CHAPTER ONE

INTRODUCTION

Background to the Study

In Nigeria as in other developing countries of the world, the government and related agencies have shown major concerns on programmes for the promotion of environmental health. The emphasis is on improving basic sanitary services such as water supply, disposal of human and animal excreta and other social and liquid waste, vector control and food sanitation. One major challenge to these sanitary services is in the area of meat handling.

Meat is very important to mankind. Apart from vegetarians, all human beings eat meat due to its nutritional value to the body. Meat refers to every edible part of any slaughtered animal, whether in its natural state or has been subjected to frozen, chilled, salted, canned or other preservative processes (WHO, 2004). Due to the high demand for meat in Nigeria and other parts of the world, slaughtering and selling of meat has become lucrative business among meat vendors.

Meat vendors refer to all the people who either slaughter animals for sale in abattoirs, hawk meat using wheel barrows or sell meat using tables (Nelson, 2016; Younes & Bartram, 2001). These three categories of meat vendors exist in any place meat is slaughtered or sold and they also constitute major distributors of meat in every society.

In Nigeria, there are a number of public slaughter houses and a few private meat processing plants distributed in cities and villages where the public buy their meat daily. Ideally, slaughter houses (abattoirs) and the environs as well as meat vendors are expected to exhibit and observe healthy environmental sanitation and personal hygiene. Experience has shown that more often than not, this ideal is not maintained by meat vendors in Nigeria. Thus, the activities of meat vendors in Nigeria and Anambra state in particular constitute a serious health challenge to every individual.

The environmental sanitation at the abattoirs as maintained by meat vendors seem to be too poor and discouraging to meat buyers. According to Adams (2016) and

Figueras (2000), meat handling requires hygienic conditions. Weobong (2001) also noted that most meat vendors use unsafe water to wash their meat. Fasanmi and Sansi (2008) also reported that meat vendors in Nigeria use unsafe tables to display meat for sale and use unsafe knives in cutting operations. This is made worse by the hawkers that carry the meat in wheel barrows uncovered, thereby exposing the meat to flies or microbial contamination.

Adelegan (2002) observed that in Nigeria, many abattoirs dispose their waste directly into streams or rivers and also use water from the same source to wash slaughtered meat. In some instances, solid wastes are deposited with other urban wastes some distance from the abattoir (Shannon, 2016).

Serious consequences relating to national productivity and development can arise from lack of hygiene and sanitation of such abattoirs and meat stalls. Edema (2005), reported that the Food and Agricultural Organization (FAO) to have indicated that illness due to contaminated food (meat inclusive) was perhaps one of the most widespread health problems in the contemporary world and constitutes an important cause of reduced economic productivity. Nearly 90 percent of diarrhea – related deaths according to Younes and Bartran (2001) and WHO (2004) have been attributed to unsafe or inadequate water supplies and sanitation. These conditions, according to Hughes and Koplan (2005), affect a large part of the world's population. An estimated 1.1 billion persons (one sixth of the world's population) lack access to clean water and another 2.6 billion to adequate sanitation (Hughes & Koplan, 2005). The meat vendors are inclusive in the affected population. All these problems could be put under control through adequate application of environmental health education by the meat vendors.

According to Adams (2016), and Sule (2011) health education is potential for achieving environmental health. In the views of Beall (2002) health education involves health facts, information descriptions or skills acquired through health instruction or experience for the purpose of improving wellness and living condition. For the purpose of this study health education is an aspect of general education

concerned with health and associated problems. It is environmental health education when the focus is on environmental safety.

Adara (2010) defined environmental health education as an aspect of general health education which is designed to develop a citizenry that is aware of safe environment. It is also defined by Winser (2015) as an aspect of general education which is concerned with healthy environment and its associated problems. According to Adedibu (2010) it is a kind of education that helps people acquire knowledge, attitudes, motivation, commitments and skills to work individually and collectively towards finding solutions to environmental health problems and prevention of environmental challenges. Onyechere (2016) and Kola-Olusanya (2011) added that the main objectives of environmental health education relate to developing awareness, knowledge, attitudes, skills, evaluating ability and participation of the recipients in environmental issues. This implies that one major aim of environmental health education is to improve people's environmental health knowledge.

Knowledge means familiarity with someone or something, which can include facts, information, descriptions or skills acquired through experience or education (Adedibu, 2010). Similarly, Ogbonna (2002) noted that knowledge can be implicit (as with practical skills or expertise) or explicit (as with the theoretical understanding of a subject). The implicit dimension of knowledge according to Ogbonna (2002), suggests practice which are defined by Sule (2011) as habitual or customary performance or operation. Sule further noted that practice is a repeated performance or systematic exercise for the purpose of acquiring skill or proficiency. It is the action or process of performing or doing something.

Operationally, environmental health knowledge means a process of educating people on matters related to environmental health with the purpose of making safe environmental health an asset valued by individuals and groups. Similarly, process of developing people's proper attitudes towards safe environmental health activities and providing opportunities for them to carry out these activities. The essence of environmental health education programme is to impart positively on the knowledge and practice of the people.

It is therefore understandable that any environmental health education programme has to be efficient and effective in order to impact positively on the environmental health knowledge and practices of the people (Nelson, 2016). In this study, environmental health education programme is a part of health education concerned with bringing about, through educational method and means, the health behaviour that is required on the part of the people on order to control physical, chemical and biological processes, influences and factors which may exert or likely to exert significant effects on the health of man in his society. The environmental health education that is planned for the meat vendors is the one that aims at making them efficient in personal hygiene; effective in environmental sanitation and in general should be used to create positive impact on their environmental health knowledge and practices of meat vendors.

The extent to which a person is effective in performing a given task depends, in part, on how the knowledge acquired relates to the person's practice (Heil & Selden, 2008). In the view of Beall (2002), knowledge for knowledge sake is vague but to a health educator, health knowledge is sterile unless it is applied to people's daily lives. Beall further explained the relationship between knowledge and practice to include that adequate health knowledge improves adequate health practice. Thus, if health knowledge is to be of benefit to the recipients, it should in some way affect their lives. As it applies to this study, the environmental health programme will focus on the health knowledge of the vendors with a view to improving their health practices.

Kola-Olusanya (2011) has demonstrated the relationship between health knowledge and health related practices. The author noted that health knowledge improves health practices and that health knowledgeable persons, under normal condition and with positive health attitudes, exhibit better environmental health practices than that person who is ignorant of environmental health matters.

Some factors that can influence people's health knowledge and practices include gender, location level of education, and years of experience (Adelegan, 2002). Most of the meat vendors are males with few females (Adams 2016). Since meat business is carried out by both male and female vendors, it is therefore important to find out

whether gender has any significant influence on the health knowledge and practice of the vendors.

In the same vein, meat vendors are found in both urban and rural areas in Anambra state. It is also imperative to investigate whether the location of business has influence on the health knowledge and practices of meat vendors. The meat vendors also have different levels of education (Potter, 2000). A few of them have university degrees; some others have either 0'level qualifications; first school leaving certificates (FSLC) or did not attend any formal education. The vendors also have different years of experience in the business. Some have spent over 50 years in the business while some others have spent between 20-40 years in the occupation. The high rate of unemployment in the country has also increased the number of new entrants into the business every year. These different levels of education and years of experience according to Environmental Protection Agency (EPA) (2010) may have some effects on their health knowledge and practices. Since these people are of different levels of education and experience, it is necessary to ascertain whether educational attainment and years of experience have any influence on the health knowledge and practices of meat vendors.

This study was motivated by the need to improve the health knowledge and practice of meat vendors. Thus, in consideration of the seemingly lack of proper knowledge and practice resulting in poor sanitation and hygiene relating to meat slaughtering, hawking and handling, the need to empirically determine the effect of environmental health education programme on the health knowledge and practices of meat vendors in Anambra state becomes imperative.

Statement of the Problem

Meat as a source of protein is very important to human health. Its handling or processing requires adequate health knowledge and practice to avoid food poisoning resulting from contaminated meat. It is expected that meat vendors should process meat in hygienic manners to avoid contamination. This involves washing their hands

and tables very well and avoiding the practice of exposing the meat to sun, flies or other vectors.

The WHO (2004) reported that 60 percent of food borne diseases in Africa are meat poisoning. This is due to improper handling practices, contaminated materials and lack of hygiene throughout the meat processing chain from slaughtering to consumption.

In almost all abattoirs in Anambra state, butchers and meat vendors still use vehicle tires to roast slaughtered animal skins and these vehicle tires contain chemical elements which are injurious to human health. Observations have shown that meat vendors use unclean tables in displaying meat as well as unhygienic knives for cutting the meat and these could be injurious to human health. The activities of those who sell meat in wheel barrows by exposing the meat to excessive sunlight, flies and microbial contaminations constitute additional health problem.

Efforts have been made towards curbing the high rate of unhygienic meat processing but none yielded the desired results. For instance, the United Nation's Rio de Janeiro conference of 1992 was a major effort held to address unhygienic meat processing worldwide but the problem remains not solved (Adara 2010). At the local scene, there is the monthly mandatory sanitation exercises observed everywhere in Nigeria as well as in Anambra state including abattoirs and meat stalls. The Anambra state government through the different local governments has posted health workers as inspectors of meat in slaughter houses and markets. Onyechere (2016) observed that most of these meat inspectors are not committed to their job. They do not go to the abattoirs regular to inspect slaughtered meat. Again interaction with meat vendors indicated that some meat inspectors accept money from vendors to allow them sell dead and contaminated meat to the public further interactions with some meat vendors indicated that government had held some seminars and workshops with the leadership of the abattoirs and sponsored Radio and Television programmes in order to improve the health knowledge and practices of those concerned with handling of meat in the state.

Despite these healthy educative and proactive measures, the problems persisted and are still persisting. This situation therefore calls for measures in form of health education programme to help solve the persisting problem. It is in the light of the environmental health challenges posed by the activities of meat vendors in Anambra state, that this study is therefore designed to ascertain the effect of environmental health education programme on the health knowledge and practices of meat vendors in Anambra state.

Purpose of the Study

The purpose of this study is to determine the effects of environmental health education programme on health knowledge and practices of meat vendors in Anambra state. Specifically, the study determined the effect of environmental health education programme on the:

1. Environmental health knowledge scores of meat vendors in Anambra State before and after environmental health education programme.
2. Environmental health knowledge scores of male and female meat vendors in Anambra State after environmental health education programme.
3. Environmental health knowledge scores of meat vendors from different locations in Anambra State before and after environmental health education programme.
4. Environmental health knowledge scores of meat vendors of different levels of education in Anambra State before and after environmental health education programme.
5. Environmental health knowledge scores of meat vendors of different years of experience as a meat vendor in Anambra State before and after environmental health education programme.
6. Environmental health practice scores of meat vendors in Anambra State before and after environmental health education programme.
7. Environmental health practice scores of male and female meat vendors in Anambra State after environmental health education programme.

8. Environmental health practice scores of meat vendors from different locations in Anambra State before and after environmental health education programme.
9. Environmental health practice scores of meat vendors of different levels of education in Anambra State before and after environmental health education programme.
10. Environmental health practice scores of meat vendors of different years of experience in Anambra State before and after environmental health education programme.

Significance of the Study

The findings of this study would be of both theoretical and practical relevance to a number of people. The meat vendors, abattoir workers, Ministries of Health, government, the Anambra populace and researchers in the area of health education will benefit from the results of this study. The study will also add to the existing knowledge in environmental health.

The first group that will gain from the findings of this study is the meat vendors. They will gain health knowledge which will help them handle slaughtered animals in hygienic manners to avoid meat contaminations. This will go a long way in making the meat inspection job of the veterinary officers easier.

The second group that will gain from the findings of this study is the abattoir workers. They will gain health knowledge and health practices. The environmental health education programme will expose them to health knowledge and practices which will go a long way to improve hygienic practices.

Another group that may benefit from the findings of this study is the Ministry of Health. The information the Ministry will get from the results of this study will act as a guide in enabling it make policies that will guide abattoir operations and other related activities in the state. The findings of the study will also help the Ministry of Health formulate environmental health policy like meat shop sanitation or banning the hawking of meat in the state.

The government will also benefit from the findings of this study. The people in government will gain knowledge that can help them encourage hygienic practices in abattoirs such as washing of meat with clean water, wearing aprons in the premises and washing of hands with clean water before touching meat. With the knowledge gained, the government may ban unhygienic practices like meat hawking and exposing meat to vectors or sunlight. This means that the result of the study will help government maintain healthy environment in the abattoirs through making laws and policies to guide sanitation programmes.

The Anambra populace will gain also from the findings of this study. They will gain health knowledge and practice. As the health knowledge and practices of the meat vendors improve, cases of food-borne diseases resulting from unhygienic handling of meat by the vendors will reduce. The vendors will learn better ways to handle slaughtered meat and the health condition of the Anambra populace may likely improve.

The findings of this study would add to the existing literature in health education programmes in Nigeria and Anambra in particular. The findings will also add to the empirical studies existing in public health and environmental health knowledge and practices. Furthermore, future researchers will benefit from the findings of this study which can act as a spring board for further research activities.

Scope of the Study

The content scope of the study included environment health knowledge and practices of meat vendors. The environmental health education programme covered included: meat and environmental pollution, consequences of man-made pollution, hazards and risk management in meat; abattoir-based pollutants; hygienic handling of meat and personal hygiene for meat vendors; and environmental hygiene practices for meat vendors. This study was carried out in Anambra State and limited to registered meat vendors in all the abattoirs and meat markets in the State. The moderator variables of the study included: gender, place of business, level of education and years of

experience of the abattoir operators. Similarly, the dependent variables included health knowledge and health practices.

Research Questions

The following research questions were posed to guide the study.

1. What are the environmental health knowledge mean scores of meat vendors in Anambra State before and after environmental health education programme?
2. What are the environmental health knowledge mean scores of male and female meat vendors in Anambra State after environmental health education programme?
3. What are the environmental health knowledge mean scores of meat vendors from urban and rural areas in Anambra State before and after environmental health education programme?
4. What are the environmental health knowledge mean scores of meat vendors of different levels of education in Anambra State before and after environmental health education programme?
5. What are the environmental health knowledge mean scores of meat vendors of different years of experience as meat vendors in Anambra State before and after environmental health education programme?
6. What are the environmental health practice mean scores of meat vendors in Anambra State before and after environmental health education programme?
7. What are the environmental health practice mean scores of male and female meat vendors in Anambra State after environmental health education programme?
8. What are the environmental health practice mean scores of meat vendors from different locations in Anambra State before and after environmental health education programme?
9. What are the environmental health practice mean scores of meat vendors of different levels of education in Anambra State before and after environmental health education programme?

10. What are the environmental health practice mean scores of meat vendors of different years of experience in Anambra State before and after environmental health education programme?

Hypotheses

The following hypotheses were postulated and tested at 0.05 level of significance:

1. There is no significant difference in the environmental health knowledge mean scores of meat vendors in Anambra State before and after environmental health education programme.
2. There is no significant difference in the environmental health knowledge mean scores of male and female meat vendors in Anambra State before and after environmental health education programme.
3. There is no significant difference in the environmental health knowledge mean scores of meat vendors in urban and rural areas in Anambra State before and after environmental health education programme.
4. There is no significant difference in the environmental health knowledge mean scores of meat vendors of different levels of education in Anambra State before and after environmental health education programme.
5. There is no significant difference in the environmental health knowledge mean scores of meat vendors of different years of experience in Anambra State before and after environmental health education programme.
6. There is no significant difference in the environmental health practice mean scores of meat vendors in Anambra State before and after environmental health education programme.
7. There is no significant difference in the environmental health practice mean scores of male and female meat vendors in Anambra State before and after environmental health education programme.
8. There is no significant difference in the environmental health practice mean scores of meat vendors in urban and rural areas in Anambra State before and after environmental health education programme.

9. There is no significant difference in the environmental health practice mean scores of meat vendors of different levels of education in Anambra State before and after environmental health education programme.
10. There is no significant difference in the environmental health practice mean scores of meat vendors of different years of experience in Anambra State before and after environmental health education programme.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

In this chapter, previous studies that are related to the subject of this study were reviewed. They were organized under the following sub-headings:

Conceptual Framework

Health Education

Environmental Health Education Programme

Health Knowledge

Health Practices

Meat Vendors

Theoretical Framework and Model

Health Belief Model

Theory of Reasoned Action

Social Cognitive Theory

Theoretical Studies

Meats and Their Contaminations and Preventions

Meat/Abattoir Waste and Environmental Pollution

Empirical Studies

Health Knowledge and Practice

Health Education Programme

Meat Vendors and Abattoir Operations

Summary of Literature Review

Conceptual Framework

Health Education

Health education has been defined in various ways by different authors. In its simplest meaning, health education is defined as the physical well being of an individual (Barlett,2008). Accordingly health education can be seen as a way of helping an individual to understand, practice and appreciate the importance of maintaining one's physical well-being.

Health education is defined as part of general education which is concerned with changes in knowledge, feelings and behaviour of people. In its most usual form, health education concentrates on developing the best possible state of well being (Hendricks, Ecols & Nelson, 2009).

It is also defined as the kind of education that concerns itself with prevailing health problems and the method of preventing and controlling them. According to Shannon (2016) health education is defined as an active process of learning and doing health related activities by oneself and it may encompass various aspects like personal hygiene, home and environmental sanitation or nutritional hygiene. Furthermore, health education according to Ajisafe (2006) is a kind of education which aims at promoting good health. From this definition, health education can be defined as the education that equips one with the ability to cope with health problems as well as maintain psychological equilibrium.

In the same manner, Ozo (2005) defined health education as the kind of education that aims at promoting the quality of health resulting from the satisfaction of needs through personal and social adaptation to one's environment. Health education from the above definition could be defined as an aspect of general education which aims at helping a person to adapt successfully with respect to productive activities, for fulfilling relationships with other people and the ability to adapt to changes and cope with the adversity of day-to-day activities.

Furthermore, health education can also be seen as the kind of education that enables people to increase control over and to improve their health. Thus, it is an integral part of health promotion, which, according to Scarnet (2016), is the coordination of health promotion, health education and related organizational economic and environmental supports for the behaviour of individuals, groups or communities that are conducive to health. Similarly, health education according to Bouton and McDonalds (2002) is a kind of education concerned with promoting the health of the whole population.
According to Barrett (2000), health education is the process of educating people about health. Some deductions could be made from thin definition. Areas within this process

of educating people encompass environmental health, physical health, social health, emotional health, intellectual health and spiritual health. In this regard, it describes the processes by which individuals and groups of people learn to behave in a manner conducive to the promotion, maintenance or restoration of health. According to the Joint Committee on Health Education and Promotion (2001), health education means any combination of planned learning experiences based on sound theories that provide individuals, groups and communities the opportunity to acquire information and the skills needed to make quality health decision.

Operationally, the researcher sees health education as an aspect of general education whose aim is to promote the general well being of the whole population. It is also the kind of education concerned with equipping the recipients with the ability and competence to deal with health related issues. Health education can also be seen as consciously constructed opportunities for learning involving some form of communication designed to improve health literacy, including improving knowledge, and developing life skills which are conducive to individual and community health. As used in this study, health education is expected to improve knowledge and practice of the meat vendors.

Environmental Health Education Programme

The term, environmental health education programme is defined by Nwose (2007)as the education of the members of the society about their immediate environment and global ecosystem. They listed the component of the programme to include physical characteristics, climate agents or contamination, natural resources and how to maintain a balance and harmonious environment based on the principles of stability, conservation, recycling, detoxification and the concept of global inter-dependence. Omebe (2007) defined environmental education programme as the kind of intervention which helps the public to acquire awareness of the environment for sustainable development. In line with the above, the researcher defines environmental health education programme as an aspect of general education designed to inform consumers about the relationship between their actions and the protection of healthy environment. Part of this explanation is that it is also a kind of intervention that aims

at promoting a healthy environment. Environmental health education programme for meat vendors should aim at helping the vendors to acquire health knowledge and improve on their practices on the job.

