimize glucose surges. In conclusion, effective diabetes management requires a multifaceted approach that involves lifestyle changes, medication, and regular monitoring. By adhering to a well-planned diabetes management regimen, individuals with diabetes can significantly improve their standard of living and mitigate the likelihood of enduring issues in the long run.

### ***Avulsed or broken tooth***

An avulsed tooth is a severe type of dental injury that can impact the psychosocial well-being of the victim. The prediction of an effective cure depends on the quick and appropriate response and management strategies by the FA care at the time of the emergency (Alyahya et al., 2018). Many studies have revealed poor knowledge of management strategies for an avulsed tooth (Alyahya et al., 2018; Awad et al., 2017), which is why understanding the correct methods for managing an avulsed tooth is essential for the community at large. Tooth replantation is a vital dental procedure that involves the reinsertion and splinting of a tooth that has been knocked out or pulled from its socket. The aim of this procedure is to prevent permanent tooth loss and restore normal oral function for the patient. In the United States, approximately five million teeth are accidentally avulsed each year, with falls and other accidents being the most common causes. Sports accidents, particularly those involving falls

or head strikes, are also frequent culprits. The American Dental Association recommends the use of mouth guards for sports that involve speed, impact, or falls, which has saved numerous lives in activities such as football, wrestling, and boxing, as well as non-contact sports like gymnastics, baseball, hockey, and cycling. School children are active and constantly involved in one or two of the mentioned sports activities. Failure to wear mouthguards during these activities increases the risk of dental injuries by 60 times. Other causes of dental trauma leading to avulsed teeth include car accidents, criminal assaults, and physical altercations (Franz, 2020).

In the event of losing a tooth, handling it with great care and taking prompt action to preserve it before seeking dental assistance is imperative. It is advised to hold the tooth by its crown, avoiding contact with the root. The tooth should be kept moist and cleansed, but it is highly recommended to refrain from using any chemical agents such as toothpaste, soap, or mouthwash as these may cause damage to the fibroblasts that are responsible for anchoring the tooth in position. Fibroblasts are a type of connective tissue cells that act as a bonding agent between teeth and bones. To ensure proper tooth preservation, one may store it in milk, or a specialized Save-a-Tooth kit designed to conserve the tooth's fibroblasts. It is important to note that fibroblasts begin to perish within 30 minutes of the incident, hence why prompt dental care is necessary. Swift action can increase the likelihood of a successful replacement. In some cases, synthetic fibroblasts can replace the patient's connective tissue cells (Roberts, 2017; Franz, 2020).

A broken tooth should be immediately searched for, rinsed to remove dirt, replaced with gum in a similar position, and held the tooth in place for some minutes by carefully holding the tooth by the crown (NHS Inform, 2020). Knocked-out teeth for a child should not be replaced else; this might disrupt the growth of the adult tooth. For adults, if replanting the tooth proves difficult, then the tooth should be immediately submerged in normal saline, milk or

even the saliva of students or water and minimise swelling by applying a cold compress to the face. Lastly, the student should be taken immediately to the dentist for a replant. All this should be done within 15 to 20 minutes (Florida Health, 2016). The key thing to remember when carrying out FA care for an avulsed tooth is that the tooth should not be held by the root or be scrubbed in any way (NHS Inform, 2020; Florida Health, 2016). Similar care is performed for a broken or cracked tooth. The fragment of the tooth should be found and immediately stored in a container of milk while you assess the dentist for the possibility of glueing the fragment back in position (NHS Inform, 2020).

Understanding these basic skills described above is essential for reducing complications resulting from the varied emergencies reviewed in this section. Also, training participants can significantly increase their knowledge of the management techniques for the specified FA care (Neto et al., 2018; Awad et al., 2017; Alyahya et al., 2018; Thapa et al., 2017). There are several emergency cases which are common in schools. Each health case has a specific first-aid management approach. However, this study explores only a few that are prevalent in secondary schools. Proper first aid training is crucial for such cases. The understanding and management of FA care are, therefore, advocated.

### **Demographics, first aid training and level of retention**

First aid training has been a compulsory component of the curriculum in secondary schools in Norway ever since the 1960s. Till this time, there has been a pervasive call for countries around the globe to adopt this policy. School children learn quickly and are easily motivated. Training is organised by St. John Ambulance or Red Cross Society. In Australia, over 70,000 pupils in primary school have been trained in first aid management by 2013, and the number has increased to 200,000 as of 2017; however, the knowledge retention rate of the trainees remains unclear for these young students (Lenson & Mills, 2016). Using a practical

and theoretical approach, Lubrano et al. (2005) in Italy reported resuscitation first aid training among 469 students (271 in theory-only groups and 189 in theory/practical group) aged 8 – 11 years. The results revealed that older students demonstrated significant retention and knowledge after the training, even six months later. The participants in the latter group were found to be better in performance in first aid management.

Besides, Connolly et al. (2007) in Northern Ireland trained 89 students of age 10 – 12 from rural areas using 46 as interventions and 43 as control. The study revealed a significant increase in their knowledge of FA when compared to baseline knowledge. Although the students had no improvement in 30% of the questions after training following the six months period, their expertise was still better than the baseline. An earlier study by Bollig et al. (2009) regarding non-resuscitative FA training among 228 young children from 5 – 7 years found a significant difference in their performance, knowledge and retention after six months. Also, the authors (Bollig et al., 2011) in Norway used a mixed method in conducting a pilot study that involved training ten kindergarten children aged 4 – 5 on non-resuscitative first aid. The results indicated that 70% of the children could correctly and consciously assess telephone lines to call for help after providing first aid to victims. Over 60% of them were able to make a proper assessment of breathing difficulty, and 40% could place victims in recovery positions after finding out their airway obstruction. This knowledge was retained even after seven months after initial training.

Furthermore, Behairy and Al-Batanony (2016) averred that the school environment is one of the best places to carry out first aid training. They assessed the effectiveness of FA and the intervention for the BLS programme on the awareness and practice among 168 school health advisors from three tiers of education; “primary, preparatory and secondary schools in the city of Unaizah situated in Egypt. The interview was used to assess participants' baseline knowledge and retest to ascertain their retention level in a six-month interval. Results show

that 22% had prior knowledge, a generally weak and incorrect situational practice. However, after the training, it was noticed that participants significantly increased both their knowledge and practice.

Since incidents of emergencies were steadily increasing in Malaysian schools, using a cross-sectional survey, Jamaludin et al. (2018) investigated the knowledge, attitude and awareness of 348 pupils of the 'International Islamic University of Malaysia Kuantan' Campus on first aid. Three hundred and sixteen participants were found to have a positive attitude and knowledge of first aid. Their attitudes were also found to be positive, and a significant relationship was observed among gender, year of study, faculty and FA training or knowledge after the training. Adopting a quasi-experimental design, researchers in Nigeria investigated the effect of demographic factors (gender, age, and level of study) towards the acquisition of CPR skills for 322 school pupils from the selected four secondary schools in Rivers State. The level of retention was measured six weeks after the training, and the study revealed that demographics did not influence the CPR abilities of the students significantly. Although students in senior secondary school-one had a higher mean score when compared to those from senior secondary school-two. Retention was also found to be the same after six weeks (Onyeaso & Onyeaso, 2016).

According to Olumide et al. (2015), their study investigated the effect of training participants on FA using a multi-stage technique for sampling. The authors assessed the knowledge and skill of 128 public transport operators in southwestern Nigeria in terms of their promptness to save accident victims' lives following the probability sampling technique. The baseline knowledge was assessed before the 2-day training intervention. First aid knowledge before, immediately after, and after three months of the intervention was 48%, 57.8% and 59.2%, respectively, showing a significant improvement, while control was 48.3%, 39.25 and 46.8%. The mean FA skills for drivers who received the intervention were 17.5%, 80% and

72.3%, respectively. The group representing control and the intervention showed significant differences with a slight drop in their retention level, advocating periodic training.

A study carried out among 883 Yarmouk University students in Jordan revealed that out of an average age of 20 years with a variation of 2.6 years, only 29.2% had prior experience with first aid, and only 11% could identify an abnormal breathing pattern by their understanding on the respiratory system of a person. The female students performed better in knowledge than their male counterparts. They concluded that FA ought to be taught at the secondary school level (Khatabeth, 2016). Similarly, using the cross-sectional design, Ganfure et al. (2018) investigated the awareness, attitude, practice, and situations that may influence FA education among 194 educators in Ethiopia. Participants indicated an interest in FA management of nose bleeding (epistaxis), choking, back and neck injuries, and epileptic seizures. They found that less than half (40%) of the population of teachers demonstrated a good knowledge of FA, and 75% showed a positive attitude towards FA. They found that older participants, years of experience, the category of school, source of FA information, and prior training significantly influenced their understanding and practice of FA. They found that only 35.6% of the participants knew how to manage epilepsy, 42.3% could manage the incidence of bleeding, and 37.6% could effectively handle choking.

Additionally, a study carried out in New Zealand investigated the attitude towards the provision of CPR and knowledge of CPR among four hundred and ninety-four students between the ages of 16 and 17 in the selected high schools. Poor theoretical knowledge of FA was found among students ( $5.61 \pm 2.61$ ). Although no differences were found among the male and female students, the students with prior exposure to training on FA (70%) scored  $6.04 \pm 2.56$  more than the knowledge score of  $4.91 \pm 2.24$  for their untrained counterparts.

### ***Impact of FA training in schools***

First aid is a useful lifesaver tool required by all members of society, whether at work, home, public locations, or schools. There are so many advocacies for the introduction of first aid as a study course in schools because of the importance of FA training in schools (Morris, 2018; El-Magarbi et al., 2017; Arli & Yildirim 2017; Onyeaso & Achalu, 2014; Plant & Taylor, 2013; Fleischhackl et al., 2009). Because children and teenagers from the age of 10 to 19 years spend one-third of their time in school environments, these persons are usually affected by traumatic or clinical injuries. It was found that 45.7% of emergency victims in Brazil are from 0 – 19 years of age, which are mostly part of the population in school environments (Neto et al., 2017); hence, FA training is needed in schools. Some recent reports on the significance of FA training on the health conditions of students have been documented. Priyangika and Hettiarachhi (2015) and Joseph et al. (2014) posited that the education environment is the most appropriate place for leading proper education on the FA. This is because it can be delivered effectively due to the institution's natural quality, making it more accessible to any educational training.

Wafik and Tork (2014) examined the significance of FA training offered by trainee nurses studying towards their degree programme to students at their preparatory school level. The study sampled 100 students from public schools in Egypt by explicitly looking at their knowledge and practice. Accordingly, the result from the test obtained after the training and a two-month follow-up assessment technique revealed that before the commencement of the first aid intervention programme, there was an insufficient level of knowledge and insufficient practical experience among the pupils at the school, which significantly improved after the intervention. The nature of the school and the intervention were found to be a predictor of the student's knowledge scores. As a result of the FA, there was an increase in the knowledge of

recent and successive training programmes and participants' practice, even though the follow-up period was short.

Moreover, Eze et al. (2015) researched the effect of training on FA management of conditions of epilepsy among trainee teachers in Nigeria at “the Federal College of Education, Akoka, Lagos State”. In particular, the questionnaire utilized by the researchers was self-administered; they looked at the outcome of the training on the understanding, attitude and management of the disease using a sample of 226 randomly selected trainees. They found that a majority of participants had negative attitudes and inadequate knowledge of epilepsy; however, after training, their management skills of epilepsy tremendously improved. The percentage of participants with insufficient knowledge and attitude went down by 15% and 16.4%, respectively, with a concomitant increase in their management skills for FA (29.6%). The authors concluded that the FA training could increase the knowledge and expertise of respondents.

Furthermore, Onyeaso and Onyeaso (2017a) objectively investigated the CPR skills among students at the University of Port Harcourt to respond to cardiac arrest cases occurring outside of a hospital setting among 150 students using pre-training and post-training (quasi-experimental design). A baseline assessment of their knowledge of CPR was made through the exposure of participants to a simulated cardiac arrest scene using a manikin to demonstrate their skill. Results showed that pre-training skills were significantly poor, although significant improvement in CPR skills was observed after the training. The range in performance was 60 – 100% after training, which was initially below 50% before the commencement of the training. Research on the learning acquisition and practice of FA among 45 students in the medical field of a private college in Maharashtra, India, was conducted by Raje et al. (2017). A 3-day training course was organised by the Red Cross Society of India consisting of theory and practical sessions. Results showed that 82.2% of participants indicated that the CPR and

causality management courses were beneficial. Over a 40% improvement was seen in post-training, with over 73.3% of students scoring above 50% in aspects of FA management. The effect of primary FA education (theoretical and practical) on the knowledge of 44 teachers (20 from control and 24 from experimental groups) from eastern Turkey was carried out by Arli and Yildirim (2017). The aspects of first aid involved were necessary FA information, basic life support, emergency management for respiratory difficulty, poisoning, bleeding, drowning, animal bites, foreign objects in the eye, ear and nose, impaired consciousness, bone fracture, dislocation and sprains, burns and freezing. The outcome reveals a significant difference ( $z = -4.215, < 0.01$ ) between the pretest and post-test scores of Individuals who are part of the intervention group.

Also, Bandyopadhyay et al. (2017) investigated the efficiency of a FA training programme among middle-school students in West Bengal, India. Two hundred and thirty sixth and 7th grade students were used, baseline knowledge about first aid was assessed, and intervention was carried out for two months. Results revealed that the baseline knowledge on managing injuries was unsatisfactory, which tremendously improved after the intervention. They asserted that including FA training in the school curriculum would be valuable for the school and the students. Onyeaso and Onyeaso (2016) carried out training on CPR amongst 347 students at senior secondary schools one and two (SSS 1 and 2) from both public and private educational institutions in Nigeria. The study ascertains whether the exposure will significantly result in a change in their first aid skills. The results showed that virtually no participant had initial CPR skills at the beginning of the training, but they gained substantial knowledge and expertise afterwards. The participants showed much enthusiasm during and after the training. It was also found that 98% advocated for the official teaching of CPR in secondary schools.

Moreover, a quasi-experimental investigation was conducted among 220 secondary school pupils to investigate the effect of FA instruction on the behaviour and practice of participants after training, revealing a significant ( $p < 5\%$ ) improvement in the student's understanding and attitude. Although the study has documented only the immediate outcome of the training, there was no follow-up to determine the short-term or long-term effect of the training programme (Mirza et al., 2017).

First aid prevents minor injuries from developing into more severe injuries. First aiders must complete the training course on FA. Administrators are responsible and accountable in school for providing first aid in cases of common illnesses and injuries (Department of Education and Employment, 2012). This responsibility can be extended to students as part of learning development for self-improvement and to facilitate the efficacy of a healthy school environment.

### **Link to Global Learning Outcome and Global perspective of the first aid training: empirical studies**

The World Bank (2019; 2018) has expressed its dissatisfaction with the global learning outcomes of children, emphasising the notion that mere enrollment in schools does not guarantee effective learning. The importance of delivering high-quality education or training was underscored, as it was recognised that such endeavours can have positive effects on both individuals and society. These effects include fostering long-term economic growth, promoting creativity, and reducing poverty. It was acknowledged that a successful education system has the potential to transform aspirations into tangible achievements. Therefore, part of the research aims to assess the effectiveness and appropriateness of various instructional approaches and learning resources in facilitating and enhancing the acquisition and retention of knowledge among learners at different levels.

Achieving positive educational outcomes requires technically accurate solutions coupled with unwavering determination, resourcefulness, and astute political insight. The RAPID framework (World Bank et al., 2022) outlines necessary actions that countries must undertake to facilitate the recovery and expedite the process of learning in the coming years. The main objective is to ensure universal access to education and promote retention of all children in educational institutions. To ensure their retention, implementing various strategies such as back-to-school campaigns, family engagement initiatives, early warning systems, removal of school fees, provision of cash transfers, and school food programmes are recommended.

Assessing learning levels on a regular occasion is crucial. The aim is to assess the present learning levels of children upon their reintroduction to school so that instructors can tailor instructional approaches in the classroom based on each child's individual starting point. Notably, these starting points are likely to be significantly lower due to previous school closures (World Bank et al., 2022) or the absence of previous exposure to content, such as first aid training. Therefore, the instruction is designed to allow the trainer to gain ongoing feedback on the different aspects of firstaid and provide means of scaffolding the learner's knowledge based on their assessment of the student's individual starting point on first aid. Giving priority to teaching fundamental concepts is imperative. Learning recovery initiatives should focus on addressing crucial content that has been lost and prioritizing fundamental abilities in literacy and numeracy, which serve as the building blocks for acquiring knowledge in other subjects. Educators should be assisted in facilitating the instruction of these competencies.

The fourth and fifth aspects of the RAPID framework are crucial to the current study as this emphasises enhancing the effectiveness of instructional methods is crucial. Implementing efficient teaching strategies that provide cost-effective solutions for teachers to address their classroom difficulties is key. These strategies include the use of structured

pedagogy programmes and instructional resources specifically designed to cater to the individual learning levels of students. This is why the current study has adopted the use of a multisensory approach to respond to the individual learning needs of those participating in the research. The fifth aspect of the framework, which develops psychosocial health and well-being, understands the need for establishing secure educational environments that safeguard children's physical and mental well-being, protect them from violence, and facilitate their access to fundamental services such as nutrition, counselling, water, sanitation, and cleanliness is essential to promote the enhancement of psychological health and well-being. The knowledge and skills gained through delivering first aid training are directed to respond to the essential outcomes provided in the framework designed by World Bank et al. (2022).

Worldwide, several reports have been documented on first aid training for different kinds of individuals in schools and other organisations of non-education type, and the impact has been almost the same for all reviewed cases. Since the 1990s, there has been a suggestion to teach essential life support (also referred to as ‘basic life support-BLS’) and training on first aid (FA) in schools, which several initiatives and recommendations from organizations such as the ‘American Heart Association and the International Liaison Committee on Resuscitation’ have supported (Bohn et al., 2015; Chamberlain & Hazinski, 2003). Despite these suggestions, the quality of training has been negatively impacted due to the lack of uniform curricula and inadequate educational personnel. In an attempt to address this, the Kids Save Lives (KSL) programme was developed to create uniform procedures and educate healthcare personnel, schoolteachers, and other members of the public on the importance of CPR training for schoolchildren (Lukas et al., 2016; Semeraro et al., 2016; Wingen et al., 2018; Banfai et al., 2018; Nakagawa et al., 2019). KSL campaigns have been carried out in various nations, and CPR education is mandated by law in six European countries, with proposed legislation in twenty-three additional European nations (Semeraro et al., 2018; Kids Save Lives, 2020).

Teaching strategies to implement KSL in school curriculums are being discussed, with current evidence indicating that BLS instruction by instructors with prior training has positive outcomes (Pichel López et al., 2018). However, the personal attitudes of teachers towards KSL and their BLS and/or levels of FA may differ. Research conducted in Spain indicates that future and present educators and parents of young students advocate for the inclusion of Basic Life Support (BLS) in school curriculums but have limited BLS knowledge (Abelairas-Gómez et al., 2019; Abelairas-Gómez et al., 2020). A more recent investigation by Abelairas-Gómez et al. (2021) surveyed 3,423 schoolteachers in Spain to assess their knowledge of FA and BLS. The topics covered the teaching of basic first aid to students and the different viewpoints on how it should be instructed. Results showed that while 75% of schoolteachers acknowledged being aware of FA, only 17% reported providing CPR, indicating a deficiency in their ability to recognize cardiac arrest. However, 98% of respondents supported integrating FA training into educational curricula at schools and universities, as well as the “KIDS SAVE LIVES” statement. FA training positively predicted participants' desire to provide CPR; additional training and specialized curriculum can improve the quality of CPR instruction in schools (Abelairas-Gómez et al., 2021). Training schoolteachers in CPR can establish a solid basis for imparting CPR-related knowledge to students in a sustainable manner. Therefore, it appears essential that FA and BLS be included in degree and other educational programmes.

The participants ranged from students to teachers and drivers. With the increasing rate of road accidents in Zambia, Mpombo and Mwanakasale (2017) assessed the knowledge, attitude and application of first aid by road workers, including traffic police officers in the Ndola region using a cross-sectional study utilizing a sample that accurately represents the characteristics or qualities of a larger group or population, hence leading to a selection of 220 respondents (50% minibus drivers and 50% police officers). They found that the respondents

had a favourable disposition towards first aid, and 98% were very willing to partake in first aid training. The educational level corresponded positively to their score in training, and policemen (54.5%) had higher performance than drivers (53.1%), while conductors (45.2%) were the least. Those with positive attitudes scored an average of 50.4%, while the ones with negative attitudes scored 35.7%. They found that their knowledge was inadequate, and formal training in first aid and lifesaving was lacking in them.

Besides, Masih et al. (2014) investigated similar issues. The purpose of their research was to evaluate the efficiency of the first aid education programme offered by the FA project in improving the awareness and skills of elementary school teachers in Dehradun district, Uttarakhand, in managing minor injuries among students. Participants (a total of 50) were selected via non-probability convenience sampling. The study discovered that the average score for knowledge of basic treatment of specific mild injuries after the test ( $34.76 \pm 4.35$ ) was significantly higher than the average score before the test ( $27.32 \pm 5.73$ ). The post-test practice score ( $18.52 \pm 2.63$ ) was also significantly higher than the pretest practice score ( $14.52 \pm 2.39$ ). The participants' knowledge and practice scores had a strong positive correlation ( $r = 0.9$ ). The researchers concluded that the training programme effectively improved the participants' knowledge and skills in managing minor injuries requiring first aid. Their findings highlight the importance of implementing first aid training programmes, which can ultimately enhance the overall health status of children.

Alhajaili and Al-Subhi (2016) conducted research to assess the degree of awareness and understanding regarding first aid among 110 female learners from the Health Science colleges at Taibah University in Saudi Arabia. The participants were randomly selected. The investigation unveiled a noteworthy improvement in the participants' understanding and awareness regarding the importance of checking for potential hazards before administering first aid. This includes understanding how to handle situations such as loss of consciousness,

applying pressure to a bleeding limb, providing support to a bone that is fractured by applying a cushion to support, soothing and cooling a burn under a running tap or cold water, ensuring the safety of a person experiencing convulsions, and properly positioning and administering medication to an individual during an asthmatic attack.

A study conducted by Nitin et al. (2015) assessed the ‘awareness, attitudes, and practices of 146 school-teachers’ in Mangalore, India, regarding the administration of first aid. The researchers also examined the readiness of facilities for first aid in nine schools. The survey showed that only 69 teachers (47% of the total) had previously undergone first-aid training. Among those teachers, 19 (13%) had a poor understanding of first aid, while 127 (87%) had a reasonable understanding. Only a few (8) teachers recognised the accurate protocol for ‘cardiopulmonary resuscitation’. However, 96 (66%) of the teachers were helpful and willing to deliver first aid as long as they had the necessary training. Seventy-four instructors indicated that they had used first aid in responding to an incident at their various school. The most commonly encountered conditions that necessitated the administration of first aid were wounds (36% of cases) and syncopal attacks (23% of cases). It was ascertained that teachers who have been previously trained in first aid were more confident in providing FA care for victims of injury or illness. Only 5 out of 9 surveyed schools had first aid kits available. The current level of competence among instructors in Mangalore to provide first aid was found to be inadequate. Thus, it is essential to implement measures in schools to ensure that first aid training is provided to students, along with regular first aid training sessions for teachers.

### **Appraisal of the literature**

A training covering a first aid curriculum is a crucial programme that helps individuals acquire the necessary skills to save lives in educational institutions and communities. The effectiveness of this training should not be underestimated, especially considering the recent surge of attention it has received. Recent research conducted in Western countries has shown

that children and teenagers aged 5 to 18 are capable of learning first-aid skills and are more likely to provide assistance. Hence, introducing first aid training programmes for children is a practical approach to optimise the effectiveness of such initiatives. However, as far as the review of knowledge on this area extends, evidence-based guidelines and education materials for first aid education for children residing in low to middle-income nations are lacking. The review indicates that most trainers have consistently used resources that are Western-oriented with slight or no modification to them. According to some authors, understanding the importance of context in determining the selection of topics, considering local customs and beliefs, and accounting for available resources and equipment is paramount. Therefore, some authors created educational materials tailored and customised to suit the specific needs and circumstances of the African region (De Buck et al., 2020), which is yet to be fully utilized.

Many countries worldwide are currently investing in their healthcare systems and providing first aid training to people of all ages and professions to improve their health outcomes. However, in Nigeria, neither the state nor federal governments have given enough attention to the issue of first aid management and training for workers, students, and other individuals. As a result, only a few primary and secondary schools in the country have embraced the concept of providing first aid training to prevent, handle, and mitigate serious health issues within their premises. In particular, secondary schools in Delta State have not undergone comprehensive training. On the other hand, several countries like Norway, USA, Nepal, Saudi Arabia, India, Canada, and England have conducted extensive first aid training. Some studies have also documented the need to expand and improve the quality of such training in Nigeria (Onyeaso, 2014; Onyeaso & Achalu, 2014; Eze et al., 2015; Olumide, 2015; Onyeaso & Onyeaso, 2016, 2017 a, b; Alabi, 2018). Unfortunately, there is a shortage of available reports on Delta State. Most studies have focused on topics such as CPR, choking, seizures, bleeding, and wounds. However, there is a lack of literature or reports on conditions

such as asthma, snake bites, diabetes, avulsed teeth, convulsions, strains and sprains, and fractures. The Delta State Chapter of the Nigerian Red Cross Society has pointed out that there is a shortage of community health care expertise, as most students and even teachers in government-owned secondary schools lack basic first aid training. Therefore, the present investigation aims to evaluate the practicality of FA resources/ training and to fill the knowledge gap among secondary school pupils by taking into account the importance of context in determining the selection of topics, considering local customs and beliefs, and accounting for available resources and equipment is paramount. Even though a team of researchers has recently developed a well-thought educational pathway for children in sub-Saharan Africa, there is still minimal application of studies showing consideration for these. Also, there are some missing components of the pathway, such as FA for Avulse teeth, which, from the review of pieces of literature, are skills necessary to develop an understanding of due to its poor knowledge of care specifics and occurrences in schools from falls or violence (Olatosie et al., 2013; Shamarao et al., 2014; Pani & Alhazmi, 2015). This is especially useful in saving the lives of secondary school students while extending the knowledge and practice in their respective communities.

### CHAPTER 3: RESEARCH METHOD

It has been observed that children in schools face numerous hazards due to the diverse range of activities they engage in. Studies indicate that adolescents and secondary school students are especially susceptible to accidents that occur in schools, and these accidents can result in severe consequences (Orzel, 1996; Afili et al., 2015; Global Health Metrics, 2020). This could be due to their tendency to engage in risky physical behaviour, as well as violent acts. The risk of accidents and injuries has long been reported by researchers over twenty years, and the current state has not changed. Findings from recent research still record the risk of injuries and violence among children and adolescents both globally and nationally. Childhood injuries are the primary cause of illness and mortality in young children (Krug, Sharma & Lozano, 2000). According to a recent report by the World Health Organisation (WHO) in 2020, vehicle traffic accidents and drowning are identified as significant contributors to mortality rates among older children. According to Guyer et al. (2009), injuries are the main reason for death, impairments, and the utilisation of health services tailored to children in the United States. Non-fatal injuries impose a significant socioeconomic burden, with around 25% of children requiring medical attention each year due to major injuries. This results in a staggering \$17 billion in medical expenses (Danseco & Miller, 2000). The primary factors contributing to non-fatal injuries in children aged 0 to 14 years encompass falls, impact from objects or surfaces, lacerations or punctures, drowning, burns, and asphyxia (Grabowski et al., 2009; Okandeji-Barry et al., 2016).

Good health is important for children's growth, development, and academic success. Education can also help children understand how to maintain their well-being. Research shows that health-risk behaviours can negatively impact adolescents' education. This includes academic achievements like graduation rates, grades, and test scores, as well as attendance, dropout rates, behaviour issues, and participation in school activities. These behaviours also

affect students' attitudes towards postsecondary education, safety in school, and overall positivity (Ogunlade et al., 2019).

The basic training programme can be helpful for skill-based peer education, especially for developing countries like Nigeria, which is among the countries with the greatest death rate for 5 – 9 years old (WHO, 2020). Whereas due to a lack of training on first aid, student and staff do not effectively manage emergency health situations (Eze et al., 2015; Onyeaso & Onyeaso, 2017) when children, including adolescents and teenagers, spend one-third of their time in schools (Masih et al., 2014). Health services in secondary schools have been neglected for a long time, and there is a lack of awareness or education on emergency health conditions in schools (Bhatia et al., 2011). It remains unknown the level of 'first aid knowledge' and management competence of pupils in secondary schools in Delta State (personal communication of the Nigerian Red Cross Society, Delta State Chapter, 2018), and it is therefore pertinent to train students on first aid. This would lower the number of fatalities in school and community emergencies since students are an excellent means for passing information on to their surrounding neighbourhood and community. The review of literature has seen an increase in studies which have emphasised that all schools should make basic first aid compulsory (Afili et al., 2015; Hoque et al., 2017; Mirza et al., 2017).

This quantitative study investigates how effective FA training is in improving secondary school student's knowledge and understanding of basic FA management skills in southern Nigeria. Indisputably, the aid given during the first few minutes of emergencies is often of great significance for victims, particularly when related to potential health outcomes and expectations of the standard of life (Peterson et al., 1999; Afili et al., 2015). It's important to remember that there can be a substantial delay before ambulance or trained rescue personnel arrive during emergencies. That's why it is crucial for bystanders to have the confidence and

expertise to administer initial medical assistance (first-aid) to those who require it (Hussain & Redmond, 1997; Goniewicz et al., 2002). Even though studies have looked at the effect of training on FA within and outside Nigeria (Bollig et al., 2009; Bollig et al., 2011; Wafik & Tork, 2013), just a few of such research have been reported in southern Nigeria, and this emphasises the necessity for this study. The current body of literature on this topic lacks adequate evidence-based guidelines and instructional resources for providing first aid training to children living in low-middle-income countries. Both context, social norms, belief and availability of resources and equipment are not considered when planning first aid training in Nigeria. It is essential to consider the context when deciding on FA topics, taking into account local norms, beliefs, and availability of resources and equipment. Understanding these aspects is crucial to the authors' claims (De Buck et al., 2020), which is one of the core reasons the present study has considered the essential element of identifying the topics based on the context assessment from previous works of literature, the local norm in the southern region of Nigeria and the availability of resources.

Participant knowledge of FA was assessed in this study after implementing training that specifically highlights FA's general rules and objectives, including the skills needed to manage incidents of selected emergencies that are common to the school environment. These are wounds or injury, unconsciousness, foreign bodies in the eyes, nose, ears or mouth, fracture, and other illnesses such as convulsions, snake bites, stings, etc. Furthermore, reviews from the previous study clearly show that training significantly increases knowledge (Ibrahim et al., 2016; Arli & Yildirim, 2017; Bandyopadhyay et al., 2017; Mirza et al., 2017; Onyeaso & Onyeaso, 2017a). Therefore, training is expected to increase participants' understanding of first aid. The study evaluated the effect of the training intervention on participants' knowledge and practice towards the provision of first aid. It will highlight the area/section of the first aid training module that reveals a significant increase or decrease in knowledge. This assessment

was done immediately after the training and subsequently over a one-month period. Therefore, the methodology chapter presents the research methods and data collection for this research. The chapter will consider the research approach and design, including the population and sample of the research study, materials and instruments of the research tools, and their relevance. Additionally, the chapter provides an operational definition of the associated variable along with the study procedure and ethical assurance, including the procedures for data collection.

### **Research Approach and Design**

The study approach is a quantitative method approach with the positivist type embedded within the experimental design. It allows for the use of a quantitative method of data collection, analysis, and integration. In answering research questions and understanding research problems, the critical influence of scientific practice on the social environment is brought into perspective with the positivism paradigm. This is because, in experimental studies of this nature, the real-world environment can easily be approximated, leading to accuracy in predictions. Aliyu et al. (2014) and Park et al. (2020) believe that an experimental design where quantitative data is collected to answer research questions and hypotheses perfectly describes and fits into the positivism approach. Hence, the theoretical philosophy associated with this quantitative research is the ‘positivism paradigm’. The positivist type of research is one where reality and truth are two separate independent perceptions in research and are self-determining, and can be studied scientifically. In positivism, events can be observed, empirically experimented and analysed to elucidate the facts embedded within. In positivism, reality can be measured using standardised instruments, and without bias, the results are used to test the facts of nature. The researcher is usually objective and unbiased, and findings are reached based on many experimental designs using the same instrument. In this paradigm, research findings are validated by comparing them to similar research from different authors. The purpose of

gathering data in this paradigm is to relate its findings to existing theory, predict how the intervention impacts the behaviour of experimental subjects, and practical application of the results (Tombs & Pugsley, 2020).

The findings are to be discussed in contrast or similar to earlier findings. As part of the qualities that make this study positivist research, the work was designed to test hypotheses (Ryan, 2018) and answer questions, and it was designed based on earlier studies. Four characters champion the positivist idea: scientific knowledge is the only legitimate knowledge, fact-gathering begets knowledge, hypotheses are generated and tested based on theories, and science is value-free. The Solomon four-stage design fits into the positivist philosophy based on the fact that facts are validated by simply testing the impact of a training programme on the knowledge of people using different approaches. The positivist examines the relationship between two or more constructs, which could be likened to finding the relationship between pre-intervention and post-intervention. One other area of positivism is the sorting of moderating factors in research, e.g. the relationship between a demographic variable and that of a dependent variable. In this investigation, the effect of gender was assessed since it could be a discriminating factor in finding reality and truth.

This study's research design is the four-stage Solomon study design, a robust form of the true experimental study design. Its suitability for this study is drawn from its unique characteristics or relevance in inferring causes and effects directly compared to other designs that are not classed or classed in the same category. For instance, an investigation conducted using a cross-sectional design may help determine the impact of training on participant knowledge, attitude or practice, as observed in several studies (Okandeji-Barry et al., 2016; Midani et al., 2018). However, these non-experimental designs' standard and level of excellence are judged by how closely they can approximate an experiment. In support, Setia

(2016) stated that cross-sectional design could not determine the direct causes and effects. However, the association between the exposure and outcome can be estimated with odds ratios.