The researcher therefore sees environmental education programme as the kind of instruction that motivates the public to participate in activities geared towards maintaining and improving the quality of the environment. It is also the kind of education or instance that helps people develop skills for prevention of environmental degradation and correction of any abuse. It is also an aspect of general education which aims at ensuring that proper environmental values and habits are taught to school children. From this conceptualization, environmental health education programme is therefore a kind of health education given to people to improve their health practices or activities. The purposes of such a programme are to improve health knowledge, change negative health attitudes and encourage healthy practices. For the meat vendors, it is for them to gain better knowledge and utilize best practices in handling meat in order to avoid meat contamination. In this study, environmental health education programme is intended to improve the health knowledge and practices of meat vendors .

Health Knowledge

The concept of health knowledge is a matter of on-going debate among philosophers in the field of epistemology. According to Barnes and Blevins (2003), health knowledge is essentially the recall and recognition of specific and universal health elements. An analysis of the above definition suggests that having health knowledge implies the ability to recall and recognize facts relating to wellness promotion and application of essential health services.

Another definition of health knowledge was given by Craven (2002) who defined it as familiarity with wellness practices or services which can include health facts, information, descriptions or skills acquired through experience or education Craven's definition implies that health knowledge involves practical or theoretical understanding of health issues especially those that can make a person to be free from contacting illness or sickness.

In reviewing the sources of knowledge, Gottschalk-Mazouz (2008) submitted that everything that people know about health originates from four basic sources. The first is from senses which are the most important, secondly authority, that is knowing from other sources like experts thirdly reason and fourthly intuition. Gottschalk-Mazouz believed that the fundamental source of health knowledge is the human sense.

In this study, the researcher defined health knowledge as that knowledge an individual should posses for him to know those processes involved in improving their health and lives. Health knowledge is a prerequisite for processing health-related information when making health choices. It is also conceptualized as any knowledge that aims at promoting wellness and quality lives. Health knowledge in this study is a dependant variable intended to be improved by environmental health education programme.

Health Practices

Health practice according to Abiola (2005) is defined as an assessment, policy development and assurance carried out in the field of public health as a function of government to provide public services. This means that health practice is the implementation of programmes and services aimed at improving public health (Mc Millian, 2016).

Furthermore, Meadows (2005) defined health practice as the application of health knowledge and experience to promote wellness as well as evaluating and measuring the impact on health. This definition suggests that health practice is the application of essential health services through the broad public health system, policy development shared leadership, translation of policy into practice. Again, Mitchell and Chet (2008) defined health practice as the continual quality improvement of public health decisions and the provision of public health services focusing on the governmental health system as well as translating science into actions and health outcome improvement. These suggest that health practice is a core process establishing a set of activities and universal understanding of related functions in the promotion of public health.

Health practice is seen by this researcher as the collectivity of activities, programmes and processes that contribute to operational effectiveness of public health activities. It is also seen as government sponsored activities that support the health of the population.

Meat Vendors

Meat vendor has been defined by many authors. According to Holmes (2016), a meat vendor is one who sells meat for human consumption. The above definition cannot be said to have covered the whole concept of meat vendor. In this regard, Angelillo, Viggiani, Greco and Rito (2001) defined meat vendor as anybody whose business is to slaughter and sell animal products.

Adams (2016) saw meat vendor as a term describing people who sell meat either by hawking or in shops. This definition is more detailed by differentiating ordinary selling of meat from meat hawking. Furthermore, Walker, Pritchard and Forsythe (2003) defined meat vendors as people within the category of professional meat handlers whose activities involve animal slaughtering and selling of meat in the open market. The above definition does not define meat vendor comprehensively because there are those within the profession of meat handlers who slaughter animals but do not sell the meat in the open market. These people rather slaughter animals for their masters in abattoirs (butchers). These butchers sell meat to the public that come to buy meat in the abattoir and also sell meat to the vendors who in turn sell to the public mostly on retail bases either in the abattoir, in meat stalls or by hawking. Within the scope of this study, a meat vendor is any person who slaughters meat for sale or buys meat from butchers and sells it to the public either by hawking or in shops or stalls.

Theoretical Framework

Health Belief Model

The Health Belief Model (HBM) was developed in the 1950s by Kurt Lewin. It is a psychological model that explains and predicts health behaviours by focusing on the attitudes and beliefs of individuals. The model is presented in Figure1.

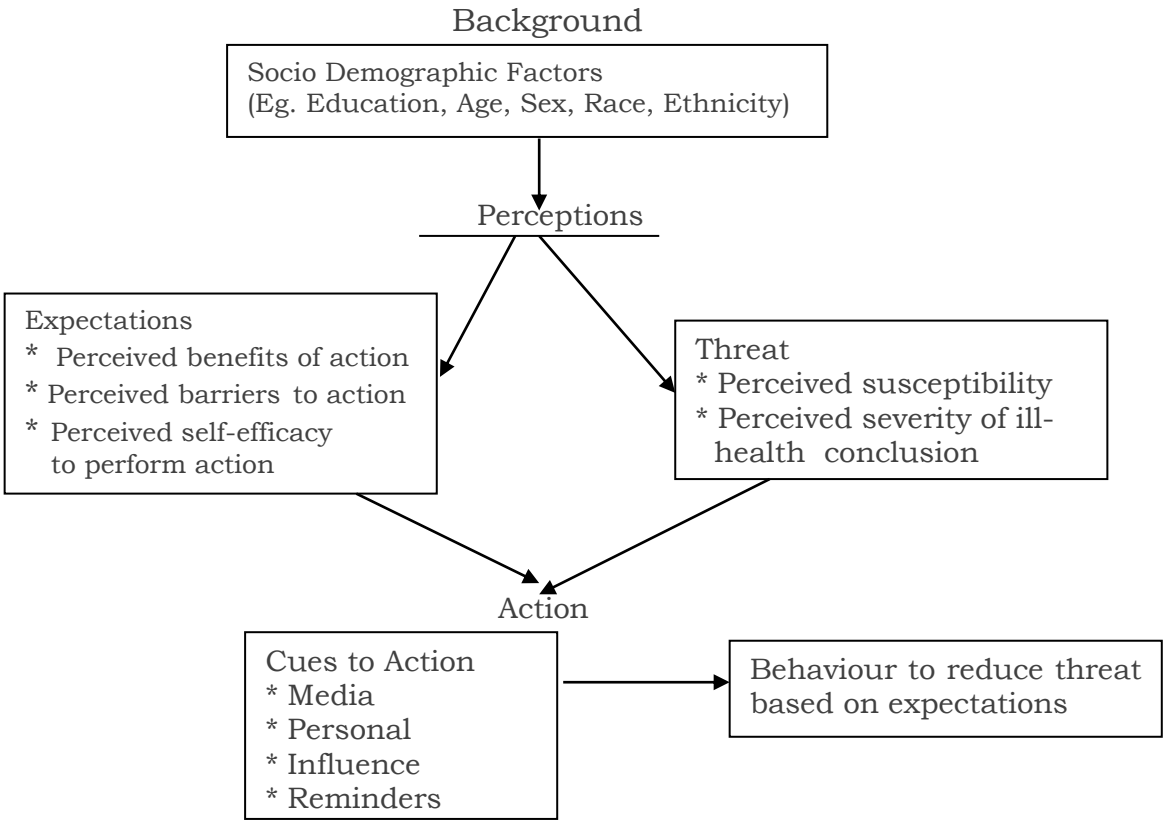


Fig.1: Health Belief Model
Source: Lewin 1950.

The model covers three major areas: background, perceptions and action. The background covers diverse demo-graphic, socio-psychological and structural variables that affect an individual's perception and thus indirectly influence health related behaviour.

Perceptions cover perceived threat and perceived expectations. The perceived threat consists of perceived severity of a health condition.

The HBM model is interactive in nature and has four primary dimensions which include: Perceived susceptibility, Perceived severity, Perceived benefits, Perceived barriers.

Perceived Susceptibility: This is a person's subjective perception of the risk of contracting a particular health condition. In health education, a person who feels that a dirty environment can contribute to a health problem will do everything possible to avoid contracting the disease condition. On the other hand a person who for some reasons sees himself as immune to the disease may not feel susceptible to the health condition.

Perceived Severity: This has to do with a person's feeling concern the seriousness of contracting an illness or leaving it untreated when contracted. This includes the difficulties the illness will create.

Perceived Benefits: This involves the effectiveness of the various available health strategies one has designed to reduce the threat of illness or the benefits one can gate in reducing the perceived threat from the health problem.

Perceived Barriers: This refers to the perceived negative aspect of the recommended course of action which may act as impediment to full appreciation of the indicated health behaviour. Sometimes, actions do not take place even though individuals may believe that the benefits of the action are effective.

The relevance of the model to this study lies in its implications for health behaviours. It can form a basis for any research meant to explore a variety of health behaviours in diverse populations.

A health educator using this model is expected to investigate the background of the research research participants and guide them to appreciate threats (dangers) posed by their activities. The severity of the problem is also expected to be understood by them. This will help them to appreciate the benefits of the health education programme and take necessary actions to overcome such barriers. Their perceived self-efficacy to perform the action required to maintain a clean environment will sustain the positive effects of the health education programme especially among meat vendors.

In the application of this model, the vendors need to be made to understand that they are susceptible to health problems emanating from dirty environment. They should also be made to understand the severity of diseases resulting from unhygienic practices in both abattoirs and meat stalls. They should as well understand the

benefits of maintaining clean and safe environment within the abattoir and meat stalls in order to avoid meat contamination. In this same vain they should be taught the necessary steps to overcome the barriers to maintaining healthy environment or personal hygiene.

Theory of Reasoned Action (TRA)

The theory of reasoned action (TRA) was developed by Ajzen and Fishbein (1980). This theory provides a construct that links individual beliefs, attitudes, intentions and behaviours based on the premise that human beings are rational and that the behaviours being explored are under volitional control.

The theory is presented Figure 2:

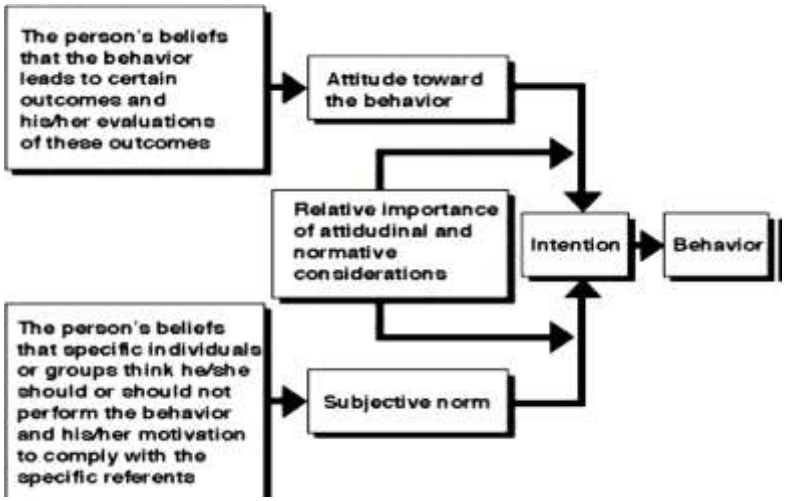


Fig.2. Theory of Reasoned Action.

Source: Ajzen,I., Fishbein, M. (1980) Understanding attitudes and predicting social behaviour. New Jersey: Prentice-Hall, Inc

l. **Behaviour:** A specific behaviour defined by a combination of four components: action, target, context, and time (e.g., implementing health education programme by health educators (action) to help meat vendors (target) in abattoirs and meat stalls to maintain hygienic practices (context) every time (time).

2. **Intention:** The intent to perform a behaviour is the best predictor that a desired behaviour will actually occur. In order to measure it accurately and effectively, intent should be defined using the same components used to define behaviour: action, target,

context, and time. Both attitude and norms, described below, influence one's intention to perform behaviour.

3. **Attitude:** A person's positive or negative feelings toward performing the defined behaviour.

4. **Behavioral Beliefs:** Behavioural beliefs are a combination of a person's beliefs regarding the outcomes of a defined behavior and the person's evaluation of potential outcomes.

In the context of this study, behaviourial beliefs may refer to the vendors' beliefs regarding environmental health and benefits (concerns) derivable from the environmental health education instructional programme.

5. **Norms:** A person's perception of other people's opinions regarding the defined behaviour.

6. **Normative Beliefs:** Normative beliefs are a combination of a person's beliefs regarding other people's views of a behaviour and the person's willingness to conform to those views.

The TRA provides a framework for linking each of the above variables together. Essentially, the behavioral and normative beliefs -- referred to as cognitive structures - influence individual attitudes and subjective norms, respectively. In turn, attitudes and norms shape a person's intention to perform a behaviour. Finally, as the profounder of the TRA argue, a person's intention remains the best indicator that the desired behaviour will occur. Overall, the TRA model supports a linear process in which changes in an individual's behavioural and normative beliefs will ultimately affect the individual's actual behaviour.

TRA is very relevant to the current study. First, it implies a health educator wishing to improve on the health knowledge and practice of meat vendors, for example, should take action, identify the target group, the context and time for programme. These are very important as their absence may not lead to the desired behaviour. In the same manner, the above behavioural components should define the intention of both the health educator and the meat vendors. This will guide them to work towards the same

goal based on the norms establishing the business or environmental norms with reference to human activities and human health.

Social Cognitive Theory

This is a theory of human functioning developed by Bandura in 1986. It is based on the idea that person's, behaviour, and environment are all key factors in influencing a person's development and learning. The theory describes human functioning as the triadic interaction between person, behaviour, and environment. Personal factors that affect behaviours include thoughts, beliefs and attitudes. Behavioural factors include the effects of prior performance and quality of the engagement in a task. Environmental factors involve access to information, external feedback, and help from other participants or from evaluators.

Bandura suggested that each of these three factors (personal, behavioural, and environmental) can influence one another and will in turn be influenced by it. Specifically, how one thinks can affect what one does and how one perceives the environment. One's behaviours can change one's environment and influence how one thinks of oneself; and the environment can affect how we think and what one does. This notion of the triadic interaction can be specifically applied to understanding the nature of human functioning. The theory is illustrated in Figure 3.

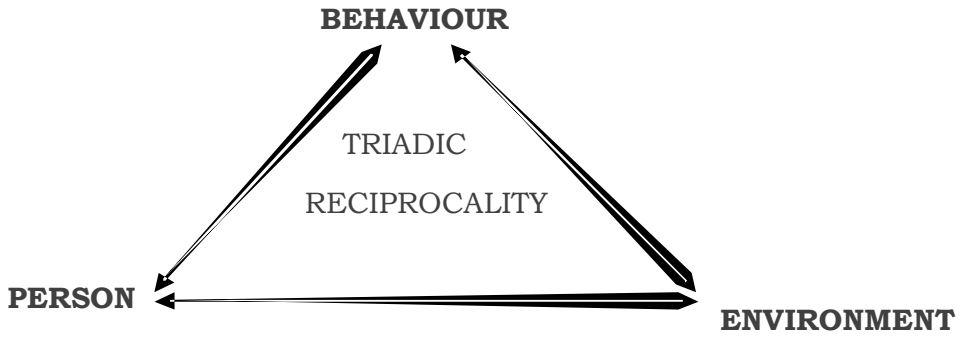


Figure 3: Model of the relations between the three types of factors in Bandura's (1986) conception of triadic reciprocity.
Source: Bandura (1986).

The relevance of the above theory to the current study lies in self-regulation which occurs during the reciprocal interaction of the environment and the person, mediated through the behaviour. Thus, self-regulation is an ongoing process that occurs during the interaction among the person, the behaviour and the environment and during this interaction, self-regulatory functioning involves several key sub-processes: planning; self-monitoring; self-evaluation and self-reaction. These sub-processes are very important in understanding meat vendors' health knowledge and practices. For instance, when placing for the programme, the vendors should be made to set task-specific goals that are used as criteria to guide their cognition in general. Again, the researcher should help the vendors to be aware and monitor various aspects of their cognition and progress towards the goals they have set. The researcher should also help the vendors to evaluate the possible discrepancy between their ultimate goal and the progress they have made toward the learning goals based on the information collected from self-monitoring. The vendors should be made to engage in self-reaction through which they generate responses to the outcomes of their performances and the responses in turn guide and motivate their future actions. These self-regulatory actions are highly related to improvement in the vendors' health knowledge and practices.

Theoretical Studies

Meats and their Contaminations and Preventions

Meat vendors sell different kinds of meat. The major ones are discussed here with respect to their contaminations and preventions.

Swine: This is one of the common meats hawked by vendors. It is a popular meat among most Nigerians. It is produced under a wide variety of production systems ranging from simple backyard pigs or the pigs living on garbage belts to family operated farms or large scale integrated pig industries with sophisticated bio security measures. According to Olukole (2006), swine meat otherwise known as pork can be

contaminated by swine cysticercosis which results from a high percentage of infected pigs particularly those not slaughtered through official channels.

Particularly in underdeveloped countries sanitary measures must be taken to prevent contamination of the environment with human feces in order to break the life cycle of tapeworms. In these countries under-reporting of swine cysticercosis results from a high percentage of pigs that are not slaughtered through official channels, particularly those prone to exposure to *Taenia.* Fortunately, consumers prevent most pig-borne food safety hazards by cooking pork and pork products.

According to Fasanmi and Sansi (2008) sanitary measures must prevent the contamination of the environment with human feces in order to break the life cycle of the tapeworm and consumers can prevent most pig-borne food safety hazards by cooking pork and pork products.

Poultry*:* As observed by Olawele, Oluduro and Famurewa (2005), even if the actual numbers of pathogenic organisms on broiler carcasses leaving processing plants are low, those pathogens in prepared (and undercooked) poultry products are amplified if held at room temperature. The handling of raw carcasses can be a source of cross contamination of other foods (Hughes & Koplan 2005). According to Obi (1990), poultry products must be properly cooked, cooled and stored, to prevent foodborne illness, particularly in commercial or institutional food service settings where larger quantities of food are being prepared at a time.

Meat from small domestic ruminants: In most developing countries, butchering of sheep and goats for local consumption often happens under poor hygienic conditions and the meat is sold or kept under conditions that favor external bacterial contamination and multiplication (Olukole, 2008).

The larval stage of the dog tapeworm (*Echinococcus granulosus)* is found mainly in organs of sheep and goats (WHO, 2004). In humans, *E. granulosus* cause a severe disease with hydatid cysts in the liver and/or the lungs (Edema & Omemu, 2004).

As observed by Olukola and Ohore (2007), educational programs must aim at raising the level of awareness of producers, meat vendors and consumers with regards to the safe handling of small ruminant meat. Again, in countries where sheep are raised for the export of mutton or lamb, risk reduction methods must be applied similar to those in beef packing plants to minimise contamination with micro-organisms or chemical residues (FAO, 2009)· Dogs must be prevented from feeding on organs of small ruminants to prevent tapeworm infection (Bankole, Oladimeji & Omemu, 2005).

Horse Meat: According to WHO (2004), the two principal agents in horse meat for food-borne disease in humans are *Salmonella* and *Trichinella*. The main chemical hazard to human health from the consumption of horse meat is cadmium, particularly if the horse meat originated from heavily polluted industrial regions.

Products from farmed deer, ostriches and crocodiles: Products from farmed unconventional livestock species are subject to the same requirements as for conventional meat. Public health risks associated with the marketing of meat from farmed deer are no greater than those of other meats. Consumption of meat from farmed ostriches poses little public health risk (WHO 1982). For meat from farmed crocodile, there is a distinct possibility of contamination with human pathogens, depending on housing, feeding, slaughtering technique and hygienic practices under which crocodiles are reared. Quality of water in which crocodiles are raised is also important. However, slaughter and hygienic processing procedures make the consumption of meat originating from farmed crocodile a negligible public health risk (Eden, Omemu & Fapetu, 2001).

Game: According to Adesokan, Ogunbamoo and Odetoyinbo (2005), wild game meat is not usually subject to veterinary inspection and can be contaminated by organisms associated with lack of hygiene. Wild game meat should be well cooked prior to consumption. Some traditional processing methods, such as the preparation of ‘biltong’ (sun-dried meat) may not guarantee the complete destruction of all zoonotic agents (Bankole, Oladimeji & Omemu, 2005).

Seafood: Eden**,** Omemu and Bankole (2005) noted that the current system for prevention and control of seafood-associated foodborne disease is inadequate. Accordingly, Food and Drug Administration (FDA) (2007:64) observed that seafood safety control programmes must address the following:

a. environmental safety
b. mechanical spreading of infectious or toxic agents through human activity
c. development of new culturing and fishing procedures.
d. change in eating habits and traditional eating habits of ethnic groups
e. awareness of public health personnel of rare diseases
f. ability to detect toxins and disease agents by specific and sensitive analytical methods
g. consumer education as the most realistic option to protect public health.

Beef: The problem of microbial safety of beef is contamination during slaughter. The muscles of a healthy animal are sterile: that is, no bacteria of fecal origin are present in the muscle tissue (Olawale, Oludoro & Famurewa, 2005).

Many of the microbial pathogens of current concern survive in the environment, in water, on pastures and in food, unless precautions are taken to ensure pathogen control. According to Olukole (2006), contamination of fresh beef and beef products with human pathogens is a consequence of a wide array of preharvest, harvest and post-harvest factors.

Transportation may favour contamination as animals are placed in close proximity to other animals and, as posited by WHO (2004), stress may further enhance cross contamination of meat with pathogens.

Slaughter and processing procedures can also enhance cross-contamination from the hide, gastrointestinal tract and other surfaces of the animal during slaughter and dressing.

According to Vounes and Bartran (2001), at the slaughter and processing plant, traditional official meat inspection procedures are inadequate to deal with the hazard of human pathogens in the gut of healthy animals. To minimize public health hazards from these pathogens it is necessary to involve industry in a process of pathogen reduction.

Sheep and Goat Meat: Sheep and goat meat is an important source of animal protein in many parts of the developing world. According to Olekole and Ohore (2007), bacterial contaminants are similar to those of beef. Toxoplasmosis in mutton and goat meat is a particular hazard for immuno-compromised people and pregnant women. Olekale and Ohore also noted that toxoplasmosis is one of the main causes of abortion in ewes and goats.

Loehr (2013) observed that pathogens which may be associated with the consumption of meat from small ruminants include: *Clostridium perfringens*, *Cryptosporidium parvum* and *Campylobacter jejuni*. According to Edema and Omemu (2005:23), the following measures will help to reduce the risks associated with contamination of sheep and goat meat:

a. Prohibit slaughter of animals in non-hygienic facilities.
   National or municipal health authorities must regularly inspect and approve these facilities.
b. Provide potable water, liquid and solid waste disposal systems, as well as basic hygiene of personnel, equipment and slaughter methods.
c. Transport meat and/or products of animal origin in containers or vehicles equipped for this purpose.
d. Implement public education and information programmes to encourage consumers to purchase only high-quality meat products.

Ostriches: Ostrich meat is seen by many as a desirable, low fat, low cholesterol, red meat alternative to beef. According to Olukole (2006), ostriches have no infectious or contagious species-specific diseases, but are susceptible to a number of infectious agents acquired from and common to other avian species. Some of these agents causing diseases may pose a threat to public health as well (WHO, 2004).

Meat/Abattoir Wastes and Environmental Pollution

According to ESRC (2012), meat slaughtering including other human activities which lead to pollution of the environment and a disruption of ecosystem functionality contribute impurities in the form of industrial, domestic, agricultural and chemical wastes to the environment. In many parts of the world, human

activities impact negatively on the environment and biodiversity. In specific terms, one type of waste that is of great concern in both urban and rural areas in Nigeria is abattoir or slaughter-house waste. Almost every day in all the urban and rural markets in Nigeria, animals are slaughtered and the meat sold to the public for consumption.

Meat wastes originate from killing; hide removal or dehairing, paunch handling, rendering, trimming, processing and clean-up operations. The abattoir wastes often contain blood, fat, organic and inorganic solids, and salts and chemicals added during processing operations (ESRC, 2012 & Loehr, 2013). In ruminants, the first stomach or paunch contains undigested materials called paunch manure, which can contain long hairs, whole grains and large plant fragments. According to Robinson, Draper, and Gelman, (2010); Kirchmann and Witter, (2011) the faeces of livestock (animal manure) consist of undigested food, mostly cellulose-fibre, undigested protein, excess Nitrogen from digested protein, residue from digested fluids, waste mineral matter, worn-out cells from intestinal linings, mucus, bacteria, and foreign matter such as dirt consumed, Calcium, Magnesium, Iron, Phosphorous, Sodium, etc. Abattoir effluent (waste water) has a complex composition and can be very harmful to the environment (Polprasert & Tran, 2013). Therefore the importance of knowing the pollution potentials of meat/abattoir wastes cannot be over-emphasized.

Pollution is a general term and is defined in many ways. According to Velz (2010), it is the befouling of the environment by man's activities, particularly by the disposal of solid, gaseous, and liquid waste products. Pollution is also defined by Holdgate (2009) as the introduction by man into the environment of substances or energy liable to cause hazards to human health, harm to living resources and ecological systems, damage to structure or amenity, or interference with legitimate uses of the environment. Lewis (2003) defined pollution as the introduction into any environment of substances that are not normally present therein and that are potentially toxic or otherwise objectionable.

Water pollution*:* Water pollution, as defined by Lewis (2003) is the contamination of fresh or salt water with materials that are toxic, noxious, or otherwise harmful to fish and other animals and to man, including thermal pollution. Water pollution is produced primarily by the activities of man, specifically man's mismanagement of water resources (Scott, 2009). A satisfactory operational definition might be that water pollution is anything whether physical or chemical that affects the natural condition or the intended use of water (Wilber, 2010). Water pollutants according to Scott (2009) include organic wastes e.g. volatile suspended solids (VSS), living agents (e.g. bacteria, viruses), plant nutrients (especially Nitrogen and Phosphorous), synthetic organic chemicals (for example. DDT, dieldrin, among others.), inorganic chemicals and mineral matter (for example metals, metal salts, acids, particulate matter, among others), sediments, radioactive materials, hot water, cold water, oil.

It is pertinent to note here that most meat vendors use polluted water to wash meat. Some of them too use polluted water to wash their hands. As a result, such hands become contaminated and any meat touched with them become contaminated too.

Air pollution*:* Middleton (2006) observed that air pollution is the contamination of air by unwanted gases, smoke particles, and other substances. Comprehensively, Loeher (2013) noted that air pollution means the presence in the outdoor atmosphere of one or more air contaminants (pollutants) in quantities, of characteristics and of duration which are injurious to human, plant, or animal life or to property, or which unreasonably interfere with the comfortable enjoyment of life and property. Air pollutants according to Middleton, (2006) and AAAS (2005) include: carbon monoxide (CO), sulfur oxides (SO), nitrogen oxides (NO), ozone (O3), carbon dioxide (CO2), ammonia and ammonium compounds (NH3 and NH4x), cyanides (HCN), fluorides (F), chlorine and hydrogen chloride (Cl and HCL), suspended particulate matter (SPM), hydro carbons (HC), asbestos fibre emissions, heavy metal particles and radioactive substances, etc.

Most abattoirs or meat vendors use vehicle tyres to roast the skins of slaughtered meat. The air around the abattoir get polluted. Sometimes, smokes and particles from the pollution settle on meat exposed to the air. The polluted air in the environment

may cause sneezing or blowing of the nose. In most cases, most of them sneeze on the meat unknowingly. Again, some of them use their hands to clean their nose that was affected by polluted air, after which they touch the meat with the uncleaned hands.

Food pollution*:* Isaac (2013) defined food pollution as the fouling, soiling or contamination of food by bacterial pathogens, harmful biological organisms and deleterious inorganic and organic chemicals. Fungi and bacteria often colonize crops stored as food. Holdgate (2009) observed that substances like metals, nitrates, oxalates, nitrosamines, various organic acids, sorbic acids, and sulfur dioxide can also contaminate food accidentally, or as a result of deliberate human action.

Bridges, Bridges, Potter (2000); Boadi and Kuitunen, (2003); Amisu, Coker and Isokpehi (2003) pointed out that the consequences of man-made pollution include transmission of diseases by water borne pathogens, eutrophication of natural water bodies, accumulation of toxic or recalcitrant chemicals in the soil, destabilization of ecological balance and negative effects on human health.

Itodo and Awulu (1991) noted that solid and liquid wastes tend to be worrisome due to the high content of putresible organic matter, which can lead to the depletion of oxygen and an impairment or disruption of water eco-functionality and a preponderance of disease-causing organisms. The meat processing wastes come from stockyards, abattoirs and packing plants, all these contain blood, fats, protein, gut contents, heavy metals, antibodies, hormones and other substances.

Adelegan (2002) observed that, in many developing nations, like Nigeria, many abattoirs dispose of their waste directly into streams or rivers and also use water from the same source to wash slaughtered meat. The situation is not any different in Anambra State where most liquid and gaseous wastes are released into the immediate environs of the abattoir. According to Ugonna (2001), in some instances, the solid wastes are deposited with other urban wastes some distance from the abattoir; the Amansea Abattoir for instance dumps its solid wastes into

the Ezu River about a kilometer upstream of Amansea, a small peri-urban community (Ugonna, 2001).

Cadmus, Olugasa, and Ogundipe, (1999); Coker, Olugasa and Adeyemi, (2001) observed that abattoir wastes contain several pathogenic species of bacteria which affect animal and human health Efforts have been geared towards curbing the menace of pollution around the world, particularly by the United Nation's organs (for instance the United Nations Environmental Programme). There are many international conferences and protocols to this effect; Rio de Janeiro Conference of 1992 was a major effort, collating previous environmental issues and bringing them to the fore. Environmental Impact Assessments (EIA) are used as planning tools to give the environment its due place in the decision making process by clearly evaluating the environmental consequences of a proposed activity before action is taken.
The major abattoir based pollutants can be specifically discussed thus:

Animal blood*:* Animal blood is known to possess high oxygen demand. Blood from beef cattle has a biochemical oxygen demand (BOD5) of 156,500mg/l and a chemical oxygen demand (COD) of 218,300mg/l (Beefland International, 2004). The implication of this fact is that discharge of animal blood into streams would deplete the dissolved oxygen (DO) of the aquatic environment.

Paunch manure*:* In ruminants, the first stomach or paunch contains undigested materials or paunch manure. According to Beefland International, (2004) the paunch manure have a moisture content of about 88% with an average COD of 177,300mg/l, and average BOD5 of 50,200mg/l. The solid portion of the paunch manure contains the greatest pollution load, about 73% of the COD and 40% of the BOD. Improper disposal of paunch manure can therefore exert oxygen demand on the receiving environment or breed large population of decomposers (micro-organism) some of which may be pathogenic.

Animal faeces or manure*:* The faeces of livestock has been observed by Middleton (2006) to consist of undigested food, mostly cellulose fibre, undigested protein, excess nitrogen from digested protein, residue from digested fluids, waste mineral matter, worn-out cells from intestinal linings, mucus, bacteria, and foreign matter such as dirt consumed , calcium, magnesium, iron, phosphorus and sodium. Improper disposal of animal faeces can therefore cause oxygen-depletion in the receiving environment. It can also cause nutrient-over enrichment of the receiving system. And the possibility of disease causation is also present.

Abattoir effluent: Ezeoha (2000) noted that fresh abattoir effluent is mainly composed of diluted blood, fat and suspended solids. It may also contain some coarse solids (manure and, pieces of meat). Generally, fresh abattoir effluent has been shown to contain solids, minerals, metals, and micro-organisms; and to exert oxygen demand. Similarly, Ezeoha, (2000); Olarewaju and Olufayo, (2004) maintained that aged and decomposing abattoir effluent is often malodorous.

Animal horns and bones*:* Animal horns and bones when not disposed off properly are unsightly; they occupy useful space; are odorous and attract flies, and can cause nuisance.

Decomposing manure pile*:* Ugonna (2001) observed that, in most abattoirs in Nigeria, both the paunch manure and the animal faeces are allowed to pile up and decompose without necessary attention. Such manure piles are permanent sources of pollution within the market environment, as they are often foul-smelling, attract both flies and scavengers, and breed mosquitoes. Again, the pollution potential of abattoir wastes can be discussed thus:

Pollution of surface waters*:* According to Itodo and Awulu (1991) abattoir wastes contain materials that have oxygen demand (BOD or COD). Therefore, runoff from abattoir wastes piles can affect the quality of nearby streams. Low level of dissolved oxygen (DO) and ammonia toxicity in such streams could result in death of fish. Coker, Olugasa and Adeyemi (2001) noted that eutrophication (excessive vegetative

growth) in stream channels, which occur because of the nutrients (nitrogen and phosphorus) in abattoir effluent, could reduce the size of receiving stream channels, which could cause over-flooding and its consequent damages. In addition to reducing streams physical and chemical quality, pathogens from abattoir effluent could be transmitted to humans via water based recreations.

Pollution of underground water*:* Abattoir wastes often contain pollutants that can enter the ground water and alter its quality (Chukwu, 2008). The presence of ground water pollutants of organic nature is made known through taste, odour, foaming or damage to crops which have been irrigated with this water. A study of nitrogen in soils under feed-lots by Murphy and Gosch, (2011) confirmed nitrogen accumulations from almost zero to 3783kg per acre in a 4m soil profile. Wilber (2010), also confirmed that samples of ground water under feed-lots in the south Platte River Valley, an area containing most of the cattle in Colorado, U.S.A, contained ammonium nitrogen up to 38mg/L, organic carbon up to 300mg/L, and had an offensive odour. Also viral diseases have been caused by ground water pollution.

Pollution of the abattoir environment*:* According to Leoher (2013) abattoir wastes can produce odours which interfere with the enjoyment of life and property and thus can be a source of localized air pollution. Robberts (2012) had earlier observed that some of the odorous compounds like Sulphides, Mercaptans, Amines and Organic acids; are tenacious, clinging to clothing and other articles, persist for long periods, and carry great distances.

Pollution or contamination of consumables: The surroundings of most abattoirs in Nigeria give offensive odours and breed mosquitoes due to the pile-up of solid wastes, faeces, carcass, horns, scraps of tissue, (Ezeoha, 2013). After rainstorm, the pile effluent flows and spreads to some other parts of the market. Salvato (2012) also observed that it is common to see pigs swim in the effluent and roam the market with their bodies covered with the putrefying wastes materials. In this process, consumables in the market could be polluted or contaminated. In the same manner,

Nwanta, Onunkwo and Ezenduka, (2011) stated that where abattoir effluent-polluted waters are used to grow salad crops and vegetables, transmission of infections is bound to occur because animal wastes are known to contain pathogenic organisms, causing salmonellosis, leptospirosis, tularemia, foot and mouth disease, hog cholera, etc.

Water quality: Research findings by Adelegan, (2002) and Adesemoye, (2006) show that only few abattoirs in West Africa use relatively very clean water for its operations. The slight failure in microbial standards is due mainly to contaminated containers used in fetching water from the main tank which is sometimes filled by water tanker service as pipe borne water supply to the abattoir is irregular. Adesemoye, for instance, observed that high biological oxygen demand (BOD) can be attributed to the high organic load resulting from meat wastes, skins, blood, salts and rumen contents carried in the effluent. High organic (and inorganic) loading of the effluent was further manifested in the extremely high total suspended solids and turbidity values as well as the huge coloration of the effluent. According to Adelegan (2002), Sheshegu community members in Ghana observed that there has been a change in the colour of their water since the abattoir started operating. According to Adelegan, wastewater from the abattoir is disposed into drains around it, which empty onto the land (also confirmed by management of Tamale abattoir) and finally drains into the seasonal stream and community dam that supply the community with water.

Olugasa and Adeyemi (2001) noted that high faecal coliform counts in the effluent is a strong indication of high pollution and hence it is not safe to dispose it into the environment. Olugasa and Adeyemi further stated that the high counts may be due to the excreta from the intestines some of which are washed to the effluent. According to Ugonna (2001) cattle, sheep and goats are usually slaughtered with their blood, part of the dung and abdominal content washed on cemented pavements in the abattoir. Ugonna noted that the solid waste is collected and dumped outside and the remains are then washed away and the wastewater runs through open drains of the

abattoir to bigger adjoining drains outside the abattoir to the neighborhood without any treatment. This situation is prevalent in a number of African countries, including Nigeria. According to Adesemoye, Opere and Makinde (2006), the presence of faecal coliform in the effluent indicates recent faecal contamination - meaning that there is a high risk that pathogens are present. Figueras, (2000); and Coker et al., (2001) observed that, there are a number of methods for waste treatment (like recycling, dumping in deep pits or burning) to meet public health and conservation requirements, which result in the destruction of pathogens and the mineralization of the organic components of sewage prior to discharge. However, according to Boadi and Kuitunen, (2003), in Nigeria, like many other developing countries, the discharge of untreated wastes into the environment is still a problem, despite the establishment of national laws (Adeyemo,2003).

Odour: It is also important to observe that the odour emanating from the abattoir is highly repugnant. According to Adeyemo (2003), the outbreak of maggots, flies and diseases are impacts of the abattoir on the environment. Solid waste is dumped just around the abattoir not far from the settlements while liquid waste eventually ends up draining into the community dugout. Salami (1998) noted that during the raining season, the solid waste is washed and spread into the houses, causing maggot and fly infestations which lead to the subsequent outbreaks of diseases such as typhoid, dysentery and diarrhea, as pertains in other developing countries.

Noise level: Inglis and Cohen (2002) stated that the noise is generated by several sources and activities at the site. These included noise made by the workers and traders, slaughter animals, motor bikes, processing activities within the slaughterhouse, plant machinery, and service vehicles including trucks and forklifts for haulage of animals to the site and dispatch of meat from the site. According to Hinton et al (2000) noise levels in all sections and at all times exceeded the acceptable limits.

Amisu et al (2003) observed that noise level (102. 3dB) recorded inside the abattoir 102.3 dB (A) was the highest. This is because all the processing activities such as slaughtering and dressing of animals and some products go on there. Slaughtering resulted in a lot of noise due to the large numbers of (over hundred) butchers doing the slaughtering at the same time.

In a study carried out in Ghana by Adesemoye, (2006), the northern cohort recorded the least noise level, 80.8 dB (A), although it was very close to the main road linking Nyankpala and Tamale. According to Adesemoye, this could be attributed to the fact that there was irregular vehicular passage, and there were times when there was no vehicular passage at all. Potter (2000) noted that high noise levels in industries are unwanted not only because they are hazardous to hearing but also because they are a hindrance to communication and cause unnecessary stress upon people who receive no immediate or direct benefit from the noise producing system. According to Boadi and Kuitunen (2003), prolonged exposure to noise levels above acceptable limits has negative health implications. The EPA Ghana, for example, has rated (AKOBEN ratings) both the Accra and Kumasi (the Capital and second largest cities in Ghana) Abattoirs RED. This is because they have failed to meet the requirements for monitoring and reporting, and best environmental practices as far as noise and waste management is concerned (EPA, 2010). In the study, five colours were used for this rating. These include GOLD, GREEN, BLUE, ORANGE and RED, indicating environmental performance ranging from excellent to poor (EPA, 2010). The colour range also indicated level of their injurious health effects for residents and workers. It is equally important to note that EPA Ghana carries out its AKOBEN ratings on the Tamale Abattoir in order to bring to the public domain the real situation of the abattoir in terms of its environmental ratings. Environmental pollution and unhygienic handling of meat can be solved through environmental health education programme.