On the contrary, the analytical cross-sectional design may have the ability to assess the relationship between the outcome of a person's health and other factors, such as increased knowledge of first aid, when applied to the current study. The design is still limited because these outcomes are simultaneously measured, and the data collection procedure is retrospective in nature. Thus, there is a high chance of recall bias (Public Health Action Support Team (PHAST), 2020). On the other hand, the quasi-experimental design shares similar features with the true experimental design, and it is a common approach used by researchers to test the effect of a variable against a subject in the field of education or natural science. The design is classified under an experimental study design that shares very similar characteristics. Several studies on FA training around the globe have promoted the use of quasi-experimental studies.

The investigation carried out by Mirza et al. (2017) on the effect of FA, ascertain the before and after outcomes of secondary school students after receiving structured FA training. The researcher used a quasi-experimental design and a multi-stage sampling technique to select 220 secondary school students from 5 schools in the study area. Correspondingly, the authors (Wafik & Tork, 2013) investigated the effectuality of the FA intervention in preparatory school children in Egypt. In another study, the researchers employed A quasi-experimental design to select 100 students enrolled in governmental preparatory schools through a multi-stage sampling technique. The intervention was designed by the authors and delivered by trainee nurses. At the completion of the training, the researcher evaluated the immediate post-test evaluation and two months post-intervention of the study.

Similarly, Onyeaso and Onyeaso (2016) investigated the effect of age, gender, and school class on students' cardiopulmonary resuscitation skills in Nigerian secondary schools. The study also adopted a quasi-experimental study design. The researchers selected a total

number of three hundred and twenty-two senior students from private and government-owned secondary school students in the south region of Nigeria. After that, a pre-test questionnaire designed to assess CPR skills was administered to the participants before and after the training and six months after the instruction to document knowledge retention. A descriptive ANOVA and t-test set at a significant level of 0.5 were used in the analyses of data retrieved from the questionnaire. The findings show that age, gender, and the class/grade of the school student had no significant effect on the respondents' CPR skills. Nevertheless, the retention rate of CPR training declined by four stages six months after, as opposed to the more traditional 8-step CPR level that was previously recorded immediately after the training. The effect suggests that the retention rate of knowledge from the intervention declines with time, whereas this was not considered in other studies (Mirza et al., 2017; Wafik & Tork, 2013).

All three studies described above have used the quasi-experimental study design, which is a design that is synonymous with the experimental design. Compared to other quasi-experimental designs, the researchers have adopted a more sophisticated approach than others in the same categories. One such sophistication is including a non-randomised control group, which shares a closer characteristic with the true experimental study design, having at least one intervention and control group (Allen, 2017). This method has been proven to be better than the post-test only or an experimental design involving both a pre-test and a post-test which is used to compare the outcome of services or the measurement between two variables before and after introducing the planned intervention (Schweiser et al., 2016). Research has proven that using a quasi-experiment design helps show how effective intervention may be in a real sense instead of proving the efficiency of intervention carried out while adhering to specific conditions (Thorpe et al., 2009; Schweiser et al., 2016). The external validity of the quasi-experimental research design is higher than that of the true experimental study design.

The quasi-experimental studies have several pitfalls despite their flexibility in being a preferred design when considering the ethical issues that may result from using the true experimental design. Studies have revealed that the external validity might be compromised in a non-randomised trial, limiting the causal effect assumed from the intervention and the outcome. However, this can be minimised if the researcher selects or includes in his study other countries or sites in a country (Schweiser et al., 2016). This can lead to more substantial external validity. On the contrary, the true experimental design may strongly overcome this limitation because the confounding variables that may potentially disrupt the study are distributed equally across the groups through randomisation (Grabbe, 2015; Imai et al., 2013). A study reported that there is a high frequency of experimental design approaches in educational research. However, these studies' design strength is weak, with minimal ability to overcome the threat resulting from internal validity (Koksal, 2013; Evrekli et al., 2011).

The above suggests that selecting the appropriate design for a study cannot be overemphasised because it helps validate the data and strengthen and promote a thorough scientific process, making the result applicable to various settings (Grabbe, 2015). However, this is not enough, as researchers need to consider the goal and the feasibility of implementing a chosen design. Accordingly, Venerable and Baskerville (2012) opined that several factors should be considered when selecting a research design. A true experimental design is a vital component with adequate methodological strength, but it is essential to remember that the study's scope and technique of implementation are other strong elements that may impede the treatment's strength. The same applies to the quasi-experimental study design, where the strength can be increased by broadening the scope with appropriate treatment implementation (Grabbe, 2015).

An appropriate intervention procedure is necessary before considering the strength. For instance, using the variable for the current study by training the treatment group on FA for a

victim experiencing cardiac arrest solely by using the defibrillator rather than applying chest compression and a rescue breath may be considered inappropriate. This may be considered inappropriate because of the regional context where a developing country like Nigeria lacks the availability or accessibility of such equipment due to a poor emergency health system from casual observation, as reported in several studies (Abel, 2014; Oseni et al., 2018). Besides the irregularity of power supply in the country (WHO, 2014; Adair-Rohani et al., 2013; Oyekale, 2017; Olowosejeje, 2020), both rural and urban areas of Nigeria will inhibit the purpose of such equipment in a health facility or an emergency. Hence, such intervention is inappropriate, even when the training criteria adopt strong and effective procedures. In this case, this includes using a multisensory approach and practical demonstration that has been hypothesised to improve knowledge and increase retention rate. Yet, it may never be applied in the long run because the equipment and other conditions are impracticable. In a review, Gibbs (2015) reported that a treatment might be strong for a specific problem but cannot bear a similar effect for every problem. The author used an example for pain treatment at different dosages and compared this to the use of painkillers such as Aspirin to treat *Staphylococcus* infections. The author concluded that researchers are likely to fail in their intervention procedure if they lack knowledge of the problem they wish to modify by their intervention or introducing specific treatment.

After a careful review of the different study designs that align with the goal of the current study on the effect of FA by evaluating their pros and cons, the current study has chosen to apply the Solomon approach of the true experimental study design in order to increase the strength of the design. A well-implemented approach to this design helps to combat the threats of internal and external validity that may occur in a quasi-experiment or in a basic true experimental design that does not observe the manipulation seen in the Solomon four-stage design. In addition, some of the quality of Koxsal's experimental design was observed through

random assignment of implementers and data collectors (Koksal, 2013). This procedure includes controlling for the implementation effect, as Koksal (2013) argues that the four stages of Solomon's design do not encompass strategies for preventing the implementation effect. Solomon's four groups are robust experimental designs that control the majority of the threats observed in other experimental designs. Maturation, testing effect, and history are all adequately controlled, which generously increases the findings' generalisability (Kirk, 2009; Koksal, 2013). The design has been in use since 1949, is very robust, and is well documented in assessing the intervention effect of an educational programme (Franc, 2020; Allen, 2017).

The test uses a design that includes both a pre-test and a post-test that randomises the participants into a group of four. Randomly assigning participants into groups indicates that each of the four groups has an equal probability of having the different characteristics of the participants, which also fulfils the assumption of mortality effect, revealing that the loss of participants in the experimental group occurs equally in the control group (Grabbe, 2015; Imai et al., 2013). In group one, a pre-test is administered, and then the intervention of the training, which in our study is the FA training, is conducted. After that, a post-test is conducted using the same instrument as the pre-test. According to Allen (2017), researchers use this procedure to ascertain whether the exposure to treatment is responsible for any differences in the outcome. Group two receives the pre-test without any intervention programme of FA training, and then the post-test is administered after the period of intervention for the other treatment group. Group three did not receive a pre-test but started with an intervention by providing FA training for the participants in that group, followed by a post-test.

On the other hand, group four did not receive a pre-test nor an intervention through FA training but was given a post-test. Studies (Aiken et al., 2009; Allen, 2017) have revealed that the presence of pre-test sensitisation can only be assessed using the current design; this is because the outcome of the post-test may not only be influenced by the intervention but also

by exposing the participant to the pre-test. Therefore, the interaction between these two may cause flaws in generalising the research, but the current method of the study ensures active inference of causal relationships. In this design, groups two and group 4 are considered the control group, while groups 1 and three are regarded as the treatment group. The treatment groups are observed over one month, and a post-test is administered afterwards to assess the participants' retention rate. The researcher executed the explained design in one of the educational contexts in Delta State, Nigeria. A complete selection of Solomon's four stages was implemented in public schools. This increases the sample size/study power and ensures widespread application of outcomes in secondary schools.

*Table 3.1. Study Design and Approach: Solomon-4 Stage Group Design*

Solomon Four Stage Group Design					
	Groups	Randomisation	Pre-test	Intervention	Post-test
<b>Treatment</b>	1	R	O <sub>1</sub>	X	O <sub>2</sub>
<b>Control</b>	2	R	O <sub>3</sub>		O <sub>4</sub>
<b>Treatment</b>	3	R		X	O <sub>5</sub>
<b>Control</b>	4	R			O <sub>6</sub>

Source: Braver and Braver 1988 (as cited in Koksai, 2013) with slight modification by Okandeji-Barry, O.R.A. for the purpose of this session.

### **Population and Sample of the Research Study**

The study population consists of all 493 Delta State public secondary school students. The state is largely an oil/agricultural producing state located in the south region of Nigeria, covering an area of 16,842 square kilometres (Delta State Government, 2021). The state has several public (493), private (338) and mission (31) secondary schools; however, this study covers only public secondary schools, also known as government-owned schools, across the three geopolitical zones of Delta State. These schools are governed by the Ministry of Basic

and Secondary Education, whose main duty is to develop/regulate educational-related policies and programmes for the state (Ministry of Basic Secondary Education, 2019). Senior secondary school classes one to two (SSS 1 - 2) students of older age and those in the lower basic level of learning (JSS 1 to 2) of younger age who spend more time studying in the public schools and are willing to take part in the research make up the populace of the study. Students from senior secondary school class three (SSS 3) were excluded because these students have limited time to study in the school due to their preparation for the external examination, leading to divided attention and possible loss of follow-up because of the limited time left before their graduation. The design of the study is targeted at students who would spend at least one to two years in the schools so that they can impact the immediate academic community with likely stability in attendance to ensure successful follow-up. The school teachers, administrators (Principals and their Vice), and teaching staff were excluded as participants since the scope of the study only covers students. Students whose parent/guardian declined consent for their children to partake in the study after informing them of the purpose and type of intervention, including a brief description of the course content, were also excluded.

Picking a sample size for an experimental design is crucial to the research process. This is because if a representative sample is not used, the study's findings may not be all-encompassing or statistically significant to assumptions and inferences made. More so, regardless of the efficacy of the result, the sample size still remains a crucial factor as to whether a clinical trial/intervention study will be approved or rejected (Gupta et al., 2016). The p-value, power, effect size & variability might be basic, but they are critical for ensuring an optimal sample size for the given study experimental study. Controlling the effect of a dropout rate, which poses a severe threat to the credibility and validity of results from experimental studies, is crucial in avoiding the loss of power or an estimate that is not precise (Gupta et al., 2016; Bell et al., 2013). Since the study is interventional (training involved) with a true

experimental design, the sample size was determined using several published acceptable techniques. It was calculated using the sample size calculator for a dichotomous endpoint: Where Alpha=0.05; Power=90%; Enrolment ratio=1; Anticipated incidence for groups 1 & 2=76% & 40%. The rates reveal the knowledge level of the control and experiment group after first aid intervention among secondary school students in Asaba, Nigeria (Okandeji-Barry et al., 2019). A calculated outcome of 37 for each of the four groups ( $37 * 4 = 148$ ) was retrieved. However, after adjusting for possible dropout rate using a previous study indicating 25% (Okandeji-Barry et al., 2019), the formula as presented by Gupta et al. (2016) and Sakpal (2010) was applied, taking a clue from their superiority sample size calculation for randomised and control group. The formula  $N1 = n/(1-d)$ , where  $d$  is the dropout rate (25%), and  $n$  is the calculated sample size (37 or 148). After the adjustment, the sample of 49.3 calculated figures was rounded to and allocated to the four groups ( $50 * 4 = 200$ ), giving an overall sample of two hundred participants. Please see the calculation below for clarity.

*Table 3.2 Sample Size Calculation*

$N_1 = \{ z_{1-\alpha/2} \sqrt{p^- \cdot q^-} * (1 + 1/k) + z_{1-\beta} \sqrt{p_1 \cdot q_1 + (p_2 \cdot q_2/k)} \}^2 / \Delta^2$							
$q_1 = 1 - p_1$							
$q_2 = 1 - p_2$							
$p^- = p_1 + kp_2 / 1 + K$							
$q^- = 1 - p^-$							
$N_1 = \{ 1.96 * \sqrt{0.58 * 0.42 * (1 + 1/1)} + 1.28 * \sqrt{0.76 * 0.24 + (0.4 * 0.6/1)} \}^2 / 0.36^2$							
$N_1 = 37$							
$N_2 = K * N_1 = 37$							
$\Delta$	$=$	$ p_2 - p_1 $	$=$	proportion absolute group-1	(incidence) difference	of between sample	groups-1 & 2 proportions size
$n_1$	$=$						
$n_2$	$=$ group-2 sample size						
$\alpha$	$=$	likelihood	of	type-I	error	(usually	0.05)
$\beta$	$=$	likelihood	of	type-II	error	(usually	0.2)
$z$	$=$	the value	for	critical	Z	of a given	$\alpha$ or $\beta$
$K$ = sample size ratio for group-2 to group-1							
Furthermore, to adjust for the dropout rate, $N1 = n/(1-d)$ (Gupta et al., 2016)							
where ...							
D=25% (0.25), the anticipated dropout, which was guided by a previous study (Okandeji-Barry et al., 2019)							

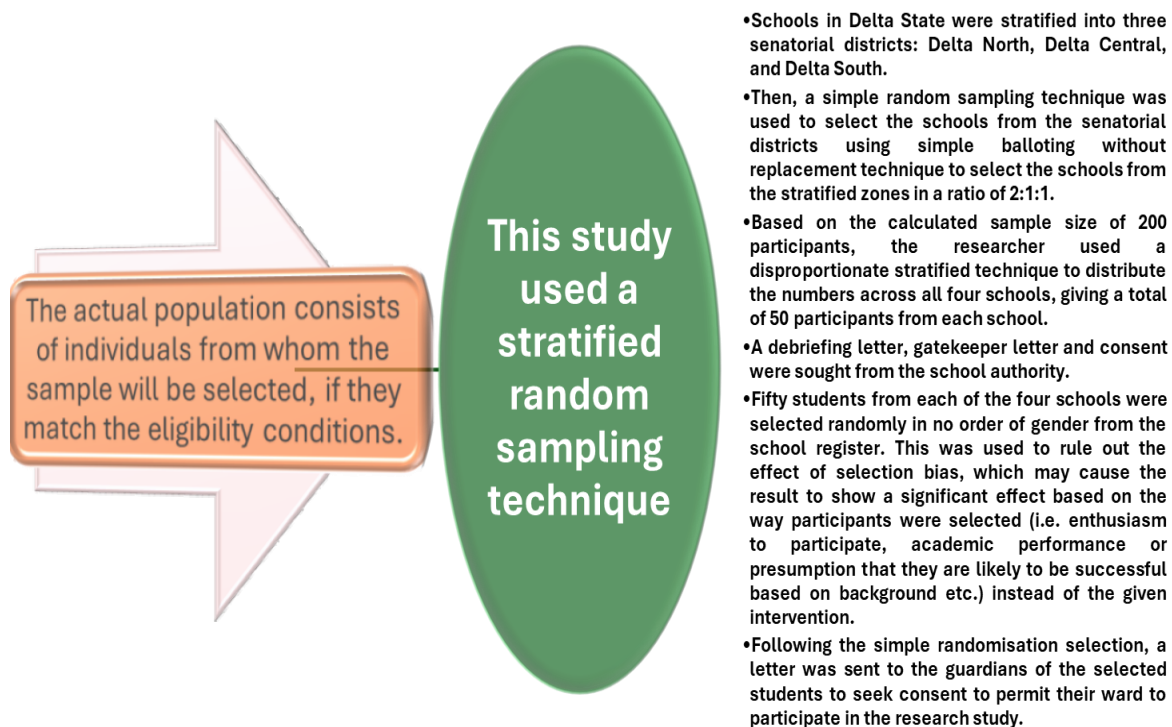
$N=37$  sample size obtained from the above calculation  
 $N1 = 37/(1-0.25)$   
 $N1 = 37/(0.75)$   
 $N1 = 49.3$ ; this was rounded to the next whole number, 50  
 Therefore, 50 participants were drawn from each of the four groups ( $50 \times 4 = 200$ )

Four schools were selected following the stratified random sampling technique (see Figure 3.1 for an overview of the selection steps). These schools were randomly selected from the state senatorial district in a 2: 1: 1 ratio. Their population and sample are presented in Table 3.3 below. The disproportionate sampling technique following the enrolment ratio used for calculating the sample size, which was one, suggests that an equal enrolment is distributed across all groups, as observed in the last column.

*Table 3.3 Population and Sample for the Study*

Delta Senatorial Districts	State Local Government Areas	Name of Secondary School	Population of School	Sample of population
<b>Delta North</b>	Ukwuani	Amai Grammar School, Amai	1000	50
		Obiaruku Grammar School, Obiaruku	1900	50
<b>Delta Central</b>	Ethiope East	Abraka Grammar School, Abraka	2000	50
<b>Delta South</b>	Burutu	Gbesa Grammar School, Ojobo	446	50
<b>Total</b>			<b>5,346</b>	<b>200</b>

**Figure 3.1** “Application of the stratified random sampling technique”



As observed in Figure 3.1, stratified random sampling was used for this study. Schools in Delta State were stratified into three senatorial districts named Delta North, Delta Central, and Delta South. Then, a simple random sampling technique was utilised to select the schools from the state's three senatorial districts (stratification) using simple balloting without replacement technique to select the schools from the stratified zones in a ratio of 2:1:1. The four schools that were selected are Obiaruku Grammar School, Amia Secondary School, Abraka Grammar School and Gbesa Grammar School (See table 3.3). Based on the calculated sample size, the study sample comprises two hundred (200) participants, and these were disproportionately selected from the four schools (50 for each school). Note that the students from each school were selected in no order of gender. These students were chosen randomly

from the school register using the 'UNIQUE RANDARRAY' formula in Microsoft Office 365 Excel (=UNIQUE(RANDARRAY(rows,,min,max,integer)) i.e. =UNIQUE(RANDARRAY(50, 1,1000,TRUE)) after approval had been obtained from the school principals. This was used to rule out the effect of selection bias, which may cause the result to show a significant effect based on the way participants were selected (i.e. enthusiasm to participate, academic performance or presumption that they are likely to be successful based on background etc.) instead of the given intervention. Following the simple randomisation selection, a letter was sent to the guardians of the selected students to seek consent to permit their ward to participate in the research study.

### **Materials/Instrumentation of Research Tools**

Quantitatively, the present study involves a large population of students who were asked specific questions on first aid knowledge and basic emergency management skills, and the results were analysed using statistical tools objectively without bias, as opined by Tashakkori and Teddlie (2008). The data is measurable and involves a performance test using a closed or open-ended questionnaire. The quantitative data part was retrieved from the experimental method using A pre-test and post-test control group design, which is a research method that involves measuring a set of participants before and after an intervention while also including a control group for comparison. At the same time, the quantitative observation data were collected during training and one month after for the post-intervention learning-retention test. Triangulating by using both the questionnaire and the observation checklist helps in order to enhance the confidence level in the observed findings, thus increasing the precision of the observed measurements. Triangulation is a crucial and recommended approach that should be extensively utilised in the context of monitoring and evaluation. The process of corroborating

findings in one study with data from various sources, methodologies, investigators, and hypotheses is a highly beneficial approach. Indeed, the capacity to juxtapose and differentiate various research outcomes. Examining several viewpoints and interpretations of a given scenario in FA or occurrence can prove to be a highly useful approach in identifying discrepancies within data and uncovering potential avenues for additional research. Furthermore, the utilisation of triangulation, specifically through the integration of data and techniques, can enhance the robustness and trustworthiness of a research finding. This, in turn, facilitates the process of elucidating and substantiating the findings. Additionally, it has the capacity to offer a more comprehensive and holistic viewpoint on a certain scenario, hence facilitating the emergence of novel ideas pertaining to this scenario (Bans-Akutey & Tiimub, 2021) where both questionnaires and observation checklist are used to gain a holistic view on FA knowledge and management of selected emergencies common in the secondary school environment in south region Nigeria.

It is important to highlight that the observation instrument is useful for both education researchers and practitioners. Accordingly, it allows for identifying students' creative potential, recognising their classroom actions, and realising critical scenarios and learning opportunities resulting from delivering training as opined by Tao et al. (2023). Observations can be classified as either overt or covert. Overt observations are those where the individuals being observed are aware that observation is taking place. In contrast, covert observations involve the observer's presence being concealed, which means that the individuals are unaware they are being observed (Centre for Disease Control, 2018). One advantage of covert surveillance is that individuals are more likely to exhibit their natural behaviour when they are unaware of being observed. However, the current study has adopted overt observation as studies on observation data collection methods for programme evaluation reveal that it is generally necessary to carry

out overt observations due to ethical concerns associated with concealing the act of observing (CDC, 2018).

The observed first-aid behaviour is systematically categorised using distinctive and relevant coding to describe related characteristics while measuring the application of first-aid using a prescribed scale for easy and accessible data collection, recording and statistical analysis. This can also be referred to as a controlled observation, which has the advantage of being easily replicated by other researchers; thus, the reliability of this type of observation is easy to ascertain. Besides, the data from this type of observation are more straightforward to collect, quantify and analyse since there is a clear and systematic categorisation process in place, leading to a more representative sample with high generalisation expectations. Despite the advantages of these methods of observation, it is relevant to note that the validity of a controlled observation is low (Mcleod, 2023) because of the Hawthorne effect, which implies that participants tend to behave or respond differently and, in most cases, better to situations when they are aware that they are being watched by an observer (Centre for Disease and Control, 2018; Mcleod, 2023). However, since the current observation approach uses standardised instruction, the internal validity is said to have been improved by counterbalancing and removing unnecessary characteristics that may result in observers' demand or investigators' effect. Moreover, because the study is an experimental design and participants are selected following random sampling techniques, the external validity is said to be improved, as supported by Mcleod (2023), Heale and Twycross (2015), Surucu, and Maslakci (2020).

This means that the quantitative data expands and further explains and promotes the credibility of the questionnaire instrument by observing the practical effect of the training based on a comparison of the results collected from written pre-and post-tests. The choice of triangulation approach for the study is informed based on the type of instrument used for data

collection (both closed and open-ended questionnaires), the specific data that needs to be gathered, the convergence of ideas and the experimental design. The training intervention is meant to improve participants' knowledge and management skills, and this improvement can be applied in society during a health crisis. It is believed that a study of this nature allows the researcher to use the standard questionnaire and observation instrument to conclude/validate the reality of knowledge of students through training (experiment).

Two instruments were constructed and/or adapted for the purpose of data collection.

1. Open and close-ended first aid test questionnaire
2. Observation Instrument for First Aid Management

The questionnaire on knowledge of first aid was adapted from different reports (First Aid for Life, 2021; Florida Department for School Health Program, 2016) and literature, assessing the construct and content against credible manuals and documents in the field of emergency medical care, specifically for essential first aid delivery (American Red Cross, 2016; St Johns Ambulance, 2023). St. John Ambulance is a philanthropic organisation that relies on the efforts of volunteers and is committed to instructing first aid techniques. St John Ambulance, a charity organisation, has been delivering first aid services and first aid training for over 140 years and has been part of the major emergency services in the United Kingdom. The organisation actively advocates for the National Health Service (NHS), offering medical assistance at public gatherings and implementing captivating youth initiatives across England. As part of the proactiveness towards the support of first aid activities in England, the charity organisation has developed resources in response to legislative requirements for teaching first aid in schools, which form part of the curriculum starting in 2020. The resources developed by St Johns Ambulance cover basic first aid techniques for common ailments. Primary school students will learn how to call for help in case of an emergency and how to manage incidents

involving head injuries. Secondary school students will be taught advanced first aid skills (i.e., choking, burns, seizure, wounds, diabetes, shocking, etc.), including cardiopulmonary resuscitation (CPR) techniques and how to use defibrillators (St Johns Ambulance, 2023). The organisational personnel, which are medical personnel, paramedics, and education providers, have developed useful resources and guidance to establish and enhance the delivery of first aid training in schools. To ensure that the resources are contextualised and fit for purpose, defibrillators were extracted from the delivery since the equipment is unavailable for use in most areas of the study location. Automated External Defibrillators (AEDs) are devices used to revive individuals who have collapsed and are unresponsive. It is essential that educational institutions have access to such equipment that can be easily accessed, but unfortunately, there is no documented evidence of educational institutions in Nigeria possessing such sophisticated devices. Therefore, in the absence of an AED, it is recommended that cardiopulmonary resuscitation (CPR) protocols be initiated immediately (Florida Health, 2016). Following the principles of simplicity as informed by the principles of providing first aid education (IFRC, 2020), the investigator has excluded excessive information that learners may unlikely encounter or use in their provision of first aid; one of such is the excluding of the assessment of AED knowledge and management skills among the participants.

Like St John Ambulance, First Aid for Life is a renowned organization comprising first aid specialists. They provide valuable guidance and exceptional first aid training to both individuals and groups. Their approach is customised to cater to the specific requirements of the participants. At First Aid for Life, the primary focus is delivering high-quality first aid training and providing people with the required skills and confidence to effectively manage emergencies. Trainers have extensive expertise in medicine and emergency services, enabling them to deliver instruction in a comforting and captivating manner, following both national and international delivery regulations. Additionally, the organisation adapts course content to

align with specific requirements and population groups, and they provide outstanding free resources available to first aid trainers all over the world. Among other awards gained, First Aid for Life won the Global Excellence award as the most outstanding first aid training provider in 2022 (First Aid for Life, 2023). The founder has core medical experience and has been featured in several bestselling peer-reviewed books and scientific journal publications on first aid and clinical practice (Hammett, 2016, 2022).

Similarly, Florida Health is a brand name for the Florida Department of Health. The Florida Department of Health (DOH) was established in 1996, as mandated by the Florida Legislature. However, public health in Florida dates back to 1888, when the Florida State Board of Health was founded. In 2007, the State Surgeon General was appointed, which was a significant milestone for the Department of Health. The Surgeon General is responsible for supervising all aspects of public health and promoting health and disease prevention in the state. With collaboration from paediatric experts and emergency educators, the emergency guide for schools has been developed to support the delivery and assessment of first aid in schools. This manual is a comprehensive and user-friendly guide for managing medical emergencies in paediatric first aid victims. It contains guidelines derived from previous manuals and serves as a crucial tool for first responders to provide optimal care during medical crises. The manual provides primary measures that should be executed to achieve the best results (Florida Health, 2023; Florida Department for School Health Program, 2016).

The researcher extensively evaluated the core resources and a critical evaluation against the guide and principles provided by IFRC (2020) and other core sources from the literature search to assess the reliability and credibility of information to fit the current state of FA education and management skills in schools. The extensive guide provided by IFRC (2020) provides useful information to guide the delivery and assessment of First aid training. When

designing first aid education programmes, it is important to keep in mind certain principles that align with the needs of the learners. These principles include:

- Understanding the learners: It is essential to evaluate the learner group thoroughly, taking into account their age, gender, responsibilities, and requirements. This help establish a connection between the learners and the topic at hand.

- Adapting the methodology: Modify the methodology to suit the learners' needs and ensure that it is grounded in familiar circumstances. Appropriate measures for safeguarding should also be put in place.

- Diversification: Use diverse activities to actively engage the learners, foster their abilities, and help them build their understanding

- Simplicity: Limit the content to what is important and ensure the learning communication is straightforward. Avoid overwhelming the learners with excessive information, topics, or approaches that they are unlikely to encounter or are unable to use.

- Facilitating Discovery: Allow sufficient time for the students to participate and be fully involved by engaging in independent exploration and introspection, enabling them to cultivate their disposition and self-assurance in providing assistance.

- Clarity: Use language that is comprehensible to the learners and fosters a sense of self-assurance. Avoid using scientific terminology or excessively intricate hypotheses.

- Outcome-oriented: Determine the desired learning objectives, such as knowledge acquisition and confidence enhancement, and assess the extent of their transformation from the beginning to the conclusion of the educational intervention.

Through a detailed literature review using appropriate frameworks such as the PICO, the researcher has drawn on key characteristics of the study population to extract relevant resources that are suitable for learners' age, responsibility and requirements. Moreover, different methods were assessed, and the four-stage Solomon approach was found to be fit for

purpose, mitigating against several biases and threats that could potentially affect the outcomes. Diverse training activities and methods of teaching, learning and assessment were explored following relevant educational, health promotion and instructional model like the ALDIE model, 'precede proceed model' and the multisensory approach to learning, with the aim of facilitating discovery, clarity and potential outcomes of the intervention through the extraction and consideration of non-complex and non-voluminous questions. Hence, the questionnaire that assesses knowledge and skills comprises 28 questions, divided into different topics to promote simplicity and provide sufficient time for the learners to comprehend and respond to aid the completeness of the assessment. These topics cover fundamental principles related to emergency situations (4 questions), techniques for administering first aid when someone is choking (3 questions), managing bleeding and wounds (4 questions), techniques like CPR (4 questions), handling seizures and burns (3 questions), addressing asthma and shock (3 questions), managing diabetes (2 questions), and providing care for a broken tooth (5 questions).

The researcher evaluated the participants' understanding of first aid, and a pre-test was administered. The test consisted of 28 knowledge and skill questions and was prepared by the researcher, following the critical review and adaptation from credible FA manuals and resources. Two school administrators confirmed the validity of the questions as fit for purpose and satisfied the contextual needs of FA skills in the study location. The investigation aimed to evaluate the participants' comprehension and proficiency in basic first-aid methodologies. A dichotomous key of yes and no was used for the responses of the participants drawn from two questions (2 open-ended questions) in the questionnaire, in addition to 26 questions (closed-ended) with options ranging from a to c whilst they were assigned a unique identification number. This is preceded by a socio-demographic section where participants are asked to indicate their gender, age, class of study and prior knowledge of first aid: five social

demographic questions (of which two were open-ended, i.e. age and previous knowledge of first-aid). The knowledge and skills aspect of the questionnaire was made of a total of 28 questions distributed among basic principles for emergency (4), first aid for choke (3), bleeding and wound (4), management techniques like CPR (4), seizure and burns (3), asthma/shock (3), diabetes (2) and care for broken tooth (5). Correct responses were assigned a value of 1, and the cumulative was calculated for each student. The mean values were converted to percentages to ascertain the knowledge level. A 50% benchmark was used to ascertain the level of knowledge dichotomised into adequate ( $\geq 50\%$ ) or not (inadequate,  $< 50\%$ ), or also assumed to be knowledgeable or non-knowledgeable, respectively.

For each area of knowledge, the correct responses were summed up separately. The means and standard deviations were employed to estimate the students' response to first aid training. The mean scores were converted to percentages to ascertain the total rate of performance. In accordance, Wafik and Tork (2014) reported in their study that the students' knowledge and understanding were said to be satisfactory if they scored 60% and above and unsatisfactory if they were below the percentage mentioned earlier. In support, research was conducted in Uganda to evaluate the knowledge, attitude, and practice of first-aid among taxi drivers. The study measured the knowledge score by assigning one point for each correct answer to knowledge-based questions. The maximum score was 20 points, which was later converted into percentages. The knowledge was then classified into two categories: excellent knowledge, meaning knowledge equal to or greater than 50%, and poor knowledge, meaning knowledge less than 50% (Ssewante et al., 2022).

The present study used observation as an additional tool to triangulate and validate questionnaire findings. This instrument was used to assess the participants' performance based on the appropriateness of the use of FA technique, time management and responsiveness in making the necessary contact with health professionals. Four instructions to the observer were

clearly stated in the first section: observer, location of assessment, date, and the class of the training participant. The observation was adapted from Australian AID (2012). The assessment is graded into five points: one (1) as low, three (3) as medium and five (5) as high. Participants were allotted one to five marks based on their observer's quantification of their competence in managing health emergencies. For each first aid application, three factors (ability to assess the circumstances, application of first aid, and communication of details of the incident) were used to judge each FA technique demonstrated after the training.

In quantitative research, the results are not the only basis for judging the quality of the study; the type of instrument, its validity and reliability are also crucial to conducting experimental research (Heale & Twycross, 2015). Face and content validity was ensured for the instrument for data collection. In order to ensure that relevant items were included in the instrument, extensive literature was done before it was adapted. The credibility of the source following the CRAAP provides confidence in adapting the observational checklist. The term "Australian Aid" is used to describe the initiatives that the Australian Government supports to help developing nations. Since 2014, the Department of Foreign Affairs and Trade (DFAT) has been responsible for Australia's official development assistance, also known as foreign aid, which is provided to developing nations. There is a global desire for a world that is safe, stable, and prosperous, and Australia Aid is actively working with other countries to achieve this goal. Reaching out to support billions of people in the world living in extreme poverty, with little or no access to clean water, while millions of children are not receiving an education and have poor access to emergency services. Australia is committed to providing support to those living in persistent poverty. The main objective of Australia's aid programme is to help people overcome poverty, focusing on places where they can have the greatest impact. Most importantly, the Australia Aid have expertise in a variety of areas, including health, education, gender equality, law enforcement, infrastructure, rural development, and the environment. All

activities initiated and implemented by Australia Aid use global best practices to guide their efforts in addressing important global issues, including emergency care and first aid education (Australia Aid, 2015). On the basis of this brief, the researcher can confidently say the choice for adapting the observational checklist is non bias and has been developed following best practices with the intention of supporting educators and promoting effective first aid delivery globally.

Moreso, the validation of the observation checklist was enhanced by comparing the key expectations and appropriate age competency of first aid skills against other credible manuals and resources (IFRSC, 2020; De Buck et al., 2020; First Aid for Life, 2021; Florida Department for School Health Program, 2016; American Red Cross, 2016; St Johns Ambulance, 2023). All resources suggest that the evaluation criteria for each first aid approach should include situation evaluation, the ability to provide appropriate measures, and the communication of key information about the emergency situation. In addition, communication with the victim to provide assurance, avoid misunderstanding of intention and promote comfort has been found to be effective in reducing victim suffering through distraction and caring techniques. According to the Australia Wide First Aid, (2021). Distraction techniques have been found to be effective in reducing the pain and discomfort experienced by pediatric patients during medical procedures. Duff et al. (2011, cited in Australia Wide First Aid, 2021) identified two primary principles:

1. Engaging in age-appropriate activities can successfully divert attention from potentially distressing procedures.

2. The presence of cognitive needs is associated with a higher probability of reducing distress levels, highlighting the importance of considering individual needs when selecting distraction techniques. Overall, this body of evidence supports the manipulation of distraction techniques to reduce pain and discomfort during medical procedures for pediatric patients. It

is suggested that being distracted can potentially lessen the experience of cognitive pain by affecting pain responses and triggering an internal pain-suppressing mechanism. As a result, this occurrence leads to a decrease in the neural activity of certain brain regions, such as the thalamus and insula, which are important in processing pain signals (Bushnell et al., 2013). In a survey conducted by Ibitoye et al. (2019) among Nigeria nurses to ascertain the use of distraction techniques as a way of relieving pain, the outcome reveals that almost all the participants (98.8%) were aware of the concept of distraction being used in pain management. A significant number of participants (97.5%) reported using distraction to manage their pain. In addition, the majority (61.3%) believed that distraction can be an effective pain management technique without resorting to the use of medication. For the purpose of first aid for adolescents, age-appropriate distraction techniques may include discussion on topics that interest the victim - comedy, and also the students who are providing the first aid may share their thoughts on breathing and relaxation practices and encourage the victim to apply that. Other distraction techniques may include the use of music and games, if available, and perhaps some tips on using cue cards and conversation openers.

The questionnaire was submitted to the dissertation supervisor for scrutiny of items to guarantee the face validity of the instrument and for constructive criticism. The researcher also assessed the validity of the instrument's content. Both the item and sampling validity were considered to measure the content validity of an instrument. Item validity seeks to ensure the content area they are intended to measure. Meanwhile, sampling validity is concerned with how well the test samples represent the total content area, adding that expert judgment is used to determine content. Especially since the researchers cannot measure all aspects and elements of a phenomenon due to some limitations inherent in nature. Therefore, sampling validity was used as a deliberate sampling strategy to select significant items and elements based on the

study's specific objectives and purposes, which is to investigate the effect of first aid training. For expert judgment, after the researcher had constructed the instrument from the existing manuals and resources, it was given to experts in Public Health research, educators and first aid trainers to test and measure the selected items for thorough scrutiny and cross-checking of the instrument to ensure that the questionnaire item's content and face validity are perfected. All relevant suggestions/corrections were made in the preparation of a final copy of the questionnaire.

The content of the instrument for collecting the data was developed in accordance with the 2016 emergency guideline for schools (Florida Department of Health School Health Programme, 2016; First aid for Life, 2021; Neto et al., 2016 a, b) on the face and content validation of first aid educational booklets for school personnel. The researcher used the training manuals for the IFRCS (2020), Australian AID (2012), St John Ambulance (2021) and the Nigerian Red Cross Society, Delta State Chapter, to cross-validate the content of the instrument. The 'face and content validity' of the manual was done partly by the Nigerian Red Cross Society, Delta State Chapter, Asaba, promoting contextualization. Further and more extensive validation against the item De Buck et al. (2020) selected and proposed in their studies confirms the adequacy and appropriateness of the items considered for the training and their relevance to sub-Sahara regions. Reliability was determined for this study through the dependability of the results which was achieved through triangulation of the questionnaire and the scores retrieved from the observation during and after the training intervention. A detailed and elaborate account of the research methodology, including analyses and the derivation of themes for this study, has been explicitly stated to promote replication and increase reliability, satisfying the other techniques for the dependability of the results. Zohrabi (2013) highlighted the three techniques as crucial areas of consideration (Triangulation, the Position of the investigator and the Audit trial) to ensure dependability, an aspect of reliability. The researcher

ensured that the adapted or adopted instrument was consistent in its internal items by applying reliability to measure the soundness and accuracy of the instrument for this study. The investigator used the Cronbach Alpha method on the 'IBM Statistics Package for Social Sciences (SPSS) Version' 21 software to determine the instrument's reliability from the small-scale pilot test data. This confirms that the respondents or participants are able to understand the terminologies and can be completed within a specified time frame. The instruments were administered to 30 students from Ekakprame Grammar School, Delta State. This choice was made because the sample institution was outside the study sample area but shared similar characteristics with the sample population. The test was administered once, and data were collected and analysed. Only respondents who consented/ voluntarily answered questions and filled in items completely were used for the reliability test. A reliability coefficient of 0.94 was established; thus, the questionnaire instrument was found reliable. Fulekar (2009) asserted that an instrument is said to be reliable when the reliability coefficient can be approximated to one (1) or close to one, while Shuttleworth (2015) opined that from a 0.70 coefficient and above, the internal contents of the instrument is termed to be consistent and useful for research. The index showed evidence of the consistency of items and was considered adequate for adoption and administration for the study.

The questionnaire served as a tool for gathering data since it offers a relatively convenient, quick, cheap and effective means of collecting data from a small and large group of persons. They can be used to measure respondents' attitudes, behaviour, or knowledge of a subject matter (McLeod, 2018). Responses from questionnaires can be easily interpreted, standardised, validated, and converted to quantitative data for statistical analysis. However, there is the limitation of respondents not providing correct or genuine responses due to social concerns, time constraints, busy schedules and nonchalant behaviour. Some respondents would want to present a positive image whilst responding to the questionnaire. Usually, these cases

assessed within the current study do not present the opportunity for such manipulation; hence, specialised training before administering the instrument, in this case, the questionnaire, was not required. However, training and discussion sessions were organized among the research assistants to ensure parity and standardisation of the approach. This study is experimental, and the questionnaire is made of a series of practical items on knowledge and management of first aid. Responding to the questionnaire was based on prior exposure/practice and the training intervention afterwards. Moreover, adequate time is allocated for this purpose. So, the perceived social desirability limitations of the pre-test will be handled during the training and detected from the post-test. Since respondents are to be trained and mentored, the possibility of this limitation is drastically reduced. The knowledge and management-related questionnaire is closed-ended and not open-ended except for the social demographic characteristic-related questions such as age and previous first aid training organisers, allowing participants to provide the specific name where this has not been identified in the options given. Thus, the knowledge question does not provide room for respondents (i.e., participants) to manipulate their desires. The Solomon four-stage design also eliminates this limitation as the social desirability of responding to the questionnaire will be checked using the control.

The questionnaire has been used even recently to collect data for first aid training programmes. Kaya et al. (2020) adopted 31 questions, including ten socio-demographic questions (questionnaire) for second-grade students of Cyprus-based tertiary institutions. Arli & Yildirim (2017) also used a questionnaire in their quasi-experimental study to collect data on first aid training intervention for private school teachers in Turkey. In measuring students' knowledge level on first aid management of skin injuries (burns, bleeding, wounds, and bruises) in Egypt, Ghany et al. (2014) used a self-administered questionnaire. This means that questionnaires have been used in different regions to collect data on first aid training. This further validates the appropriateness of the use of questionnaires for data collection.

### **Development of the training resources:**

The development of the training resources was built from existing first aid resources following the key objectives and items included in the instruments for data collections. The choice of instructional materials can greatly affect the level of engagement of learners during training sessions, as well as their ability to retain the information presented. The researcher identified and extracted the essential learning materials required for the training programme by exploring various training methods and approaches and evaluating existing educational resources.

A study conducted by Boardman in 2019 surveyed teachers from both primary and secondary schools. The study found that incorporating a multimodal approach to instruction significantly benefits the whole teaching process and individual students. Research has also shown that an effective instructional method, which incorporates multiple senses, improves the recall of information during subsequent encounters. This is true regardless of whether the stimulus is presented in a multisensory or unisensory manner. Multisensory approaches leverage the importance of kinesthetic movements and the impact of sensory stimuli on the learning process. Using several sensory modalities to construct cognitive representations of objects, ideas, or phenomena can enhance students' engagement levels, and long-term memory consolidation can be facilitated (Ferreira & Vasconcelos, 2020). Looking at the models and the need identified in the enabling factors, which is a fundamental FA skill with the aim to change behaviour, the researcher recognizes the gaps in FA experience, hence the need to improve the training using a multisensory approach.

Effective teaching strategies involve using personalized, collaborative, and challenging teaching methods that encourage active, practical, authentic, and democratic learning experiences. Various factors, such as the course design, teacher suitability, and technology stability, can influence the degree of student involvement. When planning education, it is

critical to consider the learners' sociocultural context, their motivation, and the curriculum's expectations (Trust & Pektas, 2018; Turker, 2016). After consideration of this, several items were removed or modified from the training resources. These include the removal of the use of AED, the emphasis on a participant to call an adult/ school administrator instead of the emergency service for the following reasons: availability of digital poverty in secondary schools in Nigeria where most students at that stage, either do not have a phone or have no permission to use one in school; the emergency service in Nigeria is at the state of need where there are not enough personnel to either respond to calls or provide any mobile medical services due to lack of resources, hence the chances of responding or sending any services to the school is low. In this context, the participant is expected to inform an adult who is responsible for caring in school. If there is a need for transportation, the school administrators will arrange it. Also, as part of contextualization, the emergency contact details were replaced with that of Nigeria, which is 112 in all resources.

The topics selected were used to form the learning outcomes for the training. Relevant audio visuals were included in the slides, and colourful and interactive shapes were used to capture key information about the training; smart art, animations and application of relevant transition effects were considered during the development of the slides. Short and interesting films were used to show the application of the core FA procedures before each practical session, where the participants had to do hands-on practice in groups or as individual volunteers. Most importantly, some of these films are specific to the situation experienced in the African/Nigerian context. The formative tasks used to assess ongoing progress ensured that the different senses were engaged during the formative assessment by using interactive knowledge check slides, visual worksheets, hands-on demonstration and written tasks. The instrument used for the assessment also follows a multisensory assessment procedure by including relevant pictures in the questionnaire to aid understanding of the scenario that needed FA response.

Also, the observational checklist involves the participant demonstrating and applying FA to a selected case scenario. Using all these approaches to teaching, learning and assessment enables better attention span and creates interest in the participants. When children participate in multisensory learning, they have an increased likelihood of maintaining focus and engagement for extended periods compared to situations when multisensory learning is not employed. The study by Barutshu et al. (2019) is a pioneering contribution by demonstrating a substantial correlation between multimodal processing and attention capacities in youngsters. The nature of this link is contingent not only upon the sensory bias inherent in the multisensory activity but also upon the specific type of attention being employed. Hence, the current study has considered the multisensory approach's success in developing the course content for the training.

In day one of the training, five learning outcomes were covered and four learning outcomes for day 2 of the training and day 3 of the training provide a recap and summary of all skills learnt in day 1 and 2. A brief summary of the content and components of the training has been provided in tables 3.4, 3.5, and 3.6 below.

*Table 3.4 Learning Content and Summary of Resources for Day-1 of the FA training*

<b>Training Days-1</b>
<p><b>Session learning outcome</b></p> <p>By the end of the session, learners should be able to;</p> <ol style="list-style-type: none"> <li>1. Provide the basic principles for emergency care.</li> <li>2. Identify various health issues requiring first aid care in schools and their community.</li> <li>3. Provide first aid for choke.</li> <li>4. Explain how to provide First aid for bleeding and wounds.</li> <li>5. Demonstrate the basic procedure for providing Cardiopulmonary resuscitation (CPR)</li> </ol> <p><b>Summary of content:</b></p> <p>The training content for day-1 aims to help understand the basic concepts of emergency care. It is regarding identifying different health issues that require prompt initial medical assistance in educational institutions and surrounding communities.</p> <p>This training content provides an academic description of first aid techniques for choking incidents. When encountering a choking situation, it is crucial to act quickly and provide appropriate first aid measures to ensure the safety and well-being of the affected individual. Choking occurs when an object blocks the airway, preventing the person from breathing normally.</p> <p>The instructional guide also explains the principles and techniques used to provide initial medical assistance for managing bleeding and wounds.</p> <p>It is important to learn the fundamental protocol for administering Cardiopulmonary Resuscitation (CPR) as it can help save someone's life in an emergency situation.</p> <p><b>Teaching methods:</b></p> <p>Discussions, Teaching, Role play Demonstration, Case study, intermittent use of short films describing the application of several core skills, peer to peer discussion and individual reflection, interactive knowledge check slides.</p> <p><b>Resources and assessment types</b></p> <p>Handout, demonstration using mannequin, fully stocked FA box, Worksheets, Practice mat, Projector, Projector stand, Pointers, Pens &amp; Note pads, A standby Generator to power the projector</p>

*Table 3.5 Learning Content and Summary of Resources for Day-2 of the FA Training*

<p><b>Training Day-2</b></p> <p><b>Session learning outcome</b>  By the end of the session, learners should be able to;  Recap the key learning of day-1 training</p> <ol style="list-style-type: none"> <li>1. Demonstrate the basic FA for seizure and burns</li> <li>2. Describe the basic FA for Asthma and Shock</li> <li>3. Explain the basic FA for diabetes</li> <li>4. Describe the basic FA for Avulsed tooth and cracked tooth</li> </ol> <p><b>Summary of content:</b>  Upon completion of the programme, participants will be able to review and summarize the fundamental concepts and knowledge they have acquired during the first day of training. The day one training which covers the meaning of first aid, aims of emergency care, the responsibility of a first aider, initial assessment, also known as primary survey, key safety procedures in providing first aid, communication procedure, priority of first aid, choking identification and response, recovery procedure, CPR procedure, injury and wound will be reflected on through recaps and questioning technique and summary films.</p> <p>Day 2 covered a comprehensive understanding of the fundamental first aid techniques applicable to seizures and burns, identification and FA response to asthma and shock, the different type of diabetes and the fundamental first aid measures for avulsed teeth and cracked teeth.</p> <p><b>Teaching methods:</b>  Reflection, Discussions, Teaching, Role play, Demonstration, Case study, Group activities, audiovisuals-use of short films and interactive knowledge checks within PowerPoint slides, colorful poster prints to reiterate taught skills.</p> <p><b>Resources and assessment types</b>  Handout, demonstration using mannequin, fully stocked FA box, Worksheets, Practice mat, Projector, Projector stand, Pointers, Pens &amp; Note pads, A standby Generator to power the projector</p> <p><b>Allotted time:</b> 1 hour to 1: 30 minutes</p>
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*Table 3.6 Learning Content and Summary of Resources for Day-3 of the FA Training*

<p><b>Training Day-3</b></p> <p><b>Session learning outcome</b>  By the end of the session, learners should be able to Recap the key learning of day-1 &amp; 2 training and be able to demonstrate some of the following FA.</p> <ol style="list-style-type: none"> <li>1. Provide first aid for choke</li> <li>2. Demonstrate how to provide First aid for bleeding and wounds</li> <li>3. Demonstrate the basic procedure for providing Cardiopulmonary resuscitation (CPR)</li> <li>4. Demonstrate the basic FA for seizure and burns</li> <li>5. Describe the basic FA for Asthma and Shock</li> <li>6. Explain the basic FA for diabetes</li> <li>7. Describe the basic FA for Avulsed tooth and cracked tooth</li> </ol> <p><b>Summary of content:</b>  Day 3 provides an overall summary of the key aspect covered for the training programme, participants will be able to comprehensively assess and summarize the core principles and information they have learned during the first day of instruction. The programme covers first aid, emergency care objectives, first aider duties, the primary survey, essential safety protocols, communication protocols, first aid prioritisation, choking incidents identification and response, aiding recovery process, CPR procedures, and injury and wound management.</p> <p>The training course thoroughly examined essential first-aid techniques for seizures and burns and also provided guidance on identifying and responding appropriately to asthma and shock. In addition, it addressed the various types of diabetes and fundamental first aid measures for avulsed teeth and broken teeth. Upon summary of the core activities, learners were given key break time, and the assessment procedures were administered: the 28-item knowledge questionnaire and then, afterwards, an administration of the observational checklist to learners who were randomly selected to represent a small group.</p> <p>All participants are divided into small group of 3 to 5 and were asked to pick and respond to a scenario card chosen which requires participants to respond to either one of the following FA scenarios: Choking, CPR, Recovery position, Bleeding, Seizure, Burn, Shock, Avulsed tooth, Wounds/ injuries, &amp; Diabetes.</p> <p>Opting for the overt observation, the observers who have received initial training uses a specific set of codes to classify the first-aid activity they observe, and they also have a scale they use to measure how well first-aid is being implemented, fulfilling the criteria for a controlled method of observation.</p> <p><b>Teaching methods:</b> Reflection, Discussions, Teaching, Role play Demonstration, Case study, Group activities, audiovisuals- use of short films and interactive knowledge checks within PowerPoint slides, colorful poster prints to reiterate taught skills.</p> <p><b>Resources and assessment types:</b> Handout, demonstration using mannequin, Fully stocked FA box, Worksheets, Practice mat, Projector, Projector stand, Pointers, Pens &amp; Note pads, A standby Generator to power the projector, questionnaire and observational checklist.</p> <p><b>Allotted time:</b> 1 hour to 1: 30 minutes</p>
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After the design of the training resources, the content and order of delivery were reviewed by an expert in the domain or area of first aid to assess the validity of the resources before it was piloted, just like the questionnaire. A pilot study is an initial investigation that aims to assess the viability and potential outcomes of research. Studies revealed that if the pilot study shows promise, researchers may proceed with further research while considering the appropriate methods and actions to be taken (Ln, 2017). It is most crucial to note that a pilot study is executed on a smaller scale than the primary investigation. Therefore, in the case of the current research, the study was piloted among 30 participants who shared similar characteristics of both the inclusion and exclusion criteria of the primary study. The pilot study has had a substantial impact on enhancing the quality and effectiveness of the primary study.

Some key changes were made as a result of delivering the training to the pilot population. It was observed that the allotted duration per day was exceeded to cater to the different learners' different needs. Hence, 1 to 1.5 hours was not feasible if proper attention was to be given to all participants to ensure adaptive learning. Adaptive learning offers personalised learning paths, feedback, and resources, and it focuses on the whole group. In order to provide high-quality, differentiated teaching, it is crucial for the trainer to regularly assess the learning requirements of students and apply adaptable strategies based on the defined objectives to meet those needs. In support, studies revealed that to ensure successful implementation of differentiated education in the classroom, teachers must first establish well-defined objectives for their pupils (Kurt, 2021; Smale-Jacobse et al., 2019). In the current study, clear objectives have been identified through the extensive review of literature, identifying gaps and contextual needs in areas that were used to develop the objectives. Since the delivery was effective with the extension of additional time during the pilot study, the researcher, on this basis, made relevant adjustments to the training time after discussing it with key school

stakeholders to assess the implication and practicality. It was observed that though the training time was exceeded, participants were still attentive throughout the session. This confirms the findings of Barutshu and colleagues (2019), who conducted a research study that made a significant scholarly contribution to our understanding of the relationship between multimodal processing and attention abilities in young people. The study found that the nature of this connection depends on both the sensory bias present in the multisensory activity and the type of attention being used. Overall, their findings suggest that there is a strong association between these two factors. In discussing the timeframe with the school administrators, they had no reservations with the request; hence, the duration of training was increased to 3 hours per day. Incorporating regular breaks into the training-delivering routine provides an opportunity to recharge and establish a sense of balance, enabling individuals to resume their tasks with renewed focus.

Besides the regular knowledge and skill check routine during training delivery sessions, only nine groups could be assessed using the observation checklist and administering the questionnaire to all 30 participants. Hence, for the primary study, participants were assigned randomly into a group of 5 in each of the experimental groups ( $50/5=10$  group). Giving a total of 20 groups for the two experimental constructs based on the Solomon four-stage design classification. Each group was asked to pick a card of FA scenarios drawn from the resources and training objectives. The scenarios included FA procedures for Choking, CPR, Recovery position, Bleeding, seizure, Burn, Shock, Avulsed tooth, Wound, & Diabetes. Participants of each group were given 3 minutes each to plan and an additional 3 to 5 minutes to execute the management skills of their selected scenario, assigning one member of the group to act as the first aider while others provide support to their team representative take the role of the victim needing FA care. As highlighted earlier in the previous page, the observation criteria were based on a report from the Australian AID in 2012. The assessment consists of five points, with

a score of one (1) representing a low level of proficiency, three (3) indicating a moderate or medium level, and five (5) denoting a high level. The participants were given a score between one and five based on the observer's assessment of their ability to manage their selected health emergencies. The evaluation of each first aid skill presented by each group was assessed against three factors: the person's ability to analyze the situation, apply first aid, and communicate the incident details.

It is worth restating that for collecting observation data in programme assessment, the present study has opted for overt observation as the method of choice. Hence, participants possess the knowledge of their observation. This decision is backed by prior research on observation data collection methods, which suggests that overt observations are usually necessary due to ethical considerations related to the act of observing being concealed (CDC, 2018).

### **Operational Definition of Variables**

Accurately defining the operational variables and variable types used in quantitative research is crucial. This involves determining the independent variable, predictor, dependent variable, criteria, mediator, and other relevant variables. This process is essential as it improves the clarity and understanding of the research findings and facilitates the use of appropriate terminology. The information presented in this subtheme uses vocabulary suitable for the selected statistical analysis. The major constructs linked with the study's question(s) and hypotheses are identified and presented with their meanings below. Concise operational definitions for each variable are provided to comprehensively understand their implementation within the study. The operational descriptions of terms are based on established, verified research and instruments. In some cases, further explanation is necessary and is provided to

clarify and record how the authors of prior studies or the current instrument being used define or understand the different variable constructs in the context of the present study.

Table 3.7 below explains the constructs involved in this study; thus, their operational definitions will be guided with respect to assigned variables.

*Table 3.7 Constructs for the Study*

Constructs	Independent	Moderator/Predictor	Dependent
Baseline prior knowledge	x		
Post-intervention Knowledge			x
Baseline management skill	x		
Training intervention on knowledge		x	
Post-intervention Management skill			x
Retention			x
Demographics (Gender, age, class of study)		x	

**Participants:** These are the students who were finally selected for the training. They include a selected few students from classes one, two, four and five. Depending on whether they fall within the control or experimental group, these participants may or may not be exposed to first-aid intervention training.

**Pre-test:** The pre-test is a set of questions administered to participants to ascertain first aid's baseline knowledge and management skills. It is a dependent variable.

**Baseline:** A baseline is a reference point used to compare other information. In education, baseline knowledge refers to the initial measurements or evaluations that educators use to establish a starting point for students. Baseline assessments are also known as pre-tests or formative assessments. They are dependent variables.

**Prior Knowledge:** The pre-existing knowledge of a student prior to acquiring new information. It may originate from intellectual, personal, and cultural experiences. Prior knowledge is essential as it may aid pupils in comprehending new concepts. Hence, they act as predictors or independent variables.

**Training intervention:** This is a predictor of the performance of the participants. This is expected to improve their learning. The training is composed of comprehensive notes, explanations, instruction, and teaching processes to impart first-aid knowledge and management skills through the incorporation of stimulated activities.

**Post-test:** This test is also referred to as the preliminary assessment of FA knowledge and management skills, and it is meant to bring to light the improvement in learning and knowledge about first aid. It is a dependent variable and is primarily the same 28-item questionnaire. Ordinal data were used to form the questions.

**Experimental group:** this is the group of participants that will be trained and evaluated for performance. This group is made up of students from Gbesa Grammar School, Ojobo and Amai Secondary School, Amai, both of Delta State, Nigeria. For the researcher to ensure the accuracy of the experimental results, it is crucial to maintain consistency in all aspects (i.e., except for the treatment, across both groups and, in this instance, the use of FA banners. This means that researchers can evaluate the full impact of the treatment without any interference caused by unrelated variables.

**Control group:** The control group is the group that will not receive any training but rather the engagement that is achieved through responding to the instruments given during the pre-test or post-test, or both. The control group is made up of students from Obiaruku Grammar School, Obiaruku and Abraka Grammar School, Abraka, in Delta state, Nigeria. Participants in the control group have characteristics similar to those of the experimental group. They play a crucial role in serving as valuable reference points for comparing the outcomes of the

experimental group who receives the FA training, which is the group undergoing experimentation or educational intervention.

**Baseline knowledge** is simply the participants' old or earlier knowledge of first aid or an assessment of a student's existing knowledge, prior to the introduction of new content. It serves to set a baseline for learning, much to the starting line in a race. It is a dependent variable in this research and was measured using the pre-test.

**Baseline management skill:** As a dependent variable, it assesses the participant's existing technical competence in managing first aid cases. It involves how the participants, before the training, can undertake a first-aid rescue procedure, e.g., the performance of CPR.

**Retention:** This is the participants' ability to retain what they have been taught after one month. It was measured in percentages, and these records were documented after the training and post-test. The number of correct items recalled one month after the training by correct items recalled immediately after the training was given, multiplied by 100.

**Demographic factor:** The demographic in question is gender. However, others were listed, including the class of the student, age, and questions on any previous knowledge of first aid. The demographic factors are expected to moderate the training results of the participants.

**Post-intervention knowledge:** This is a dependent variable, and it is knowledge obtained by participants after the training has been completed. It is measured by the performance of the participants from the post-test questions. The dependency of this construct is based on the training, participation of the students, the instructional tools, and the multisensory approach to be adopted.

**Post-intervention management skill:** This dependent variable was measured with the observation instrument. This skill was used to ascertain the participants' competence in handling health emergencies and administering first aid when cases arise. In testing this skill,

the participants demonstrated each of the techniques (CPR, wound dressing, Choking, Recovery position, Bleeding, Seizure, Burn, Shock, Avulsed tooth & Diabetes etc.).

**Interactive effect:** In an estimated model, the role of a variable and its impact on the dependent variable is known as an interactive effect. The influence of an interaction effect variable on a dependent variable depends on the level of a third variable. When there is an interaction effect, the combined impacts of the factors on the dependent measure are known as interaction effects. The current study will assess if the interaction between training intervention, banner presence, previous knowledge, participant's class of study, age, school type, and gender may cause changes in the post intervention knowledge or retention. The impact of one factor is dependent on the magnitude of the other factor when an interaction effect is present (Garofalo et al., 2022). An independent variable may or may not cause a significant effect on the dependent variable when standing alone but may become effective depending on the level of presence of another independent variable.

**The main Effect:** This is measured using the questionnaire and the observation checklist. It looks at the effect an independent variable may cause on the dependent variable without consideration of other independent variables.

## **Study Procedures and Ethical Assurances**

The procedure based on the quantitative method of data collection involves quantifying all data to be collected, either as codes or in marks scored for performance. According to Cameron (2015), this procedure involves defining purpose statements for the research, collecting data, analysing the data, and making inferences from analysed results. In accordance with the methods of Mirza et al. (2017) and Mersal and Sattar-Aly (2016), the study will be conducted in four stages: preparation, assessment, implementation, and evaluation using a lesson plan. Photographs and videos for the training will be presented. The procedures adopted

for this study include obtaining approval from the UNICAF University Research Ethics Committee and oral consent from the State Ministry of Basic and Secondary Education, Asaba, to address the schools or principals involved in the study. The selected schools were visited to provide the students, teachers and administrators with written consent (using provisional approval) from UNICAF University. This was done formally to obtain permission from the school heads to seek the cooperation of students and staff during the training intervention. The Red Cross Society, Delta State Chapter was also contacted and involved in the study to raise the quality of the training and knowledge delivery on first aid. Their full participation was sought verbally. A questionnaire comprising of questions on the various aspect of first aid was compiled following the training manual, purpose and objectives of the training programme. The schools were finally visited by the Red Cross personnel (Trainers), two trained nurses, a lecturer in public and community health and the researcher. Irrespective of their background, all resource persons engaged in a series of meetings to discuss all aspects of the study and were retrained before the intervention to promote uniformity of purpose. This is also referred to standardization in the field of education.

Standardisation is a process that ensures all personnel, including teachers, trainers, assessors, and quality assurers, interpret and follow the course and training standards consistently. It helps to maintain consistency and fairness towards all learners or participants in this context during their time participating in the study. The implementation of standardised practices promotes collaboration among individuals, encouraging a collective approach instead of individual efforts. It also guarantees that learners receive fair and impartial services. Nevertheless, it's crucial to consider the specific requirements of each learner. In support of the need for and importance of standardization, a passionate and renowned educator emphasized the needs for teachers, trainers, assessors, and quality assurers to customise their teaching,

learning, and assessment resources to cater to individual learners' particular needs (Gravells, 2017).

The assessment and training programme was carried out following the agreement of all procedures with the participating schools; the place, time and days of training were further discussed with the school administrators and communicated to the students by school heads, especially on the conduct of the training programme. Oral consent was obtained from the school principals, the community and the students. The pre-test questions were administered and then retrieved. The pre-test questions administered previously to establish their baseline knowledge and management of first aid were re-issued after the training programme, after which the same questions were utilised for retention one month after the training intervention. The following procedures were followed during the implementation of the research: Two trainers from the Nigerian Red Cross Society Delta State Chapter, two nurses, alongside the researcher and other first aid experts who have been certified as trainers, were involved in the training. The training was conducted for three days, for three hours per day, in a selected hall that was spacious and could conveniently accommodate the participants and resource persons. Theory and practical sessions were carried out primarily on simulated CPR using a mannequin, bleeding, and wound, while volunteered peers and trainers demonstrated choking, burns, shock, seizure and recovery position as a form of role-play. Focal point discussions, individual sessions, demonstrations and re-demonstrations were carried out to reinforce the lesson. The selected school represents the control (2) and experimental (2 treatment) groups, where the control group received no training. The theoretical part was taught using the adopted training manual and other free resources made available in the St John Ambulance and First Aid for Life resource centre in preparing PowerPoint slides that are spread across specific learning outcomes per day, as reflected in Table 3.4 to 3.6, which was supplied to the schools after the

training. The intervention programme followed the IFRCS (2016) module, and subjects like basic principles of emergency care, choking, wounds/bleeding, CPR, seizure, burns, asthma, shock, diabetes, and broken or avulsed teeth was delivered and assessed.

The participants were evaluated after the post-test. The same pre-test questions was used to assess participants' management and general knowledge as post-test evaluation almost right after the training and one month afterwards for retention rate as observed in table 3. 8 below.

*Table 3.8 The Study Procedure Detailing the Application of Solomon Four Stage*

<b>Randomisation</b>		<b>Pre-test</b>	<b>Intervention</b>	<b>Post-test</b>	<b>Retention (1-month)</b>
<b>Treatment</b>	R	Amia Grammar School	Amia Grammar school	Amia Grammar school	Amia Grammar school
<b>Control</b>	R	Obiaruku Grammar School		Obiaruku Grammar School	Obiaruku Grammar School
<b>Treatment</b>	R		Gbesa Grammar School	Gbesa Grammar School	Gbesa Grammar School
<b>Control</b>	R			Abraka Grammar School	Abraka Grammar School

## **Ethical Assurances**

The investigator sought ethical approval for the research, which was gained from the ‘UNICAF University Research Ethics Committee (UREIC)’, and local research approval was also gained from the Ministry of Health in Delta State. Following that, oral permission to

conduct the study on secondary school subjects was obtained from the Ministry of Basic and Secondary Education, Asaba, Delta State. This was obtained by explaining the details concerning the purpose and significance of the training, the manual and curriculum adopted, the schedule, and the model to be used for the study. The principals or vice-principals duly informed the guardian of the participants to be used as the treatment (experimental) group to seek their consent on the acceptance of the conditions of the treatment group accordingly through the guardian consent form designed by the researcher. The management of the state arm of the Red Cross Society resident in Asaba was visited for deliberations on possible collaboration, assistance, support or participation. Upon accepting conditions that did not conflict with the research's purpose, the Red Cross Society was fully involved in the training and assessment of participants. Oral consent to carry out the research was obtained from all relevant stakeholders, including verbal and written consent, which was also obtained from the heads of the individual schools involved in the study. Informed consent was obtained from the legal guardians of the respondents after the intention was met, and the content and significance of the research were adequately clarified to them. They were told that their involvement was voluntary and that they would not suffer any consequences in their academics if they chose not to participate. The questionnaires were coded to ensure confidentiality and anonymity.

Ethical concerns are some of the crucial points to look out for in any research approach. The aspects bordering on ethical assurance include consent on voluntary participation in the training, proper introduction of research purpose and procedures, including its benefits and privacy, supply of copies of experimental results, an assurance of the anonymity and confidentiality of the participants, and a control and monitored instruction pattern that void of power abuse from either participant or researcher. The study must be void of bias of any kind, including gender, age, sexual orientation or race and details of the research must be clearly reported (Creswell & Plano-Clark, 2011). Four areas were considered in this study: ensuring

participant safety, obtaining informed consent, respecting privacy rights, and maintaining honesty with colleagues. For studies adopting the experimental design, researchers are expected to provide full details of the study even within the report to satisfy readers' concerns about the quality and ethics followed in designing the research, fulfilling the GREET guideline (Philip et al., 2016). The study is supposed to be free of bias towards any group of persons based on ethnicity, gender, sexuality, race or age. This study involves secondary school students aged 10 to 25, presumably making up the age range of secondary school students in Nigeria. Both the male and female genders are to be sampled and involved in the training, thus fitting the study to the perfect approach that is void of gender bias. Voluntary participation is another feature of concern in experimental research. In this study, participants' consent was sought through the legal guardian who completed the consent form on behalf of their word before the investigation commenced. Verbal consent was received from participants as well on their voluntary participation, with participants requested to indicate a Yes or No to the questions raised before the study commenced. The participants were also informed of the purpose and methodology of the research during the period of visits to the schools and before the start of the training. This was done through an introductory letter and the gatekeeper form sent to the host communities and the heads of the secondary schools. As the case may be, a corresponding approval was obtained from the schools and/or the host communities. A copy of the consent and approval letters is attached to the report appendix. The instruments used for data collection observed all forms of anonymity of the participants. Codes were used instead of identifiable names. The only details requested of participants were age, gender, class of study, previous knowledge, and identity number. Names, phone numbers, or participant addresses were not needed as part of the information presented in the instruments (see the observational instrument and questionnaire in the appendix). In accordance with ethical

research assurance, the investigator aims to provide a copy of the results for all participating schools at the end of the study.