Environmental Health Education Programme

According to Winser (2015) , environmental health education aims at helping people to achieve environmental health by their own actions and efforts. It begins with the

condition of people in improving their own environmental health and developing a sense of responsibility. According to Pisharoti (1975), the general purposes of environmental health education programme are of three folds. They include:

i. To make health a valued community asset;
ii. To help individuals to became competent in and to carryout those activities they must undertake themselves, as individuals or small groups in order to realize fully the state of health depending in the constitution of the World Health Organization (developing such practices as are believed to bring about the best possible state of well being.
iii. To promote the development and proper use of health services.

Pisharoti further stated the specific objectives of environmental health education programme to include:

i. To educate the people on matters related to environmental health as to make safe environmental health practices and measures a valued individual and community asset.
ii. To develop social norms and values that would lead to the adoption of improved environmental health practices.
iii. To secure political and budgetary support for environmental health programmes
iv. To obtain intelligent cooperation on the implementation of regulations from these at whom these regulations are aimed.
v. To develop among the schoolchildren the required knowledge and the proper attitudes towards safe environmental health practices and to provide opportunities for carrying out these practices.

According to Ezeoha (2013), the success of environmental health education programme depends on the sustained, active and voluntary cooperation of people to bring about the desired changes in their existing behaviour. According to Chukwu (2008). It is hard to induce people to accept new practice. It therefore, requires systematic efforts and simultaneous attention to such variables or factors like social, psychological, economic technological, administrative and political. This, calls for

socialization. According to Leoher (2013), many existing practices are the result of contacts and socialization within the family or community environment during the lifetime of the individual. It is in this regard that environmental health education programme is intended to impact positively on the health knowledge and practices of the meat vendors.

Empirical Studies

Studies on Health Knowledge and Practices

Roberts (2012) carried out a study on the impact of health education programme on the knowledge and practices of school children in Pritoria. The purpose of the study was to assess the knowledge and practices of the respondents as well as the effectiveness of the intervention regarding health education programme on personal hygiene.

The design applied for the study was "Experimental Group-Control Group; Randomized Research participants". Two research questions and one hypothesis guided the study. A sample of 60 school children in the age group of 8 -10 years were selected for the study. Simple random technique was used. A group of 30 respondents was taken as the control group and the other 30 was taken as the experimental group.

Data collected were subjected to mean, standard deviation and t-test. The major findings included: that most of the respondents had good knowledge of good personal hygiene and the ways to achieve it but in real life situation, they were not practicing it. There was no significant difference in the mean scores of pre-and post-testing of the control group on various components of personal hygiene of the respondents. Data from the experimental group showed the mean difference in the pre-and post-tested scores on knowledge with regard to various components of personal hygiene to be higher and the t-values were also significant. Health education intervention was effective in improving knowledge and practices of school children regarding personal hygiene.

This study is related to the present study. First, it focused on improving the health knowledge and practices of the respondent which is also the main thrust of the current work. Secondly, it employed quasi-experiment which was also adopted in the current work. It however differs from the current work by using school children as respondents while the current work studied vendors who are adults. Another area if difference is that, while the current work adopted intact group, the former used experimental and control groups.

Bas, Ersu and Kivanc (2006) evaluated food hygiene knowledge, attitude and practices of food handlers' in food business in Turkey. The purpose of the study was to evaluate knowledge, attitudes and practices concerning food safety issues among food handlers.

It was a survey guided by two research questions and one null hypothesis. The sample of the study comprised 764 food handlers in 109 food business centres in Ankara. The population comprised 31 hospital food services; 14 catering establishments; 4 school food services, 4 hotels; 17 Kebab houses; 14 takeaways and 18 restaurants. Questionnaire and interview were the instruments for data collection. All statistical analysis were conducted using SPSS for Windows (Version 11.0, 2001,Chicago, I.L. Statistical significance was set $p<0.05$.

The following findings were made; (a) The food safety knowledge of food handlers were poor; (b) Majority of the participants had not taken food safety training (c) Majority of the participants reported hygiene practices. There was difference in food safety practices scores between trained and untrained food handlers ($P <0.05$). The hands of food service staff can be vectors in the hygiene or cross-examination. The above study relates to the current one by investigating health knowledge and practices. Even though the focus was on food handlers, meat which is the focus here is also part of food. The difference lies in the design. While the former was a survey, the current work is quasi-experimental.

Urachim and Babayemi (2010) investigated knowledge and attitude of a group of Nigerian undergraduates towards environmental sanitation. It was a cross sectional survey guided by two hypotheses. Eleven thousand, seven hundred and sixty-five (11, 765) undergraduates of University of Ibadan formed the population. A multi-stage sampling technique was used to select a sample of 1000 respondents.
Participants were proportionally represented. As such, 423 respondents were randomly selected from humanities and arts, 378 from science and technology and 199 from health sciences.

A researcher-developed questionnaire was the instrument for data collection. The instrument was duly validated and the reliability (0.69) was also found to be high. Self-administered questionnaire was utilized for data collection and t-test was used in data analysis.
The major findings were as follows: There is both positive and significant relationship between knowledge and attitudes towards environmental sanitation. Males had significantly better knowledge of environmental sanitation ($p = < 0.05$). There were significant differences recorded across field of study ($P<0.05$) subgroups as regards knowledge of environmental sanitation. This study is related to the present one by indicating how human activities can impact on the environment. It also indicated how gender can influence the acquisition of health knowledge. It was a quasi-experiment with intact group and as such, has significant relationship with the current study.

Izugbara and Umoh (2004) assessed indigenous waste management practices among the Ngwa people of South Eastern Nigeria. The purpose of the study was to assess the traditional waste management practices in the light of their implications for policy implementations.

The descriptive survey research design was adopted. Four research questions and two hypotheses guided the study. A researcher developed questionnaire duly validated by experts was the instrument for data collection. The reliability index of the instrument

was found to be 0.72 which was considered adequate for the study. Interview was also used in the data collection.

The researcher with the help of seven assistants administered the instrument. Seventy-eight men and women, ranging in age from 58 to 102 were interviewed independently.

The major findings were as follows: The Ngwa people had no single term for describing waste. The Ngwa people categorized wastes into solid or liquid, degradable or non-degradable. Wastes resulted mainly from human activities like farming, cooking and animal slaughtering. Participants noted that a major feature of indigenous waste management among the Ngwa people was segregation. Waste water from domestic activities was recycled in many indigenous ways.

Studies on Health Education Programmes

Shelu, Ajegbe and Abubakar (2006) investigated the roles of teachers in the promotion of environmental health education programme among secondary school students in Ilorin, Kwara State.

The main purpose of the study was to examine the influence of students' socio economic and religious background, physical environment and what health education teachers could do to promote optimal mental health among students. The study adopted the descriptive survey research design and was guided by four research questions and four hypotheses. The stratified random sampling technique was used to select 120 samples out of estimated 10,000 population from 10 secondary schools in the area of the study.

A self-structured questionnaire validated and found reliable with 0.72 coefficient correlation was used for the study.

The data collected were analyzed using simple percentages and chi-square statistic. The results of the study showed that respondents' socio-economic and religious background, physical environment and teachers' expected roles significantly influenced students' development of optimal mental health.

The findings are summarized thus: Socio-economic background of the respondents was significantly related to the development of optimal mental health of the students. Religious background of the respondents was significantly related to development of mental health of the students. School physical environment of the respondents was significantly related to development of optimal mental health of the students. Teacher's role in the promotion of mental health of the students was significantly related to the development of the optimal health of the students. The study above is related to the current study. It focused on mental health promotion which in the current study is related to health knowledge. It differs however by design. While it adopted descriptive survey, the current work is quasi-experimental.

Boer, Beck, Durinck, Verbeck and Dijk (2004) carried out a study on health education programme for workers at risk for early retirement. The main aim of the study was to evaluate their occupational health education programme for workers at risk which could reduce early retirement and increase the work ability, reduce stress related symptoms, and improve quality of life and satisfaction with the occupational physicians care.

The quasi-experimental design was adopted. Two research questions and two null hypotheses guided the study. A researcher developed questionnaire duly validated by experts was used in data collection structured interview was used in data collection. The population of the study comprised 1000 employees of the company who were older than 50 years were selected for the study. Fifteen occupational physicians were involved in the study.

The health education programme comprised three consultations including an assessment interview. The procedure included the construction of a detailed action plan, consultation of the employees supervisors and personal managers, and if appropriate, referral to the general practitioner, a medical specialist or psychologist. To assess the process variables of the intervention, a personal file was written by the occupational physician for each employee in the intervention group.

All data were checked and analysed using the statistical package for the social sciences (SPSS-10.0). The following findings, among others, were made: On average, employees had been working for approximately 30 years for the company and should continue to work for another 8.5 years until their regular pension. The average agreed regular pension age was 61.8years. There are no differences in baseline characteristics between the experimental and control groups. At baseline, the intervention group showed significantly worse emotional well being and social isolation than the control group. Both experimental and control groups were as successful at remaining to work or having a regular pension.

This study is related to the current one. It was a study on health education programme and so also the current work by indicating how health education programme can impact on human activities and human, environment.

Musa, Parkoyi and Akanbi (2006) carried out a study on evaluation of health education programme on safe immunization injection among health workers in Ilorin. The main purpose of the study was to assess the effect of health education programme on knowledge and standard of practice of safe-immunization injection among health workers in static immunization centres.

The quasi-experimental design was adopted. The study was conducted in 3 stages. The population of the study comprised health workers in public health centres. At the first stage, pre-tested semi-structured questionnaire was administered to 102 consenting staff while observational checklist was completed for each of the 13 fixed immunization centres in the study area. In the second stage, the research participants were grouped into two: one served as the case group (50 research participants) who had health education given and the other was the control (52 research participants) who was not given health education. At the third stage, questionnaire and observational checklist similar to what was used at the first stage were administered to both the case and the control groups.

The data generated were validated manually for possible errors and then entered and analyzed on a microcomputer using EPI – into version 6 software package. Chi-

square test was used to determine the statistical significance of differences observed in the two group at 0.05 level of significance.

The following findings were made: Health workers' understanding of safe immunization injection at the pre-intervention stage was low. It was found that the knowledge of the respondents on injection safety was much better in the third stage than what it was in the first stage. Safe injection practices at the third stage improved better than what was observed at the first stage. Knowledge and practice among the case group improved more than the control group.

Cave and Curtis (1999) investigated the effectiveness of promotional techniques in environmental health. The main purpose of the study was to ascertain effective health education techniques for promoting environmental health. The study was carried out in London and Loughborough Cities. All the environmental health workers in cities formed the population of the study.

Questionnaire surveys and direct observations were used in data collection. The direct observation was used to evaluate the impact of the intervention.

Mean scores, chi-square and t-test were used in data analysis. The following findings among others were made on the effective intervention techniques for promoting environmental health. Adequate description of how the intervention can be adapted to local conditions; Adequate description of resources required to carry, out the intervention programe. Respondents' participation in design of programme, goals and ways of measuring outcome. Explicit design of behaviour change intervention involving formative research to develop feasible and practical replacement behaviour is needed. Constant monitoring of the intervention process to avoid digression into ineffective activities.

Studies on Meat Vendors and Abattoir Operations

Fasanmi, Olukole and Kelinde (2010) carried out a study on microbial studies of table scrapings from meat stalls in Ibadan metropolis. The purpose of the study was to investigate bacterial and fungal contaminants on table scrapings from meat stalls and

their implications for meat hygiene. It was an experimental study guided by two research questions and two hypotheses.

Fifty samples of table scrapings were collected from nine (9) meat markets in the area of study. The instruments used for sample collection were adequately sterilized to avoid prior contamination. The samples were placed on trypticase-soya-agar (TSA) for trophic bacteria and Sabouraud-glucose-agar (SGA) supplemented with chloraphenical for fungi. Petri dishes were incubated at 37^0C for 48-72 hour while the cultures were observed daily under a stereoscopic microscope for the presence of bacterial colonies and or fungal mycelium. The serial dilution method was used for total microbial counts.

Pure isolates of resulting growth were identified using morphological and biochemical methods and the occurrences of each identified bacterial and fungus was recorded with its percentage occurrence. The Duncan multiple range tast was used to compare means.

Major findings are as follows: There was facial contamination of meat through water and or hands and or unhygienic handling of meat right from the slaughter slabs. The mean value of bacterial count was 2.78 x 10^5 CFU/ml while that of the fungi count was 0.72 x 10^5CFU/ml with a significant difference ($P<0.05$). Meat contamination was a strong positive correlation between the sizes of the markets and the microbial load counted in the samples. Inadequate facility was responsible for poor hygiene level in the city.

Haileselassic, Taddele, Adhana and Kalayou (2012) investigated the safety knowledge and practices of abattoir and butchery shops and the microbial profile of meat in Mekelle City, Ethiopia. The purpose of the study was to assess the food safety knowledge and practices in meat handling and to determine microbial load and pathogenic organisms in meat at Mekelle City.

It was a descriptive survey guided by three research questions and two hypotheses. The target population consisted of all the owners of meat shops in the city as well as all the abattoir workers. Random sampling technique was adopted and five butchers

were randomly selected. A total of 100 meat samples were collected to asses the microbial load of the meat samples. Hygiene and sanitation were determined using structured interview.

Data were analyzed through statistical package for social sciences (SPSS) 11.5 statistical package. Descriptive statistics such as mean and frequencies were used to present the findings. Mean of total viable count of microbial load in the abattoir and butchery shops and street meat sale from backyard slaughters were compared with one way ANOVA.

The findings are as follows: Majority of the abattoir workers had not taken training concerning food hygiene. The highest mean of total viable count of microbial load were observed in street meat shops which was significantly different (P = 0.0075). There was no clear division of slaughtering process in Mekelle city abattoir and there was no preventive mechanism installed for rodents and insects. Abattoir workers in the city did not wear aprons or overalls to product the meat from cross contaminations. There was a marked growth of bacterial contaminants in the collected meat samples. The practices of backyard slaughter and street meat selling were the principal's sites for bacterial contaminant of meat.

The above study is very much related to the current one. Both the former and latter focus on the activities of meat handlers. Secondly, both focused on how health education can impact on the health knowledge and practices of meat handlers. Though both differed in the designs adopted, their approaches are similar.

Summary of Reviewed Related Literature

The review of related literature covered conceptual framework, theoretical framework, theoretical studies and empirical studies. Under the conceptual framework, such concepts as health education and environmental health education programme were defined. Other concepts defined under this sub-heading included health knowledge, health practice and meat vendors.

Under theoretical framework, three theories were discussed. The theories included; Health Belief Model, Theory of Reasoned Action and Social Cognitive Theory. Each of the theories was first reported and their relevance to the current study was also highlighted. The three theories combined to give the study its theoretical base.

The theoretical studies comprised the common meats handled by vendors including their contaminations and preventions. Another aspect discussed under this sub-heading included meat and abattoir waste as well as environment pollution.

Several studies were reviewed under the empirical studies. Some of the studies reviewed were on health knowledge and practices. Other aspects of empirical studies covered included studies on health knowledge and practices, health programmes and meat vendors and abattoir operations as they relate to environmental health. Though meat handling, programmes and environmental pollution were implied in the studies, it is important to note here that none of them indicated impact or effect of environmental health education programme on either health knowledge or practice of the people. Secondly none of the studies was specifically on meat vendors in Anambra State. None of them also showed how environmental health education programmes can impact or affect meat vendors' health knowledge or practices either in Anambra State or in any other state of the federation.

The above shows that serious research efforts have not been done on the environmental health education programme on health knowledge and practices of meat vendors especially in Anambra State. An obvious gap in knowledge has therefore been noticed. This study is therefore intended to bridge the above gap in literature as it aims at investigating the effects of environmental health education programme on the heath knowledge and practices of meat vendors in Anambra State.

CHAPTER THREE

METHOD

This chapter discussed the method and procedures that were adopted in this study. The discussion is presented under the following sub-headings: design of the study, area of the study, population of the study, sample and sampling techniques, instrument for data collection, validation of the instrument, reliability of the instrument, method of data collection, programme procedure, control of extraneous variables and methods of data analysis.

Design of the Study

The design of this study was quasi-experimental. Specifically, it was a pre-test, post-test research design involving intact groups. This design sought to establish the cause and effect relationship between the variables of interest. The design is appropriate for the study because it allowed research participants to be assigned to groups without complete randomization (Araoye, 2003; Akubueze, 2010).

Quasi experimental design was used because random assignment of research participants was not possible. In addition, some researchers like Agu (2013) and Makata (2013) who conducted similar studies to determine the effects of instructions on the health knowledge and practices of their respondents also used quasi experimental design. The researcher therefore considered this design to be suitable for the study. The experimental treatment used is the Environmental Health Education Programme (EHEP) in which the meat vendors were taught environmental health education lessons in their abattoirs. The design is presented in Table 1

Table 1: Design of the Experiment

Group	Pre-test	Treatment	Post-test
Experimental	Q_1	X_1	Q_2

Key: Q_1 = Pre-test for the experimental group

X_1 = Treatment of the experimental group

Q_2 = Post-test for the experimental group

Area of the Study

The area of the study is Anambra State. The state has 21 local government areas distributed in three senatorial zones. It shares boundaries with Enugu, Delta, Imo and Kogi States in the East, West, South and North respectively.

Anambra is an Igbo-speaking state and thickly populated by people due to the commercial activities in the state. Thus, the state is made up of indigenes and non-indigenes who are in the state either for commercial activities or civil service jobs.

Anambra State has many traders, civil servants and farmers, especially in rural areas. The inhabitants of the state are hospitable.

The state has many abattoirs located in the Urban and sub-Urban centres in the state. The meat vendors slaughter or buy meat from the abattoirs and then proceed to their stalls or hawk it along the street. The reason for choosing Anambra State for the study is because Anambra people eat a lot of meat especially at festive and social events.

Population of the Study

The population of the study comprised all the 384 registered meat vendors in Anambra State, (Anambra State Ministry of Health, 2015), a field survey carried out in June, 2015 revealed that there are seven major abattoirs in the state. Out of the seven abattoirs in the state, four (Amikwo Awka Abattoir; Onitsha Main Market Abattoir; Nnewi Abattoir and Awka-Etiti Abattoir) are located in the Urban centres. Other three (Nwakanwa Amansea Abattoir; Nteje and Odumodu abattoirs) are located in the rural areas. The population distribution is shown in Appendix A, page 89.

Sample and Sampling Technique

The sample for this study consisted of 253 meat vendors made up of 153 males and 100 female. In selecting the sample, all the seven registered abattoirs in Anambra State were listed according to their locations. Simple random sampling of balloting with replacement was used to select five abattoirs for the study. From the five selected abattoirs, the stratified simple random sampling technique was used to get three abattoirs in urban areas and two abattoirs in rural areas. In each selected abattoir; all

the meat vendors were used for the study. This gave a total of 253 meat vendors in the five selected abattoirs. The sample distribution in shown is Appendix B, page 90.