### **Data Collection and Analysis**

The purpose of triangulation is to consolidate a finding using data from different sources. It is the combination of more than one approach to solidify research findings for a construct or research question (Heale & Forbes, 2013). This is another form of validation for research findings through the use of two or three data collection procedures. Two or more pieces of evidence are used for a single object of focus to authenticate the finding from an independent construct. Sourcing for meanings from two or more quantitative data increases the confidence level placed on a particular finding hereby repelling doubts about the soundness of a research question. This is the essence of triangulation (Morris, 2017). In today's world of vast information and false data, it is crucial to use rigorous social science and policy-based research to identify phenomena and validate data sources through triangulation techniques. Triangulation involves using multiple methods and sources of data in research to better understand phenomena and validate interpretations of them. This method tests the accuracy of data by combining evidence from various sources (Moon, 2019). The goal of triangulation is to verify, falsify, validate, or uncover scholarly claims (Hanson-DeFusco, 2023).

In this quantitative design, only quantitative data can be used to triangulate any finding, which is quite difficult. Hence, the Solomon 4-stage advance-level experimental design was a perfect fit for the case of triangulation. The researcher may tag it 'reverse triangulation' by the use of the four-stage design, where two or more moderators or predictors eliminate one or two limitations to a research finding as observed in figure 3.8. This is assumed to be in the form of a negative triangulation since it is one design used to expunge the research limitations that could have exerted an impact on the conclusions drawn from the study. In the original quasi-experimental designs, selecting the control and treatment from the same students, location, and

school may affect the post-test finding of the control group as students may interact after training to share knowledge. However, this is not the case for this study, as control and experimental were not taken from the same school.

The questionnaires were collected, marked and recorded accordingly. Re-assessment (retention) of knowledge and management of first aid was carried out after four weeks (in one month). The data underwent human verification to ensure correctness, followed by coding and entry into Microsoft Excel Version 2019 Spreadsheet Package and meticulously cleaned before transporting it to International Business Machine (IBM) 'Statistical Package for Social Sciences (SPSS) Version 20 software' for further analysis. All correct answers were coded one (1), and answers that were incorrect were coded zero (0). The total performance for knowledge and management of all first aid strategies was coded into points since there is one question for each first aid topic covered in the study. The average score was converted into a percentage for each section of the instrument.

**RQ<sub>1</sub>.** What is the baseline knowledge of first aid among secondary school pupils in Delta State, Nigeria? The pre-test was used to answer this question. The data collected are ordinal, and simple frequency counts and percentages were employed to analyse the correct and incorrect responses for both the pre-test experimental group and the control group.

**RQ<sub>2</sub>.** What is the impact of first-aid training on the immediate knowledge acquisition and emergency management skillset of secondary school students in Delta State, Nigeria, compared to those who have not received such training? This question is broadly divided into two parts (**RQ<sub>2a</sub>** and **RQ<sub>2b</sub>**), of which the first part assesses the FA knowledge through a questionnaire, and part b assesses the ability of students to apply the knowledge through demonstration of the skill set, assessed via an observation checklist.

An educational experiment that included the implementation of FA training was delivered to the experimental group. The researcher introduced a three-day FA practical training on the knowledge and management of basic life emergency skills needed in secondary schools according to the Evidence-Based Practice (EBP) foundation steps (Philip et al., 2016). The ADDIE instructional model guided the intervention in assessing the effect of training on participants. Course materials, such as slides, posters and links for age-appropriate resources for essential FA in schools, can be accessed online (First Aid for Life, 2021; Florida Department for School Health Programme, 2016) and in the appendix. The summarised grid displaying the educational material given to the participants in the different phases of the intervention is presented below.

*Table 3.9 The Grid Displaying the Summary Education Material Provided to Learners*

<b>Group structure</b>	<b>Stages of Intervention</b>		
	<b>Stage 1: Pre-training</b>	<b>Stage 2: Live training</b>	<b>Stage 3: Post Training</b>
<b>Control Group 1 and 2</b>	Absence of training and educational material on FA	Absence of training and educational material on FA	Absence of training and educational material on FA
<b>Intervention group 1</b>	FA posters and banners were fixed in strategic positions around the school environment after the pre-test questionnaire was successfully administered, the objective of the workshop and leaflets containing a summary of	3 hours training per day, include practical hands-on session ensuring a multi-sensory approach to teaching-use of short films), Access to training slides, worksheet and print	FA posters and banners around strategic positions in the school environment

	basic FA skills is given to students	posters during the training
<b>Intervention group 2</b>	No posters or banners around the school environment, No leaflets were given containing a summary of the basic FA skills	3 hours of training per day, including practical hands-on sessions ensuring a multi-sensory approach to teaching-intermittent use of short films), Access to training slides, worksheet and print posters during the training

**RQ2a.** How does first-aid training influence the immediate knowledge acquisition of secondary school students in Delta State, Nigeria, compared to those who have not received training? Data were coded and entered into Microsoft Excel Version 2019 Spreadsheet Package and IBM 'Statistical Package for Social Sciences (SPSS) Version' 20 software for further analysis. The individual effect of the independent factors on the dependent variable was tested using the Multiple Regression Model at a 95% confidence interval in accordance with Ganfure et al. (2018) and Eze et al. (2015). Analyses of the relationships between the tests that were conducted before the intervention and post-test were performed using the student t-test for the intervention and non-intervention groups. Here, the treatment's effect is assessed between groups one and 2. Furthermore, a meta-analytic analysis ( $Z_{\text{meta}} = (Z_{p1} + Z_{p2}) / \sqrt{2}$ ) is used to add the pre-test and non-pretest groups' effect by combining all four groups into a single outcome measure. In effect, this solidifies the superiority of the design to adjust for the pre-test sensitisation and to maintain the power of the pre-post-test experimental design.

**RQ<sub>2b</sub>.** Does first-aid training improve FA emergency management skillset of secondary school students in Delta State, Nigeria? The observation checklist was employed to evaluate the impact of the training on students organised in groups of 2-3. The baseline knowledge of the experimental group operates as the control for evaluating the influence of training on students' FA management skills. In accordance with the Solomon 4-stage design, only the students in the experimental group who had the pretest were evaluated for their emergency management skills, utilising the scores recorded prior to and immediately following the training across all first aid topics included in the course content and knowledge questionnaire. The Chi-square test was employed to determine significant changes between the pre-intervention and post-intervention FA emergency management processes for assessing the FA circumstances addressed in the course, applying fundamental FA strategies, and communicating FA data. Additionally, a T-test was conducted to ascertain the significance of the change in FA emergency management skills.

**RQ<sub>4a & b</sub>.** What is the learning retention rate of secondary school students towards FA knowledge or FA emergency one month after the training? The retention of FA knowledge was accessed using the same questionnaire. However, this was administered after one month of completing the training. Similarly, the FA management of health emergencies was measured using the observation instrument, which was quantified on a five-point scale. The level of retention was also measured using the same method; the change in retention was measured using the formula below:

Learning Retention % =  $\frac{\text{Retention score one month after the training}}{\text{post-test score}} \times 100$

**RQ<sub>5a & b</sub>.** What factors have an interactive effect on the post-intervention and learning retention rate of first aid skills among secondary school students in Delta State? ANCOVA

analysis was employed to evaluate the interactive effects of variables including training intervention, banner presence, prior knowledge, participant's year of study, age, posttest scores, school type, and gender on student retention rates, with a statistical significance set at a p-value of 0.05. Also, part b of question 5 posed the question, 'What is the magnitude of improving the FA knowledge of experimental participants? The extent of enhancement in first-aid knowledge among experimental participants was assessed using binary logistic regression analysis.

### **Hypothesis:**

**H01.** There is no significant difference between the experimental and control group's knowledge scores on FA for emergencies. The student t-test analysis was used to test the significant distinction between the outcome of the post-test performances for each first aid technique. It is assumed that if the training session is effective, a significant effect will be found between the group that received the intervention and those who did not receive the training.

**H02.** There is no significant disparity between the pre-intervention and post-intervention results of the experimental group. The Pearson Chi-square test was employed to test the significant difference in percentage performance level between the test conducted before the intervention and after the intervention (post-test) for each first aid skill. The difference is that the correct and incorrect responses were used for both the control groups and intervention groups. The control group had its own chi-square values for the 'pre-test and post-test' using the correct and incorrect responses, the same as the experimental. The chi-square value and p values were used to ascertain the level of significance at both (95% or/and 99%) confidence levels to indicate the level of impact of the training on that particular subject, e.g. choke, CPR, bleeding.

**H03.** The demographic variables (i.e. age, class, gender, prior knowledge) of the

participants do not significantly affect the outcome of FA training in Delta State, Nigeria. ANOVA was used to ascertain the significant effect of gender and other demographic variables on the performance of the students after training, while the coefficient of the determinant (R) was used to ascertain the percentage influence of the demographic variable on the training. Multiple Regression. The individual or main effect of the demographic variables (age, class of study, gender and location) on the training and performance of the participants was determined using the unstandardised coefficient at a 95% confidence interval.

**H04.** There are no significant differences between participant retention rates immediately and one month after the FA training. The difference between the post-test and retention rate was calculated using the students' t-test. More so, the superiority of the education intervention strategies is assessed, and the retention of those exposed to the post-training material is compared against participants who were not exposed to the post-training material. On the other hand, participants who were exposed to both pre-training, live-session, and post-training instructional material were assessed against participants who only had the live session. (*See table 3.9 above for details*).

## Summary

This study attempts to quantify how effective first aid training intervention was in determining the outcome of the knowledge and emergency management competence of secondary school students in Delta State. The study was sectioned into five parts. This chapter outlined the research methods and data collection procedures. It began with an introductory text to the methodology adopted in this study, followed by the study approach and design, population of subjects and chosen sample of the research study, instrumentation of research tools, operational definition of variables, study procedures, ethical assurances, and data collection pattern. Concisely, the quantitative approach was basically adopted; thus, only quantitative data was collected. The positivism approach was used based on the research

paradigms since it defines most of the concepts in this study. The Solomon Four Stage design was used to eliminate the challenges of the ordinary quasi-experimental design. The study population comprised all public secondary schools in Delta State, and the inclusion criteria were based on a longer period of availability and stability in schools as students. Therefore, junior secondary school classes one and two and senior secondary school classes one and two were used, while classes three at the senior and junior levels were excluded since they were preparing to leave the school and mostly engaged in the preparation or writing of their external examinations. The sample studied was made up of four schools based on the geopolitical zoning of the state. The schools were Obiaruku Grammar School, Obiaruku; Amai Secondary School, Amai; Abraka Grammar School, Abraka and Gbesa Grammar School, Ojobo, distributed across the three political strata. The basic constructs were operationally defined in this section. The 28-item questionnaire on first aid (plus five demographic questions, making a total of 32 items) and first aid management observational instruments were used to collect data after due approval from the ethical committees, the secondary school educational boards and the school management. A consent form was sent to the participant's guardians before the study commenced, and a proper introduction to the whole concept of the research was communicated to the participants. Data were analysed using IBM SPSS. Both inferential and descriptive analyses were carried out based on the research questions and hypotheses.

## CHAPTER 4: FINDINGS

First aid is a basic lifesaving technique that should be learnt by all (Morris, 2018). Nigeria remains one of the most populous African countries classified as developing; however, its public health sector is underdeveloped. It needs infrastructural and human capital intervention (Awoyemi, 2019). More importantly, the health sector is understaffed in many facilities across the country. Because of this reason, health care is not maximally offered to its citizens promptly; hence there is a need to narrow this gap with regular first aid training for the vulnerable population by targeting students in remote locations where healthcare facilities are not abundantly available. It is imperative to conduct FA training since it will help reduce the loss of lives resulting from delays in healthcare services and the timely healthcare interventions for public schools in suburbs and remote communities. The unpredictable nature of accidents and their frequency/ occurrence among young children in school have made it important to equip every student with basic lifesaving skills through training programmes. This study looked at the peculiar conditions with health care delivery in some suburbs and rural areas in Delta State Nigeria and randomly selected secondary school students for FA training. The impact of the training was ascertained, and the factors that may have moderated the student's understanding and skillset were assessed. This chapter re-emphasises the trustworthiness of the data that has been gathered and examined.

In quantitative research, the trustworthiness of data can be established through internal and external validity, reliability and objectivity of the instrument used for data collection. These constructs are crucial to the authenticity and applicability of the research findings, which is the fundamental purpose for carrying out any study as well as the practical implications. This chapter essentially looked at the four determinants as follows. Measurement of internal validity and its attendant threats were controlled through statistical testing and experts' evaluation of the internal content of the instrument. The reliability of any instrument, often

referred to as the degree of stability and consistency in the response of test personnel to items construed in the questionnaire, is a key aspect of developing and revising the instrument for the collection of data. This section further shows the outcome of the analysed data collected using the research instruments from training intervention and observation. It meticulously correlates each piece of information with the established objectives of this investigation, and this chapter presents the diversified demographic details of the participants, answers to earlier raised research inquiries, and hypotheses formulated. The goal of the training intervention was to help them become highly proficient by enhancing participants' knowledge and management competencies related to FA. Since there is a gap in the delivery of emergency response services around secondary schools, this study is essential in dealing with the ongoing gaps identified in this area.

The crux of this study is to understand the effect of FA training on students' knowledge. Those involved in public health and human resource management can gain valuable insight by understanding the retention rates and patterns related to FA knowledge following a training intervention. This information can help determine whether FA knowledge will increase or decrease. It will also help them determine the factors influencing retention (to be discussed later) and design a training template for other interventions on FA. In conducting this study, this study was founded on six research questions and formulated six corresponding hypotheses. The data collection pattern and study design was the Solomon Four Stage design; hence, it is crucial to know the factors that differentiate the pre-test performance from the post-test results of participants to decipher the role of each factor in the experimentation. The analyses were carried out using descriptive, inferential, or both to answer each research question or hypothesis. The discussion section cogitates the findings from this study according to the research question and hypotheses raised and formulated, keeping in mind the study design and

data-gathering method. This chapter further accounts for and provides answers and relevant links in response to all these issues in the research questions and hypotheses.

### **Trustworthiness of Data**

Three variables were used for this study: the dependent (baseline knowledge and emergency management of first aid, post-intervention knowledge of first aid, health emergency management skill, and retention rates), moderator (demographic variables – age, class and previous knowledge) and independent variables (training intervention, use of posters/banners, the provision of training slides). The pre-test and post-test questions were predetermined before the commencement of intervention after due consultation and comparison with earlier established instruments for first-aid training-based experimental studies, as discussed in the previous chapter.

Based on the rules for establishing the internal validity level, the changes in the dependent variables are determined only from the independent variables. The training intervention mainly determined post-intervention knowledge and management skills for the study. The improvement in the skill set of students who received first aid was regulated by intervention, which was determined based on the post-test results of those who never received the training. Also, the concurrent risks to the internal validity of a qualitative study were addressed using two control and two intervention (treatment) groups set as replicates. The effect of experimentation (the post-test results on knowledge and management) was determined, and pre-testing was done for one control and experimental group. Participant (students) selection was made randomly, and consent was sought from the principal and the parents/guardians of the participants before the pre-test. The issue of participants' monitoring and relocation to different areas was bypassed using students from classes that still have more than a term/semester or year to spend in school. Hence, Junior Secondary School Students (JSS-1 to 2) and participants in Senior Secondary School (SSS-1 to 2) were used for the study.

External validity is often used to validate and assume research findings from a research sample in a broader population; external validity is achieved by carefully selecting appropriate sampling techniques and samples. Moreso, an unbiased and widespread representation was promoted by drawing the sample from all three geo-political zones based on the stratification of the state. From classes sampled for activation, students who have more than one year to study in the school (senior and junior secondary classes 1 and 2) were selected, a period that could be used for producing a chain effect or transference of knowledge of first aid on those who never participated in the study. This ensures that training can positively impact the broader population of students who did not receive the training. The sampling technique used in selecting the students was random, which excludes biases from choosing a particular class of students, e.g. the most intelligent, most active students from the upper socio-economic class, one gender, religion, tribe or ethnicity.

A random selection represents the entire community of students irrespective of socio-demographic differences. In extension, this ratifies the disproportionate sampling technique (for the total number of students selected from each school), assuming that the same enrolment pattern prevails across the sampled schools. Hence, a similar representation can be found across other schools that were not included in the study. To establish concrete external validity, the researcher employed statistical regressions using 99% and 95% confidence intervals which can be used to make accurate interpretations and implications on a more general note. Other significant factors that were considered were time, intervention, and measurement of constructs.

Objectivity within the context of this research is the appropriate interpersonal, interaction and communication proximity between the researcher and subjects who participated in the research, which was targeted at eliminating bias. It is noteworthy to state that the closer the researcher is to the participants, the higher the likelihood of emotional influence from the

participants and this is known to have the capacity to skew the process for gathering data and, in the long run, influence the authenticity of the results. In this study, the researcher maintained the utmost professionalism in the pre-data collection, training intervention, and post-data collection. None of the students was allowed to further interact with the researcher after a training session except within the confines of what was taught and within the premises of the training centre. The process of delivering was fair, considering the learning needs of individual students. However, any attention that goes beyond the standard educational needs and learning provision for participants was avoided during the course of the training intervention. The instruments were only distributed at the time of data collection. The reflective journal concept for the design, methodology, instrument and data analysis follows several other published first-aid training assessment reports. The Solomon four-stage design was adopted since it eliminates difficulties, nuisances and random effect confounding variables (covariates), which limits the conventional pretest-posttest quasi-experimental designs (Shuttleworth, 2009a) through a randomised allocation of participants (subjects) to groups. These covariates were adequately checked with the use of randomisation and widespread distribution of sample participants. The results of this study could be, however, limited to a single state, but with the use of more robust data collection methods/ design like the Solomon four-stage design, findings can be far-reaching and implementable.

The pretest-posttest data collection method is used for many experimental designs. Including the retention test in addition to the initial pretest-posttest is important in assessing the long-term effect and strength of a training intervention that has incorporated a multisensory teaching and learning approach. This is very useful in ascertaining the level of change in knowledge and practice that has been accentuated by the intervention across design groups (treatment and control) (Shutterwood, 2009b). One area of concern is the statistical tests used

in this research. The tests were adopted by virtue of their ability to determine the significant effect of the training intervention when comparing control groups to treatment groups.

For data analysis, standard statistical tests (ANOVA, descriptive statistics, chi-square, etc.) for pre-test to post-test experimental design (in addition to the retention test) were used as earlier re-iterated by Alessandri et al. (2017). The Pearson chi-square test was utilised since the data is drawn from frequencies of correct and incorrect responses to test questions on aspects of first aid whilst being categorised into two or more (gender, classes and previous knowledge of first aid). Chi-square is also appropriate in estimating the expected response after an intervention or sampling and testing the pre-test's independency from the post-test. The differences in the subject groups based on the type of treatments necessitated the use of chi-square.

The inferential statistic, in this instance, an independent sample t-test was used to ascertain if there could be any significant distinction between both groups (control and first aid training intervention). With a t-test, the changes that occurred over time of the normally distributed pre-test and post-test results can be ascertained. It helps to determine the effectiveness of an intervention programme, which is one of the purposes of this research. This test can be used to determine if there are notable differences between the groups of first aid participants and if these differences are enough to be considered significant. ANCOVA will be considered if pre-test scores across the different groups are widely varied. ANOVA was used since it could test the effect of demographic variables, and the mean score from each first-aid technique was compared to know if there were significant differences.

The t-test, descriptive statistics and chi-square have been used as analytical data parameters for determining the efficacy of a first aid intervention in higher institutions in Turkey (Mert et al., 2018) using the same pretest-posttest model with a questionnaire. Their report also validated the use of IBM SPSS as credible statistical software. The report by

Maguluru et al. (2018) aligned with the data collection, design and instrumentation used in this study. The chi-square test of independence, pre-test and post-test model was adopted in their research. In a recent first aid training paper from Amsterdam, the United Kingdom, and Sierra Leone by Sijbrandij et al. (2020), the IBM SPSS was used, and the independent t-test and chi-square analysis were deployed to make meaning of the data that was collected. As a result, the trustworthiness of the data collected, as well as the methodology and interpretations of the results, are in good light. The selected statistical methods were also adopted in other research across the globe, including the Doctoral Thesis of Salim (2020) and Riaz, et al. (2020).

### **Reliability and validity of data**

The reliability of any instrument is used to determine whether or not an instrument for data collection will produce the same response if administered more than once. For this study, it was used to test the level of stability in responses to the assessment questions for the training intervention. The reliability of the instrument (pre-test or posttest questionnaire) was assessed based on the popularly used test-retest method. If the reliability coefficient value is 0.8 or higher, the reliability is assumed to be very good; if it is 0.6-0.79, moderate reliability is assumed. If it is less than 0.6, the reliability outcome is considered poor and unreliable. The final attuned pre-test questionnaire was initially sent to 30 students in the population as a pilot. After 20 days, the same questionnaire was again sent to the same people to observe its reliability. The Cronbach's Alpha analytical method was used in this study. It was calculated for the 30 test-retest respondents, for which  $\alpha = 0.94$ , certifying the reliability of the questionnaire and its suitability for onward administration. This was done by carefully summing up the respondents' answers to obtain the average score per question, which was used for the reliability test.

The internal validity was assessed through the content validity index (CVI). The CVI measures the appropriateness of items constituted in an instrument considering the study's

goals, the examined pieces of literature, and subject coverage. The CVI designed by Waltz and Basel was used to assess the validity of the questionnaire's content. To validate the pre-test or post-test questionnaire, the researcher engaged and used the expertise of ten (10) experts in test and measurement in public health research, including the thesis supervisor. The experts examined the items of the instrument from their point of view based on their different understanding and experience, knowledge of training intervention and the overall purpose of the study for which the instrument was designed. In calculating the CVI, each of the experts was requested to cross-check each item's relevance on a four-point Likert scale of 4 = completely relevant, 3 = related but needs review, 2 = needs a basic review, and 1 = unrelated/reconstruct. The total number of related and completely related responses (options 3 and 4) was divided by the number of experts (10), which was then used to calculate the CVI. Following the decision rule, if the value was lesser than 0.7, the item would be rejected; if it was between 0.7 and 0.79, it would be quickly reviewed; and if it was greater than 0.79, it would be acceptable and adopted for administration to respondents. If the index was between 0.8 and 0.9, the content validity would be deemed appropriate. In the present study, the number of answers to options 3 and 4 was calculated, and its percentage was obtained; by dividing the resulting value by the number of respondents (10 people), the CVI of the questionnaire (0.87) was obtained. This ensures a high level of validity for the study's instrument.

## **Results of findings, including graphical illustrations**

### ***Demographic data***

The information related to the participants' socio-demographic data is presented in Table 4.1. The participant's gender, age, class of study, previous knowledge of first aid and school use of extra training materials are presented using a total of 200 participants.

**Table 4.1***Demographic Information of Participants*

Geopolitical District Sampled Grammar Schools	Delta North Obiaruku		Amai		Delta Central Abraka		Delta South Gbesa		Total		<i>Mean</i>	<i>SD</i>
Demographic factors	N	%	N	%	N	%	N	%	N	%		
Gender											1.41	0.49
Male	12	24	21	42	18	36.0	30	60.0	81	40.5		
Female	38	76.0	29	58	32	64.0	20	40.0	119	59.5		
Ages (years)											14.57	1.91
≤ 10	1	2.0	1	2.0	2	4.0	0	0	4	2.0		
11	3	6.0	2	4.0	4	8.0	0	0	7	3.5		
12	9	18.0	12	24.0	5	10.0	1	2.0	17	8.5		
13	9	18.0	6	12.0	6	12.0	5	10.0	32	16.0		
14	12	24.0	13	26.0	8	16.0	9	18.0	35	17.5		
15	10	20.0	8	16.0	9	18.0	10	20.0	42	21.0		
16	6	12.0	6	12.0	7	14.0	9	18.0	30	15.0		
17	0	0	2	4.0	7	14.0	6	12.0	19	9.5		
18	0	0	1	2.0	2	4.0	9	18.0	13	6.5		
≥ 19	0	0	0	0	0	0	1	2.0	1	0.5		
Grade of the students											2.69	1.08
JSS 1	10	20.0	10	20	11	22.0	4	8.0	35	17.5		
JSS 2	16	32.0	10	20	11	22.0	15	30.0	52	26.0		
SS 1	15	30.0	15	30	11	22.0	13	26.0	54	27.0		
SS 2	9	18.0	15	30	17	34.0	18	36.0	59	29.5		
Previous knowledge of FA											1.39	0.48
Yes	17	34.0	16	32.0	7	14.0	37	74.0	77	38.5		
No	33	66.0	34	68.0	43	86.0	13	26.0	123	61.5		
FA Banner presence											1.25	0.43
Yes	0	0	50	100	0	0	0	0	50	25		
No	50	100	0	0	50	100	50	100	150	75		

N (frequency count) = 50, % = 100.

The socio-demographic information in Table 4.1 showed that there were more female (N= 119, 59.5%) participants than the male (N =81, 40.5%) counterparts with varying numbers across the different schools. The age-wise distribution showed that most (21%) of the participants were 15 years old, while only a mere 0.5% were 19 years old. Based on the class of study, 29.5% were from SS2, while 17.5% were from JSS 1, which was the lowest in number. The results also showed that 38.5% of participants already had some form of lecture about first aid, while the remaining 61.5% never had any form of FA lecture. Banners and other related FA graphical contents were kept in the training centre of Amai Grammar School, Amai: a school under the experimental group, while the others never had banners around the school premises that acted as FA teaching aid.

#### ***Research Question 1/Inferences:***

What is the pre-intervention knowledge of first aid among secondary school students in Delta State, Nigeria? Table 4.2 elicits from participants their baseline knowledge of first aid.

**Table 4.2*****Baseline knowledge of first aid among secondary school students in Delta State***

First Aid/Responses	Control Obiaruku		Experimental Amai		$\chi^2$	p-value
	N	%	N	%		
Basic Principles of Emergency Care					3.28	0.35 <sup>NS</sup>
correct response	21	42.5	20	40.0		
incorrect response	29	57.5	30	60.0		
Understanding Choke					3.20	0.36 <sup>NS</sup>
correct response	19	38.7	23	45.3		
incorrect response	31	61.3	27	54.7		
Knowledge of Wound/Bleeding					2.00	0.572 <sup>NS</sup>
correct response	21	42.0	22	44.5		
incorrect response	29	58.0	28	55.5		
Understanding CPR					8.48	0.037*
correct response	20	40.5	16	32.0		
incorrect response	30	59.5	34	68.0		
Understanding Seizure					60.88	0.000*
correct response	6	12.0	5	10.0		
incorrect response	44	88.0	45	90.0		
Understanding Burn					0.80	0.849 <sup>NS</sup>
correct response	28	56.0	24	49.0		
incorrect response	22	44.0	26	51.0		
First Aid for Asthma					9.04	0.029*
correct response	32	64.0	33	66.0		
incorrect response	18	36.0	17	34.0		
First Aid for Shock					5.20	0.158 <sup>NS</sup>
correct response	33	66.0	24	48.0		
incorrect response	17	34.0	26	52.0		
First Aid for Diabetes					0.36	0.549 <sup>NS</sup>
correct response	24	49.0	29	58.0		
incorrect response	26	51.0	21	42.0		
First Aid for Avulsed/Cracked Tooth					3.24	0.072 <sup>NS</sup>
correct response	21	42.0	20	40.0		
incorrect response	29	58.0	30	60.0		
Mean correct score	13.72		13.22			
SD	2.69		2.52			
% Correct pass	44.26		42.65			

<sup>NS</sup> = no significant difference, \*S = significantly different, SD = standard deviation. % = percentage

The information retrieved in Table 4.2 showed that the difference in baseline knowledge of first aid between the control and intervention groups differs according to the type of FA. There was a notable disparity in the level of knowledge regarding CPR ( $\chi^2 = 3.20, p = 0.037$ ), seizure ( $\chi^2 = 60.88, p = 0.000$ ), and first aid for Asthma ( $\chi^2 = 9.04, p = 0.0029$ ). There was insignificant difference in the baseline knowledge between experimental and control groups for basic principles of emergency care ( $\chi^2 = 3.28, p = 0.35$ ), understanding choke ( $\chi^2 = 3.20, p = 0.36$ ), knowledge of wound and bleeding ( $\chi^2 = 2.00, p = 0.572$ ), understanding of burn ( $\chi^2 = 0.80, p = 0.849$ ), first aid for shock ( $\chi^2 = 5.20, p = 0.158$ ), first aid for diabetes ( $\chi^2 = 0.36, p = 0.549$ ) and avulsed tooth ( $\chi^2 = 3.24, p = 0.072$ ). The overall baseline knowledge using correct responses also showed a very insignificant difference in knowledge, with control having 44.26% correct response (mean = 13.72, SD = 2.69) and experimental having 42.65% (mean = 13.22, SD = 2.52).

### ***Research Question 2a/Inferences:***

How does first-aid training improve the immediate knowledge acquisition of secondary school students in Delta State, Nigeria, compared to those who have not received training? The post-intervention knowledge scores of students on first aid are presented in Table 4.3

**Table 4.3***Table 4.3 Post-intervention Knowledge of First Aid among Secondary School Students*

First Aid/Responses	Control (N = 100)				Experimental (N = 100)				$X^2$	$p$ -value
	Obiaruku		Abraka		Amai		Gbesa			
	N	%	N	%	N	%	N	%		
Basic Principles of Emergency Care									0.02	0.888 <sup>NS</sup>
correct response	23	45.5	22	44.5	29	57.5	27	54.0		
incorrect response	27	54.5	28	55.5	21	42.5	23	46.0		
Understanding Choke									8.00	0.005*
correct response	20	39.3	22	43.3	23	45.3	15	30.0		
incorrect response	30	60.7	28	56.7	27	54.7	35	70.0		
Knowledge of Wound & Bleeding									2.42	0.120 <sup>NS</sup>
correct response	26	52.0	22	44.5	32	64.0	31	62.5		
incorrect response	24	48.0	28	55.5	18	36.0	19	37.5		
Understanding CPR									3.56	0.050 <sup>*</sup>
correct response	21	41.0	18	36.0	28	55.5	29	58.0		
incorrect response	49	59.0	32	64.0	22	44.5	21	42.0		
Understanding Seizure									24.50	0.000*
correct response	6	12.0	7	14.0	21	42.0	31	62.0		
incorrect response	44	88.0	43	86.0	29	58.0	19	38.0		
Understanding Burn									2.42	0.000*
correct response	22	44.0	24	48.0	26	47.0	17	34.0		
incorrect response	28	56.0	26	52.0	24	53.0	33	66.0		
First Aid for Asthma									44.18	0.000*
correct response	40	80.0	38	76.0	37	73.0	32	64.0		
incorrect response	10	20.0	12	24.0	13	27.0	18	36.0		
First Aid for Shock									31.78	0.000*
correct response	31	62.0	30	60.0	37	74.0	35	70.0		
incorrect response	19	38.0	20	40.0	13	26.0	15	30.0		
First Aid for Diabetes									8.82	0.003*
correct response	29	62.0	30	59.0	32	64.0	30	61.0		
incorrect response	21	38.0	20	41.0	18	36.0	20	39.0		
First Aid for Avulsed & Cracked Tooth									0.02	0.888 <sup>NS</sup>
correct response	20	40.8	22	44.0	26	51.5	31	61.3		
incorrect response	30	59.3	28	56.0	24	48.5	19	38.8		
Mean correct score	14.4		14.32		17.4		17.2			
							4			
SD	2.60		2.45		3.00		3.18			
% Pass	46.5		46.2		56.1		55.6			

<sup>NS</sup> = no significant difference, \* = significantly different

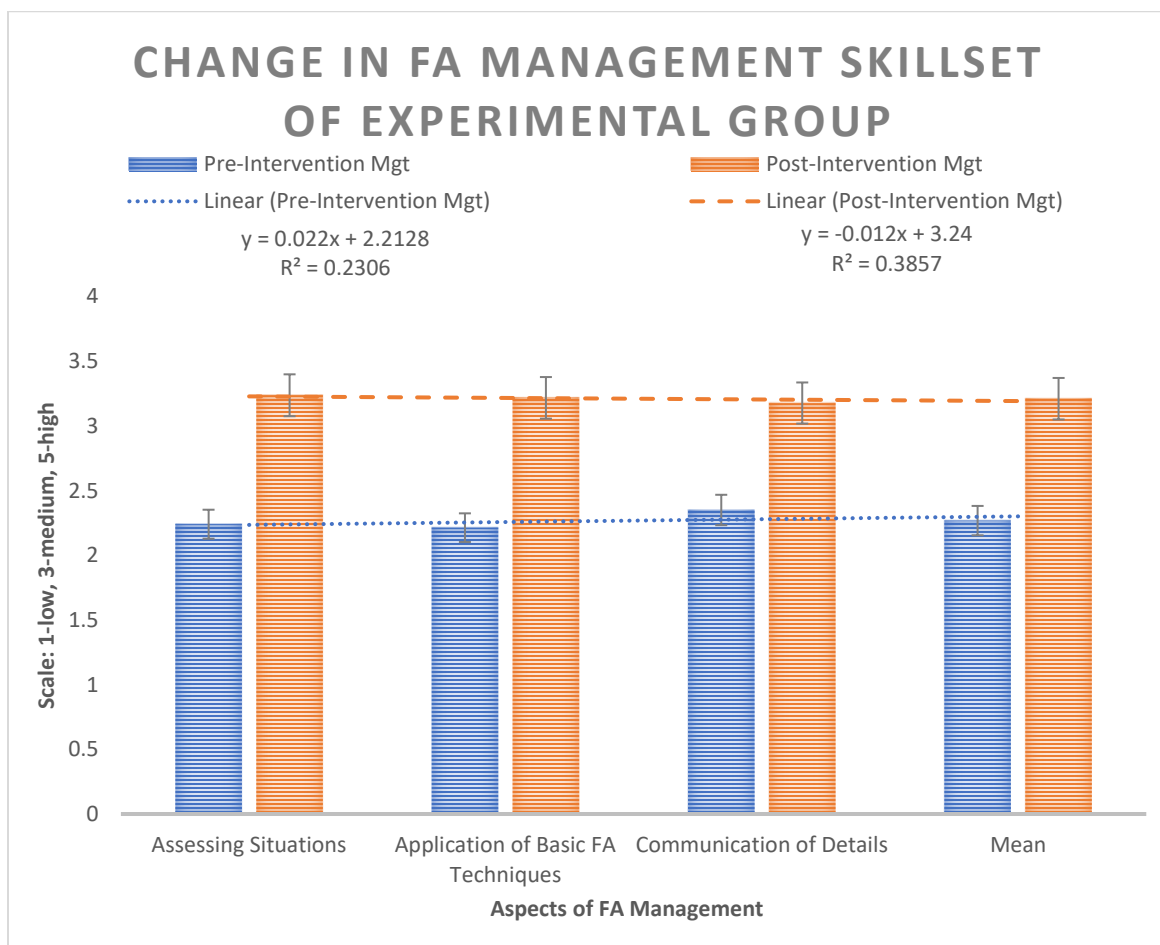
The effect of the training intervention was assessed by comparing the knowledge of FA between the control and experimental groups, as presented in Table 4.3. The data showed there was a significant difference in FA knowledge for all ten aspects apart from Basic principles for emergency care ( $\chi^2 = 0.02, p = 0.888$ ) and knowledge on wound/bleeding ( $\chi^2 = 2.42, p = 0.120$ ) and first aid for avulsed tooth ( $\chi^2 = 0.02, p = 0.888$ ). For understanding choke ( $\chi^2 = 8.00, p = 0.005$ ), understanding CPR ( $\chi^2 = 3.56, p = 0.050$ ), seizure ( $\chi^2 = 24.50, p = 0.000$ ), burn ( $\chi^2 = 2.42, p = 0.000$ ) and first aid for Asthma ( $\chi^2 = 44.18, p = 0.000$ ), shock ( $\chi^2 = 31.78, p = 0.000$ ) and diabetes ( $\chi^2 = 8.82, p = 0.003$ ) there was a significant difference in the baseline knowledge between experimental and control groups. The range for correct responses for the control was from  $14.32 \pm 2.45$  (46.2%) to  $14.40 \pm 2.60$  (46.5%) for the control group, while the experimental showed a better average between  $17.24 \pm 3.18$  (55.6%) and  $17.40 \pm 3.00$  (56.1%).

### ***Research Question 2b/Inferences:***

Does first-aid training improve the FA emergency management skillset of secondary school students in Delta State, Nigeria? To substantiate the effect of the training, the observation checklist was used to assess students in groups of 2-3 per group. The baseline knowledge of the experimental group serves as the control for assessing whether the training impacts the FA management skillset of students. Following the Solomon 4-stage design, only students in the experimental group who received the pretest were observed for their emergency management skills by drawing on the scores observed before and immediately after the training for all areas of first aid covered in the course content and knowledge questionnaire. These were principles of emergency care, choking, wound/bleeding, CPR, seizure, burns, asthma, and diabetes. The first

aid management skill set was assessed using three scaled constructs (appropriateness, time management and responsiveness) as given in the observational checklist, and three areas of FA management were assessed, as seen in Figure 4.1 and Table 4.4.

**Figure 4.1** *Participant's FA Management Skillset in the Experimental Group Before and After Intervention*



The analysed data showed that there was a substantial change (significant) between pre-intervention management and post-intervention management skills for assessing the FA situations covered in the course ( $\chi^2 = 30.0$ ,  $p = 0.001$ ), application of basic FA techniques ( $\chi^2 = 15.0$ ,  $p =$

0.010) and communication of FA details ( $\chi^2 = 21.0$ ,  $p = 0.007$ ). The results also showed that the pre-intervention FA emergency management skill score of  $2.26 \pm 0.93$  (45.16% correct management skillset) greatly improved after post-intervention to  $3.20 \pm 0.83$  (63.98% correct FA management skillset) (see table 4.4).

**Table 4.4**

*Table 4.4 Change in FA Management Skillset among Secondary School Students in Delta State*

First Aid Management	Pre-Management			Post-Management			$\chi^2$	$p$ -value
	A	TM	R	A	TM	R		
Assessing Situations	2.44	2.23	2.05	3.07	3.39	3.25	30.0	0.001*
Application of Basic FA Techniques	2.19	2.32	2.13	3.07	3.26	3.32	15.0	0.010*
Communication of Details	2.26	2.47	2.32	3.16	3.21	3.16	21.0	0.007*
Weighted Mean	2.30	2.34	2.17	3.10	3.29	3.24		
SD	0.13	0.12	0.14	0.05	0.09	0.08		
Overall Mean Management	2.26±0.93			3.20±0.83				
Management skill (%)	45.16			63.98				
t-value = -12.645, $p$ -value = 0.000*, df = 18								

<sup>NS</sup> = No significant difference, \*S = significantly different, N = 19 (Scale 1-low, 3-medium, 5-high), A = appropriateness, TM = time management, R = responsiveness

The students' T-test was also carried out concurrently to determine whether this improvement in FA management skills is significant. The results showed significant changes in scores ( $t = -12.645$ ,  $p = 0.000$ ) between participants' pre and post-intervention FA management skillsets.

### Research Question 3/Inferences:

Which intervening factors or demographic characteristics (such as age, gender, and prior exposure to first aid situations) influence the immediate knowledge of secondary school students following first aid training in Delta State? The level of interaction between the intervening factors and the post-test outcome is presented in Table 4.5.

**Table 4.5**

*Table 4.5 Intervening/ Demographic Factors and Their Influence on the Knowledge Scores of Participants Immediately After the First Aid Training*

Tests of Between-Subjects Effects						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	496.622 <sup>a</sup>	6	82.770	10.606	.000	.248
Intercept	191.587	1	191.587	24.548	.000	.113
Intervention	105.969	1	105.969	13.578	.000*	.066
Banner presence	11.063	1	11.063	1.418	.235 <sup>NS</sup>	.007
Previous Knowledge	37.249	1	37.249	4.773	.030*	.024
Class	5.166	1	5.166	.662	.417 <sup>NS</sup>	.003
Age	.335	1	.335	.043	.836 <sup>NS</sup>	.000
Gender	20.689	1	20.689	2.651	.105 <sup>NS</sup>	.014
Error	1506.258	193	7.804			
Total	52184.000	200				
Corrected Total	2002.880	199				

R Squared = .248 (Adjusted R Squared = .225)  
Dependent Variable: Posttest  
<sup>NS</sup> = has no significant effect, \* = has significantly effect

According to the ANCOVA analysis of the data in Table 4.5, the two main factors had an interactive influence on the post-test scores of participants. The variables considered were training intervention, presence of a banner, previous knowledge, participant's class of study, age, and gender. Of these variables, only training intervention ( $F = 13.578$ ,  $p = 0.000$ ) and previous knowledge ( $F = 4.773$ ,  $p = 0.030$ ) had a significant interactive effect. This follows the decision

rule that if the analysed p-value is less than the statistical p-value of 0.05, it is considered statistically significant.

### **Research Question 4a/Inferences:**

What is the retention rate of secondary school students towards FA knowledge one month after the training? After one month of the training/ intervention programme, the retention rate was analysed and presented in Table 4.6.

**Table 4.6**

*Table 4.6 Retention Rate for First Aid Knowledge One Month After the Intervention among Secondary School Students in Delta State*

First Aid/Responses	Control (N = 100)		Experimental (N = 100)						$\chi^2$	p-value
	Obiaruku	Abraka	Amai	Gbesa						
	N	%	N	%	N	%	N	%		
Basic principles of Emergency Care									0.030	0.880 <sup>NS</sup>
correct response	17	33.0	20	40.5	31	61.0	34	67.5		
incorrect response	34	67.0	30	59.5	20	39.0	16	32.5		
Understanding Choke									4.500	0.034*
correct response	22	43.3	23	45.3	24	48.0	16	32.0		
incorrect response	28	56.7	27	54.7	26	52.0	34	68.0		
Knowledge of Wound/Bleeding									5.120	0.024*
correct response	27	54.5	23	46.0	34	67.5	32	64.5		
incorrect response	23	45.5	27	54.0	16	32.5	18	35.5		
Understanding CPR									14.364	0.045*
correct response	23	45.0	15	30.0	29	57.0	31	62.5		
incorrect response	27	55.0	35	70.0	21	43.0	19	37.5		
Understanding Seizure									20.48	0.000*
correct response	9	18.0	4	8.0	28	54.0	27	54.0		
incorrect response	41	82.0	46	92.0	22	46.0	23	46.0		
Understanding Burn									0.180	0.671 <sup>NS</sup>
correct response	26	52.0	21	42.0	27	54.0	23	46.0		
incorrect response	24	48.0	29	58.0	23	46.0	27	54.0		
First Aid for Shock									14.580	0.000*
correct response	28	56.0	30	60.0	37	74.0	32	64.0		
incorrect response	22	44.0	20	40.0	13	26.0	18	36.0		
First Aid for Asthma									19.220	0.000*
correct response	32	64.0	22	44.0	44	88.0	33	66.0		
incorrect response	18	36.0	28	56.0	6	12.0	17	34.0		

First Aid for Diabetes									10.580	0.001*
correct response	24	49.0	32	63.0	34	68.0	31	63.0		
incorrect response	26	51.0	18	37.0	16	32.0	19	37.0		
First Aid for Avulsed/Cracked Tooth									2.080	0.556 <sup>NS</sup>
correct response	22	44.5	23	46.0	28	56.3	27	54.0		
incorrect response	28	55.5	27	54.0	22	43.8	23	46.0		
% Mean score	14.08		13.38		18.68		17.92			
SD	2.36		2.70		3.32		3.67			
Retention scores	45.4		43.2		60.3		57.8			
Retention (%)	97.6		93.5		107.5		104			
NS = no significant difference, * = significantly different										

After the training intervention, the retention pattern was assessed by comparing FA's post-intervention knowledge and students' knowledge after one month for both the untrained (control) and trained (experimental) groups, as presented in Table 4.6. The data revealed a significant difference in FA knowledge retention with increased knowledge after one month. The only aspects of FA that had no significant change in retention were Basic principles for emergency care ( $\chi^2 = 0.03$ ,  $p = 0.880$ ), understanding burn ( $\chi^2 = 0.180$ ,  $p = 0.671$ ) and first aid for avulsed or cracked tooth ( $\chi^2 = 2.080$ ,  $p = 0.556$ ). For others, there was a significant increase or decrease in knowledge. For understanding choke ( $\chi^2 = 4.500$ ,  $p = 0.034$ ), knowledge of wound/bleeding ( $\chi^2 = 5.120$ ,  $p = 0.0024$ ), CPR ( $\chi^2 = 14.364$ ,  $p = 0.045$ ), understanding seizure ( $\chi^2 = 20.48$ ,  $p = 0.000$ ), First aid for shock ( $\chi^2 = 14.580$ ,  $p = 0.000$ ), first aid for Asthma ( $\chi^2 = 19.220$ ,  $p = 0.000$ ), and first aid for diabetes ( $\chi^2 = 10.580$ ,  $p = 0.001$ ) had significant changes and with improvement in knowledge content. The range of correct responses for the control was from 14.08±2.36 (45.4%) for Obiaruku and 13.38±2.70 (43.2%) for Abraka (control groups), while the experimental showed a better average between 18.68 ±3.32 (60.3%) for Amai and 17.92±3.67 (57.8%) for Gbesa. Therefore, the retention for Obiaruku was 97.6%, Abraka was 93.5%, Amai was 107.5%, and Gbesa was 104%, showing increased understanding.

**Research Question 4b/Inferences:**

What is the difference between participants' first-aid emergency management skills immediately after the intervention and one month after the training? The retention rate of FA emergency management skills was calculated by comparing the skills observed after one month of the interventions with those observed immediately after the training (post-intervention) multiplied by 100. Following the Solomon 4-stage design, only the experimental group that did not participate in the pretest were eligible (50) for the retention test. This group were observed immediately after the training and one month later for retention. The observation checklist was used to observe the eligible students (in groups of 3-4, given a total of 15 groups) performing the various FA emergency management skills given in the course content immediately after receiving the training and one month later for all areas of first aid covered in the course content and knowledge questionnaire. These were principles of emergency care, choking, wound/bleeding, CPR, seizure, burns, asthma, and diabetes. The first aid management skill set was assessed using three scaled constructs (appropriateness, time management and responsiveness) as given in the observational checklist, and three areas of FA management were assessed, as seen in Figure 4.2 and presented in Table 4.7.

**Table 4.7**

*Table 4.7 Retention of FA Emergency Management Skills among Secondary School Students in Delta State*

First Aid Management	Post-Management			Retention			$\chi^2$	$p$ -value
	A	TM	R	A	TM	R		
Assessing Situations	3.18	3.71	3.18	1.93	2.60	1.98	17.0	0.002*
Application of Basic FA Techniques	3.40	3.70	3.43	2.23	2.40	2.77	34.0	0.000*
Communication of Details	3.27	3.87	3.20	2.47	2.67	2.40	17.0	0.004*
Weighted Mean	3.28	3.76	3.27	2.21	2.56	2.38		
SD	0.11	0.10	0.14	0.27	0.14	0.40		
Overall Mean Management	3.44±0.82			2.38±0.93				
FA Management skill Retention (%)	68.89			47.65				
% Retained	[69.17]							
t-value = 13.483, $p$ -value = 0.000*, df = 14								

<sup>NS</sup> = No significant difference, \*S = significantly different, N = 15 (Scale 1-low, 3-medium, 5-high), A = appropriateness, TM = time management, R = responsiveness

Table 4.7 shows the FA emergency management retention rate among participants. The results showed a significant change ( $t = 13.483$ ,  $p = 0.000$ ) between post-intervention FA management skills and those observed after one month of training. This was evident for all the three scaled constructs used: assessing FA situations ( $\chi^2 = 17.0$ ,  $p = 0.002$ ), application of basic FA techniques ( $\chi^2 = 34.0$ ,  $p = 0.000$ ) and communication of FA details ( $\chi^2 = 17.0$ ,  $p = 0.004$ ). The results also showed that the post-intervention FA emergency management skill score of  $3.44 \pm 0.82$  (68.89% correct FA emergency management skillset) dropped due to the one-month time lap to  $2.38 \pm 0.93$  (47.65% correct management skillset). Hence, the retention rate for FA emergency management skills is 69.17%.

**Figure 4.2** *The Retention Rate of Participant's FA Management Skillset after One Month of Intervention*

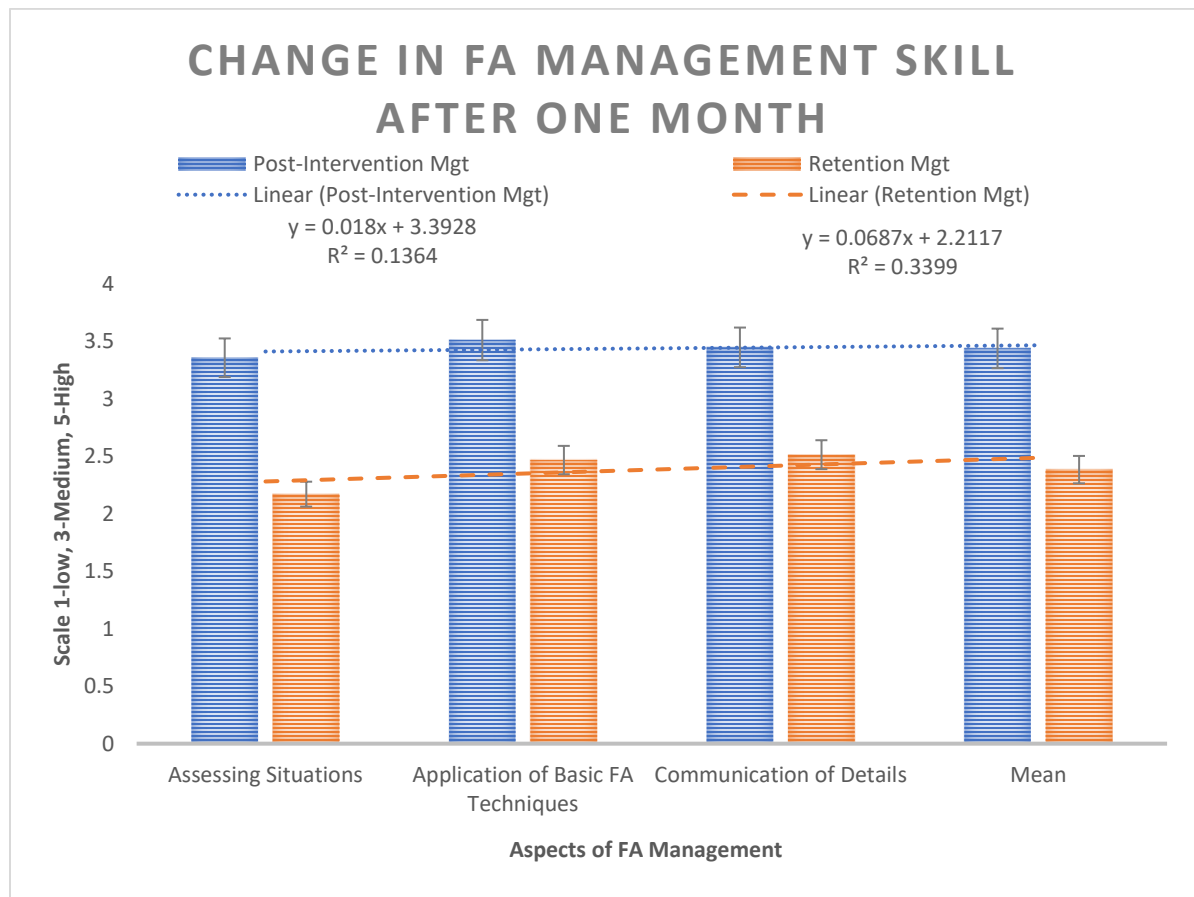


Figure 4. 2 also confirmed the knowledge drop in FA emergency management skills. This suggests that the existing relationship between participants' FA emergency management skills immediately after intervention and one month after is weak.

#### **Research Question 5a/Inferences:**

What factors have an interactive effect on the retention rate following the first aid training for secondary school students in Delta State? The moderating factors that affect the retention rate are presented in Table 4.8.

**Table 4.8***Table 4.8 Interactive Factors Moderating Retention Rates After FA Training Intervention*

Tests of Between-Subjects Effects								
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>b</sup>
Corrected Model	1154.575 <sup>a</sup>	8	144.322	15.623	.000	.396	124.987	1.000
Intercept	119.372	1	119.372	12.922	.000	.063	12.922	.947
Banner Posted	1.033	1	1.033	.112	.738 <sup>NS</sup>	.001	.112	.063
Previous Knowledge	1.907	1	1.907	.206	.650 <sup>NS</sup>	.001	.206	.074
Gender	1.928	1	1.928	.209	.648 <sup>NS</sup>	.001	.209	.074
Age	33.092	1	33.092	3.582	.060 <sup>NS</sup>	.018	3.582	.469
Class	50.294	1	50.294	5.445	.021*	.028	5.445	.641
Schools	13.515	1	13.515	1.463	.228 <sup>NS</sup>	.008	1.463	.225
Posttest	21.604	1	21.604	2.339	.128 <sup>NS</sup>	.012	2.339	.331
Intervention	261.706	1	261.706	28.331	.000*	.129	28.331	1.000
Error	1764.380	191	9.238					
Total	54215.00	200						
Corrected Total	2918.955	199						

a. R Squared = .396 (Adjusted R Squared = .370)

b. Computed using alpha = .05

Dependent Variable: Retention

<sup>NS</sup> = no significant effect, \*S = significant effect

The analysed data in Table 4.8 showed that two major variables had an interactive effect on the retention rate of students using the ANCOVA analysis. The variables considered were training intervention, banner presence, previous knowledge, participant's class of study, age, posttest examination, school type, and gender. Of these variables, only training intervention ( $F = 28.331, p = 0.000$ ) and a class of study ( $F = 50.294, p = 0.028$ ) had a significant interactive effect,

while other variables did not. This follows the decision rule that the null hypothesis is rejected if the analysed value of ‘p’ is lesser than the statistical p-value of 0.05.

### **Research Question 5b/Inferences:**

What is the magnitude of improvement in first-aid knowledge among experimental participants, as determined by binary logistic regression analysis? The impact of the training on the level of knowledge of FA among the experimental participants is presented in Table 4.9.

**Table 4.9**

*Table 4.9 The Overall Contribution of Independent Variables on The Knowledge of FA among Participants*

‘Variables in the Equation’		B	SE	‘Wald’	df	Sig.	‘Exp (B)’	‘95% CI for EXP(B)’	
								Lower	Upper
Step 1 <sup>a</sup>	Previous Knowledge (1)	-.338	.362	.874	1	.350	.713	.351	1.448
	Banner (1)	-.464	.487	.907	1	.341	.629	.242	1.634
	Gender(1)	-.103	.331	.096	1	.757	.903	.471	1.728
	Age	-.098	.117	.695	1	.404	.907	.721	1.141
	Class			2.405	3	.493			
	Class(1)	-.407	.602	.458	1	.499	.665	.205	2.165
	Class(2)	-.681	.526	1.674	1	.196	.506	.181	1.419
	Class(3)	-.582	.435	1.790	1	.181	.559	.238	1.311
	Intervention	1.419	.455	9.718	1	.002*	4.131	1.693	10.080
	Constant	.345	1.984	.030	1	.862	1.412		

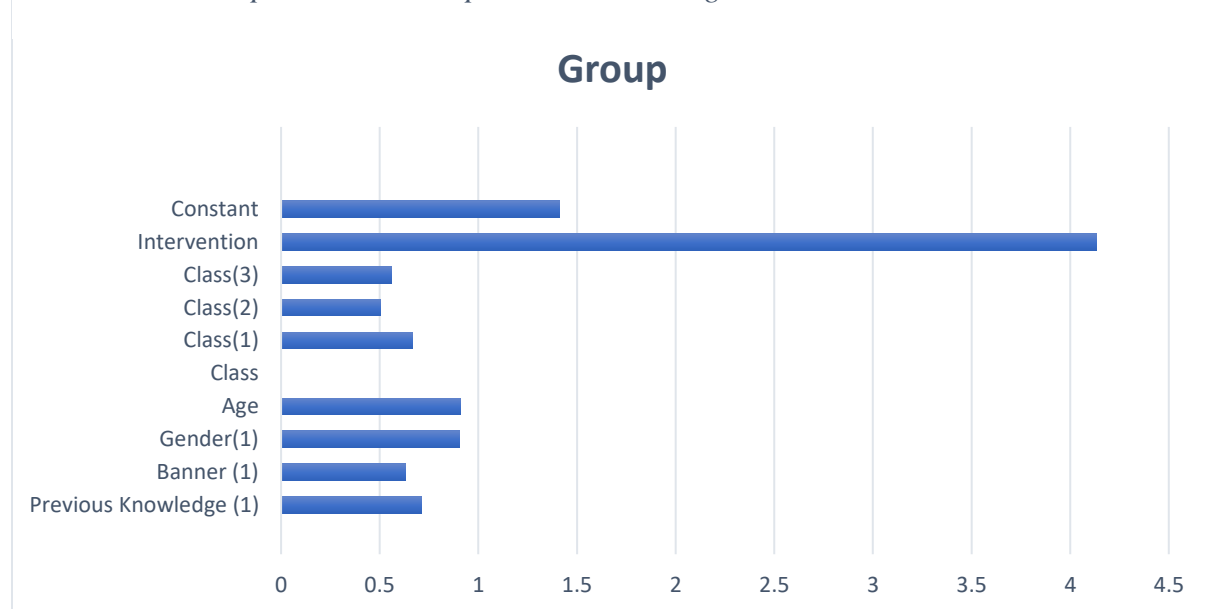
a. Input variable(s) provided in step 1: Previous Knowledge, Banner, Gender, Age, Class, Intervention,

\*significant

Table 4.9 shows the binary logistic regression analysis conducted to ascertain the magnitude of improving the FA knowledge of experimental participants through varied instructional methods and other demographic variables. The odd ratio indicates that, for every

participant who was trained in first aid, there is the likelihood that they will be approximately four times (AOR = 4.131) more knowledgeable than those who did not have any intervention, even with their previous knowledge and availability of FA banners and posters on average. This tendency to be more knowledgeable ranged from 1.693 to 10.080 times. The increase in other variables is less likely to affect performance after the training intervention, although it has a varied range, as observed in Figure 4.3.

**Figure 4.3** *The Predictors of FA Knowledge among Secondary School Students Enrolled on the Experimental Group in Delta State Nigeria*



Besides the training intervention, an odds ratio of less than 1 for all other factors indicates that each factor is negatively associated with the likelihood of improved first-aid knowledge. This suggests that the presence of a banner, previous knowledge, class of study, age, and gender may reduce the probability of students having better first-aid knowledge, controlling for other variables. In other words, the likelihood of possessing or gaining first aid knowledge in the presence of these

factors is low. Further exploration would be needed to understand the reasons behind these associations.

### ***Restating the hypothesis:***

**Hypothesis 1:** After the training, there were no significant differences between the experimental and control groups' knowledge scores on First Aid for emergencies. The hypothesis was tested in Table 4.10 through a t-test analysis.

**Table 4.10**

*Table 4.10 T-Test Analysis of Significant Differences in the Treatment Group and the Control Group FA Knowledge Post Scores*

'Paired Samples Test'		'Paired Differences'				T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	'Std. Error Mean'	95% Confidence 'Interval of the Difference' Lower Upper			
Pair 1	Mean difference	-2.960	4.0922	.4092				
	Posttest Control	14.360	2.5167	.2517	-3.7719 -2.1480	-7.233	99	.000*
	Posttest Experimental	17.320	3.0777	.3087				

Correlation = -0.061,  $p = 0.549$ ,  $N = 100$

\*Significantly different, <sup>NS</sup> = not significantly different

Table 4.10 showed a significant ( $t = -7.233$ ,  $p = 0.000$ ,  $df = 99$ ) difference between the experimental and control group post-intervention knowledge. The result also showed that the mean posttest score of  $14.360 \pm 2.52$  for the control group was also lower than the mean FA score of  $17.320 \pm 3.08$  for the experimental group.

**Hypothesis 2:** There is no significant difference between the pre-and post-knowledge scores on first aid in the experimental group. The hypothesis was tested in Table 4.11 through a t-test analysis.

*Table 4.11 T-test Analysis on the ‘Significant Difference Between Pre and Post-intervention for FA Knowledge’*

		‘Paired Samples Test’						t	df	Sig. (2-tailed)
		Mean	Std. Dev.	Std. Error	95% CI of the Difference					
				Mean	Lower	Upper				
Pair 1	Mean difference	-	4.388	.621						
	Pre intervention	4.180	2.518	.356	-5.427	-2.933	-6.736	49	.000*	
	Post intervention	13.220	3.003	.425						
Correlation = -0.257, p = 0.071, N = 50										

\*Significantly different, <sup>NS</sup> = not significantly different

The results in Table 4.11 showed a significant ( $t = -6.738$ ,  $p = 0.000$ ,  $df = 49$ ) difference in the pre-intervention and post-intervention results of the experimental group (Amai Grammar Schools). The result also revealed that the mean pre-intervention score was  $13.220 \pm 2.52$ , which was also lower than the post-intervention FA score of  $17.400 \pm 3.00$ .

**Hypothesis 3:** The demographic variables (i.e. age, class, gender, prior knowledge, etc.) of the participants do not significantly affect the post-intervention FA knowledge in Delta State, Nigeria. The effect of demographic variables on the post-test scores is presented in Table 4.12.

**Table 4.12**

*Table 4.12 'Multiple Regression Analysis' on The Significant Impact of The Demographic Variables of The Participants on Outcome of FA Training*

Model Summary										
Model	R	R Square	'Adjusted R Square'	'Std. Error of the Estimate'	'Change Statistics'			df	df2	Sig. 'F Change'
					'R Square Change'	F Change	1			
1	.471 <sup>a</sup>	.222	.197	2.8422	.222	9.155	6	193		.000
a. Predictors: (Constant), Schools, Class, Gender, Banner Posted, Previous Know, Age										
ANOVA <sup>a</sup>										
Model		'Sum of Squares'		df	'Mean Square'	F		'Sig.'		
1	'Regression'	443.761		6	73.960	9.155		.000 <sup>b</sup>		
	'Residual'	1559.119		193	8.078					
	Total	2002.880		199						
'a. Dependent Variable': Posttest										
'b. Predictors: (Constant)', Schools, Class, Gender, BannerPosted, PreviousKnow, Age										
Coefficients <sup>a</sup>										
Model		Unstandardized Coefficients		Standardized Coefficients		t		Sig.		
		B	Std. Error	Beta						
1	(Constant)	7.432	1.813			4.098		.000		
	Gender	.791	.426	.123		1.857		.065		
	Age	.010	.148	.006		.066		.948		
	Class	.212	.255	.072		.832		.407		
	Previous Know	1.500	.438	.231		3.423		.001*		
	Banner Posted	2.543	.487	.348		5.221		.000*		
	Schools (treatment groups)	.532	.207	.188		2.564		.011		
a. Dependent Variable: Posttest, * significantly different										

In Table 4.12, multiple regression analysis was employed to ascertain the effect of demographic variables on the post-intervention knowledge of the students. The result revealed that demographic factors like gender ( $t = 1.857$ ,  $p = 0.065$ ), age ( $t = 0.066$ ,  $p = 0.948$ ), and class of study ( $t = 0.832$ ,  $p = 0.407$ ) do not have any significant effect on the post-intervention knowledge. However, previous FA knowledge ( $t = 3.423$ ,  $p = 0.001$ ), training intervention ( $t = 2.564$ ,  $p = 0.011$ ) and the presence of FA banners ( $t = 5.221$ ,  $p = 0.000$ ) had a significant impact

on the post-intervention knowledge of the participants. Based on the ANOVA carried out, all demographic factors put together had a significant effect ( $F = 9.155$ ,  $p = 0.000$ ) on the post-intervention knowledge. This pooling effect was determined using the R-square of 0.222, which means all demographic factors and the training intervention had a 22.2% possibility of influencing the FA knowledge of the students.

Following the decision rule, if the p-value is more than 0.05, then the relationship is not significant. Since the p-value of 0.000 is lesser than 0.05, then the null hypothesis, which states that there is no significant effect on demographic factors of the participants on FA knowledge in Delta State, Nigeria, can be rejected, while we fail to reject the alternate hypothesis. It can therefore be said that the participants' demographic variables significantly impact the outcome of FA training in Delta State, Nigeria.

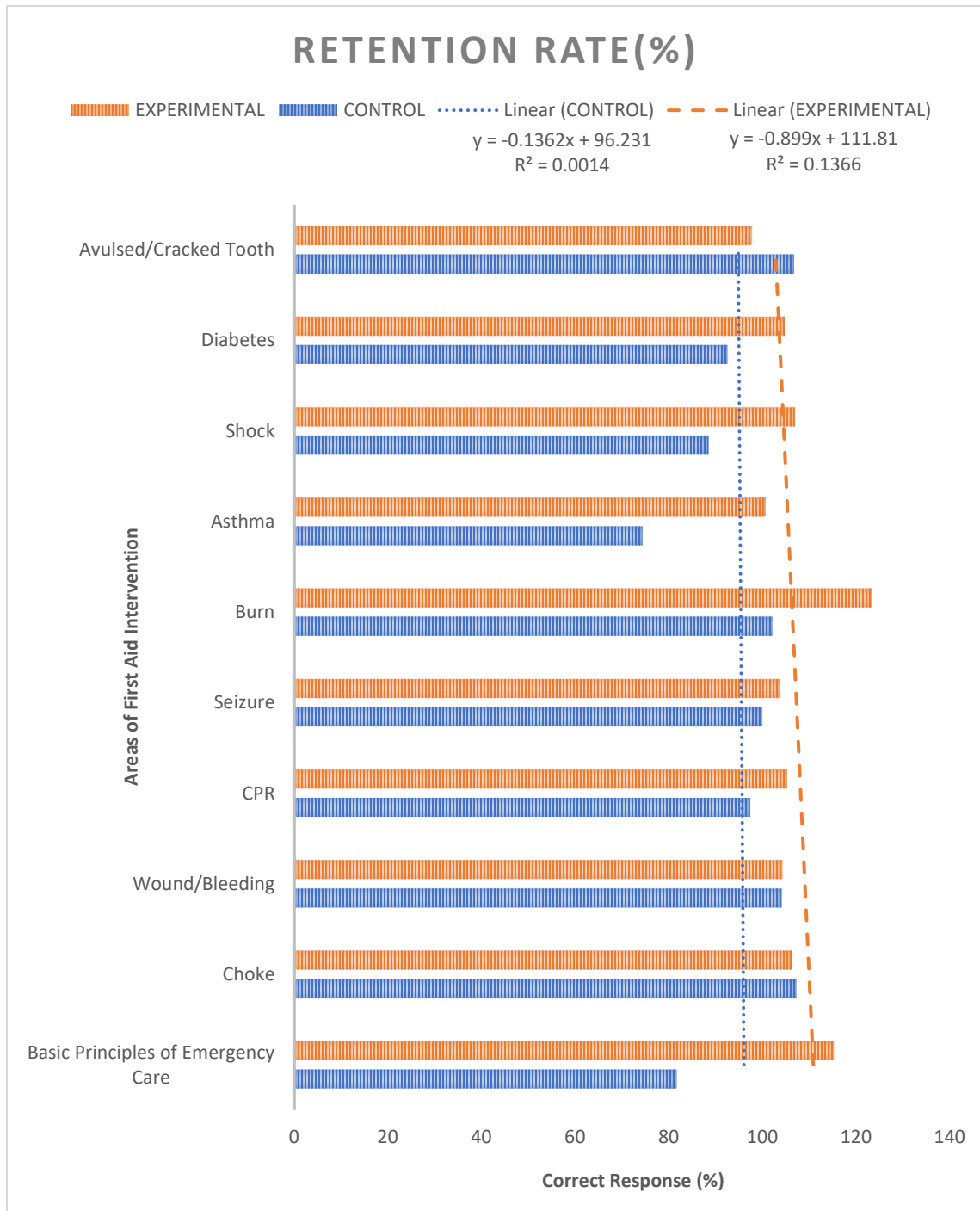
**Hypothesis 4:** No significant differences exist between participant post-test knowledge scores and retention rates one month after the FA intervention programme. The difference between the knowledge retention and post-intervention score is given in Table 4.13.