Instrument for Data Collection

Two sets of instrument developed by the researcher were used for data collection. The first instrument is titled "Environmental Health Knowledge Test" (EHKT) while the second instrument is titled "Environmental Health Practice Scale" (EHPS). Consultation with environmental health experts and knowledge gained from the review of related literature guided the researcher in developing the instruments. EHKT and EHPS are shown in pages 93 and 96 respectively.

Each of the instruments has two parts: A and B. Part "A" of EHKT contained items on personal data of the respondents (i.e. gender, area of business; level of education and years experience) while Part "B" contained seventeen (17) questions on environmental health knowledge with four response options and eight true or false questions. Similarly, Part "A" of EHPS contained items on personal data of the respondents while part "B" of the instrument contained 20 questions on environmental health practices of the meat vendors with four-point response options of SA (Strongly Agree); A (Agree); D (Disagree) and SD (Strongly Disagree). The instruments are shown in Appendices E and F pages 93 & 96 respectively.

Validation of the Instrument

The face and content validity of EHKT and EHPS were established by the researcher through the use of experts. To do this, copies of the instrument together with purpose of study, research questions and hypotheses were given to one expert in health education, one expert in science education and one expert in measurement and evaluation, all from Nnamdi Azikiwe University, Awka. They were asked to examine the instrument in terms of content relevance, item clarity and coverage of the aspect under investigation and type of statistics to be used to analyze the data. The experts' suggestions guided the construction of final draft that was submitted to the supervisor for approval.

Reliability of the Instrument

The questionnaire was pre-tested with 30 meat vendors from an abattoir located at Ugwuoba, Enugu State. This was done with the assumption that the abattoir and research participants of the study are similar and comparable with those to be used in the final study.

In order to do this, copies of the questionnaire were administered in September, 2015 on a group of thirty (30) vendors by the researcher and research assistants on face – to – face basis and collected on the spot. The data collected from the vendors' responses to the items of the instrument were used to determine the reliability of the instrument by applying the Kudder Richardson (K – R21) method. The K-R21 method was used because the items in EHKT are dichotomously scored. This gave a reliability value of 0.93. On the other hand, Cronbach Alpha's internal consistency measure was used to establish the reliability EHPS. This gave a value of 0.63. Hence, the instrument is considered reliable. The computation for the reliability tests is shown in Appendices G and H pages 98 and 99 respectively.

Health Education Programme Procedure

The health education programme was carried out in two phases namely "A" and "B". Phase "A" was the training of research assistants while phase "B" was the actual training of the meat vendors.

Phase A: Instructing the Research Assistants

Instructing Research Assistants: Three environmental health officers were recruited from Environmental Health Department of Awka South Local Government Area and the secretary, butchers association of Anambra State to assist in instructing the meat vendors. Since they are environmental health experts, the training given to them involved telling them the procedures to be followed in assisting the researcher to present the environmental health education programme to the meat vendors. Instructional materials were made available to them so as to ensure that the knowledge they impart was adequate and uniform. This lasted for one contact.

Part B: Training of Meat Vendors:

A letter of introduction was collected from the Head of Department (HOD) to allow the researcher and the research assistants to enter the abattoirs for data collection. Permission to conduct the study was requested for and obtained from the Chairmen of the various abattoirs on presentations of the letter. Verbal consent was obtained from the vendors. Arrangements were made with the various heads of the abattoir and their consent to participate in the study obtained. The purpose of the research was explained to them to enable them fully participate in the study.

The instrument was administered for the pre-test by the researcher and research assistants in the five selected abattoirs on face to face basis. The illiterate respondents were asked to complete the questionnaire by verbally responding to questions in the presence of the researcher/research assistants.

After collecting the pre-test data by the researcher and the research assistants, the meat vendors were exposed to six sessions (one session each week) of environmental health education programme on various aspects of environmental health. The researcher and research assistants carried out the programme weekly to the designated abattoirs. Each abattoir was visited every week to continue with the exercise which lasted for not more than 20 -25 minutes per day. Altogether, the lessons lasted for a total period of six (6) weeks.

Week One: On the first day of the programme, the test instruments were administered as pre-test to all the participants in the sampled abattoirs. The second step involved exposing the meat vendors to meat / abattoir and environmental pollution. Pollution was defined and types of pollution were identified. The abattoir based pollutants were identified and discussed.

Week Two: The first step witnessed the revision of the previous lessons. The second step was the exposition of the meat vendors to lessons on the consequences of man-made pollution. The consequences of man-made pollution were identified and

discussed. The vendors were also taught how to manage risks common to domestic or farm animals.

Week Three: The first step was revision of the previous lesson. The second step was the presentation of lessons on hazards and risk management in meat to vendors. The hazards and risks involved in meat management or handling were identified and discussed. The vendors were also taught risk management strategies for meat vendors.

Week Four: The previous lesson was reviewed in the first step. At the second step, lessons on abattoir-based pollutants were presented to the meat vendors. The abattoir-based pollutants were identified (listed) and discussed. The need to reduce the health risks posed by abattoir-based pollutants was also taught to the vendors.

Week Five: The meat vendors were taught lessons on hygienic handling of meat in meat stalls and personal hygiene for meat vendors. They were taught basic terms in hygienic handling of meat. The personal hygienic practices for meat vendors were listed and discussed. They were also taught the process for proper handling of meat products.

Week Six: The meat vendors were taught environmental hygienic practices for meat vendors. The hygiene/sanitation practices for meat vendors were taught to the vendors.

The post-test was then administered on the research participants. Thus, at the end of the teaching programme, copies of the same questionnaire were served to the participants. This time, however, the items were reshuffled, and administered to the research participants in the abattoirs by the researcher and research assistants so that there was no influence of the pre-test on their response to the post-test.

Appendix O, page 132 indicates pictures taken during the environmental health education programme which lasted between the first week of January, 2016 and second week of February, 2016 in the selected abattoirs. All the meat vendors attended up to 75 percent of the teaching sessions and therefore participated in the post test evaluation.

Control of Extraneous Variables

The following measures were taken to control extraneous variables that are likely to affect the results of the experiment.

a. To avoid initial group differences, intact classes were used. Similarly, analysis of covariance (ANCOVA) was used for data analysis in order to control the initial differences of participants in the intact classes

b. To avoid experimental bias and to maintain homogeneity of instruction, the training of the research assistants was done by the researcher with common lesson plan.

c. The guard against itinerant vendors who often buy meat from different abattoirs, the management of the abattoirs were used for easier identification of their members.

d. Again, to avoid forgetfulness, the time for post-test was not too long after treatment to avoid forgetting what they had learned. The pre-test items were reshuffled and renumbered before they were used for post-test to reduce the influence of the pre-test on their response to the post-test.

Method of Data Analysis

Data generated in the study were collated and analyzed using Statistical Package for Social Sciences (SPSS) version 15. Mean scores were used to answer the research questions. The differences between the pre-test mean and post-test means were regarded as the mean difference scores. That was used to answer the research questions. The hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). ANCOVA was used because the data were dychomously scored. It was also used to take care of initial differences of participants in the intact classes.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

This chapter presented the analyses of data generated from the study according to research questions and hypotheses. The summaries of major findings of the study were also presented.

Research Question 1:

What are the environmental health knowledge mean scores of meat vendors in Anambra State before and after environmental health education programme?

Table2: Mean Scores on Environmental Health Knowledge of meat vendors after Environmental Health Education Programme (n = 253)

Study Groups	N	$\overline{X}$	SD	$\overline{X}$ Difference
Pre-Test	253	61.65	16.55	
Post –Test	253	71.43	14.71	9.78

The data in Table 2 showed the environmental health knowledge mean difference scores $\bar{X}$= 9.78 of the meat vendors after environmental health education programme. The findings of the study showed that the post-test environmental health knowledge mean score X=71.43 of the meat vendors was higher than their knowledge mean score $\bar{X}$= 61.65 before environmental health education programme. This means that the environmental health knowledge of the meat vendors improved after the environmental health education programme.

Research Question 2:

What are the environmental health knowledge mean scores of male and female meat vendors in Anambra State before and after environmental health education programme?

Table 3: Mean Scores on Environmental Health Knowledge of the Research participants According to their Gender (n = 253)

Gender	N	Pre-Test $\bar{x}$	Post-Test $\bar{x}$	$\bar{(X)}$ Difference
Male	153	55.6	60.00	4.4
Female	100	57.85	63.75	5.9

Data in Table 3 showed that the male meat vendors recorded pre-test environmental health knowledge mean of $\bar{X}$=55.6 and post test environmental health knowledge mean of $\bar{X}$ =60.00 with mean difference of $\bar{X}$ =4.4. In the same vein, the female meat vendors recorded pre-test environmental health knowledge mean of $\bar{X}$=57.85 and post test environmental health knowledge mean of $\bar{X}$=63.75 with mean difference of $\bar{X}$=5.9.

Research Question 3:

What are the environmental health knowledge mean scores of meat vendors from urban and rural areas in Anambra State before and after environmental health education programme?

Table 4: Mean Scores on Environmental Health Knowledge of the meat vendors According to their Location (n= 253)

Location	N	Pre-Test $\bar{x}$	Post-Test $\bar{x}$	$\bar{X}$ Difference
Urban	149	66.33	71.8	5.4
Rural	104	60.86	62.36	1.5

Data in Table 4 showed that meat vendors who are from urban areas recorded pre-test environmental health knowledge mean of $\bar{X}$=66.33 and post test environmental health knowledge mean of $\bar{X}$=71.8 and those in rural areas recorded pre-test environmental

health knowledge mean of $\bar{X}$=60.86 and post test environmental health knowledge mean of $\bar{X}$=62.36. The table showed the mean difference of ($\bar{X}$=3.9) in favour of urban meat vendors.

Research Question 4:

What are the environmental health knowledge mean scores of meat vendors of different levels of education in Anambra State before and after environmental health education programme?

Table 5: Mean Scores of Environmental Health Knowledge of the meat vendors According to their Level of Education (n = 253)

Level of Education	N	Pre-Test $\bar{x}$ score	Post-Test $\bar{x}$ Score	$\bar{X}$ Difference
Primary	95	47.67	58.15	10.48
Secondary	109	49.5	58.50	9.0
Tertiary	49	84.71	94.01	9.3

The results of the study in Table 5 shows that meat vendors with primary education gained higher environmental health knowledge mean scores $\bar{X}$=10.48, than those with secondary education, $\bar{x}$ =9.0 and tertiary education $\bar{x}$ =9.3.

Research Question 5:

What are the environmental health knowledge mean scores of meat vendors of different years of experience as meat vendors in Anambra State before and after environmental health education programme?

Table 6: Mean Scores of Environmental Health Knowledge of the meat vendors According to their Level of Experience (n = 253)

Yrs. of Exp Education	N	Pre-Test $\overline{x}$ score	Post-Test $\overline{x}$ Score	$\bar{X}$ Difference
1-2yrs	67	61.69	71.45	9.79
3-4yrs	33	54.50	65.77	11.27
5yrs and above	153	55.68	65.17	9.49

Table 6 showed that respondents who had between 3-4yrs experience gained better environmental health knowledge mean difference score of $\bar{X}$=11.27 followed by those with 1 to 2 years of experience $\bar{x}$ = 9.79. Vendors who had 5years experience and above recorded the lowest environmental knowledge mean difference scores of $\bar{X}$=9.49.

Research Question 6:

What are the health practice mean scores of meat vendors in Anambra State before and after environmental health education programme?

Table 7: Mean Scores on Environmental Health Practice of the meat vendors after Environmental Health Education programme (n = 253)

Study Groups	N	$\overline{X}$	SD	$\bar{X}$ Score Difference
Pre-Test	253	61.21	11.13	
Post –Test	253	71.89	10.47	10.68

The data in Table 7 showed the mean difference scores of ($\bar{x}$ = 10.68) in the practice of the meat vendors with respect to environmental health before and after environmental health education programme. The findings of the study showed that the post-test of environmental health practice mean score of ($\bar{x}$ =71.89) of the meat vendors was better than their mean practice score of ($\bar{x}$ = 61.21) before environmental health education programme.

Research Question 7:

What are the environmental health practice mean scores of male and female meat vendors in Anambra State before and after environmental health education programme?

Table 8: Mean Scores on Environmental Health Practice of meat vendors According to their Gender (n = 253)

Group	N	Pre-Test $\overline{x}$ Score	Post-Test $\overline{x}$ Score	$\overline{X}$ Difference Score
Male	153	61.33	71.2	9.87
Female	100	71.20	54.2	17.0

The analysis of the practice mean scores of the meat vendors showed those who were females recorded the highest practice mean scores of $\bar{X}$=17.0, while the males scored the least $\bar{X}$=9.87. This indicated that practice mean difference score of $\bar{X}$=7.13 in favour of females.

Research Question 8:

What are the environmental health practice mean scores of meat vendors from different locations in Anambra State before and after environmental health education programme?

Table 9: Mean Difference Scores of Environmental Health Practice of meat vendors According to their Location (n = 253)

Group	N	Pre-Test $\overline{x}$ Score	Post-Test $\overline{x}$ Score	$\overline{X}$ Difference Score
Urban	149	52.63	71.23	18.6
Rural	104	49.61	57.69	8.08

When the meat vendors health practice scores were analyzed according to their areas of locations, the result showed those who were from urban areas recorded the highest

post-test score of $\bar{X}$=18.6 while those from rural areas scored $\bar{X}$=8.08. The mean difference of $\bar{X}$=9.52 was recorded in favour of meat vendors from urban areas.

Research Question 9:

What are the environmental health practice mean scores of meat vendors of different levels of education in Anambra State before and after environmental health education programme?

Table 10: Mean Scores on Environmental Health Practice of Meat VendorsAccording to their Level of Education (n = 253)

Level of Education	N	Pre-Test $\overline{x}$ Score	Post-Test $\overline{x}$ Score	$\overline{X}$ Difference Scores
Primary	95	55.37	65.20	9.80
Secondary	109	57.57	68.72	11.16
Tertiary	49	74.80	85.20	10.41

Table 10 presented the pre-test and post test mean scores of the meat vendors according to their levels of education. The respondents with secondary school certificate had a higher environmental health practice mean difference scores of $\bar{X}$=11.16, followed by those with tertiary education, of $\bar{X}$=10.41. Those with primary education recorded the lowest mean gain environmental health practice mean score of $\bar{X}$=9.80.

Research Question 10:

What are the environmental health practice mean scores of meat vendors of different years of experience in Anambra State before and after environmental health education programme?

Table 11: Mean Scores on Environmental Health Practice of the meat vendors According to their Years of Experience (n = 253)

Yrs. of Experience	N	Pre-Test $\bar{x}$ score	Post-Test $\bar{x}$ Score	$\bar{X}$ Score Difference
1-2yrs	67	61.31	72.21	10.90
3-4yrs	33	56.50	67.16	10.66
5yrs and above	153	57.11	68.30	11.19

The results of the study in table 11 showed that meat vendors with 5 years experience and above had environmental health practice mean difference score of $\bar{X}$=11.19, followed by those with 1-2 years experience of $\bar{X}$=10.90 and those with 3 to 4 years experience of $\bar{X}$=0.66.

Testing Null Hypotheses

Hypothesis 1:

There is no significant difference in the environmental health knowledge mean scores of meat vendors in Anambra State before and after environmental health education programme.

Table 12: Summary of ANCOVA Analysis of Environmental Health Knowledge Mean Score of the meat vendors before and after Environmental Health Education Programme (n=253)

Source of variation	Sum of squares	Degree of freedom	Mean squares (Variance Estimate)	F-ratio	P-value (0.05)
Corrected model	201.53(a)	2	12.36	31.90	0.01
Intercept	2332.01	1	180.09	98.24	0.004
Health K. scores	214.23	2	12.31	4.05	0.002
Error	1212.4	250			
Total corrected	6215.01	253			
Total	3221.02	252			

a = R squared = 31 (Adjusted R.Square=28)

Table 12 shows the summary of ANCOVA analysis of testing the null hypothesis of no significant difference in the environmental health knowledge mean scores of meat vendors. The table shows the F-value of 4.05 with a corresponding P-value of 0.02 at 2 degree of freedom. This implies that environmental health knowledge of the meat vendors before and after environmental health education programmme differed.

Hypothesis 2:

There is no significant difference in the environmental health knowledge mean scores of male and female meat vendors in Anambra State before and after environmental health education programme.

Table 13: Summary of ANCOVA Analysis of Environmental Health Knowledge Mean Scores of Meat vendors According to Gender (n=253)

Source of variation	Sum of squares	Degree of Freedom	Mean squares (Variance Estimate)	F-ratio	P-value (0.05)
Corrected model	343.02(a)	2	11.42	24.88	0.01
Intercept	2053.11	1	149.7	77.09	0.005
Gender score	205.14	2	12.63	3.99	0.031
Error	1232.01	250			
Total corrected	5392.1	253			
Total	3111.01	252			

a = R squared = 43 (Adjusted R Square = 32)

Table 13 shows the ANCOVA summary of environmental health knowledge mean scores of the meat vendors according to gender. There was significant difference among the mean scores on environmental health knowledge of male and female meat vendors before and after environmental health education programme df=2; F-ratio =3.99; p=0.031). P-value is less than the F-ratio, hypothesis 2 is therefore significant.

Hypothesis 3:

There is no significant difference in the environmental health knowledge mean scores of meat vendors in urban and rural areas in Anambra State after environmental health education programme.

Table 14: Summary of ANCOVA Analysis of Environmental Health Knowledge Mean Scores of the meat vendors According to Location (n=253)

Source of variation	Sum of squares	Degree of freedom	Mean square (Variance Estimate)	F-ratio	P-value (0.05)
Corrected model	205.34(a)	2	12.48	25.82	0.01
Intercept	40211.6	1	151.31	15.99	0.2
Location scores	198.84	2	12.34	5.99	0.002
Error	116.01	250			
Total corrected	502.33	253			
Total	309.36	252			

a = R squared = 15 (Adjusted R square = 20).

Table 14 shows the summary of ANCOVA analysis testing the null hypothesis of no significance different in the environmental health knowledge mean scores of urban and rural meat vendors. The result shows F-value of 5.99 with a P-value of 0.002 which is less that 0.5 level of significant at 2 degree freedom. The null hypothesis is therefore rejected implying that environmental health knowledge mean scores differed.

Hypothesis 4:

There is no significant difference in the environmental health knowledge mean scores of meat vendors of different levels of education in Anambra State after environmental health education programme.

Table 15: Summary of ANCOVA Analysis of Environmental Health Knowledge Mean Scores of the Meat Vendors According to their Levels of Education (n = 253)

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square (Variance Estimate)	F-ratio	P-Value (0.05)
Corrected model	220.50(a)	3	14.35	32.84	.001
Intercept	33242.05	1	182.32	97.26	.005
Pre-Health Knowledge Score	224.16	1	14.97	99.85	
Level of Education	2605.82	2	51.05	9.28	0.002
Error	1291.83	250			
Total Corrected	7382.00	253			
Total	5231.50	252			

a= R squared = .48 (Adjusted R Square = .45)

Hypothesis 4 was tested with analysis of covariance (ANCOVA) as shown in table 15. There was significant difference among the environmental health knowledge mean scores of meat vendors of different levels of education in Anambra State after environmental health education programme (df=2; F-ratio= 9.28; p=0.002). p-value is less than 0.05 significant level set for accepting the hypothesis. Hypothesis 4 is therefore significant.

Hypothesis 5:

There is no significant difference in the environmental health knowledge mean scores of meat vendors of different years of experience in Anambra State before and after environmental health education programme.