**Table 4.13**

*Table 4.13 T-test Analysis on the Significant Difference Between Posttest and Learning Retention for FA Knowledge*

‘Paired Samples Test’								
		‘Paired Differences’				T	df	
		Mean	Std. Deviation	‘Std. Error Mean’	‘95% Confidence Interval of the Difference’ Lower Upper			‘Sig. (2-tailed)’
Pair 1	Mean difference	-.1750	4.4388	.62053	-.79394 .44394	-.558	199	.578 <sup>NS</sup>
	Posttest score	15.840	3.17249	.22433				
	Retention score	16.015	3.82990	.27081				
Correlation = 0.207, p = 0.003, N = 200								
*Significantly different, <sup>NS</sup> = not significantly different								

**Figure 4.4** Participant's Retention Pattern After One Month of Training Intervention



The findings presented in Table 4.13 revealed that the observed increase in knowledge ( $t = -0.558$ ,  $p = 0.578$ ,  $df = 199$ ) between the students' immediate post-intervention and retention

246

scores was insignificant, as observed in Figure 4.4. The result also showed that the mean post-intervention score of  $15.840 \pm 3.17$  was slightly lower than the retention score of  $16.016 \pm 3.83$ . Although there was an improvement in individual FA areas, the overall changes observed were not statistically significant.

## **Evaluation of Findings**

### ***Participant's pre-intervention knowledge of first aid***

The first research question elicited information on the pre-intervention knowledge of students in secondary schools in Delta State for the group who received training (experimental groups) and those who did not receive training (control groups). The analysed data showed that the pre-intervention knowledge (% correct responses) was 44.3% and 42.7%, below the expected average of 50% for the control and experimental group, respectively (Table 4.2). It is critical to note that the schools were selected on the grounds that the current set of students has never been trained on FA, even though they offer physical and health education as a subject. This alone explains the reason why the level of knowledge is slightly below average. However, based on the decision rule and the dichotomy placed for being knowledgeable or not, one can say the knowledge level is low, poor or not knowledgeable on a general note. This result is not very different from that of Adesegun et al. (2019), who also had less than 44% of participants with good knowledge, meaning more than 56% had poor knowledge before the commencement of the training. There would not have been any need for intervention if they had very good knowledge; hence this justifies the purpose of carrying out the study in the designated schools.

The study in Nepal by Thepa et al. (2017) also had high school students with poor knowledge of first aid, especially with seizures. Fricke-Galindo et al. (2018), AlHammadi et al. (2017) and Kaul et al. (2017) papers opined that most of their study participants had poor to fair knowledge at baseline, which is similar to the case of secondary school students in Delta State, Nigeria. It is then evident that at the baseline level, knowledge of FA was poor. Other studies where poor pre-intervention knowledge was recorded were Alyahya et al. (2019), Jamaludin et al. (2018), Amro & Qtaity (2017), Jones et al. (2017) and Joseph et al. (2015). The poor knowledge of participants indicates that first aid is currently not well practised or adopted within these schools, and the attention of relevant authorities is needed at this point.

The level of knowledge can be said to be detrimental to the health and safety of the students within and outside the school. Though the knowledge level was rated poor or low, the outcome for the inferential statistical did not reveal any significant difference between the pre-intervention knowledge on FA for basic principles of emergency care, choke, wound/bleeding, burn, shock, diabetes, and avulsed tooth. However, there was a notable ('significant') difference in knowledge of CPR, seizure, and asthma among participants from the experimental and treatment groups (Table 4.2). The absence of differentiated knowledge between the two groups could be attributed to the reduced complexity of administering FA on the wound, burns, and avulsed tooth, which is readily taught in health education. Some curriculums try to cover these areas of public health; however, there is some form of complexity in performing FA for CPR, and because of those with previous knowledge, it is possible to see these variations in knowledge. Asthma, seizure and CPR can be seen as FA that needs special expertise, and in African settings, health conditions like seizure are given different interpretations of the cause. Except for those that have had first aid

exposition on seizure, CPR and others, this notion is carried into schools. Hence, it is not surprising to see the difference in knowledge content for seizures, asthma and CPR.

### ***Effect of training intervention on FA Knowledge of Participants***

The second research question was to determine the impact of FA training on the understanding of secondary school pupils in Delta State, Nigeria. The findings revealed that the post-intervention understanding of FA increased for the experimental group (55.6% – 56.1%) while the control group remained low (46.2% – 46.5%), as seen in Table 4.3. By comparing the degree of change (improvement) in FA knowledge between the ‘experimental and control group,’ the effect of the training can be said to have a positive impact on the knowledge outcome. There was an increase in FA knowledge, which did not happen with the control group. This finding corroborates with that of Kapoor et al. (2017), Mizra et al. (2017), Czyzewski et al. (2017) in Poland, who reported that training increased knowledge of FA. The study findings also align with the outcome of Mobarak et al. (2015), who reported that in Taif, Saudi Arabia, secondary school students' knowledge of FA improved after a training intervention. Bechara et al. (2018) also confirmed that training intervention positively influenced knowledge and confidence in the management of diabetes. One of the primary purposes of education is to gain knowledge and skills, which build the learner's confidence.

On the other hand, training focuses on developing specific skills, which stimulates productivity and confidence boosts. According to an online career guide by Indeed Editorial Team (2021), training enhances knowledge and skillset as trainees are exposed to relevant lessons and facts on a particular subject matter. This may have been why those who were trained had a better score, reflecting their improvement in knowledge compared to those who were not trained in FA.

It is believed that the singular act of training intervention can and will positively promote the skill set of participants in FA, even after secondary school. The training intervention must have boosted their morale and previous exposure to emergencies or knowledge of first aid, as Anderson et al. (2011) stated. The results also indicated that there was a notable (statistically significant) change and enhancement in knowledge for choke, CPR, seizure, burn, asthma, shock, and diabetes, while knowledge on basic principles for emergency care, wound/bleeding, and avulsed/cracked tooth had no significant difference (Table 4.3). Globally, it has been reported that knowledge of FA for Asthma is relatively poor or low (Aqeel et al., 2015; Adeyeye et al., 2018), and Africa accounted for most of these (Ozoh et al., 2019); hence, this improvement is a step in the right direction. In Amro & Qtaity (2017) report, participants had high FA scores for bleeding, but for CPR, it was moderate. The high scores for bleeding indicate a better understanding of wound/bleeding, as found in this study. In Onyeaso and Onyeaso's (2017a) study, CPR skills improved significantly after training in Port Harcourt, Nigeria. This clearly indicates that health conditions like burns, diabetes, and shock, which initially had no significant difference in knowledge content between the trained and untrained, now had a distinct line of differentiated knowledge level, while CPR and seizure retained their significant difference between the two groups. This contrasts with the findings from Bechara et al. (2018), who reported that training intervention positively influenced knowledge and confidence in managing diabetes. This could be interpreted to mean that the training intervention made a significant change in participants' knowledge in accordance with the report of Amro and Qtaity (2017).

### ***Intervening factors on the outcome of the training intervention***

The third research question was raised to find out if there were any significant interactive effects of intervening variables (age, class of study, banner presence, previous knowledge, training, and gender) on the outcome (the posttest knowledge or score on FA) of the training intervention on first aid among the secondary school students in Delta State. The results revealed a significant interactive impact of previous knowledge and the training intervention on the post-intervention knowledge of FA (Table 4.5). The hypothesis that asserts that the demographic variables of the participants have an insignificant impact on FA training in Delta State, Nigeria, was raised, and multiple regression analysis was employed to test for other explicit outcomes. The findings showed that demographic factors had a significant 22.2% pool influence on the knowledge of FA, mostly with previous knowledge and banner/poster presence. This suggests that a variety of multisensory teaching methods are predictors of the increase and retention of FA knowledge. Wu and Tai (2016) opined that a combination of multisensory instructional design improves students' motivation to learn, which in turn increases their knowledge. Knowledge of FA immediately after the intervention did not vary significantly by age, gender, or class of study (Table 4.12). The results suggest that the non-modifiable determinant alone does not significantly influence participants' knowledge and management skills.

This is in contrast with the report of Jamaludin et al. (2018) from Malaysia, who found that gender and year of study had an effect on knowledge; further, he recommended the implementation of curricula on first aid in schools. It is now clear that the training specifically influenced the participants' performance (the experimental group). At the same time, a positive outcome was observed when modifiable and non-modifiable determinants were combined to judge the training

outcome. Those who never got any training, irrespective of their previous knowledge, class, gender, or age, had lower scores. From this finding, the importance of training for the understanding of FA is thus re-emphasised and authenticated. This evaluation further validates the results of Mobarak et al. (2015), who recounted that training increased secondary school students' knowledge of FA in Taif, Saudi Arabia. It is also in accordance with the reports of Joseph et al. (2015), Amro and Qtaity (2017), Jones et al. (2017), Jamaludin et al. (2018) and Alyahya et al. (2019), who stated that training interventions significantly improve FA knowledge of participants.

This study, however, contradicts that of Jamaludin et al. (2018), who conducted a study in Malaysia on the effect of gender and the year of study. Jamaludin et al. (2018) reported that gender and year of study affected the knowledge. This reason may not be far-fetched, as it is known that societal beliefs, perceptions and practices, including the dynamism in human behaviour, may affect learning outcomes. If there is an established perception that first aid is meant for all genders and classes of persons, these variables will have a reduced effect on the learning outcome. Whilst it is not clear if this was the case for Jamaludin et al. (2018), it could be a result of the differences in the cognitive-motivational functioning of boys and girls in learning (Ghazvini & Khajehpour, 2011). The influence of previous knowledge re-iterates the importance of training. Even though the time when the previous training was conducted, or knowledge was gained was not specified, it explains the reason for the fairly reasonable pre-test score (knowledge of FA), which was around 45% correct responses. It also brings to mind the value the participants placed on FA training. A recent report from Taklual et al. (2020) asserts that previous first-aid training gotten by any participants can significantly affect the current training intervention demonstrated in this study.

### ***FA knowledge retention rate of participants***

In assessing the retention of FA knowledge, a fourth research question on the retention rate was formulated to determine changes in secondary school students' knowledge scores towards FA emergency skills/ management after one month of the intervention. Findings indicated a substantial disparity (significant) in the retention of knowledge for choke, wound/bleeding, CPR, seizure, shock, asthma, and diabetes; however, there was no change in knowledge after a month for basic principles of emergency care, burn, and avulsed/cracked tooth (Table 4.6) when post-intervention knowledge was compared with knowledge after one month of training for the intervention and control groups.

The differences in specific areas of FA between the two groups could be attributed to the level of complexity in administering FA. For example, CPR, Asthma and Diabetes are known to be serious illnesses that require dedicated and consistent care or attention, while avulsed tooth may not require special skills; hence, the reason for the non-significant difference observed. The study also showed that the number of correct responses on FA after one month (knowledge retention) increased from 56.1% to 60.3% (107.5% retention) and 55.6% to 57.8% (104% retention) for experimental and slightly dropped from 46.5% to 45.4% (97.6% retention) and from 46.2% to 43.2% (93.5%) for control (Table 4.6). After the session, there seemed to be an apparent increase in knowledge based on the evidence; however, this was not statistically significant (Table 4.11).

The learning retention rate (change in post-intervention knowledge after one month) among participants was not significant, although there was an increase in knowledge. The period (one month) could have been marked by the participants' quest to read more. It may not have been unconnected with the placement of banners within the school premises, which aroused participants'

continued interest in understanding FA. The findings are the same as that of Olumide et al. (2015), where participants in FA training developed more interest. One can also say that the inference from this is that students' interest in Nigeria will likely increase after a training session on FA, which calls for continuity from stakeholders and funders. One of the implications of this increase in knowledge is that it will take longer for the retention to drop, especially with the intense training received by the participants through various use of reliable multisensory teaching and learning styles. Although Bollig et al. (2009) and Anderson et al. (2011) reported a drop in retention after six months, it could have been attributed to the period participants were left unattended with no refresher course on FA or materials/ resources re-enforcement strategies in place. This could be done by positioning different relevant banners around strategic areas of the institution. The data from this study and others on retention rates can be put together for forecasting retention patterns.

#### ***4.4.5 Interaction of demographic factors with retention rates of Participants***

In this study, the learning retention rate recorded one month after training was assessed, and it was important to understand what factors influence retention. In response to this query, the question of what factors have an interactive effect on the retention following one month after the first aid training intervention among students in Delta State was raised. Findings showed that the participants' class (or level) of the study and the training intervention for the experimental groups had an interactive effect on the retention of FA knowledge (Table 4.8). Lubrano et al. (2005) & Borovnik et al. (2022) reported that retention was better with older students, which inferred that class of study could be a determinant factor. Retention was better for participants in the experimental group, while those in control had a drop in retention. This invariably means that the

quality of training in terms of the instructional strategy, materials, and pattern of engagement also significantly affects the level of retention of FA knowledge. In Anderson et al. (2011) report, there was advocacy for refresher courses (training) to increase retention rates. With this understanding, training interventions are a valuable aspect of sustaining retention. Proenca (2020), in his blog article, opined that the duration of a training intervention influences the retention rate. It is possible that a short 3-day training strategy had a significant effect on the retention rate. The summarised PowerPoint presentations may have aided quick assimilation and understanding, thereby positively interacting with the retention rate by increasing knowledge (Czyzewski et al., 2017) and improving retention. Similarly,

### ***Effect of training intervention and other demographic factors on FA Knowledge***

It is important to quantify the rate at which the fundamental constructs and determinants of learning outcomes impacted the post-intervention knowledge acquisition of FA. In order to plan for future health promotion and education interventions, it was necessary to examine the participants' knowledge, understanding, and management skills relevant to FA care, as well as the effectiveness of the intervention and how their demographics may have influenced these factors. These indicators are crucial to take into account when assessing the influence of the study. The analysed data showed that only the training intervention greatly impacted participants' learning outcomes. Other factors like the class of study, gender, and age have minimal effect on the knowledge of FA. The odd ratio indicated that the training intervention likely improved the FA knowledge of the experimental group approximately four times (AOR = 4.131) than that of the control, even with their previous knowledge and availability of FA banners and posters (Table 4.7). Again, it is apparent that the training impacted the understanding of the experimental group.

Although other studies did not measure the level of increase training had on their participants, this finding aligns with Kapoor et al. (2017), who said FA knowledge and management skills increased significantly after training. In Poland, Czyzewski et al. (2017) revealed that training increased knowledge of FA, and Connolly et al. (2007) reported a significant improvement in participants' baseline knowledge score of FA after training.

### ***Post-intervention knowledge between control and experimental groups***

It was important to know if the observed variation in knowledge between participants who did not receive training (control) and those who received training (experimental groups) was significant just to attest that the training intervention was highly effective. The null hypothesis was formulated and tested, which states that there is insignificant difference between the experimental and control group's knowledge score on FA for emergencies. The findings showed that there was a significant difference between the experimental and control group post-intervention knowledge (Table 4.10). This is obviously due to the training received by the experimental group. The result again corroborates the assertion that training people on FA significantly improves their knowledge, according to Joseph *et al.* (2015), Amro and Qtaity (2017), Jones et al. (2017), and Alyahya et al. (2019). It also corroborates with the report of Mizra et al. (2017), where FA training was conducted in Mekkah and found a significant improvement in knowledge. In addition, Mobarak et al. (2015) documented that the knowledge of the trained participants was far better than the untrained secondary school students in Saudi Arabia.

### ***Knowledge levels before and after the intervention of experimental groups'***

In understanding the impact of the training, it is crucial to assess the experimental groups' test scores before and after the training. The hypothesis posits that there is no substantial disparity in the scores of the experimental group prior to and following the implementation of the intervention, as indicated in Table 4.11. The result revealed a notable disparity (statistically significant) between the scores of the group that received training (experimental) before and after the intervention provided to participants, and this was in accordance with Behairy and Al-Batanony (2016), who said 22% had prior knowledge of FA, but there was a significant improvement in scores after training.

### ***Differences in the pre and post-intervention FA management skillset***

A triangulation of instruments was used to support the efficacy of the training on students' knowledge of FA. Through the assertion from the hypothesis that insignificant differences existed between participants' pre- and post-FA management skillsets, the investigator measures the students' management skillset before and after the training. The results showed that the pre-intervention management score (45.16% correct management skillset) was greatly improved after post-intervention (63.98% correct management skillset), and this change was significant (Table 4.4). There was a statistically notable difference between participants' pre and post-FA management skillsets for assessing situations, applying basic first aid and communicating details using appropriateness, time management, and responsiveness as criteria for judgment. Although the level of improvement was not exactly the same as that of knowledge that was theoretically assessed, there are indications that training involving practical sessions had a positive and significant effect on their management skill. The findings are absolutely aligned with many other

research investigations carried out globally, including Masih et al. (2014) and Bandyopadhyay et al. (2017) in West Bengal, India, which reported on the improvement of training participants in the management of minor injuries in Uttarakhand. Also, Raje et al. (2017) reported their findings on causality management in Maharashtra, India; likewise, Eze et al. (2015) reported on the management of seizures in Akoka Lagos, Nigeria. It shows that the training was truly impactful and helpful to the participants.

### ***The retention rate for participants' FA emergency management skillset***

Retention of management skills was also triangulated to complement that of knowledge and the hypothesis. There is no significant difference between participants' FA management skills after intervention and one month after training. The results showed that the post-intervention management skill score (68.89% correct management skillset) dropped (47.65% correct management skillset) due to the one-month time lap. Participants' first aid management retention rate significantly changed after one month (Table 4.7). There was a statistically notable difference between participants' scores immediately after the FA training and retention (one month after the training) of the FA emergency management skillset for assessing situations, applying basic first aid and communicating details using appropriateness, time management, and responsiveness as criteria for judgment. This drop could be caused by several factors, such as the inability to repeat demonstrations after the training due to space and time and the technicalities/complexity involved, as in the case of CPR, which was mostly assessed. Recall that Fricke-Galindo et al. (2018) and Kaul et al. (2017) opined that although there was an improvement in knowledge, practice (management) was relatively poor or low. Usually, there is a considerable gap between theoretical knowledge and its practical implementation, which is believed to have affected retention.

## **Summary of the section**

The results were examined to address the research inquiries and hypotheses. Four constructs were used to ascertain the trustworthiness of the data presented: internal and external validity, reliability, and objectivity. A questionnaire and observational checklist were cross-checked, and its internal content was validated through proper scrutiny of its relevance and applicability to the research of focus by experts in tests, measurement and public health research along with the thesis supervisor. The objectivity of the study was determined based on the appropriateness of the communication pattern and proximity between instructors and participants. This was done to eliminate bias and maintain a fair sense of judgement and examination of participants.

A reliability coefficient of 0.94 was obtained using Cronbach Alpha before administering the instrument. The instruments were administered to 200 randomly assigned participants of two groups (experimental and control) in four different schools in Delta State, Nigeria. The research findings were found applicable in a wider geographical context based on external validation. The data were analysed using different statistical tools based on the way the research inquiries and hypotheses were constructed. The research adopted and employed descriptive (mean, frequency count, standard deviation and percentages) and inferential (students t-test, ANOVA, ANCOVA multiple regression, binary logistic regression, and chi-square) statistics in answering the core research questions and asserted hypothesis. Six research questions and six hypotheses were used for this research. Below are the research questions and their corresponding answers, the hypotheses formulated, and the tests obtained.

Question 1: What is the pre-intervention knowledge of first aid among secondary school pupils in Delta State, Nigeria? The analysis showed no significant difference in pre-intervention knowledge on FA for Basic Principles of Emergency Care, choke, wound/bleeding, burn, shock, diabetes, and an avulsed tooth. However, a significant difference was observed among participants for knowledge of CPR, seizure, and asthma (Table 4.2). It was also revealed that the pre-intervention knowledge (the % of correct responses) was 44.3% and 42.7%, which was below the expected average of 50% for the control and experimental groups, respectively. A critical observation of these studies reveals that the knowledge level for FA is usually low or moderate in most cases, as found in the report of Behairy and Al-Batanony (2016), and this seems global (Aqeel et al., 2015; Adeyeye et al., 2018; Fricke-Galindo et al., 2018; AlHammadi et al., 2017; Kaul et al., 2017).

Question 2a: How does FA training affect the emergency management understanding of secondary school students in Delta State, Nigeria? The answer was that FA's post-intervention understanding increased for the experimental group (55.6 – 56.1%) while the control group remained low (46.2% – 46.5%). There was also a significant change ('improvement') in the knowledge of choke, CPR, seizure, burn, asthma, shock, and diabetes. In contrast, knowledge of basic principles of emergency care, wound/bleeding and avulsed/cracked tooth had no significant difference. This finding corroborates that of Masih et al. (2014), Behairy and Al-Batanony (2016), Onyeaso and Onyeaso (2017a).

Question 2b: Does first-aid training improve FA emergency management skillset of secondary school students in Delta State, Nigeria? The findings noted that there was a considerable difference ('statistically significant,'  $t = -12.645$ ,  $p = 0.000$ ) between participants' pre and post-intervention

FA management skillset for assessing situations, application of basic first aid and communication of details using appropriateness, time management and responsiveness as criteria for judgement (Table 4.4). This finding is comparable to that of Kapoor et al. (2017).

**Question 3:** What factors significantly affect the outcome of the training intervention on first aid knowledge among secondary school pupils in Delta State? The answer was that there was a significant interactive effect of previous knowledge ( $F = 4.773$ ,  $\text{sig.} = 0.030$ ) and the training intervention ( $F = 13.578$ ,  $\text{sig.} = 0.000$ ) on the post-intervention knowledge on FA (Table 4.5). Previous knowledge has shown to be a powerful force in implementing the training intervention.

**Question 4a:** What is the retention rate of secondary school students towards FA emergency one-month period after the training? The outcome revealed a significant difference in the retention of knowledge for choking, wound/bleeding, CPR, seizure, shock, asthma, and diabetes. However, after a month, there was no change in knowledge of basic principles of emergency care, burn, and avulsed/cracked teeth (Table 4.6). Also, the number of correct responses on FA after one month (knowledge retention) increased from 56.1% to 60.3% (107.5% retention) and 55.6% to 57.8% (104% retention) for experimental and slightly dropped from 46.5% to 45.4% (97.6% retention) and from 46.2% to 43.2% (93.5%) for control. The drop in CPR knowledge could have been linked to the technicalities involved; hence, the participant could lose track of the correct processes of administering CPR to victims. Bollig et al. (2009) paper tries to explain this concept.

**Question 4b:** What is the difference between participants' first-aid emergency management skills immediately after the intervention and one month after the training? The result showed that the pre-intervention management score of  $2.26 \pm 0.93$  (45.16% correct management skillset) was greatly improved after post-intervention to  $3.20 \pm 0.83$  (63.98% correct management skillset) (Table 4.7). First aid management retention rate among participants also had a significant change ( $t = 13.483$ ,  $p = 0.000$ ) after one month, while the post-intervention management skill score of  $3.44 \pm 0.82$  (68.89% correct management skillset) dropped due to the one-month time lap to  $2.38 \pm 0.93$  (47.65% correct management skillset). This is the same as the findings of Olumide et al. (2015). It can be attributed to many factors like sustained practicability, low demonstration of FA management skills after the training intervention, and level of assimilation during training.

**Question 5a:** What factors have an interactive effect on the retention rate after first aid training intervention among students in Delta State? The extract from the results reveals that class of study ( $F = 5.445$ ,  $\text{sig.} = 0.020$ ) and the training intervention ( $F = 28.331$ ,  $\text{sig.} = 0.000$ ) had an interactive effect on the retention of FA knowledge (Table 4.8). It is possible that as the level of education rises, individuals tend to have a more remarkable ability to retain and recall information. It also shows that the multisensory approach adopted for the training significantly affected students' recall of information stored in the different senses.

**Question 5b:** What is the magnitude of improving the FA knowledge of experimental participants through varied instructional methods, as determined by binary logistic regression analysis? The answer was that the odd ratio indicated that the training intervention likely improved the FA knowledge of the experimental group approximately four times ( $\text{AOR} = 4.131$ ) than that

of the control, even with their previous knowledge and availability of FA banners and posters (Table 4.9). This result further buttressed the report of Bandyopadhyay et al. (2017) that training increases knowledge and practice.

Hypotheses 1: ‘There is no significant difference between the’ experimental and control group's knowledge score on FA for emergencies immediately after the training. The hypothesis was tested, and the result revealed a significant disparity ( $t = -7.233$ ,  $p = 0.000$ ,  $df = 99$ ) ‘between the experimental and control group post-intervention knowledge mean scores. This aligns with the importance of training interventions that can make a genuine change in knowledge, attitude and management of first aid. Many first-aid researchers have reported and confirmed similar findings (Alyahya et al., 2019; Jamaludin et al., 2018; Amro & Qtaity, 2017; Jones et al., 2017; Joseph et al., 2015).

Hypotheses 2: There is an insignificant difference between the pre-intervention and post-intervention scores of the experimental group. The hypothesis was tested, and the result showed that there was a significant ( $t = -6.738$ ,  $p = 0.000$ ,  $df = 49$ ) difference in the pre-intervention and post-intervention scores of the experimental group participants (Table 4.11). This finding reiterated the extent to which training on FA knowledge and management impacts the competence of the participants in FA care, and it is in line with the report of Adesegun et al. (2019), Alyahya et al. (2019); Jamaludin et al. (2018); Amro & Qtaity, (2017); Jones et al. (2017); and Joseph et al. (2015). This explains that if training is carried out, the tendency for participants to do better and provide adequate FA care in emergencies increases rather than allowing them to read by themselves to acquire more skills.

Hypotheses 3: There is no significant impact of the demographic variables of the participants on FA training in Delta State, Nigeria. The hypothesis was tested, and the result showed that social demographic variables had a significant pool influence ( $F = 9.155$ ,  $\text{sig.} = 0.000$ ,  $df = 199$ ) on the knowledge of FA, mostly with previous knowledge ( $t = 3.423$ ,  $\text{sig.} = 0.001$ ), banner/poster presence ( $t = 5.221$ ,  $\text{sig.} = 0.000$ ) and treatment (schools) ( $t = 2.564$ ,  $\text{sig.} = 0.011$ ). Class of study, age and gender alone did not have any significant interactive effect on post-intervention knowledge of FA (Table 4.12). However, when in combination with other modifiable determinants of health such as prior knowledge, the presence of posters or banners and treatment, which is the intervention training provided to participants, results in a significant influence on the knowledge outcome of participants. This result showed that demographics could influence the post-intervention performance of a participant in line with Midani et al. (2019) and Jamaludin et al. (2018).

Hypotheses 4: There are no significant differences between participant retention rates immediately after one month of the FA training. The hypothesis was tested, and the result showed that the retention (change in post-intervention knowledge after one month) among participants was not significant ( $t = -0.558$ ,  $p = 0.578$ ,  $df = 199$ ), showing very minimal reduction or increase (Table 4.11). The results showed that the drop or increase in knowledge after one month was not significant enough to observe any meaningful difference in performance; however, there was an increase in knowledge similar to the report of Olumide et al. (2015).

## **CHAPTER 5: IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS**

### **Introduction of the section**

A recent fact sheet by WHO (2021) reported that every year, over four million people die due to injuries, constituting 8% of all deaths globally. The report also shows that the top causes of death for 5 to 29 years of age are injury-related, and an estimated 10% of all years lived with disability result from injuries. Moreover, ten million people visit or request the services of the emergency department or general practitioner because they suffer from non-fatal injuries per year. These statistics are on a global scale, although the distributions are not even because some people are more prone to injuries than other persons based on certain factors such as their birthplace, living status, gender or age (WHO, 2021; Gong et al., 2021; Dellinger & Gilchrist, 2019). For example, there is an increase in fall-related injuries as age increases. On the other hand, a poor built environment in the school is one of the risk factors for injuries.

The vulnerability of young children to injuries suggests that there is a need for school leaders to act and respond promptly to create awareness of risk, reacting appropriately to minimise the severity and impact on young children. Several studies have revealed that insufficient knowledge of first aid can result in poor attitude and practice, resulting in severe injury, disability, and, in worse cases, the victim's death (Qureshi et al., 2018; Sharif et al., 2016). Moreover, CPR skills that are essential for dealing with non-responsive victims by increasing the chances of survival are relatively low globally, which has become a concern for public health (Birkun et al., 2021). CPR knowledge in schools is poor, and a study reveals that over half of the respondents have little knowledge of CPR (So et al., 2020). And yet, there is a considerable cost and benefit implication for preventing all health issues because fatalities and short/long-term disability can be

reduced when victims receive quality first aid care. The knowledge of first aid provides a range of benefits for students, parents, community members and the entire population. Knowing that a person with first aid knowledge is present at the site of an emergency provides reassurance to both the casualty and all concerned parties because the likelihood that such a person will respond promptly and manage the situation before help arrives is high when compared to someone with little or no knowledge of first aid. Also, research has shown that the outcome of these provisions of first aid care continues to significantly impact the recovery process of sick or injured students, reducing the chances of fatalities and death among victims. Different methods, such as quasi-experimental or true experimental, were used in some of these studies to ascertain the effect of training on the participant. None of these methods is as robust as the Solomon four-stage experimental design. ‘Solomon’s four stage’ is a robust experimental design that delivered high-quality research outcomes for the intervention programme by controlling the majority of the threat observed in other experimental designs. Maturation, testing effect, and history are all adequately controlled, and this increases the generalisability of the findings.

Therefore, the study has employed the quantitative approach using the Solomon 4-stage experimental design. Since Koksall (2013) arguably explained that this design does not entirely control the implementation effect, some quality of Koksall’s Experimental Design was observed by randomly assigning the data collectors and implementers to the four schools, mitigating the limitation of Solomon Four Stage Design. In addition, the study intervention was guided with essential educational training models and frameworks to develop the instructional guide used and provided to the intervention group to understand the effect of receiving first aid training on secondary school students in Delta State, Nigeria. Approval of ethics was gained from the

‘UNICAF University Research Ethics Committee’ and the Ministry of Health Research Committee in Delta State. Permission to conduct the study on secondary school subjects was obtained from the Ministry of Basic and Secondary Education, Asaba, Delta State. This was obtained by explaining the details concerning the purpose and significance of the training, the manual and curriculum adopted, and the schedule and model for the study. Consent was also obtained from the principals and guardians of the participants.

This section deals with the practical and social implications, otherwise referred to as the inferences drawn from this study, the recommendations put forward for possible application, the recommendation for further research and the conclusions made from all the findings so far.

## **Implications**

Health organisations and public health professionals have opined that almost a million teenagers die yearly from an injury sustained in school, at home, and in other places due to a poor healthcare system, especially in underdeveloped and developing countries. First aid training has been widely recognised as an effective way of saving lives. The significance of any research work is in its applicability and inferencing. FA training, its impact, and its overall relevance are dependent on how feasible the findings can guide the development or review of policies regarding health care provision. First aid training and administration have become essential with the rise of school-based health crises. Knowing that the supply of health care services is limited in developing countries like Nigeria, it is important to equip students with first aid knowledge and management skills for effective practice. Having good knowledge of first aid will reduce casualty rates drastically. Haven reviewed, scrutinised and analysed the results of this study; the following

practical and social implications were put forward for onward evaluation and adoption and a wider assumption.

***Multi-sensory FA training approach is impactful:***

The multi-sensory approach in teaching first aid is known to engage more than one sense of the participant at a time. It makes learning more interesting and impactful. As individuals, we have access to a wide range of sensory inputs. Nonetheless, unisensory approaches are favoured in schools, despite being artificial and typically discouraging for children. Instructional methods involving different senses aim to get students interested in an activity by appealing to at least two of their senses (sight, sound, smell, or touch) and then connecting that activity to a specific learning goal. This includes many approaches to presentation, participation, and assessment. Teaching first aid using projectors to display training power-point slides, audio-visual for watching videos and listening to sound, mannequins to demonstrate CPR techniques, banners for retention and practical demonstrations of recovery patterns, choke, and others have a way of reinforcing, putting into memory and improving student's level of assimilation on different aspects of first aid. The efficiency of multi-sensory learning is found in its ability to provide a more realistic way of approximating a natural setting, thus ensuring that learning is effective. In contrast, the unisensory approach is less effective in its outcome (Shams & Seitz, 2008, as cited in Johnston et al., 2022). However, studies have shown that after a successful multisensory approach to teaching, the memory is triggered more quickly the next time there is contact, whether through a multisensory or unisensory stimulus. Multisensory methods capitalise on the significance of kinesthetic (body-based) motions and the influence of the senses on the learning process. Using more than one sense

to form mental representations of things, concepts, or phenomena helps pupils in schools engage with them more deeply, improving long-term retention (Ferreira & Vasconcelos, 2020).