Table 16: Summary of ANCOVA Analysis of Environmental Health Knowledge Mean Scores of the Meat vendors According to their Different Years of Experience (n =253)

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square (Variance Estimate)	F-ratio	P-Value (0.05)
Corrected model	140.00(a)	3	11.8324	32.66	.001
Intercept	2634.001	1	51.3225	82.54	.003
Pre-Health knowledge score	2675.05	1	51.72089	9.28	.00
Years of Experience	3214.08	2	9.28	9.27	.004
Error	1282.44	250			
Total Corrected	7241.01	253			
Total	4830.48	252			

a= R Squared = .42 (Adjusted R Squared = .41).

Hypothesis 5 was tested with analysis of covariance (ANCOVA) as shown in table 16. There was significant difference among the environmental health knowledge mean scores of meat vendors of different years of experience in Anambra State after environmental health education programme (df=2; F-ratio = 9.28; p=.004). p-value is less than 0.05 significant level set for accepting the hypothesis. Hypothesis 5 is therefore rejected.

Hypothesis 6:

There is no significant difference in the environmental health practice mean scores of meat vendors in Anambra State before and after environmental health education programme.

Table 17: Summary of ANCOVA Analysis of Environmental Health Practice Mean Scores of the Meat Vendors before and after Environmental Health Education Programme (n=253)

Source of variation	Sum of squares	Df	Mean squares	F-ratio	P-value (0.05)
Corrected model	250.8	2	12.44	24.89	0.01
Intercept	2322.2	1	160.84	194.3	.003
Health Practice score	262.4	2	12.24	3.64	0.041
Error	3340.1	250			
Total corrected	33.40.1	253			
Total	3436.1	252			

a = R squared = .26 (Adjusted R Squared =.21)

The data in table 17 above showed that the F-ratio was 3.64 with p-value of 0.041. The ANCOVA analysis therefore indicated significant difference in the environmental health practice mean scores of the research participants before and after environmental health education programme. Hypothesis 6 is therefore significant.

Hypothesis 7:

There is no significant difference in the environmental health practice mean scores of male and female meat vendors in Anambra State after environmental health education programme.

Table 18: Summary of ANCOVA Analysis of Environmental Health Practice Mean Scores of the Meat Vendors According to Gender (n=253)

Source of variation	Sum of squares	Df	Mean squares	F-ratio	P-value (0.05)
Corrected model	206.31	2	12.02	21.61	0.01
Intercept	1531.5	1	160.82	79.03	0.003
Gender scores	204.21	2	12.05	3.11	0.002
Error	1112.32	250			
Total corrected	501.02	253			
Total	3112.06	252			

a= R Squared = 34 (Adjusted R Square = 38)

Table 18 showed the ANCOVA summary of the environmental health practice mean scores of male and female research participants. The data in the table showed that the F-value was 3.11 while the p-value was 0.002. The ANCOVA analysis therefore indicated significant difference in practice mean scores of the male and female vendors. The hypothesis was therefore significant.

Hypothesis 8:

There is no significant difference in the environmental health practice mean scores of meat vendors in urban and rural areas in Anambra State before and after environmental health education programme.

Table 19: Summary of ANCOVA Analysis of Environmental Health Practice Mean Scores of the Meat Vendors based on Location (n=253)

Source of variation	Sum of squares	Degree of freedom	Mean square (Variance Estimate)	F-ratio	P-value (0.05)
Corrected model	265.4(a)	2	11.84	30.81	0.01
Intercept	2314.02	1	163.83	73.6	0.002
Location score	216.21	2	12.02	4.18	0.012
Error	2133.9	250			
Total corrected	502.34	253			
Total	2346.1	252			

a= R Squared = 16 (Adjusted R Square =.15)

Table 19 showed the ANCOVA summary of the environmental health practice mean difference scores of vendors who were from urban and rural areas. The figures in the table showed that the F-value was 4.18 while the p-value was 0.012. The ANCOVA analysis therefore indicated significant difference in environmental health practice mean scores of the research participants. Hypothesis 8 is therefore significant.

Hypothesis 9:

There is no significant difference in the environmental health practice mean scores of meat vendors of different levels of education in Anambra State before and after environmental health education programme.

Table 20: Summary of ANCOVA Analysis of Environmental Health Practice Mean Scores of the Meat Vendors According to their Level of Education (n = 253)

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square (Variance Estimate)	F-ratio	P-Value (0.05)
Corrected model	223.44(a)	3	14.947909	31.24	.00
Intercept	3432.99	1	58.5917	62.03	.00
Pre-Health practice score	3611.99	1	60.0998	70.0998	.00
Error	1198.05	250			
Level of Education	3211.86	2	56.67327	9.28	0.064
Error	1198.05	250			
Total Corrected	826.08	253			
Total	5198.49	252			

a= R squared = .46 (Adjusted R squared =. 42)

Hypothesis 9 was tested with analysis of covariance (ANCOVA) as shown in table 20. There was no significant difference among the mean scores of meat vendors of different levels of education in Anambra State after environmental health education programme on their environmental health practice (df=2; F-ratio = 9.28; p=0.064). p-value is greater than 0.05 significant level set for accepting the hypothesis. Hypothesis 9 is therefore significant.

Hypothesis 10:

There is no significant difference in the environmental health practice mean scores of meat vendors of different years of experience in Anambra State after environmental health education programme.

Table 21: Summary of ANCOVA Analysis of Environmental Health Practice Mean Scores of the Meat Vendors According to their Years of Experience (n = 253)

Source of Variation	Sum of Squares	Degree of Freedom	Mean Square (Variance Estimate)	F-ratio	P-Value (0.05)
Corrected model	142.02(a)	3	11.8245	31.42	.001
Intercept	2631.03	1	52.434	81.53	.002
Pre-health practice score	2672.09	1	51.7182	86.11	.001
Years of experience	3210.02	2	55.682	9.28	.35
Error		250			
Total Corrected		253			
Total		252			

a = R squared = .47 Adjusted R squared = .46)

Hypothesis 10 was tested using analysis of covariance (ANCOVA) as shown in table 21. There is no significant difference among the mean scores of meat vendors of different years of experience in Anambra State after environmental health education programme on their environmental health practices (df=2; F-ratio = 9.28; p-value = 0.35). p-value is greater than 0.05 significant level set for accepting this hypothesis. Hypothesis 10 is therefore significant.

Summary of Major Findings

Based on data analysis, the following major findings were made:

1. The meat vendors after environmental health education programme recorded a higher environmental health knowledge mean score of $\bar{X}$=71.43 than before intervention which is $\bar{X}$=61.65.

2. Meat vendors who were females gained higher environmental health knowledge mean difference scores of ($\bar{X}$=3.75) after environmental health education programme than the males.
3. Meat vendors who were in urban areas gained higher environmental health knowledge mean scores of ($\bar{X}$=5.4) than those in rural areas ($\bar{X}$=1.5).
4. Meat vendors with primary education and secondary education gained higher environmental health knowledge mean score of ($\bar{X}$=10.48 and $\bar{X}$=10.32 respectively), after environmental health education programme.
5. Meat vendors who had 3 to 4 years experience gained better environmental health knowledge mean scores of ($\bar{X}$=11.27), followed by those with 1 to 2 years of experience ($\bar{X}$=9.79).
6. Meat vendors recorded a higher environmental health practice mean difference scores of ($\bar{X}$=71.89) after environmental health education programme than before intervention ($\bar{X}$=61.21).
7. Meat vendors who were males gained higher environmental health practice mean difference scores of ($\bar{X}$=71.2) after intervention than the females.
8. Meat vendors who were in urban areas recorded higher environmental health practice mean scores ($\bar{X}$=18.6) than those in rural areas ($\bar{X}$=8.08).
9. Meat vendors who had secondary and tertiary education had a higher environmental health practice mean difference scores of ($\bar{X}$=11.16 and $\bar{X}$=10.41) respectively, when compared with their primary school counterparts who scored environmental health practice mean difference scores of ($\bar{X}$=9.8).
10. Meat vendors with 5 years and above experience had the highest environmental health practice mean scores of ($\bar{X}$=11.19), followed by those with 1 to 2 years of experience ($\bar{X}$=10.90).
11. There was a significant difference ($p<0.05$) in the environmental health knowledge mean scores of Meat vendors before and after environmental health education programme.
12. There was a significant difference ($p < 0.05$) in the environmental health knowledge mean scores of male and female Meat vendors after environmental health education programme.

13. There was significant difference ($p < 0.05$) in the environmental health knowledge mean scores of urban and rural Meat vendors after environmental health education programme.
14. There was a significant difference ($p<0.05$) in the environmental health knowledge mean scores of the meat vendors in relation to their different levels of education.
15. There was significant difference ($p<0.05$) in the environmental health knowledge mean scores of the meat vendors when analyzed according to their years of experience.
16. There was a significant difference ($p<.0.05$) in the health practice mean scores of the meat vendors before and after environmental health education programme.
17. There was significant difference ($p <0.05$) in the environmental health practice mean scores of male and female meat vendors after environmental health education programme.
18. There was significant difference in the environmental health practice mean scores of urban and rural meat vendors after environmental health education programme.
19. There was no significant difference ($p>0.05$) in the environmental health practice mean scores of the meat vendors of different levels of education.
20. There was no significant difference ($p>0.05$) in the environmental health practice mean scores of the meat vendors when analysed according to years of experience.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

In this chapter the major findings of the study were discussed in relation to the stated research questions and hypotheses. Discussion of the findings of the study was presented under the following sub headings:

- Effects of environmental health education programme on health knowledge of the meat vendors in Anambra State
- Effects of environmental health education programme on health practice of the meat vendors in Anambra State

The overall conclusion drawn from the findings, recommendations, implications of the study and suggestions for further research were also presented.

Effects of Environmental Health Education Programme on Health Knowledge of the Meat Vendors in Anambra State

The findings of the study showed that the post test environmental health knowledge mean score of the meat vendors were higher than their pre-test knowledge mean score by a difference of mean score of ($\bar{X}$=9.78). The ANCOVA analysis carried out showed that this difference was significant, (p>0.002). This result was expected because of the environmental health education programme the meat vendors were exposed to.

The findings of the study were in consonance with those documented by Fasanmic, Olukole and Kelind; Haileselassic, Taddele, Adhana and Kalayou (2012); and Isaac (2013), who observed that there was improvement in health knowledge and increase in good health practice of their research participants after educational interventions.

Furthermore, a similar study on the effect of environmental health education programme on meat related-knowledge and practices of the research participants, in Pankshin Community, Nigeria by Abiola (2005) was also in consonance with this present study. The result revealed a significantly higher increase in knowledge, and practice of the research participants after health instructions. These results suggested

that environmental health education programme can promote an improvement in the environmental health knowledge of the meat vendors.

In addition, the study also examined the effect of moderator variables of gender, location level of education and years of experience. With respect to location, the findings of this study seem to suggest that the research participants from urban areas acquired higher environmental health knowledge than others from rural areas. The knowledge dropped significantly among males with mean difference of ($\bar{X}$=3.75) in favour of females. This finding was not surprising, since meat vendors in urban areas are expected to be more active in taking greater responsibility and decisions concerning environmental health, and are therefore more likely than their rural counterparts to gain better environmental health knowledge. The reason for the drop in the health knowledge mean scores of male meat vendors might be because female meat vendors are more actively involved in food matters. The males may therefore begin to lose interest in matters concerning environmental health education programmes.

This finding of this study was in agreement with that documented by Adesemoye, Opere and Makinde (2006) who examined the effect of health education on health knowledge of abattoir workers and found that the knowledge gain differed remarkably by gender and location. The study also revealed that females had lower pre-test knowledge and higher post-test knowledge. The fact that the pre-test knowledge was higher showed that they already knew about health knowledge, so the mean difference was expected and the females might be paying more attention to issues concerning meat, read about meat and discussed more about meat. Interestingly, this finding was in agreement with that documented by Polprasert and Tran (2013). Polprasert and Tran examined the effects of teaching environmental health education on the health knowledge and practices of post food sellers in Uganda, and observed that males gained lower health knowledge as compared to mean gain scores of female food sellers. This agreement was, however, not statistically significant, ($p>0.05$).

With respect to the vendors' level of education, the results of the study showed that as the meat vendors level of education increased their ability to acquire, retain and be able to use environmental health knowledge do not increase correspondingly. Meat vendors with tertiary education gained lowest environmental health knowledge mean scores of ($\bar{X}$=9.3) compared to mean difference scores of ($\bar{X}$=18.0) and ($\bar{X}$=10.48) among meat vendors with secondary and primary education, respectively. This difference, however, was not statistically significant. This result was surprising, because ordinarily, it would have been expected that those with tertiary education would have a significantly higher mean difference scores compared to others. Meat vendors' education has been seen as a key determinant of health knowledge and practice (Chukwu, 2008). Better educated meat vendors seem to be more willing to engage in innovative behaviour than the less educated ones. Better educated meat vendors are also seen to be more willing to have more knowledge of environmental health than less educated ones because of their literacy, greater familiarity with modern institutions and a greater likelihood of rejecting a fatalistic attitude towards life. There was evidence that for whatever reason, meat vendors' education indeed promotes environmental health knowledge and practice in most communities (Edema & Omemu, 2004). The reason attributable to this unusual phenomenon in this present study could be that this group of vendors, who had tertiary education, took the teaching sessions for granted and they might assume they already knew everything about environmental health and a such did not show adequate seriousness.

This result, however, is at variance with the findings of a study documented by Inglis and Cohen (2002) which showed significant differences in health knowledge by educational level, with those with tertiary education backgrounds having higher scores than other groups.

Similarly, Itodo and Awulu (1999) in their study to determine the association of maternal education, gestational age, parity and socioeconomic status with poultry and piggery knowledge and subsequent practice also confirmed that a significant relationship ($p<0.002$) was observed between health knowledge and practice educational status of the respondents.

When the effect of environmental health education programme was further analyzed according to years of experience, the result of the study in Table 6 showed that respondents who had 3 to 4 years of experience gained better environmental health knowledge mean difference scores of ($\bar{X}$=11.27), followed by those who had 1 to 2 years experience with mean difference scores of ($\bar{X}$=9.79). Those vendors who had 5 years and above experience had higher health knowledge mean difference scores of ($\bar{X}$=9.49). Again, this result was surprising, since it was expected that those who had 5years and above experience, and scored higher in the pre-test should score higher in the mean score but it was not so. This was in line with the assertion by World Health Organization (2005) which stated that employment and working conditions greatly affect health and involvement in health activities. This is because daily activities of the meat vendors affect their interest in environment health education programme. These findings again were at variance with the result of the study by Levis (2003), which demonstrated significant differences in environmental health knowledge when analyzed according to years of experience, with those who had more years of experience having higher scores than other groups. In conclusion, the analysis of the results showed that environmental health education programme improved knowledge of meat vendors. The research participants displayed higher environmental health knowledge after the environmental health education programme.

Effects of Environmental Health Education Programme on Health Practice of the Meat Vendors in Anambra State

The result of the study showed that environmental health education programme improved health practices of the meat vendors. The research participants after the educational intervention displayed higher health practice mean gain scores compared to their practice mean gain scores before environmental health education programme, (table 6). The health practice mean gain scores was ($\bar{X}$10.68). The ANCOVA analysis carried out indicated significant difference ($p<0.041$) in the health practice mean gain scores of the meat vendors before and after environmental health education programme. This result was expected because of the level of environmental health

education programme the research participants were exposed to, since evidence seemed to suggest that knowledge influences practice, (Meadons, 2005).

The findings of most researchers are in agreement with the results of this present study. For instance, Loehr (2013) investigated the effect of health education programme on food-related-knowledge and practices of literate women in Pankshin community. The findings of the study showed that there was statistical significant difference between the practice mean gain scores of the women exposed to health education programme (HEP) and those not exposed to HEP. This finding reinforces the suggestion that knowledge influences practice as documented by Meadons, (2005).

Similarly, the findings of this study corroborates a research carried out by Olukole (2006) to assess the effect of health education module on the health practices of mothers with undernourished children aged 0 – 5 years old. The result showed that the respondents' health practices before the intervention was positive. Using the paired t-test, the practice mean scores increased after the intervention, implying that the practices were strengthened but not significant statistically.

In addition, a research by Olawale, Oluduro and Famurewa (2005) designed to assess the changes in health practice of workers in canteens and eateries before and after 3 months of attending a health education intervention programme is in agreement with the present study. The result showed that all the enrolled workers showed significant increase in practice scores after attending the health education sessions ($P<.001$).
Ironically, the findings of a study to determine the effect of health instruction among research participants enrolled in sanitary standards courses by Salvato (2012) seems to different from the result of the present study. The results indicated that, even though all grade levels in practice scale scores was noted in grades seven and eight after intervention. The age of the research participants could have accounted for the contradiction in this study. The research participants involved in the research were very young people. Young students may not consider issues of health seriously, since they do not have any decision making roles at home concerning family health.

Just like with knowledge, the study also examined the moderator variables of gender, location, level of education and years of experience in terms of their individual associations with health practice which was the dependent variable. When the health practice mean gain scores of the research participants were considered according to gender, the ANCOVA of the result indicated a significant difference ($p<0.05$). Table 8 showed that those females recorded highest health practice mean gain scores of ($\bar{X}$=17.0), followed by males (who recorded health practice mean scores of ($\bar{X}$=9.87). Those who were from rural areas scored the lowest mean scores of ($\bar{X}$=8.08) against ($\bar{X}$=18.6) recorded by those from urban areas. This was also the pattern observed when the health knowledge mean scores of the research participants were analyzed according to gender. These females who recorded the highest health knowledge mean difference scores also had the highest practices mean difference scores, suggesting that there was a relationship between knowledge and practice. The reason for the drop in the practice mean difference scores just like the drop in knowledge mean difference scores of the meat vendors might be because females are more actively involved in family food matters. The males may therefore begin to lose interest in matters concerning health education programmes especially those related to Kitchen.

The study by Wilber (2010) which investigated the effect of health education programme on food-related-knowledge and practice of literate women in Illinois, USA fund that as people grow, they feel that they have known everything and no need to waste their time. The result showed that age has no significant influence on the health practices of the women. Sample size, however may be a factor in the inconsistencies observed in these various studies.

When analyzed according to education, the result of the study in table 20 showed that level of education influenced the research participants' health practices towards environmental health education programme. Interestingly, it was the research participants who had secondary school certificate that had a higher practice mean difference scores of ($\bar{X}$=11.16), and closely followed by those with tertiary education mean difference scores of ($\bar{X}$=10.41). Those with primary education had a practice mean scores of ($\bar{X}$=9.80). The ANCOVA analysis indicated a significant difference

($p<0.05$) in the practice mean difference scores of the rural meat vendors of different levels of education. This result again was surprising since educated vendors (those who attended tertiary institution), who have easier access to information, would have been expected to record higher practice mean difference scores, than meat vendors from other educational levels. The explanation lied largely in the influence exerted by social or cultural division of work where family affairs or responsibilities depend on gender.

On the other hand the result of the study on the effect of environmental health education programme on food-related-knowledge and practices of literate women in Illinois by Wilber (2010), seem to suggest that level of education has no significant influence on the health practices of the women. Again, when the data were analyzed according to years of experience, the result in table 10 did not show any remarkable changes in the practice mean difference scores of the meat vendors. The meat vendors with 5 years and above experience had the mean difference practice mean difference scores of ($\bar{X}$=11.19), followed by those with 1 to 2 years experience ($\bar{X}$=10.90), and those with 3 to 4 years experience ($\bar{X}$=10.66), respectively.

The highest increase in practice difference scores observed among vendors with 5 years and above experience (even though not significant), could be because, since they were engaged in the business for long, they were therefore more devoted to environmental health practices. This could influence their practice positively towards environmental health practices.