In this study, those who received training intervention were through the multi-sensory approach, a technique that has allowed them to retain knowledge even more. The range of impact of the training measured in numbers was from one to ten times (Table 4.7) compared to those without training with an average of four times. Using multi-sensory teaching techniques significantly improves students' knowledge of first aid up to four times compared to those who have previous knowledge with no subsequent training, even when there was contact. This lends credence to the research of Ferreira and Vasconcelos (2020). This multi-sensory approach has great potential in equipping first aiders.

This approach in this study provided instructors (facilitators) the opportunity to motivate participants, bridge the communication gap, and produce positive results. Many authors have supported this approach (Browne, 2011; Aja et al., 2017) even though there was no specificity in the number of times the approach imparted learning and teaching as well. One of the recent reports emphasising the importance of a multi-sensory training approach was that of Boardman (2019), which expresses the outcome/ benefits of the approach for the trained teacher. Other studies that have appreciated this approach include Ashbaugh (2016), Alwaqassi (2017) and Syahputri (2019). They opined that the approach changes the learning pattern in educational communities. The approach engages almost all senses, hence improving understanding and retention faster. Incorporating this approach is most vital for training students on first aid in developing countries because the perception of participants and how they engage with their environment dramatically

lies in the ability of the brain to recall pieces of information from the various sensory channels (Johnston et al., 2022).

The training pattern has become more impactful than the conventional. Training individuals in different fields and workplaces improves efficiency and performance. It fortifies resilience; hence, training interventions in education ultimately increase the ability to understand and retain. Training is essential to any society's development, particularly for people responsible for responding to medical emergencies or laypersons who have the goodwill to save lives. The effect of the training is supposed to linger for the best possible application. For first aid, training intervention has been more than impactful. Wafil and Tork (2014) showed that training intervention for participants improves FA knowledge significantly. The same report was given by Bandyopadhyay *et al.* (2017) in West Bengal, India. With this understanding multi-sensory approach for instructional strategies should be adopted since this helps retention. The use of banners before, during, and after the training goes a long way in sustaining students' understanding and management of health emergencies that require first aid.

### ***Duration of training affects the level of comprehension.***

McKillop (2021) opined that engaging in a short first aid course will assist first-aiders in improving their skills. Fresher courses on basic principles, recovery position, CPR, and seizure will be necessary on a regular basis. According to Training Express (2021), a professional first aid training organization proposed that each aspect of first aid or basic life-saving technique should be taught for a specified period. For example, AED or CPR alone should be taught for 2 – 3 hours for maximum comprehension. However, the present study carried out training for ten aspects of first aid for a period of three days. Each day took about 3 hours since the participants are secondary

school students whose stamina for learning should not be extended more than 3 hours with breaks in between or one hour and thirty minutes at a strength. It means that the time spent on CPR alone was not more than one hour. This probably has reduced their level of comprehension or practical demonstration of CPR. This may have been why Onyeaso and Onyeaso (2017a) dedicated a full day to training secondary school students in Port Harcourt, Nigeria, on CPR, and their performance was much better. It reiterated that quality time is needed to train students in crucial areas of first aid like CPR and choking. Other less complex aspects, like shock, burns, and wounds, may not require that much time. It is imperative to state that the duration of training is an essential factor that influences learning and comprehension.

### ***Retention is affected by the duration of time and class of study***

On a norm, first aid certifications are valid for a period of one to three years, and one of the sustainable ways to keep first aiders updated is to keep practising or engaging in response to emergencies; otherwise, knowledge and Practice will naturally fade away. Poor response to health emergencies is inevitable if there is a lack of Practice (McKillop, 2021). Maintaining skill through self-imposed revision is essential if first aiders must retain knowledge and management skills. A refresher course is essential; as the saying goes, ‘practice makes perfect. Therefore, the researcher recommended that first aiders be given a downloadable up-to-date digital manual, and a print copy of the resources used for the training. These will enable them to practice at home at any given opportunity. Students can adopt this method, and where the students do not have any smart devices, the parent devices can be used, or the hard copy resources become very relevant in the absence of smart devices in the participants' homes.

### ***Students retain knowledge more often than management skills.***

There is a tendency for students to forget what they have been taught in first aid, especially regarding management skills or practical experience in handling health emergencies, so there is a need for them to practice FA response patterns in a simulated environment, in school or at home with family members. This study clearly shows that the retention rate for knowledge increased with the knowledge surpassing that of the post-intervention. This indicates that the students who read extra acquired more knowledge, developed more interest, and did more research in general first aid; however, for the management skillset to improve, there is a need for Practice. Understanding practical based concepts requires a deliberate effort toward experimentation and perfection. McKillop (2021) suggested the use of first-aid posters in the workplace. It is exactly what the multi-sensory approach was designed for in this study. The health and safety notices placed on boards could trigger remembrance faster than normal.

### ***Previous knowledge on first aid moderate outcome of a training intervention***

Previous knowledge had influenced first aid training outside, as reported by some authors. Maalim-Issack et al. (2021) revealed from their report on first-aid training among kindergarten teachers in Ethiopia that teachers with previous knowledge of first-aid performed better than those without previous knowledge. Those with previous knowledge were three times more knowledgeable than their counterpart. This is clear evidence that previous training significantly impacted training outcomes. In this study, whilst determining the influence of different factors on the post-test score, the training intervention and previous knowledge of students significantly influenced the results (Table 4.5). The training intervention is the purpose of the study, and it will be the significant factor that is supposed to influence the performances of participants; however,

the previous knowledge also had an interactive effect on the posttest and most likely the pretest, which could be noticed from the scores that were slightly above 40%. The previous knowledge gathered from the physical and health education classes, church programmes, community health sensitisation advocacies, social groups, or research students has the capacity to subtly moderate the research findings. In New Zealand and Australia, Parnell et al. (2006) study also specifically trained high school students on CPR and had about 70% pass due to previous knowledge.

***CPR, choke, seizure, and burns require special training and attention.***

Owing to the post-test scores from the experimental group (Table 4.3), that was around 50%. It is pertinent at this point to state that more time should be dedicated to these topics. These areas of FA are technical and require more Practice. For example, CPR is delicate and, if not performed, probably would not yield any positive results on victims of accidents. Teaching these topics separately or with more attention may have been why Onyeaso and Onyeaso (2016), in Port Harcourt, Rivers State, Nigeria, selected four secondary schools to be trained on CPR and measure retention within six weeks after the intervention. He found no significant increase or reduction in knowledge. It is suspected that the special focus on CPR and time spent explaining the dynamism of performing a cardiovascular resuscitation process helped the students understand more and retain the knowledge for a longer time, which was the case in this study.

The study of Olumide et al. (2015) also supported the FA course-specific intervention. In Olumide *et al.* study, commercial drivers were trained for two days on basic life-saving techniques for accident victims. The results showed significant improvement (17.5% to 80%) from baseline knowledge. The retention rate after three months showed only a slight drop in improvement (from 80% to 72%) in the skillset. It is safe to say that the more specific the FA training intervention

will be, the higher the chances of improvement and retention, even after a longer period. **Eze et al. (2015)** training on FA was specifically on epileptic seizures for one day, as opposed to barely 40 minutes in this study. The training significantly increased knowledge and management of epilepsy, increased positive attitude by 30%, and increased management skills by 25%. **Raje et al. (2017)** study was also based on CPR and casual management. It was a three-day training that incorporated theory and practical sessions. The findings revealed an overwhelming 73.3% improvement, which is far greater than the participants in this present study. **Maalim-Issack et al. (2021)** extensively reported on a training carried out specifically for choke among teachers in Addis Ababa in Ethiopia, after discovering that their level of knowledge on choke was low. After the training, 95% of the students were positive about providing first aid for a choke. An entire training session was dedicated to choke alone. This re-emphasises the importance of treating crucial complex areas of first aid with special attention.

## **Recommendations for application**

Providing recommendations after every study is essential to put into perspective the importance of carrying out more surveys on FA. The following recommendations were put forward for implementation as a result of the findings of this study.

### ***Training and Development of students and staff in secondary schools***

Training equips humanity with the challenges they face in the health sector in the routine discharge of their duties. Every FA training strengthens the trainee's capacity to engage effectively in their ability to support and act promptly in a given emergency expertise. Training interventions in first aid will support students in saving lives in secondary schools. It will help reduce and prevent injuries and illness from worsening and eventually save victims' lives. Bratina et al. (2018) said training students and teachers on managing first aid conditions is necessary. Midani et al. (2019) believe that training and educating people on first aid will significantly reduce the loss of lives through injuries and health emergencies. In secondary schools, students are fond of reckless play, and injuries can be sustained from such activities. Training and developing staff and students will help to reduce this injury or loss of lives from playing or any accident in secondary schools in Nigeria, especially those from rural areas.

### ***Inclusion of first aid in the school curriculum***

There is no other time to approve the inclusion of first aid as a new subject area or incorporate it into a subject on health education at the primary, secondary and tertiary institution levels. Today, first aid is taken as a basic course in health, safety and environment. In most production and manufacturing companies as well as multinational corporations, first aid is taught monthly or revised before the start of work. The oil and gas industry serves as a good example.

Including schools in the list of institutions that should make first aid education compulsory is not out of place. Joseph et al. (2014) posited that the education environment is the most appropriate place for leading proper education on the FA. Adopting the inclusion of FA training into the secondary school curriculum in African countries has become more than necessary. Already, there are so many advocacies for the introduction of first aid as a study course in schools because of the importance of FA training in schools (Morris, 2018; El-Magarbi et al., 2017; Arli & Yildirim 2017; Onyeaso & Achalu, 2014). Primary and secondary schools should be provided with FA training on a regular basis.

Joseph et al. (2014) and Priyangika and Hettiarachhi (2015) earlier argued that schools are the most appropriate places to deliver lectures or carry out first aid education due to the incessant nature of accidents that occur there. Wafik and Tork (2014) posited that showed how significant first aid education is to preparatory school students in Egypt. In Onyeaso and Onyeaso's (2016) paper, about 98% of the secondary school students' participants advocated for the inclusion of CPR training in their school curriculum. The inclusion of the first aid into primary and secondary school curricula has been an age-long recommendation by public health researchers. Gebrewold et al. (2016), De-Buck et al. (2015) and Workneh et al. (2021), among others, supported this idea through their report. In the cross-sectional survey of Midani et al. (2019) in the United Arab Emirates, over 54% were found to be unknowledgeable of FA; however, the attitude towards FA was found to be positive. They recommended that FA should be made accessible to any population that is interested in regular update courses.

### ***The need for an awareness campaign on first aid and its importance to the rural and local populace***

From the report of Gebrewold et al. (2016), some African countries still believe that epileptic seizure is caused by certain evil spirits or traditional linkages that can be cured through some unexplainable means. According to the study, some Ethiopians think that epilepsy may be treated by breathing in the smoke from a struck match or by consuming a specific type of "Holy Water" and that a person must be cured of their condition before they can enroll in school. The most surprising part was that some teachers believe epilepsy is a psychiatric or insanity-related illness. This shows that some Africans, including Nigerians, believe that epileptic seizures are linked with insanity or psychiatric issues, hence the need for more awareness campaigns to disorient Africans of these religious beliefs. The awareness of first aid training has been expanded to primary school teachers and pupils. This is based on the belief that primary school accidents and health hazards can occur. Hosapatna et al. (2021) reported on training primary school teachers in Udupi district of Karnataka, India. Whilst the teacher came to understand that providing basic treatment for minor injury is called first aid, their knowledge of first aid and its importance greatly improved. They recommended the inclusion of first aid into the primary school curriculum of India or that district and regular update is also needed. Joseph et al. (2015) also reported training of school teachers in Mangalore, Southern India. The research paper by Workneh et al. (2021) added that kindergarten and elementary school teachers should be included as they carried out first aid training in Gondar, north-western Ethiopia, with the teachers having an appreciable increase in knowledge and practice towards first aid.

### ***Extending first aid training to drivers, churches, universities campuses and employers***

Globally, accidents and health emergencies are major public health issues that must be addressed because they can lead to loss of lives, suffering and economic downturn. Road accidents in Nigeria are on the rise, and casualties are increasing. Statistics from the Federal Road Safety Corp show a high rate of injuries from road crashes. A few authors have reported on FA competence and perception among intercity or commercial drivers. It is believed that this training will help reduce the mortality rates. Olumide et al. (2015) reported on drivers from the Ibadan metropolis, and Olugbenga-Bello et al. (2012) on Osogbo drivers both in south-western Nigeria and Eberendu (2017) reported on commercial drivers from Itam Motor Park at Uyo town, in south region of Nigeria. There are good reasons to suspect that a comprehensive assessment of drivers' FA competency and management has been reported or published from any of the other states in the south region of Nigeria since this evidence is limited. Although in other African cities, the campaign on FA is being broadened, e.g., Wubet et al. (2020), among teachers in Ethiopia, Teshale and Alemu (2017) reported on taxi drivers in Addis Ababa, Ethiopia. There is a need for the public health professional body, in collaboration with the Nigerian Red Cross Society, to provide awareness to regular road users. Teachers are not exempt, as well as churches and universities of higher learning, because this is a responsibility for all. Carrying FA training for members in a church, mosque, or any centre of religious worship is important since these places have gatherings that are packed full of people most times on worship days, and there are incidences of injury or other health emergencies. Training members of a faith-based worship centre will reduce the mortality and injury rates. There may be a sudden collapse of buildings like the one experienced

in Asaba recently (Agency Report, 2022) and Lagos. There may even be stampedes due to the crowded nature of these worship centres. Similarly, educational institutions like universities need to equip workers and students with FA. There are very limited published reports on these three areas, hence the need to extend and intensify the training in these aspects.

### **Recommendations for future research**

The following suggestions or topics have been put forward for more research;

1. An extensive study should be conducted on the factors influencing students' attitudes towards first aid management at Delta State. A survey conducted by Ganfure et al. (2018) in Ethiopia investigated factors influencing people's perception of FA. The study revealed that attitude, practice, and instruction were significant contributors to their perception. The reviewed literature has clearly pointed out culture and religion as a factor, but it is important to extend carry out studies to clearly delimit the factors that could be influencing the way people perceive first aid. Understanding these factors can help in the development of policies regarding FA training courses and curricula.
2. The effect of locality and culture on the management of first aid in Nigeria from selected ethnic nationalities. As much as researching first aid competence, perception, Practice, or knowledge has become pertinent, it is also important to find out the possible influence of cultural and regional factors on the management of first aid. Religious inclinations sometimes influence decisions upheld in African states. A good example is that of Ethiopia in the report by Maalim-Issack et al. (2021), where Epileptic Seizure was assumed to be caused by some spiritual factors. It is important to carry out a cross-sectional survey on

health service providers in rural and local settlements in Nigeria to collate information on their perceptions and how these perceptions have or can influence their management of health emergencies. This will help in making very informed decisions on the rollout pattern of first aid policies and implementation.

3. Cross-sectional survey of first aid skill among motorists and cyclists in Delta State, Nigeria: implications for public safety. In their recent paper, Karaca and Kose (2020) also advised that an update for training for first aid is required of first aiders and first aid educators for more efficiency. Bystanders may not necessarily be health professionals; hence, training other professionals in first aid is important. In many places of work, there are reported incidences of health emergencies, and some researchers have done some incredible work. For example, Mpombo and Mwanakasale (2017) reported on FA training conducted on road transport workers and traffic Policemen in Zambia. Olumide et al. (2015) conducted FA training for commercial drivers in the city of Ibadan, Oyo State, Nigeria. There seems to be limited research on cyclists and motorists in different states in Nigeria. So far, only Oyo state has a single report. Other trainings in Nigeria and across the globe were focused on other professionals. The reduction in pre-hospital mortality in developed countries is tied to the basic life-saving training and knowledge by bystanders, which is yet to be emphasised in African countries like Nigeria. Drivers of vehicles are usually the first to respond to a motor crash victim. Hence, training motorists has become more than imperative. Olugbenga-Bello et al. 2012 investigated FA knowledge and competence for 229 male intercity drivers of Osogbo, an ancient Yoruba town in southwestern Nigeria, through a cross-sectional survey. In this survey, 26.1% understood

basic resuscitation procedures, while 80% agreed to be trained in first aid. This reveals the low level of FA competence among commercial drivers in Osogbo and re-iterates the need to expand FA training to motorists.

4. First aid training for teachers in secondary schools in remote riverine and coastal communities in developing countries. There are obvious indications that only this study sampled major rural riverine secondary schools in Delta State. There is a need to carry out studies in other riverine communities because they need FA training more than the urban area schools. The Niger Delta is largely riverine, and only capital cities have access to enormous healthcare facilities. The riverine and rural areas have limited health resources and staff.
5. Factors affecting retention of first aid management skills after the training intervention. From the various studies that were reviewed, retention seems to be influenced by the quality of the training, the duration and the FA course type. As much as the training is considered crucial to public health, the retention rate needs to be investigated after every training. Thus, studying the major factors that could moderate the way students retain is important. The use of banners and posters helped the Amai experimental group retain more knowledge, which needs to be put into perspective in other research.
6. Forecasting the effect of time on the rate of retention of first aid among students in secondary schools. The successful implementation of any FA training course depends on the trainees' retention rate. The re-training process can be envisaged based on the understanding of the retention pattern among participants. It is good to know how time influences the retention rate. The studies available looked at one, three and six months of

post-intervention knowledge retention in separate case studies. It will be necessary to look holistically at the impact of time on retention so that concise refresher training can be developed using time as a major factor.

7. Considering the effect of equipment available during first aid training activities and its impact on building students' confidence is recommended. Additionally, decolonization of the first aid curriculum and its effect in changing participants' attitudes and practices should be considered when designing the first aid curriculum for future research. Researchers in the medical field are recently considering the use of varied skin colour in describing the symptoms of wound injury, which have been noted to be a key indicator for proper diagnosis of the severity of the injury, and the provision of the right care is achieved when the diagnosis is correct. Another area considered in our study is ensuring that the resources are tailored.

## **Conclusions**

Basically, first aid, as the name implies, is the very first support, aid, assistance, or attention given to an injured, accident or ill victim. This aid can come in different forms, patterns and approaches. Depending on the type of prevalent condition, the aid provided is typical of that condition. It is also the intervention given by a bystander on the scene of an accident or condition of ill health in the absence of a qualified health professional. The underlying aim of providing first aid is to save a life within the golden hour. There are several ill health situations that require the intervention of first aid. Some include cardiac arrest, epileptic seizure, choking, shock, fire

burn, wound, bleeding from the nose or broken skin, diabetes, sprain, strain, bone fracture, asthma, avulsed tooth, and many others.

Understanding these health emergencies is essential since they can occur at any time and place. One of the places where health emergencies frequently happen is the school environment. Schools, including tertiary and primary, are places of learning where students and pupils interact daily and have social events like gaming. Students spend considerable time in secondary schools, and within this period, they are vulnerable to physical and mental health impacts as they engage in activities like sports and indoor and outdoor exercises, not prioritising safety directives from the school or instructors. In a country like Nigeria, there is a need to fill the void by providing essential lifesaving and emergency response services.

Since the study is primarily based on first aid, training intervention, and the effect on FA knowledge and management skillset, very relevant materials on the different areas were reviewed and reported. Information was retrieved from online databases like ResearchGate, CINAHL, EMBASE, MEDLINE, PubMed, ScienceDirect, Elsevier, ERIC, Google Scholar, Google, and PsycINFO. These peer-reviewed materials determined the choice of research design, methodology and questionnaire to be used. The two theoretical frameworks for this study were the PRECEDE-PROCEED health promotion and education model and the ADDIE training model. These models explain how a first aid training model is delivered while considering the importance of incorporating the multi-sensory approach. The concept of first was explained with its relevance to public health and first aid in schools. A precise review was conducted on the attitude, knowledge, and management of first aid in schools, the relationship that exists among the different constructs, the prevalence of popular health conditions, and the corresponding first aid response in

schools. The different first aid techniques like basic emergency care, seizure, sprains and strains, bone fracture, CPR, burn, wound and bleeding, avulsed tooth, asthma, convulsion, shock, poisonous snake bites, diabetes and choke were thoroughly reviewed. The impact of demographic factors and training intervention on the level of retention of FA knowledge and management skills was revised. The impact of FA training in school was equally appraised.

Training helps develop people's ability to take responsibility and deliver quality services. It boosts productivity, reduces turnover, and enhances skillset, knowledge and competence. There are so many physically strenuous activities that can lead to ill health. The training was adopted to measure the effect it will have on the 'knowledge and Practice of first aid' in secondary schools in Delta State. Delta State, which is in the south-south (also referred to as south region) geopolitical zone of Nigeria, is one of the states in the forested, lowland terrain of the Niger Delta with diverse terrestrial and aquatic life forms. The state has 25 local government areas divided into three senatorial districts (north, central and south), and they cover an area of about 16,850 square kilometres. Its capital is Asaba, an Igbo-speaking region located along the Niger River.

Delta State is the 20<sup>th</sup> most populous state with multi-ethnic nationalities, making it perfect for first aid intervention. The state has so many secondary schools, some in remote locations with limited health facilities. Secondary schools were selected based on the fact that these schools accommodate mostly teenage populations of 10 to 19 years, a period characterised by a high level of proactivity and energy for social interactions. A FA training intervention was carried out using a multi-sensory approach. Power points slides, videos, pictures, demonstrations using mannequins, real-time simulated health emergencies and instructions were used to explain major

and abstract concepts in FA. The training was conducted for three days at various locations (schools).

Based on this blueprint, the quantitative research design was adopted since the data collected were quantitative and allowed for analysis and interpretation. This study adopted the positivist paradigm within its experimental set-up. The paradigm allows the researchers to collect data, analyse, interpret and integrate the retrieved information. The Solomon Four Stage Design, a true experimental study design by Richard Solomon in 1949, was employed using a control group and an experimental group with two schools allocated each to the groups, making a total of four. Although it is a complex design and has advantages over the conventional ‘quasi-experimental pre-test to post-test design’, the Solomon Four Stage design was adopted to reduce the level of bias, check intervening variables, standardised data collection procedure, correct internal validity issues that moderate results and provide a robust, widely application research finding. The design involved the groups, randomisation, pre-test, intervention and post-test. The study population consists of all secondary schools and students in Delta State. The study sample consisted of 200 pupils randomly selected from public secondary schools. The students were drawn from JSS 1 and 2 and SSS 1 and 2 from Delta State, Nigeria, picking 50 per school. The study is an interventional (training involved) approach using a true ‘experimental design (with a control group)’. Therefore, the sample size was determined using several peer reviewed published papers that were informed by internationally acceptable techniques. The schools selected were Amai Grammar School, Amai (Experimental) and Obiaruku Grammar School, Obiaruku (Control) in Delta North, Abraka Grammar School, Abraka (Control) in Delta Central and Gbesa Grammar

School, Ojobo (Experimental) in Delta South Senatorial districts, drawing 50 students from each school. The students were selected randomly in a disproportionate manner.

A closed and multiple-choice open-ended questionnaire and observational checklist were used to collect data on performance on FA before and after the intervention. The questionnaire was partly self-constructed and adapted. Questionnaires are used since they are an easy, convenient, cheap, quick and effective way of collecting data from both small and large samples. Specific questions on first aid knowledge were asked. The questionnaire was made of three parts: A: additional consent checklist, B: assessment questions on different areas of first aid, and C: solicited demographic information from respondents. The areas covered and the number of questions raised were fundamental principles of emergency care (4), choke (3), bleeding and wound (4), CPR (4), understanding seizure (1), burns (2), Asthma (2), shock (1), diabetes (2) and avulsed/cracked tooth (5) making a total of 28 knowledge-based test questions. Correct responses scored one mark among the multi-choice questions, and wrong ones scored zero. The benchmark was assuming good knowledge was 50% and above, while poor or low knowledge was 49% and below, making it dichotomous.

The demographic information collated was the age of the participant, gender, class of study, previous knowledge, name of school, and location. The observational checklist consists of nine (9) FA management/practice questions on assessment of health emergency situations (3), application of basic first aid techniques (4) and communication of details of the incident (2). All questions were measured by virtue of appropriateness, time management and responsiveness. A 3-point Likert scale of low (1), medium (3) and high (5) was used. These questions were open or close-ended, multi-choice in accordance with the American Red Cross, First Aid for Life and

Florida Department for School Health Programme, while an observation checklist for assessing FA management skillset was used for triangulation and was adapted from the Australian AID.

The validity of the instrument, the internal and external consistency was ascertained. The Delta State Chapter of the Nigerian Red Cross Society cross-validated (face and content) the questionnaire before it was administered. Cronbach Alpha ( $\alpha = 0.94$ ) was used to go ascertain the level of reliability of the instrument. Ethical clearance was obtained from UNICAF University, oral and written consent from the sampled schools as the case may be, and members of the Nigerian Red Cross Society were contacted for quality assurance of the training. Based on the Solomon Four Stage Design, a pretest was given, followed by the training intervention and then a post-test. Data was collected after the tests and analysed based on the research questions and hypotheses raised and formulated. Statistical software was used to analyse the data collected, including IBM SPSS version 21 and Microsoft Excel. Both inferential and descriptive statistical models were used to analyse and interpret the research questions and formulate hypotheses. The trustworthiness of the data collected was ascertained through ‘internal and external validity, reliability, and objectivity.’

Based on the impact of first aid training among secondary school pupils in Delta State, Nigeria, seven (7) constructs were used to understand the impact of FA training. The constructs were baseline knowledge and management skillset (independent variable), training intervention and demographic factors (predictor/intervening variables) and post-intervention knowledge, management skillset and retention (dependent variables). The participants were also referred to as the selected secondary school students. A preliminary assessment (pre-test) was administered before the commencement of training, the intervention was the multi-sensory instructions, and the

post-test was given after the training. The experimental groups received the training, while the control groups didn't receive any FA training. The following were the 'research questions and hypotheses' raised and formulated for the study, followed by their findings. The restated research questions are

1. What is the pre-intervention knowledge of first aid among secondary school pupils in Delta State, Nigeria? This question was analysed using the Pearson Chi-Square ( $\chi^2$ ) crosstab test and descriptive statistical analysis. The results indicated that there was no statistically significant distinction in pre-intervention knowledge on FA for Basic Principles of Emergency Care, choke, wound/bleeding, burn, shock, diabetes and avulsed tooth; however, a significant difference was observed for knowledge on CPR, seizure, and asthma among participants. The pre-intervention knowledge (% correct responses) was 44.3% and 42.7%, below the expected average of 50% for the control and experimental group, respectively. This clearly indicated that the pre-intervention knowledge of both the experimental and control groups was low or poor. It justifies why FA training intervention is necessary. The finding was similar to that of Thepa et al. (2017), Neto et al. (2018), and Kaul et al. (2017), who reported that low pre-intervention knowledge was recorded. The low levels were known to be unhealthy for students' daily social activities and, hence, need to be updated and scaled up to withstand health emergencies.
2. How does FA training affect the understanding of 'secondary school students' in Delta State, Nigeria? This question was analysed using the Pearson Chi-Square ( $\chi^2$ ) crosstab test and descriptive statistical analysis. The results thus showed that the post-intervention understanding of FA increased for the experimental group (55.6 – 56.1%) while the control

group remained low (46.2 – 46.5%). There was a significant change (improvement) in knowledge for choke, CPR, seizure, burn, asthma, shock, and diabetes, while knowledge on basic principles of emergency care, wound/bleeding and avulsed/cracked tooth had no significant difference. The result corroborates the reports of Kapoor et al. (2017), Mizra et al. (2017), Czyzewski et al. (2017) on the effectiveness of training interventions in improving the knowledge of participants. This showed that training truly enhances understanding, which is essential to the Practice of first aid in schools.

3. What factors have a significant interactive effect (interactive effect) on the outcome of the training intervention on first aid among secondary school students in Delta State? The ANCOVA analysis was used to answer this question. The results revealed that previous knowledge ( $F = 4.773$ ,  $\text{sig.} = 0.030$ ) and the training intervention ( $F = 13.578$ ,  $\text{sig.} = 0.000$ ) significantly interacted with post-intervention knowledge on FA. In accordance with the reports of Joseph et al. (2015), Amiro & Qtaity (2017), Jones et al. (2017), Jamaludin et al. (2018), and Alyahya et al. (2019), the training was the major factor influencing the knowledge as well as previous knowledge on first aid. Other factors like age, class of study, and gender did not interact with the post-test or post-intervention knowledge of FA. Having previous knowledge which could have been retained over time may have supported their performance at post-test.
4. What is the retention rate of secondary school students towards FA emergency over a one-month period? This question was analysed using the Pearson Chi-Square ( $\chi^2$ ) crosstab test and descriptive statistical analysis. The results thus showed that There was a significant difference in the retention of knowledge for choke, wound/bleeding, CPR, seizure, shock,

asthma, and diabetes; however, there was no change in knowledge after month for basic principles of emergency care, burn, and avulsed/cracked tooth. The number of correct responses on FA after one month (knowledge retention) increased from 56.1% to 60.3% (107.5% retention) and 55.6% to 57.8% (104% retention) for experimental and slightly dropped from 46.5% to 45.4% (97.6% retention) and from 46.2% to 43.2% (93.5%) for control. The increase in retention rate was attributed to the effectiveness of the training using the multi-sensory approach and the banners that were left at the school premises in agreement with Olumide et al. (2015).

5. What factors have an interactive effect on the rate of retention after first aid training intervention among students in Delta State? The ANCOVA analysis was used to answer this question. The results showed that the class of study ( $F = 5.445$ , sig. = 0.020) and the training intervention ( $F = 28.331$ , sig. = 0.000) had an interactive effect on the retention of FA knowledge. This further explained what Lubrano et al. (2005) reported in their paper whilst reaffirming the importance of quality training for better retention.
6. To what extent of improvement in FA knowledge will the intervention and other demographic factors have an effect on the participants? The extent of improvement was measured using the Binary Logistic Regression analysis. The results showed that the odd ratio indicated that the training intervention likely improved the FA knowledge of the experimental group approximately 4 times ( $AOR = 4.131$ ) than that of the control, even with their previous knowledge and availability of FA banners and posters. The average of four (range of one to ten) times; further corroborates the relevance of training and how the multi-sensory training approach in spite of previous FA knowledge, could improve

understanding. This has concluded and validated the perception that FA training can significantly increase the knowledge and Practice of FA during health emergencies in secondary schools.

In an attempt to test the hypotheses further and authenticate the research findings from the questions raised, six additional hypotheses were formulated and presented in null format for further testing, analysis and discussion. The following hypotheses are hereby restated;

1. There is an insignificant difference between the experimental and control group's knowledge scores on FA for emergencies. The hypothesis was established using the student t-test, which compares the means of two groups to determine the effect of one mean on the other. The results showed a significant difference ( $t = -7.233$ ,  $p = 0.000$ ,  $df = 99$ ) between the knowledge of the experimental and control group post-intervention scores. In furtherance of understanding the effect of the training, these findings revealed that the training had a significant impact on FA knowledge of the experimental group in accordance with the reports of Joseph et al. (2015), Amro & Qtait, (2017), Jones et al., (2017), and Alyahya et al. (2019).
2. There is no significant difference in the pre and post-scores of the experimental group. The t-test analysis was used to ascertain the significant difference between the two test scores. The results showed a significant ( $t = -6.738$ ,  $p = 0.000$ ,  $df = 49$ ) difference between the pre-intervention and post-intervention scores of the experimental group participants. This repeats and re-affirms the previous finding by specifically looking at the effect of the

intervention on the group that received training. The finding re-iterated the report of Behairy and Al-Batanony (2016).

3. There is no significant impact of the demographic variables of the participants on FA training in Delta State, Nigeria. Since the variables are demographic in nature and the pool contribution is to be ascertained, multiple regression analysis was used to test this hypothesis. The results showed that socio-demographic variables had pool significant influence ( $F = 9.155$ , sig. = 0.000,  $df = 199$ ) on the knowledge of FA, mostly with previous knowledge ( $t = 3.423$ , sig. = 0.001), banner/poster presence ( $t = 5.221$ , sig. = 0.000) and treatment (schools) ( $t = 2.564$ , sig. = 0.011). Class of study, age and gender did not interact ('interactive effect') with the post-intervention knowledge of FA.
4. There are no significant differences between participant retention rates immediately after one month after the FA training. The hypothesis was tested using t-test, and the results showed that participants' retention (change in post-intervention knowledge after one month) was insignificant ( $t = -0.558$ ,  $p = 0.578$ ,  $df = 199$ ), showing very minimal reduction or increase.
5. There are no significant differences between participants' pre- and post-intervention FA management skillset. The hypothesis was analysed using the Pearson chi-square ( $\chi^2$ ) crosstab test and descriptive statistical analysis. The results thus showed that There was a significant difference ( $t = -12.645$ ,  $p = 0.000$ ) between the pre- and post-intervention FA management skillset of participants for assessing situations, application of basic first aid and communication of details using appropriateness, time management and responsiveness as criteria for judgement. The pre-intervention management score of  $2.26 \pm 0.93$  (45.16%

correct management skillset) was greatly improved upon after post-intervention to  $3.20 \pm 0.83$  (63.98% correct management skillset). This finding supported the previous finding on the effect of the training on FA knowledge.

6. There is no significant difference between participants' FA management skills after intervention and one month after training. The hypothesis was analysed using the Pearson chi-square ( $\chi^2$ ) crosstab test and descriptive statistical analysis. The results thus showed that the first aid management retention rate among participants showed a significant change ( $t = 13.483$ ,  $p = 0.000$ ) after one month. The post-intervention management skill score of  $3.44 \pm 0.82$  (68.89% correct management skillset) dropped due to the one-month time lap to  $2.38 \pm 0.93$  (47.65% correct management skillset). The popular saying that Practice makes perfect is re-emphasised from this finding. Retaining management skills is now known to be more difficult than knowledge. Hence, spending more time or doing a dedicated practical session on management skills like CPR is pertinent, which may require a higher level of professionalism.

Conclusively, first aid is undoubtedly a very useful tool in saving lives, and the full implementation of FA training courses in different organisations has become more than necessary. Training students and teachers in schools, including primary schools, is worth carrying out. Training interventions have great effects in enhancing skillsets and should be encouraged henceforth. The present research has clearly shown that participants (students) are interested in getting trained and equipped with basic life-saving knowledge. Schools are epic centres for learning with places where students interact. Accidents sometime could be unpredictable. Due to

their busy schedule and limited workforce, medics and healthcare professionals are usually not readily available at the scene of accidents or health emergencies. Therefore, it has become imperative to conduct FA training across institutions of learning in Nigeria and Africa at large.

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## APPENDICES

### Appendix A: Data collection instrument

#### *QUESTIONNAIRE*

#### **The Effect of First Aid Training Among Secondary Schools in Delta State, Nigeria**

**Name of School:** \_\_\_\_\_

**Serial Number:** \_\_\_\_\_

Assessment type: a) Pre-test      b) Post-test

Instruction: Please circle the appropriate answer for the questions below

Basic principles for emergency care

1. If three of your friends are injured at an uncompleted building near the school assembling hall, what will be the first thing you will do when considering to help?

a) Call for emergency help      b) Assess the casualties      c) Assess the scene for danger

2. Which among the three of your friends will you offer to help in order of severity?

a) the friend who is conscious but mourning in pain      b) the one with a bad leg injury which is losing a lot of blood      c) the friend with a broken leg

3. Choose the correct order (sequence) of the primary survey for First Aid (FA)

a) Danger, Airway, Response, Breathing, Circulation [DA, RBC]      b) Danger, Response, Airway, Breathing, Circulation [DR, ABC]      c) Airway, Breathing, Circulation, Danger, Response [AB, CDR]

4. What is the goal of the primary survey for FA

- a) To report the danger    b) To make the area safe    c) To check for life-threatening conditions in order of priority

### Understanding of choke

5. As a student, how do you know if someone is choking?

- a) Speak well and breathing normal    b) Breathing more quickly than standard    c) Unable to speak, breath or cough

6. As a student, if your friend is eating a biscuit and suddenly begin to choke while eating the biscuit; what FA will you give (Please, this is a multiple-choice, hence you can pick more than one correct answer)



3.

Also

called the

**5 Abdominal thrusts** **Heimlich**

- a) Do the Heimlich manoeuvre on him

**manoeuvre.**



**5 Back blows**

b) Give him five back blows between his shoulder blades

c) Put your finger down his throat to dislodge (remove) the obstruction



7. As a student, you suspect that your friend is having a heart attack because he told you that he could not breathe well and he is having a tight pain in the chest. What first aid will you give?

a) Sit him in a comfortable position   b) Get him to lay down flat   c) Encourage him to stand up and move around slowly

### **Knowledge of bleeding and wound**

8. If your classmate is severely bleeding because he has cut his arm, how will you treat the injury?

a) Give him aspirin                      b) Put the injured limb in some cold water      c) Apply direct pressure

9. If your friend has a bad cut on his hand, what is the first thing you should do?

b) a) Apply pressure to the wound with your hands      b) Give them aspirin      c) Tell your friend to raise and put pressure in the area until you secure gloves from the first aid box

10. If your friend fall and sustain a wound in his leg when playing football, how will you care for the injury?

a). clean under running water, dry and cover with a sterile dressing   b) clean with cotton wool and alcohol and cover with a dressing   c) clean with iodine and cover with a sterile dressing

11. Assuming one of your classmates has just fallen from a height and you observe clear fluid and watery blood coming from the nose or ear, what could he be suffering from?

a) Fractured skull,   b) Fracture Legs      c) Fracture hand

#### Understanding of Cardiopulmonary Resuscitation (CPR)

12. Cardiopulmonary resuscitation (CPR) is used to treat \_\_\_\_\_ condition?

a) An asthma attack      b) a bleeding leg or heart attack      c) Sudden Cardiac Arrest

13. On your way to the classroom, your friend was lying on the ground, and you asked if everything is fine, but no response; what should you do next?

a) Leave the student to wake up by himself                      b) Begin CPR                      c) Check if his airway is clear

14. Perhaps, you need to perform CPR on your friend above because he has collapsed and stopped breathing; how many chest compressions to rescue breaths should you give?

- a) 20 compressions to 5 breaths                      b) 40 compressions to 4 breaths                      c) 30 compressions to 2 breaths

15. Where should you place your hands when performing chest compressions?

- a) Just above the belly button,   b) centre of the chest on the breastbone,   c) at the top of the breast bone near the throat

#### Understanding of seizure and burns

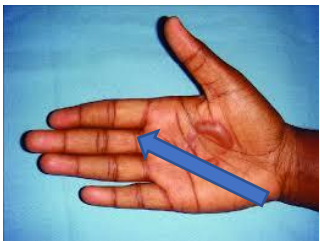
16. Assuming your friend has a major epileptic seizure, what will you do to help?

- a) Place a spoon in the casualty mouth to stop them from swallowing the tongue  
b) Remove objects and clear the area from possible hazards that may lead to injury  
c) Give CPR immediately as he/she will stop breathing

17. A fire accident has just caught one of your classmates hands during school labour; for a minimum of how long should you place or immersed the hand under cold water?

- a) 5 minutes    b) 10 minutes    c) 20 minutes

18. If the burn resulted in a blister, will you break the blister when treating the burns



This is what a blister looks like

- a) Yes    b) No

### Understanding FA for Asthma and Shock

19. One of your schoolmates had an asthmatic attack while she was sweeping the classroom; what could have triggered the attack?

Dust    b) the broom    c) none of the above

20. Arrange the below statement (1-4) in the correct order to show how you will administer FA to your schoolmates having an asthma attack during the crises

1. Calm down the victim, Loosen any tightened clothing on him or her
2. Place the victim in a near sitting position with his hands rested on both knees
3. Give medication as soon as possible, if any and available, to lessen the disorder
4. Lastly, call for help

a) 1, 2, 3, 4        b) 4, 3, 1, 2    c) none of the above

21. As a student, your classmate experienced a primary shock after colliding with another of his team members while playing a football game on the school field; in what order will you administer FA to the victim.

1. Keep the patient warm without offering stimulants.
2. Untie tight clothing initially worn by the victim and keep the victim still
3. Lay the victim on the position where the shock occurred with the lower part of the body in a prone position to increase blood flow.
4. Stop bleeding and provide relief if observed, and then call for help from medics.

a) 1, 2, 3, 4    b) 3, 1, 2, 4    c) None of the above

### Understanding FA for Diabetes

22. Your friend at school was experiencing a feeling of dissatisfaction, personality change, sweating with cold, clammy skin, shaking, the deduction of consciousness, a sense of confusion and fast breathing. She had once informed you as a friend that she has diabetes, and the symptoms she presented are like **hypoglycaemia** (low blood sugar). How will you respond to the emergency?

1. Give her some fruit juice containing about 6-8 ounces,
2. Give candy, two to three packets
3. Give two to three teaspoons of sugar.
4. Give diet drink

a) All the above    b) one of the above except number 4    c) None of the above

23. As a student, if you suspect a friend is experiencing emergency symptoms of **hyperglycaemia** (high blood sugar), what emergency care will be needed?

Just ignore them because it is not a case of sugar

Call for help from a responsible adult or health unit; while you wait for help to arrive, keep checking the breathing, pulse and whether they respond to you.

If they become unresponsive at any point, open their airway, check their breathing and prepare to start CPR.

If they become unresponsive at any point, do not apply CPR as this may cause more harm

2 and 3    b) 1 only    c) 1 and 4

Understanding FA for Avulsed tooth and Cracked tooth

24. What is the time required for the care provided for a knocked-out tooth?

a)  $\leq 40$  minutes.    b) 78 hours.    c) Time limit is not applicable when caring for an avulsed tooth

25. One of your friends in SS3 (an adult) knocked out his/her tooth at an accident site; what FA will you give?

a) Search for the broken tooth immediately, pick it up only by the crown (never by the root), rinse to remove dirt and replace it in the gum of the victim in a similar position and hold the tooth in place for some minutes by carefully holding the tooth by the crown

b) I will not search for the broken tooth or replace it; instead, I will concentrate on the victim and help reduce the bleeding with a sterile gauze or clean wet cloth.

c) Search and pick up the tooth using the root, which is the available site to avoid wasting time, rinse the dirt and replant the tooth?

26. Answer Yes or No to the options below. Is it okay to place the knocked-out tooth of your adult friend into any of the liquid or material below?

a) Normal saline	Yes or No
------------------	-----------

b) Milk	Yes or No
---------	-----------

c) The saliva of students or water **Yes or No**

	Yes or No
d) clean cloth or a nylon bag	

**27. As a senior student,** how will you provide FA for a primary school child who knocked out his/her tooth at an accident site?

1. I will not place the baby tooth back into the socket because it may cause problems to the development of the permanent tooth

2. Apply gauze to the area of the knocked-out tooth for about 15 minutes to control bleeding

3. Place the tooth back into the socket; this will help the proper development of the permanent tooth

a) 1 & 2 only    b) 3 only    c) None of the above

28. What is the FA for a cracked or broken tooth

a) The broken part (also known as a fragment) of the tooth should be found and immediately stored in a container of milk; quickly ensure you see the dentist for a possibility of glueing the fragment back in position

b) The tooth cannot be glued, so it is useless to find the broken piece or cracked part; hence, I will just keep the victim calm and apply a cold compress if the tooth hurts

c) None of the above

#### Socio-Demographic Characteristics

29. Age (in years); \_\_\_\_\_

30. Gender; a) Male    b) female

31. Class of study; a) JSS1    b) JSS2    c) SSS1    d) SSS2

32. Any previous training on first aid; a) Yes    b) No

33. If you have answered Yes to question 31, who were the organisers of the FA training?

a) Religious organisation (e.g. church or mosque)    b) School    c) Community

d) Social groups (e.g. Red cross, Boy's guide or Girls guide etc.)    d) Research student

e) Others (please specify) \_\_\_\_\_



## OBSERVATION INSTRUMENT

The Effect of First Aid Training Among Secondary Schools in Delta State, Nigeria

Please rate the student's performance in terms of Appropriateness (A), Time Management (TM), and Responsiveness(R) to emergency needs. Provide any additional feedback in the Comments section. Enter the appropriate numbers.

RATING SCALE (1-5):      1 = LOW      3 = MEDIUM      5 = HIGH

<b>Name of School</b>	
<b>Students ID/ Level</b>	FAT/_____ <b>Class:</b> _____
<b>Assessor Name</b>	
<b>Location/Venue</b>	
<b>Date of Observation</b>	
<b>Situation observe for</b>	
<b>Instructions</b>	1. Over a period, observe the student completing each of the following tasks: a) Assess the situation b) Apply basic first aid techniques c) Communicate details of the incident 2. Enter the date on which the tasks were undertaken 3. Place a tick in the box to show they completed each aspect of the task to the standard expected by school health 4. Complete the feedback sections of the form by commenting, if required

Did the Trainee subject	Yes	No	Rating Scale	Comment
<b>Element 1: Assess the situation</b>				
Identify physical hazards to own and others health and safety.			<b>A- TM- R-</b>	
Minimize immediate risk to self and health and safety of the casualty by			<b>A- TM-</b>	

controlling hazard/s following accepted practice			<b>R-</b>	
Assess casualty's vital signs and physical condition following accepted practice			<b>A- TM- R-</b>	
<b>Element 2: Apply basic first aid techniques</b>				
Provide first aid management following established first aid procedures and available resources and equipment			<b>A- TM- R-</b>	
Monitor casualty's condition and response to the casualty's condition following accepted first aid principles and school guidelines			<b>A- TM- R-</b>	
Seek first aid assistance from others promptly as appropriate			<b>A- TM- R-</b>	
Record accidents and injuries following accepted procedures			<b>A- TM- R-</b>	
<b>Element 3: Communicate details of the incident</b>				
Request appropriate medical assistance using the most relevant and appropriate communication mechanism			<b>A- TM- R-</b>	
Convey details of casualty's condition and first-aid management activities accurately to emergency services or relieving personnel			<b>A- TM- R-</b>	
<b>Did the overall student performance meet the standard?</b>				

**Instrument adapted with slight modification from;** Australian AID (2012). Perform Basic First Aid Procedures: assessor manual. <https://tinyurl.com/yr9pz3kw>

## Appendix B1: UREC decision 1



UREC Decision, Version 2.0



### Unicaf University Research Ethics Committee Decision

**Student's Name:** Ogheneniorue Okandjeji-Barry

**Student's ID #:** R1701D2243527

**Supervisor's Name:** Dr Mundia Likando

**Program of Study:** UUM: EdD - Doctorate of Education

**Offer ID /Group ID:** O20617G20688

**Dissertation Stage:** DS 3

**Research Project Title:** Effect of First Aid Training Among Secondary School Students in Southern Nigeria

**Comments:**

Questionnaire:  
The first part about agreeing to participate should not be here. These are underaged children. The consent for participation is taken by the legal guardians i.e. parents. This is a very complicated questionnaire. It is not age-appropriate. The researcher should either address this to teachers or make a new questionnaire for the students that is age-appropriate.

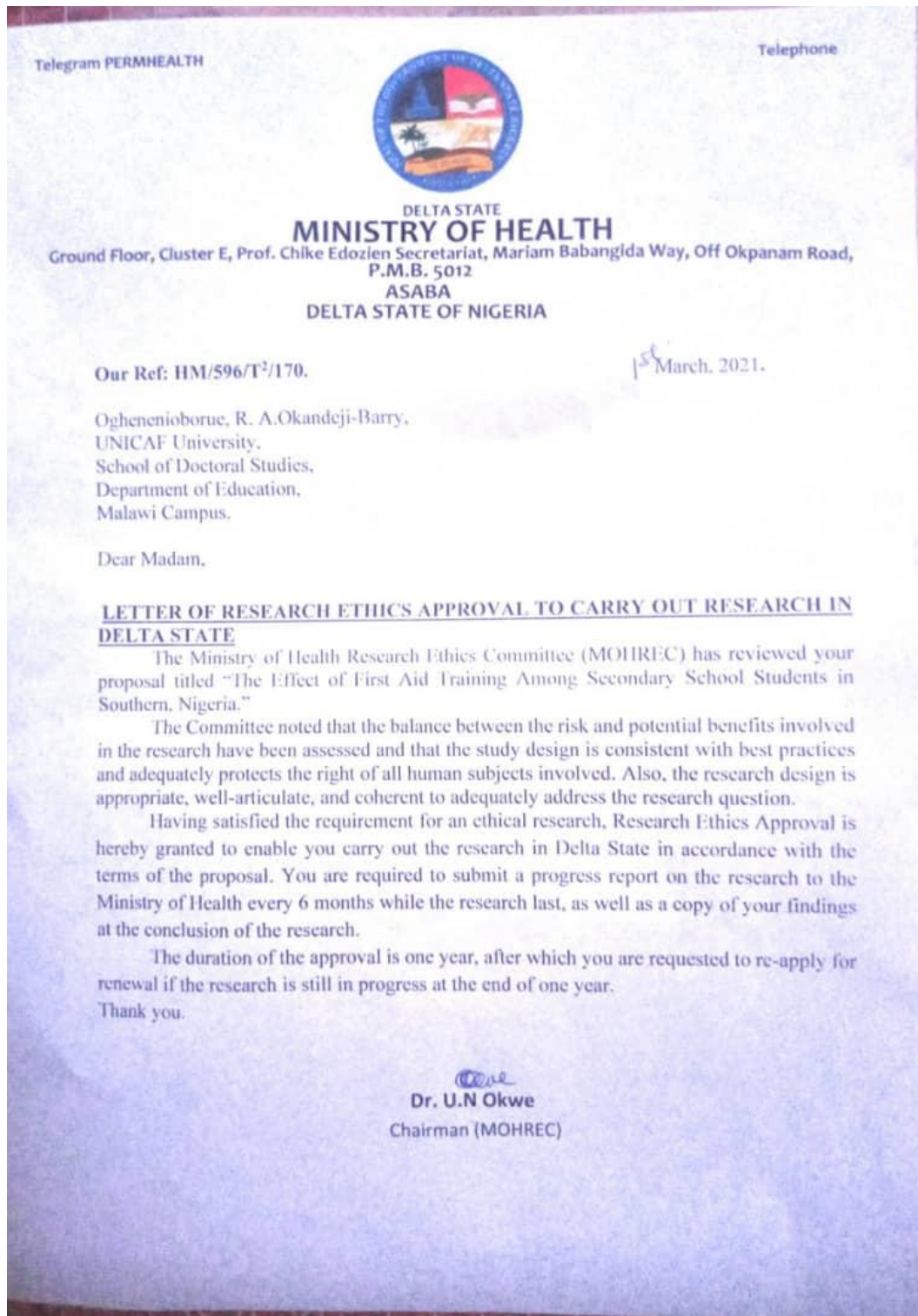
**Decision\*:** Approved B

**Date:** 24-Jun-2021

\*Provisional approval provided at the Dissertation Stage 1, whereas the final approval is provided at the Dissertation stage 3. The student is allowed to proceed to data collection following the final approval.

## **Appendix B2: UREC decision 2**

## Appendix B3: MOHREC decision



## Appendix C: Sample of guardian informed consent form



UU\_GIC - Version 2.0



### Guardian Informed Consent Form

#### Part 1: Debriefing of Participants

**Student's Name:** Oghenenioborue. Rume. A. Okandeji-Barry

**Student's E-mail Address:** rorue4purpose@gmail.com

**Student ID #:** R1701D2243527

**Supervisor's Name:** Mundia Likando Yusuf Suleiman

**University Campus:** Unicaf University Malawi (UUM)

**Program of Study:** PhD in Education

**Research Project Title:** Effect of First Aid Training Among Secondary School Students in Southern Nigeria

**Date:** 05-Jan-2021

**Provide a short description (purpose, aim and significance) of the research project, and explain why and how you have chosen this person to participate in this research (maximum 150 words).**

The research study title is the Effect of First Aid (FA) Training among Secondary School Students in Southern Nigeria. Although previous works have revealed that training increases knowledge, the interest extends beyond training with an added advantage of examining the training's retention over a period. Hence, the study has employed an experimental study design to select your ward/child: as his/her name was chosen at random. The questions asked are to assess the understanding of some First aid measures during an emergency. Also, to evaluate the impact of training on knowledge. This will help us recommend actions that will help improve emergency care in the community while equipping the participant with lifesaving FA skills. Your ward's name was chosen randomly from the secondary school register following ethical approval procedures and school approval.

The above named Student is committed in ensuring participant's voluntarily participation in the research project and guaranteeing there are no potential risks and/or harms to the participants.

Participants have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In these cases, data collected will be deleted.

All data and information collected will be coded and will not be accessible to anyone outside this research. Data described and included in dissemination activities will only refer to coded information ensuring beyond the bounds of possibility participant identification.

I, Oghenenioborue. Rume. A. Okandeji-Barry, ensure that all information stated above is true and that all conditions have been met.

**Student's Signature:**

**Guardian Informed Consent Form****Part 2: Certificate of Consent**

This section is mandatory and should to be signed by the participant's legal guardian

**Student's Name:** Ogheneniorue. Rume. A. Okandje-Barry

**Student's E-mail Address:** rorue4purpose@gmail.com

**Student ID #:** R1701D2243527

**Supervisor's Name:** Mundia Likando Yusuf Suleiman

**University Campus:** Unicaf University Malawi (UUM)

**Program of Study:** PhD in Education

**Research Project Title:** Effect of First Aid Training Among Secondary School Students in Southern Nigeria

I have read the foregoing information about this study, or it has been read to me. I have had the opportunity to ask questions and discuss about it. I have received satisfactory answers to all my questions and I have received enough information about this study. I understand that the participant is free to withdraw from this study at any time without giving a reason for withdrawing and without negative consequences. I consent to the use of multimedia (e.g. audio recordings, video recordings) for the purposes of the participation to this study. I understand that all data will remain anonymous and confidential, unless stated otherwise.

I, , the legal guardian  
of  allow and provide consent  
that  can willingly participate in the study.

I, , the legal guardian  
of  have been ensured that verbal consent  
given by  will also be taken before the study.

## Appendix D1: Gate keeper form



UU\_GL - Version 2.0



### Gatekeeper letter

**Address:** Amai Secondary School, Amai, Ukwuani LGA

**Date:** 07/01/2021

**Subject:** Request to recruit and train students

Dear Sir,

I am a doctoral student at Unicaf University Malawi. As part of my degree I am carrying out a study on Effect of First Aid Training Among Secondary School Students in Southern Nigeria.

I am writing to enquire whether you would be interested in/willing to grant permission to recruit participants from your school for this research.

Subject to approval by Unicaf Research Ethics Committee (UREC), this study will use your school hall for a three-day first aid training activities of the selected students.

The study will provide first aid training for the selected students; the training will major on the general rules and objectives of first aid, skills needed to manage incident of selected emergencies common to the school environment. These are; wound or injury, unconsciousness, foreign bodies in the eyes, nose, ears or mouth, fracture, avulsed tooth other illnesses such as convulsion, asthma and diabetes. The participant's understanding of first aid will also be assessed before, and after the training with subsequent follow-up of one month, the work will be carried out under the supervision of Dr Yusuf Suleiman

Furthermore, I will like you to relate the study's purpose to all concern persons and allow me to assess the school register to facilitate the randomise selection process and recruit on the school premises. Also, give access to relevant personal data after participants have consented and enable children to complete experiments during school hours for 1hr 30mins to 2hr for three days and 1 hr for a specific day after one month following the training.

Thank you in advance for your time and for your consideration of this project. Kindly please let me know if you require any further information or need any further clarifications.

Yours Sincerely,

Oghenenioborue, R. A. Okandeji-Barry

**Student's Name:** Oghenenioborue, R. A. Okandeji-Barry

**Student's E-mail:** rorue4purpose@gmail.com

**Student's Address and Telephone:** UNICAF University, Malawi 07384700932

**Supervisor's Title and Name:** Dr Yusuf Suleiman

**Supervisor's Position:** Research Supervisor

**Supervisor's E-mail:** y.suleiman@unicaf.org

## Appendix D2: Gate keeper form



UU\_GL - Version 2.0



### Gatekeeper letter

**Address:** Gbesa Grammar School, Ojobo, Burutu LGA

**Date:** 07/01/2021

**Subject:** Request to recruit and train students

Dear Sir,

I am a doctoral student at Unicaf University Malawi. As part of my degree I am carrying out a study on Effect of First Aid Training Among Secondary School Students in Southern Nigeria.

I am writing to enquire whether you would be interested in/willing to grant permission to recruit participants from your school for this research.

Subject to approval by Unicaf Research Ethics Committee (UREC), this study will use your school hall for a three-day first aid training activities of the selected students.

The study will provide first aid training for the selected students; the training will major on the general rules and objectives of first aid, skills needed to manage incident of selected emergencies common to the school environment. These are; wound or injury, unconsciousness, foreign bodies in the eyes, nose, ears or mouth, fracture, avulsed tooth other illnesses such as convulsion, asthma and diabetes. The participant's understanding of first aid will also be assessed, this may be before (or), and after the training with subsequent follow-up of one month, the work will be carried out under the supervision of Dr Yusuf Suleiman.

Furthermore, I will like you to relate the study's purpose to all concern persons and allow me to assess the school register to facilitate the randomise selection process and recruit on the school premises. Also, give access to relevant personal data after participants have consented and enable children to complete experiments during school hours for 1hr 30min to 2hr for three days and 1 hr for a specific day after one month following the training.

Thank you in advance for your time and for your consideration of this project. Kindly please let me know if you require any further information or need any further clarifications.

Yours Sincerely,

Ogheneniorue, R. A. Okandje-Barry

**Student's Name:** Ogheneniorue, R. A. Okandje-Barry

**Student's E-mail:** rorue4purpose@gmail.com

**Student's Address and Telephone:** UNICAF University, Malawi 07384700932

**Supervisor's Title and Name:** Dr Yusuf Suleiman

**Supervisor's Position:** Research Supervisor

**Supervisor's E-mail:** y.suleiman@unicaf.org

## Appendix D3: Gate keeper form



UU\_GL - Version 2.0



### Gatekeeper letter

**Address:** Obiaruku Grammar School, Ukwuani LGA

**Date:** 07/01/2021

**Subject:** Request to recruit students

Dear Sir,

I am a doctoral student at Unicaf University Malawi. As part of my degree I am carrying out a study on Effect of First Aid Training Among Secondary School Students in Southern Nigeria.

I am writing to enquire whether you would be interested in/willing to grant permission to recruit participants from your school for this research. Subject to approval by Unicaf Research Ethics Committee (UREC), this study will use your school hall for data collection from the selected students. The study will recruit students and administer a questionnaire and observation to ascertain first aid knowledge and management skills on the general rules and objectives of first aid, skills needed to manage incident of selected emergencies common to the school environment. These are; wound or injury, unconsciousness, foreign bodies in the eyes, nose, ears or mouth, fracture, avulsed tooth other illnesses such as convulsion, asthma and diabetes. The participant's understanding of first aid will also be assessed, this may be before (or), and after training of the intervention group with subsequent follow-up of one month, the work will be carried out under the supervision of Dr Yusuf Suleiman.

Furthermore, I will like you to relate the study's purpose to all concern persons and allow me to assess the school register to facilitate the randomise selection process and recruit on the school premises. Also, give access to relevant personal data after participants have consented and enable children to complete the questionnaire and other task for observation during school hours for 1 to 2hr for specific days and subsequently after one month following the training of the intervention group. The training resources will be made available to all participating schools once the project has been completed.

Thank you in advance for your time and for your consideration of this project. Kindly please let me know if you require any further information or need any further clarifications.

Yours Sincerely,

Oghenenioborue, R. A. Okandeji-Barry

**Student's Name:** Oghenenioborue, R. A. Okandeji-Barry

**Student's E-mail:** rorue4purpose@gmail.com

**Student's Address and Telephone:** UNICAF University, Malawi 07384700932

**Supervisor's Title and Name:** Dr Yusuf Suleiman

**Supervisor's Position:** Research Supervisor

**Supervisor's E-mail:** y.suleiman@unicaf.org

## Appendix D4: Gate keeper form



UU\_GL - Version 2.0



### Gatekeeper letter

**Address:** Obiaruku Grammar School, Ukwuani LGA

**Date:** 07/01/2021

**Subject:** Request to recruit students

Dear Sir,

I am a doctoral student at Unicaf University Malawi. As part of my degree I am carrying out a study on Effect of First Aid Training Among Secondary School Students in Southern Nigeria.

I am writing to enquire whether you would be interested in/willing to grant permission to recruit participants from your school for this research. Subject to approval by Unicaf Research Ethics Committee (UREC), this study will use your school hall for data collection from the selected students. The study will recruit students and administer a questionnaire and observation to ascertain first aid knowledge and management skills on the general rules and objectives of first aid, skills needed to manage incident of selected emergencies common to the school environment. These are; wound or injury, unconsciousness, foreign bodies in the eyes, nose, ears or mouth, fracture, avulsed tooth other illnesses such as convulsion, asthma and diabetes. The participant's understanding of first aid will also be assessed, this may be before (or), and after training of the intervention group with subsequent follow-up of one month, the work will be carried out under the supervision of Dr Yusuf Suleiman.

Furthermore, I will like you to relate the study's purpose to all concern persons and allow me to assess the school register to facilitate the randomise selection process and recruit on the school premises. Also, give access to relevant personal data after participants have consented and enable children to complete the questionnaire and other task for observation during school hours for 1 to 2hr for specific days and subsequently after one month following the training of the intervention group. The training resources will be made available to all participating schools once the project has been completed.

Thank you in advance for your time and for your consideration of this project. Kindly please let me know if you require any further information or need any further clarifications.

Yours Sincerely,

Oghenenioborue, R. A. Okandeji-Barry

**Student's Name:** Oghenenioborue, R. A. Okandeji-Barry

**Student's E-mail:** rorue4purpose@gmail.com

**Student's Address and Telephone:** UNICAF University, Malawi 07384700932

**Supervisor's Title and Name:** Dr Yusuf Suleiman

**Supervisor's Position:** Research Supervisor

**Supervisor's E-mail:** y.suleiman@unicaf.org

## Appendix E1: Letter of Authorisation

### Letter of Authorisation

Dear Mrs Oghenenioborue Okandeji-Barry

**RE (Gate Keeper Letter): Request to Recruit and Train Students on First Aid as part of your Thesis Programme. 'Effect of First Aid Training Among Secondary School Students in Southern, Nigeria'**

We are pleased to inform you that after careful consideration by the school administration and parents, you have been approved to use our school as one of the study institutions for your data collection and training.

We hope the school will benefit from this research, and we will support you in achieving the aim of the research through our participation. We wish you a successful research study, and do let us know if you need our support as you proceed with the research.

Signed on behalf of

Name of School: Amai Secondary School, Amia Delta State.

Sign: \_\_\_\_\_


Name: EBINUM PATRICK CHINEDUM

Position: VICE-PRINCIPAL ADMIN.

Date: 8 March 2021



## Appendix E2: Letter of Authorisation

<b>GBESA GRAMMAR SCHOOL</b>	
<b>OJOBO</b>	
	
Our Ref: _____	C/o A. Ojobo, Burutu L.G.A, Delta State
Your Ref: _____	Date: <b>10th March, 2021</b>

**Dear Mrs Oghenenioborue Okandeji-Barry,**

**LETTER OF AUTHORISATION**

**RE: Request to Recruit and Train Students on First Aid as part of your Doctoral Programme: "Effect of First Aid Training among Secondary School Students in Southern Nigeria"**


We are delighted to inform you that, after a thorough review of the content(s) of your proposed training, and in-depth deliberations with the students and the Parent-Teachers Association (PTA), the school administration have deemed it fit to approve of your training.

This letter is therefore an authorisation for you to commerce your proposed first aid training which will be beneficial to our students, the school, and host community at large. We shall provide all necessary support for you to achieve your set research objectives.

On behalf of the management and staff, we wish you a fruitful study. Please feel free to contact us if you need any other support as regards the training.

Regards

**Bunuzigha Brisibe**  
*Principal*  
Signed on behalf of  
Gbesa Grammar School, Ojobo, Burutu LGA, Delta State



## Appendix E3: Letter of Authorisation

### Letter of Authorisation

Dear Mrs Ogheneniborue Okandeji-Barry,

RE (Gate Keeper Letter): Request to Recruit Students as Research Study Participants of the Thesis title *'Effect of First Aid Training Among Secondary School Students in Southern Nigeria.'*

We are pleased to inform you that after careful consideration by the school administration and parents, you have been approved to use our school as one of the study institutions for your data collection.

We hope the school will benefit from the research outcome, and we will support you in achieving the research aim through our participation. We wish you a successful research study and do let us know if you need our support as you proceed with the data collection process.

Signed on behalf of

Name of School: Obiaruku Grammar School, Obiaruku, Delta State.

Sign: 

Name: Enemune Azubike E.

Position: Principal

Date: 11<sup>th</sup> March 2021

## Appendix E4: Letter of Authorisation

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Dear Mrs Oghenenioborue Okandeji-Barry

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Signed on behalf of

Name of School: Abraka Grammar School, Abraka, Delta State.

Sign: 

Name: Onyiah W. E. Osi SA

Position:

Date: 4<sup>th</sup> March 2021



## Appendix E5: Variable Definitions for the Research Topic

Names of Variables	Variable classification underlying key thesis concepts
<b>Dependent Variables</b>	<p>These variables are the outcomes being measured and influenced by the training intervention.</p> <ul style="list-style-type: none"> <li>• <b>Post-intervention Knowledge:</b> The knowledge participants gain after completing the training is measured by performance on the post-test questionnaire. It assesses the improvement in first-aid knowledge resulting from the training.</li> <li>• <b>Post-intervention Management Skill:</b> This is assessed through observations of participants demonstrating their ability to handle various first-aid scenarios (e.g., CPR, wound dressing). It evaluates the skills gained in managing first-aid cases after training.</li> <li>• <b>Retention:</b> This measures the ability of participants to retain first-aid knowledge and skills one month after training. It is expressed as a percentage and is assessed by comparing pre-test and post-test results after a month.</li> <li>• <b>Baseline Knowledge:</b> This refers to the participants' initial knowledge of first aid before the intervention, measured by the pre-test.</li> <li>• <b>Baseline Management Skill:</b> This denotes the participants' initial skills in managing first aid situations before the intervention, also measured by the pre-test</li> </ul>
<b>Independent Variables</b>	<p>These are the variables that are manipulated or categorised to observe their effects on the dependent variables.</p> <ul style="list-style-type: none"> <li>• <b>Training Intervention:</b> This is the primary independent variable, referring to the comprehensive first-aid training provided to the experimental group. It includes notes, explanations, instructions, and simulated activities designed to improve knowledge and management skills.</li> </ul>
<b>Moderating Variable</b>	<p>This variable potentially influences the strength or direction of the relationship between the independent and dependent variables.</p> <ul style="list-style-type: none"> <li>• <b>Demographic Factors:</b> These include gender, class of the student, age, prior knowledge of first aid and banners. These factors may moderate the effectiveness of the training intervention on post-intervention knowledge and management skills.</li> </ul>
<b>Control Variables</b>	<p>These variables are held constant to ensure that the results are due to the training intervention rather than other factors.</p> <ul style="list-style-type: none"> <li>• <b>Control Group:</b> Participants in this group do not receive the training intervention and serve as a comparison group to evaluate the effect of the training. They are from Obiaruku Grammar School and Abraka Grammar School.</li> <li>• <b>Experimental Group:</b> Participants in this group received the training intervention and were compared against the control group.</li> </ul>