Conclusion

The conclusion of the study is that meat vendors who were in the urban areas gained environmental higher health knowledge scores than those in the rural areas. Again meat vendors with primary education gained higher health knowledge mean scores than those with secondary and tertiary education. In addition, research participants who had 3 to 4 years experience gained better health knowledge than those who had 5 years and above experience. The result of the study also indicated that gender, level of education and years of experience did not necessarily influence vendors' health

practice. Furthermore, meat vendors who were females, and those with secondary education, gained higher health practice mean scores than those with primary and tertiary education qualifications. The differences, however, were not statistically significant.

Implications of the Study

The results of this study showed that female meat vendors gained higher health knowledge mean scores more than their male counterparts. Similarly, those residing in rural areas gained low health knowledge mean scores. This implies that female meat vendors and those residing in urban areas have the desire to acquire health knowledge needed to keep members of the public healthy. Educational efforts therefore, need be targeted at vendors of rural areas. Other appropriate teaching methods need to explored to assess the efficacy of the programme. Environmental health education programmes can therefore be employed as a veritable method of addressing the low health knowledge and practices of males and rural meat vendors in Anambra State.

Again, meat vendors with primary education in this study were shown to have gained higher health knowledge mean scores more than those that attended secondary schools, including vendors with tertiary education who recorded the lowest mean difference in their practice score when compared to vendors with primary and secondary school. The implication is obvious. It implies that level of education influences health knowledge but in practice, it was not encouraging. These limitations did not in any way invalidate the study.

Recommendations

A number of recommendations that arose from this study are stated below:-

1. There is the need to include environmental health education programmes in the mobile schools for meat vendors and market people in Nigeria. This is with the intention to expose them to adequate environmental health information which will improve their health knowledge, as well as aid them in engaging in positive health practices in their areas of business.

2. The environment for health education programmes should be made as informal as possible to eliminate what looks like student-teacher relationship as found in formal learning environment, to enable the meat vendors express themselves freely and thereby learn more.
3. Meat vendors should be encouraged by government to enroll in health education programmes and should be provided with educational leaflets/information on health practices.
4. Mass media campaigns on environmental health education programme should be used and complemented with other methods that have been found to be very efficacious in influencing knowledge and practices towards environmental health education programme. Teaching/ counseling on health education should be advocated in rural areas since it has been proved to be very efficacious.
5. The study has proved that less educated vendors have the potentials to acquire knowledge as well as engage in positive health practices if exposed to environmental health education programme. Efforts, therefore, should be made to design appropriate health education programmes that can meet the needs of this group of less educated vendors.

Limitations of the Study

This study has some limitations. The first limitation is that only the registered abattoirs in the area of the study were used. The registered abattoirs are regulated by the government and their mode of operations are different from those of the unregistered ones. Since their mode of operations are different, the application of the results to the unregistered abattoirs may face some challenges.

Another limitation of the study is that the meat vendors were not studied in their meat shops or sheds. They were studied in abattoirs where they come to buy meat. This therefore limits the generalization of the findings.

Suggestions for Further Study

1. A more elaborate research on environmental health education programme should be undertaken to cover a wider geographical area of Anambra State, in order to incorporate more research samples. This will provide a more generalizable result.

2. Environmental health knowledge and practice of restaurants operators should also be investigated for comparative purposes.
3. The same study can be carried out in the same area after some years to find out if any change has occurred.
4. A comparative study on the same topic can be carried out involving Anambra State and any other state.
5. The same study can be carried out in any geo-political zone of Nigeria.

REFERENCES

Abiola, R. (2005). Impact Assessment of Industrial Effluent on Water Quality of the Receiving Alaro River in Ibadan, Nigeria. *An International Journal of Environmental Sciences,* Ethiopia. 5(2) 305-309.

Adara, O.A. (2010). Effects of environment on human productivity. *Nigeria Journal of Health Education and Welfare of Special People,* 3(1) 71-76.

Adedibu, S.O. (2010). Effect of mothers nutritional knowledge and attitude on Omani Children's Dietary Intake. *Oman Medical Journal,* 26(4), 253 – 257.

Adelegan, J.A. (2002). Environmental policy and slaughterhouse waste in Nigeria. *228th WEDC Conference Report.* Calcutta, India.

Adesemoye, A.O. Opere, B.O. Makinde, S.C.O. (2006). Microbial content of abattoir wastewater and its contaminated soil in Lagos, Nigeria. *African Journal of Biotechnology* 5(20), 1963-1968

Adesokan, I.A. Ogunbanwo, S.T. Odetoyinbo, B.B. (2005). Microbiological quality of selected brands of beer in Nigeria. *Nigerian Society Journal for Microbiology, 4, 12-16.*

Adesemoye, A.O. Opere. B.O. Makinde, S.C.O. (2006). Microbial content of abattoir wastewater and its contaminated soil in Lagos, Nigeria. *African Journal of Biotechnology*, 5(20), 16-19.

Agu, M.C. (2013). Effects of teaching contraceptive use on the health knowledge and attitudes of post partum multifarious mothers in Anambra State. *Unpublished Ph.D Dissertation.* Nnamdi Azikiwe University, Awka.

Ajisafe, U.H. (2006). *Communities and environmental law: politics and cultures of legal identities.* Arbor: University Press.

Akubueze, T.C. (2010). *Research methods and statistics in education and social sciences*. Owerri: Oscar Graphics.

American Association for the Advancement of Science. (2005). Air *conservation*. Washington D. C.: American Association for the Advancement of Science.

Amisu, K.O. Coker, A.O, & Isokpehi R.D. (2003). Arcobacter butzlieri strains from poultry abattoir effluent in Nigeria. *African Medical Journal* (80), 218-221.

Angelillo, W. Viggiani, E. Greco, E. & Rito, G. (2001). Effect of an educational intervention related to health and nutrition on pregnant women in the villages of Central Java Province. *Indonesia Health Education Journal*, 22(13), 305 -315.

Araoye, M.O. (2003). *Research methodology with statistics for health and social sciences.* Illorin; Nathadex.

Bankole, M.O. Oladimeji DS, & Omemu AM (2005). Microorganisms associated with the palms of food-vendors in Abeokuta Metropolis. *Nigerian Journal Microbiologists, 8, 16*-21.

Barett, B.M. (2000). *Ecology of changing Planet.* 2nd Edition. London: Prentice Hall Inc.

Bas, K. Ersu, O. & Kivanc C. (2006). *The environment and lives of adolescents in developing countries.* Washington D.C: International Centre for Research in Women.

Beall, A.M. (2002). *Culture, the status of women and demographic behavior: Illustrated with the case of India.* England: Clarendon Press.

Beefland I. (2004). *Elimination of water by Packing-House Animal Paunch and Blood*. *International Journal of Health Education, 7* (9), 20-25.

Boer, V. Beck, K. Durinck, R. & Dijik, R. (2004). Women's environmental education can improve child nutrition in India. *National Family Health Survey Bulletin* 15, 1-4.

Boadi, K.O. & Kuitunen M (2003). Municipal solid waste management in the Accra metropolitan area, Ghana. *The Environmentalist*, 23, 211-218.

Bridges, O. Bridges, J.W. & Potter, J.F. (2000). A generic comparison of the airborne risks to human health from landfill and incinerator disposal of municipal solid waste. *The Environmentalist 20*, 325-334.

Cadmus, S.I.B. Olugasa, B.O. & Ogundipe, G.A.T. (1999). The Prevalence and Zoonotic Importance of Bovine Tuberculosis in Ibadan, Nigeria. *Nigerian Journal of Veterinary Medical Association*, 65-70.

Cave, R. & Curtist, J. (1999). Impact of environmental education programme on knowledge and dietary intake practices of primary school children in London and Loughborough Cities. *Journal of Nutritional Science* 5(2), 83-90.

Chukwu, O. (2008).Analysis of Groundwater Pollution from Abattoir Waste in Minna, Nigeria. *Research Journal of Dairy Sciences*, 2(4), 74-77.

Coker, A. O. Olugasa BO, & Adeyemi AO (2001). Abattoir wastewater quality in South Western Nigeria. *Zambian Journal of Nutritional Science*, 2(12), 813-817.

Diswas, M. Roy, C. Sen, J. & Diswas, K. (1990). *Food production and the environment policy issues*. New Delhi: Oxford Press.

Edema, M.O. & Omemu AM (2004). *Microbiology and food hygiene in public food services*. Abeokuta: Eagle Press.

Edema, M.O. Omemu, A.M. & Bankole, M.O. (2005). Microbiological safety and quality of ready-to-eat foods in Nigeria. *Nigerian Journal of Nutritional Science*, 1(9), 8-12.

Edema, M.O. Omemu, A.M. & Fapetu, O.M. (2001). Microbiology and Physicochemical Analysis of different sources of drinking water in Abeokuta. Nigeria. *Nigerian Journal for Microbiology*, 15(1), 57-61.

Eheri, G.U. & Morris, O. (1996). The Impact of effluent for Bodija abattoir on the physical-chemical parameter of Oshunkaye Stream in Ibadan City, Nigeria. *African Journal of Biotechnology*, 5, 18-21.

Environmental Sustainability Resource Centre (ESRC), (2012). *Meat processing: Environmental impacts*, http:// wrrc.p2pays.org/p2rx/index.cfm?page= subsection &hub id=44...Retrieved 10th June,2012.

Environmental Protection Agency EPA (2010). The environmental status of rural women: a pilot study. *Nigerian school health Journal* 8 (1), 67 – 74.

Ezeoha, S. L. (2013). Analysis of Groundwater Pollution from Abattoir Waste in Minna, Nigeria. *Research Journal of Dairy Sciences*, 2(4), 74-77.

Ezeoha, S. L. (2000). *Pollution and Biogas Production Potentials of Abattoir Wastes*. *Unpublished Masters thesis.* Department of Agricultural Engineering, University of Nigeria, Nsukka, Nigeria.

FAO, (2007). 'FAO guidance to governments on the application of HACCP in small and/or less-developed food businesses'. Retrieved on 14 October.

Fasanmi, O.G. & Sansi J.A. (2008). *Essentials of meat and milk inspection and hygiene*. Ibadan: Tunmid Printronic.

Figueras, S.B. (2000). *Pollution control in developing economy*. Kumasi: Ghana University Press.

Food and Drug Administration (FDA). (2007). "*Managing Food Safety: A HACCP Principles Guide for Operators of Food Establishments at the Retail Level (Draft)*". Retrieved on 14 October.

Green, A. (1990*). Standard methods of examination of water and wastewater*. Washington D.C: Oxford Press.

Haileselassic, K. Taddele, D. Adhana, W. & Kalayou, F.O. (2012). Safety knowledge and practice of abattoir in Kenya. *Journal of nutrition education,* 31(1), 23-30.

Heil, J & Selden, B. (2008). The analysis allocation and activity pattern in environmental planning. *Journal of Food and Nutrition* 6(3), 53-68.

Hendricks, K. Ecols, J. & Nelson, F. (2009). Anthropometric characteristics and environmental protection for rural school children. *Journal of Biological Anthropology* 2(1), 227 – 231.

Holdgate, M.W. (2009). *A Perspective of environment pollution*. London: Cambridge University Press.

Hughes, J.M, Koplan, J.P (2005). Saving Lives through Global Safe Water. *Emerging Infection Discourse Journal, 11*(10), 1636-1637.

Inglis, G.D. Cohen A.C. (2002). Influence of anti-microbial agents on the spoilage of meat-based entomophage diet. *Journal of Entomology, 97,* 235-250.

Isaac, P.C.G. (2013).*Public health engineering. London:* E and F.N. Spoon Ltd.

Itodo, A. & Awulu, K. (1991). Mass media message and environmental behavior of rural women in Nigeria. *Journal of Biosocial Science* 28 (2), 227 – 239.

Itodo, I.N, & Awulu, J.O. (1999).Effects of Total Solids Concentration of poultry, cattle, and piggery waste. *American Society Agricultural Engineering Journal,* 3(2), 121- 128

Izugbara, J. & Umoh, B. (2004). Helping women improve environment in the developing world: beating the zero sum game. *World Bank Technical paper 114.* Washington, DC, USA: World Bank.

Jolt, J.G. Krieg, N.R, Sneath, PHA, Stanley, JT, Williams, S. (2004). *Bergey's manual of systematic bacteriology.* Maryland: Williams & Wilkins Co. Baltimore.

Kola – Olusanya, B.C. (2011). Effect of environmental education on knowledge of nutrition in relation to prevention of stomach cancer among undergraduates in South-West, Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*, 12 (7), 220 – 235.

Kirchmann, H. & Witter, E. (2011). *Composition of fresh, aerobic and anaerobic farm animal dungs*, http://www. sciencedirect.com/science/pii/0960852492901998. Retrieved 26th May, 2012.

Lewis, R.J. (2003). (ed). *Hawleys condensed chemical dictionary*, 12th edition. N.Y.: Van Nostrand Reinhold Co.

Lennette, E.H, Balows, A. Hausler, W. & Shadomy H.J. (1985). *Manual of clinical microbiology*. Washington DC: American Society for Microbiology.

Lewin, K. (1951). The health belief model and personal health behaviour. *Health Education Monographs 2*(4), 409 – 419.

Loehr, R.C. (2013). *Agricultural waste management*. London: Academic Press.

Makata, E.N. (2013). Effects of two methods of teaching sexuality education on sexual health knowledge and attitudes of secondary school students in Enugu-State. *Unpublished Ph.D Dissertation,* Nnamdi Azikiwe University, Awka.

McDonalds, A.C. (2002). A study of knowledge attitude and practice of environmental education among women of Hubi. *Unpublished Ph.D Thesis*, University of Hubi, China.

McMillan, H. (2016). *Handbook on health education.* Chicago: Irwin Publishers.

Meadons, P. (2005). The impact of agricultural practices on biodiversity. *Journal of Agriculture, Ecosystem and Environmental Management*, 55, 201- 212.

Mitchell, A. & Chet, A. (2008). *Fundamentals of nursing.* New York: Lippincott, Williams & Williams Publishers.

Middleton, J. J. (2006).*The Encyclopedia Americana,* International Edition, Vol. 1, Grolier Inc.

Murphy, L.S. & Gosch, J. W. (2011). *Nitrate Accumulation in Kansas Groundwater*, Project Completion Report, OWRR Project, A – 016 - Kan., Kansas State University.

Musa, G. Parkoyi, F. & Akanbi, N. (2006). Health education knowledge and attitudes in Urban Illorin. Nigeria: *Journal of Biosocial Science*, 18, 273 -283.

Nelson, R.N.(2016). Environment health practices of tourist workers. *Journal of Environmental Sciences, 62(2),* 29-33.

Nnachi, T.M. & Nwose, S. T. (2007). *Radio advertising techniques and environmental education: A summary of a field experiment in the Philippines and Nicaragua.* New York: Manoff International Inc.

Nwanta, J.A., Onunkwo, J. & Ezenduka, E. (2011). Analysis of Nsukka Metropolitan abattoir solid waste and its bacterial contents in south eastern Nigeria: public health implications, *Nigerian Journal of Technology*, 30, (2) 30-35.

Obi, I.U. (1990). *Statistical methods of detecting differences between treatment means*. Enugu: SNAAP Press.

Odeyemi, A. (1996). The effect of environmental education module on the knowledge, attitude and practices of mothers with undernourished children aged 0 – 5 years old. *Unpublished Doctor of Medicine Dissertation,* ESUT, Enugu.

Ogbonna, J.C. (2002). Food hygiene training: the next step. *Journal of Royal Society of health 4(2),* 209 – 211.

Okonko, I.O. Adejoye, Q.D, Ogunnusi T.A, Fajobi, E.A, & Shittu, O.B. (2008). Microbiological and physicochemical analysis of different water samples used for domestic purposes in Abeokuta and Ojota, Lagos State, Nigeria. *African Journal of Biotechnology,* 7(3), 617-621.

Olarewaju, O. & Olufayo, A. A. (2004). Physico-chemical and Microbiological Characteristics of Effluents of Major Abattoirs in Ibadan. *Nigerian Journal of Technology*, 3, (2) 224 - 229.

Olawale, AK, Oluduro, A.O. Famurewa, O. (2005). Evaluation microbiological and sanitary standards of canteens and eateries in Osun State Polytechnic. *Nigerian Journal of Technology*, 3, (1) 22- 24.

Olukole, S.G. (2006): Assessment of Enforcement and Impacts of Two Veterinary Legislations in Oyo State, Nigeria. *Master of Veterinary Public Health (MVPH) Thesis*, University of Ibadan, Nigeria.

Olukole, S.G. (2008): Assessment of Enforcement and Impacts of Two Veterinary Legislations in Oyo State. *Nigerian Veterinary Journal, 29 (3),* 41-47.

Olukole, S.G. Ohore, O.G. (2007):Prevalence of Metastrongylosis in slaughtered pigs in Eruwa and Ibadan, Oyo State, Nigeria. Journal of Animal Health and Production,5, 23-26.

Omaka, S. (2009). Health behaviour, illness behavior and sick role behaviour. *Archives of environmental health 12(6),* 246 -249.

Omebe, G.J.S. (2007). The environment, crop cultivation, preservation and storage methods of a West African Community. *Journal of Ecology and Food Nutrition 25,* 1-9.

Onyechere G.O.(2016). *Introduction to environmental health.* Lagos: Inter-Printer Ltd.

Ozo, A.H. (2005). Adolescents living in boarding houses in Nsukka, Enugu-State and their contribution to nutrition in Delta. *Ecology and Food Nutrition 30(5),* 195–205.

Pisharoti, K.A (1975). Guide to the integration health education in environmental health programme. Geneva: World Health Organization Offset Publication

Polprasert, C.P.K &Tran F.T. (2013).Anaerobic Baffle Reactor (ABR) Process for Treating a Slaughterhouse Waste, *Environmental Technology*, 13, 857 865.

Roberts, H., (2012).*Waste handling practices at red meat abattoirs in South Africa*. *International Journal of Environmental Pollution*, 2, 49 - 56.

Robinson, K. Draper, S.R. & A.L. Gelman. (2010).Biodegradation of Pig Waste: Break down of Soluble Nitrogen Compounds and the Effect of Copper. *Environmental Pollution*, 2, 49 - 56.

Sada, J.L. (2008). Food and nutrition: Attitudes, beliefs, and knowledge in the United Kingdom. *American Journal of Clinical Nutrition*, 65, 19855 – 19955.

Salvato, J.A. (2012). *Environmental engineering and sanitation*. NY: John Wiley.

Scott, V. H. (2009).*The Encyclopedia Americana*, International Edition, Vol. 28. USA: Grolier Inc.

Scarnet, J.C. (2016). *Essential of health education for colleges and universities*. London: Oxford press.

Shannon E.B. (2016). *Environmental health management and control. New Jersey:* McgRAW Hill Books

Shelu, M. Ajegbe, S. & Abubakar, M. (2006). Impact of environment on food, nutrition and diet. *Biomedical Research, 22(3),* 305-310.

Siwuch, R.G.D. (2009). *Principles and Procedures of Statistics*. New York: McGraw Hill book.

Sule, I.K. (2011). Effect of nutrition education programme on food-related-knowledge and practices of literate women in Pankshin Community. *Nigeria Mediterranean Journal of Social Sciences,* 14(15), 35 – 47.

Ugonna, N.C. (2001). Environmental education among rural women. *Journal of review in physical, Health Education and Recreation* 2(1), 23-24.

Urachim, K. & Babayemi, C. (2010). Street food: environmental knowledge and attitudes of food vendors in Nsukka Urban, Enugu State, *Nigeria Journal of Nutritional Sciences* 23, 1 & 2, 19 – 25.

Velz, C.J. (2010). *Applied stream sanitation*. N.Y.: Wiley Inter.

Walker, P. Pritchand, L. & Forsythe, R.H. (2003).Effects of incubation temperature on isolation of Campylobacter jejuni genotypes from food enriched in Preston broth. *Journal of Environmental Microbiology*, 69, 46 -49.

Weobong, C.A. (2001). Distribution and seasonality of microbial indicators of pollution in Subin, an urban river in Kumasi, Ghana. *Masters' Thesis*. Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

Wilber, C. G. (2010). *The Biological aspects of water pollution*. Illinois: Charles Thomas Publications.

WHO, (1982): World Health Organisation, Geneva. Guidelines for organization and management of surveillance of food-borne disease. WHO monograph No. VPH/82. 39

Winser, U. (2005). Health practices for food vendors. *Journal of Health Education 5(16),* 80-85.

World Health Organization (WHO). (2004). Water, sanitation and hygiene links to health: Facts and figures updated November 2004 [accessed May 30, 2008]. Available from http://www.who.mt/watersanitation health/publications facts2004/ en/print. html.

Younes, M. & Bartram, J. (2001). Waterborne health risks and the WHO perspectives. *International Journal of Hygiene and Environmental* Health, (2), 255- 263.

Appendix A

Population Distribution of Meat Vendors in Anambra State

S/N	Name of abattoirs	Location / Status	Number of Meat Vendors
1	Nwakanwa Abattoir	Amansea/ Rural	52
2	Awka Abattoir	Amikwo, Awka/ Urban	28
3	Nteje Abattoir	Nteje/ Rural	48
4	Odumodu Abattoir	Odumodu Junction/ Rural	50
5	Onitsha Main Market Abattoir	Main Market Onitsha/ Urban	60
6	Nnewi Abattoir	Nnewi Market/ Urban	65
7	Awka-Etiti Abattoir	Awka-Etiti/ Urban	81
	Total		384

Source: Field Survey, June 2015.

Appendix B

Sample Distribution of the Meat Vendors in Anambra State

Urban Areas			
Treatment Group			Treatment Group
Onitsha Main Market Abattoir			Awka Abattoir, Amikwo.
Male	Female	Total	Male Female Total
36	24	60	16 12 28
Nnewi Abattoir, Nnewi.			
Male	Female	Total	
38	27	65	
Sub – Total		125	28
Rural Areas			
Treatment Group			Treatment Group
Nwakama Abattoir, Amansea.			Nteje Abattoir, Nteje
Male	Female	Total	Male Female Total
30	22	52	33 15 48
Sub – Total		52	48
Grand Total		253	

Appendix C

Human Kinetics and Health Edu. Dept.
Nnamdi Azikiwe University,
Awka.

Dear Respondent

I am a Ph.D student of the above named institution interested in finding out the effects of environmental health education intervention programme on health knowledge and practices of meat vendors in Anambra State. Could you please respond to the questionnaire. All your responses are purely for research purposes and information supplied shall be treated as confidential. No means are required to be written.

Okeke, F.N.

Researcher.

Appendix D

LETTER OF PERMISSION TO COLLECT DATA

Department of Human Kinetics
and Health Education
Nnamdi Azikiwe University
Awka, Anambra –State
Nigeria.
04/08/2015.

Tel:08033572873

Our Ref:……

TO WHOM IT MAY CONCERN

RE: MRS. F. N.OKEKE

The bear of this note, by name Mrs. F.N. Okeke is a Ph.D student of Human Kinetics and Health Education Department, Nnamdi Azikiwe University, Awka. Kindly give her all the necessary assistance she may need in the course of her research work.

Prof. J.O. Okafor

HOD.

Appendix E

PRE- TEST

ENVIRONMENTAL HEALTH KNOWLEDGE TEST (EHKT)

Part A: Background Information

Instruction: Please, you are required to provide the needed information by ticking (√) in the column that best describes you.

Sex: (a) Male ☐ (b) Female ☐

Area of Business: (a) Onitsha main market Abattoir ☐

(b) Awka Amikwo abattoir ☐

(c) Nnewi Abattoir ☐ (d)Amansea Nwakama Abattoir ☐ (e) Nteje Abattoir ☐

Educational Level: (a) FSLC ☐ (b) WAEC/NECO ☐

(c) NCE/OND ☐ (d) Degree ☐

Year in Business: (a) 1-2yrs ☐ (b) 3–4yrs ☐

(c) 5yrs and above. ☐

Part B: Environmental Health Knowledge Test (EHKT)

Instruction: The items below are on environmental health knowledge. You are therefore expected to answer the questions below by ticking (√) in the column of the option that you take as the correct response to the question or statement made.

1. All these diseases can result from eating contaminated meat <u>except</u> (a) Cholera (b) Dysentery (c) Diarrhea (d) Pneumonia
2. Environmental sanitation in the abattoir deals with all these <u>except one</u> (a) Control of vector (b) disposal of animal waste (c) prevention of meat contamination (d) Regular supply of meat.
3. The failure of a meat vendor to wash his hands after using the toilet may lead to (a) Meat contamination (b) Personal hygiene (c) Quarrel (d) Food borne diseases.
4. Personal hygiene can help us (a) Attract vectors; (b) Spread diseases (c) Reduce the spread of diseases (d) Improve revenue base.
5. The provision and control of all factors in people's physical surrounding which can affect their health is known as (a)pollution (b) environmental health (c) portable water (d) waste disposal.

6. One of the following is abattoir-based pollutant (a) Animal horns and bones (b) meat freezing (c) Seafood (d) Water for washing meat.
7. The main objective of health education is to (a) change an individual's own health behavior positively (b) eliminate waste (c) promote social services (d) maintain monthly sanitation exercise.
8. Cross-contamination of meat can result from (a) Regular washing of hands (b) Eating bad meat (c) Eating bad fruits (d) Touching meat with dirty hands.
9. Poor sanitary practices in meat handling can lead to (a) bacterial infection (b) food poisoning (c) all of the above (d) none of the above.
10. One's environmental health cannot be affected negatively by (a) air pollution (b) water pollution (c) land pollution (d) cross-pollination
11. Which of the following is abattoir-based pollutant: (a) Animal blood (b) Paunch manure (c) Abattoir effluent (d) All of the above.
12. Environmental sanitation does not include (a) provision of adequate and safe water supply (b) proper disposal of wastes (c) elimination of environmental hazards (d) washing of hands after using the toilet.
13. Industrialization, urbanization and ignorance are the major causes of (a) environmental education (b) environmental pollution (c) environmental sanitation (d) environmental health
14. Dust and smoke especially in the abattoir are the major causes of (a) air pollution in abattoir (b) water pollution in abattoir (c) land pollution in abattoir (d) noise pollution in abattoir.
15. Which of these is NOT a correct method of refuse disposal in abattoir: (a) Burning (b) Composting (c) Dumping animal wastes into gutters in the abattoir (d) Dumping animal wastes into pit toilets in the abattoir.
16. Which of these diseases can be contacted by eating unhygienic meat? (a) Dysentery (b) Leprosy (c) Malaria (c) Measles.
17. Defecating around the abattoir can lead to (a) Meat pollution(b)Paunch manure (c) Animal faeces (d) Meat contamination.

Please, answer "True" or "False" in the following questions by ticking (√) in the blank spaces provided:

18. Animal blood should not be discharged into streams to avoid water pollution.
    True ☐ False ☐
19. Animal paunch should be treated and disposed into shallow holes.
    True ☐ False ☐

20. Dumping animal horns in open spaces in the abattoir can breed decomposers which may be pathogenic.
    True ☐ False ☐

21. Animal blood should be channeled into dip pit where they can be disinfected.
    True ☐ False ☐

22. Animal manures should not be allowed to pile up and decompose in the abattoir.
    True ☐ False ☐

23. Piled up animal wastes in the abattoir should be properly treated and disposed of into dip pits and covered with sand. True ☐ False ☐

24. Animal waste should be properly treated and disposed of into dip pits and cover them with sand. True ☐ False ☐

25. Horns and bones of slaughtered animals should not be littered in the slaughter house or around meat shops.
    True ☐ False ☐

Appendix F

PRE- TEST

ENVIRONMENTAL HEALTH PRACTICE SCALE (EHPS)

Part A: Background Information

Instruction: Please, you are required to provide the needed information by ticking (√) in the column that best describes you.

Sex: (a) Male ☐ (b) Female ☐

Area of Business: (a) Onitsha main market Abattoir ☐

(b) Awka Amikwo abattoir ☐

(c) Nnewi Abattoir ☐ d)Amansea Nwakama Abattoir ☐ (e) Nteje Abattoir ☐

Educational Level: (a) FSLC ☐ (b) WAEC/NECO ☐

(c) NCE/OND ☐ (d) Degree ☐

Year in Business: (a) 1-2yrs ☐ (b) 3–4yrs ☐

(c) 5yrs and above. ☐

Instruction: Please, indicate your practices in the abattoir/ meat shop by ticking (√) in the spaces provided.

S/N	Practices in Abattoir/ Meat Shop	Strongly Agree	Agree	Disagree	Strongly Disagree
26	I normally clean and disinfect meat knives, tables and hooks.				
27	Bushes and weeds are not allowed to grow around our meat stalls or abattoir				
28	When not in use, we normally cover meat stalls.				
29	I always keep my nails trimmed to avoid meat contamination.				
30	I always clean and disinfect my meat stall properly before and after use.				
31	I always wear clean apron and hairnet before cutting slaughtered meat.				

32	I wash and scrub the table with soap before putting slaughtered meat on it.				
33	I wash my hands very well after using toilet before touching meat.				
34	After coughing and sneezing, I normally wash my hands before touching meat.				
35	I do not smoke in my meat stall.				
36	I do not display meat in my meat stall on dirty surface.				
37	I do not expose meat to excessive sun light.				
38	While cutting meat, I do not spit.				
39	I do not urinate in meat stall or around the abattoir.				
40	I do not channel abattoir effluents into running water in the abattoir.				
41	I treat and dispose animal faeces into deep pits and cover them.				
42	I gather animal horns and bones together in the abattoir.				
43	I sweep my meat stall every morning before I start my business.				
44	Gathered animal horns and bones in our abattoir are sold to people who use them as raw material for ceramics or fish feed.				
45	Animal faeces in our abattoir are properly treated and disposed of into deep pits and cover them with sand.				

Appendix G

Reliability Test of EHKT

Part B: Kuder-Richardson 21(KR_{21})

$KR_{20} = \frac{N}{N-1}\left(\frac{V-\sum p1q1}{v}\right)$

Where KR_{20} = Correlation coefficient

N = Number of items

V = Variance of the whole test

P_i = Proportion of people passing the items

q_t = Proportion of people failing the items.

Item	**Pass**	**Fail**	**P_t**	**q_i**	**p_iq_t**
1	13	17	0.43	0.57	0.2451
2	29	1	0.96	0.04	0.0384
3	21	9	0.70	0.30	0.2100
4	11	19	0.36	0.64	0.2304
5	24	6	0.80	0.20	0.1600
6	18	12	0.60	0.40	0.2400
7	12	18	0.40	0.60	0.2400
8	17	17	0.56	0.44	0.2464
9	18	12	0.60	0.40	0.2400
10	23	7	0.76	0.07	0.1824
11	28	2	0.93	0.07	0.0651
12	28	2	0.93	0.07	0.0651
13	25	5	0.83	0.17	0.1411
14	22	8	0.73	0.27	0.1971
15	25	5	0.83	0.17	0.1411
16	4	26	0.13	0.87	0.1131
17	26	4	0.86	0.14	0.1204
18	28	2	0.93	0.07	0.0651
19	27	3	0.90	0.10	0.0900
20	24	6	0.80	0.20	0.1600
21	28	2	0.93	0.07	0.0651
22	29	1	0.96	0.04	0.0384
23	26	4	0.86	0.14	0.1204
24	25	5	0.83	0.17	0.1411
25	24	6	0.80	0.20	0.1600
Total					**4.3017**

$x\frac{\sum x}{n} = \frac{555}{15} = 22.2$

$$v = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2 = \frac{13343}{25} - \left(\frac{555}{25}\right)^2 = 533.72 - (22.2)^2 = 40.88$$

$$KR_{20} = \frac{N}{N-1}\left(\frac{V-\sum piqt}{v}\right) = \frac{25}{25-1}\left(\frac{40.88-4{,}3017}{40.88}\right) = \frac{25}{24}(0.89477) = 0.932$$

:. $KR_{20} = 0.93$

Appendix H

Reliability Scale of EHPS

$$\alpha = \frac{K}{K-1}\left(1 - \frac{\sum v_i}{v_t}\right)$$

Where α = correlation coefficient
K = Number of items
V_t = Variance of individuals items
V_t = Variance of total items

Item	SA	A	D	SD	X	V_t
1	3	1	4	22	1.50	0.9166
2	1	7	18	4	2.16	0.5010
3	3	6	12	9	2.10	0.8900
4	2	0	12	16	1.60	0.6400
5	21	6	1	1	3.50	0.9166
6	10	6	14	0	2.86	0.8204
7	5	5	11	9	2.20	1.0933
8	0	10	16	4	2.20	.04266
9	0	3	20	7	1.86	0.3404
10	1	0	19	10	1.73	0.4071
11	1	2	14	13	1.70	0.5433
12	1	3	15	11	1.80	0.5600
13	4	4	18	4	2.26	0.7590
14	2	5	14	9	2.00	0.7333
15	1	6	11	12	1.86	0.7404
16	3	1	8	18	1.63	1.9097
17	4	2	12	12	1.93	1.0084
18	4	0	9	17	1.70	1.0100
19	1	3	16	10	1.83	0.5511
20	5	1	5	19	1.73	1.2737
Total						**15.0409**

$$v_t = \frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2 = \frac{7505}{80} - \left(\frac{599}{80}\right)^2 = 93.8125 - (7.48)^2 = 37.8621$$

:. $V_t = 37.8621$

$$\alpha = \frac{20}{20-1}\left(1 - \frac{15.0409}{37.8621}\right) = \frac{20}{19}\,(1 - 03972) = 0.6345$$

:. α = 0.63

The reliability coefficients show that the instrument is reliable and suitable for the study.

Appendix I

Pre-Test

Marking Scheme for Knowledge Test

Items	Answer
1	D
2	D
3	A
4	C
5	D
6	A
7	A
8	D
9	C
10	D
11	D
12	A
13	B
14	A
15	C
16	A
17	D
18	True
19	False
20	True
21	True
22	True
23	True
24	True
25	True

Appendix J

Time-Table for Learning Experiences

Weeks	Topics for Experimental Group
Week1	Pre-test Meat/Abattoir and environmental pollution
Week 2	Consequences of man-made pollution
Week 3	Hazards and risk management in meat
Week 4	Abattoir-based pollutants
Week 5	Hygienic handling of meat and personal hygiene for meat vendors
Week 6	Environmental hygiene practices for meat vendors and Post test

Appendix K

TEACHING PLANS

Teaching Plan of Week One

Subject: Environmental Health Education Programme

Topic: Meat/ Abattoir Wastes and Environmental Pollution

Duration: 45mins

Specific Objectives:

By the end of this lesson, the vendors should be able to:

Cognitive Domain

Identify meat/abattoir wastes that pollute environment

Define pollution.

Psychomotor Domain

State types of pollution

State abattoir based pollutants.

Affective Domain

Appreciate abattoir environment free from pollutants.

Entry Behaviour: The trainer should:

a. Ask the vendors what they know about abattoir waste, pollution and pollutants.

INSTRUCTIONAL PROCEDURE FOR WEEK ONE

Content Development	**Trainer's Performance Activity**	**Vendors Performance Activity**	**Instructional Materials**	**Instructional Strategies and Skills**
STEP 1 Introduction	The trainer presents a poster with drawings showing waste product and ask the vendors to comment on the poster presented. She further informs the vendors the purpose of the evaluation of the pre-test and thereafter administers the test.	The vendors observe the poster with the drawing and respond to the trainer's questions. They attempt the pre-test.	Flipchart Marking pens Posters Visual aids	Set induction; Questioning; Brains storming; Pre-Test

STEP 2 Meaning of Abattoir Waste & Pollution	The trainer explains to the vendors that abattoir waste include waste product generated in slaughter houses. She also defines pollution as disposal of solid, gracious and liquid product. She further define pollution as the introduction by man into the environment of substance or energy liable to cause hazards to human health, harm to living resources and ecological system, damage to structures, interference with legitimate use of the environment.	The vendors jot down the definitions of pollution and ask questions for clarification where they are confused.	White board, Flipchart Marking pens Posters Visual aids	Group discussion, Questioning, Reinforcement, Use of Examples.
STEP 3 **T**ypes of Pollution	The trainer guides the vendors to state the types of pollution they know. The trainer explains each of the three main types of pollution.	The vendors states the types of Pollution i. water pollution ii. Air pollution iii. Food pollution.	White board, Flipchart Marking pens Posters Visual aids	Explanation, Questioning, Reinforcement, Use of Examples.
STEP 4 Need for Abattoir free from Pollutants	The trainer explains to the vendors the need for abattoir free from pollutants: i. Hygienic processing of meat. ii. Safety of the vendors in the abattoir iii. Clean environment	The vendors write down the needs for abattoir free from pollutant.	White board, Flipchart Marking pens Posters Visual aids	Explanation, Discussion, Brainstorming, Questioning, Reinforcement.
STEP 5 Evaluation	The trainer will ask the vendors the following questions: i. What do you understand by abattoir waste? ii. What is the meaning of pollution? iv. Why is it important to have abattoir free from pollutants?	The vendors attempt the trainer's questions	White board, Flipchart Marking pens Posters Visual aids	Summary and closure skills

Teaching Plan of Week Two

Subject: Environmental Health Education Programme

Topic: Consequences of Man-made Pollution

Duration: 45mins

Specific Objectives:

By the end of this lesson, the vendors should be able to:

Cognitive Domain

i. Identify the consequences of man-made pollution

Psychomotor Domain

i. State the consequences of man-made pollution.

Affective Domain

Appreciate how to manage risks common to domestic/farm animals.

Entry Behaviour: The trainer should:

a. Ask the vendors what they know about environmental pollution.

INSTRUCTIONAL PROCEDURE FOR WEEK TWO

Content Development	Trainer's Performance Activity	Vendors Performance Activity	Instructional Materials	Instructional Strategies and Skills
STEP 1 Introduction	The trainer presents a poster with drawings showing different types of pollutants.	The vendors observe the poster with the drawing and jot down points.	Flipchart Marking pens Posters Visual aids	Set induction; Questioning; Brains storming; Pre-test
STEP 2 Consequences of Man-made Pollution	The trainer explains to the vendors the consequences of man-made pollution to human life. i. pollution of surface water ii. Pollution of underground water iii. Pollution of abattoir environment iv. Contamination of meat or consumables. v. Causing odour	The vendors jot down the consequences of man-made abattoir pollution. They can ask questions where they are confused.	White board, Flipchart Marking pens Posters Visual aids	Group discussion, Questioning, Reinforcement, Use of Examples.

	around the abattoir. vi. Increased noise level around the abattoir.			
STEP 3 Appreciating how to manage risks common to Domestic/farm animals	The trainer guides the vendors to state how to manage risks common to domestics/farm animals: i. proper pen maintenance. ii. Avoiding stressing of animals. iii. proper monitoring of the quality of cattle feed. iv. Animal treatment based on experts instruction.	The vendors states how to manage risks common to domestic/farm animals. They also ask questions where they are confused	White board, Flipchart Marking pens Posters Visual aids	Explanation, Questioning, Reinforcement, Use of Examples.
STEP 4 Evaluation	The trainer will ask the vendors the following questions: i. What are the consequences of man-made pollution? ii. State the consequences of man-made pollution ? iii. In which ways can one manage risks common to domestic/farm animals?	The vendors attempt the trainer's questions	White board, Flipchart Marking pens Posters Visual aids	Summary and closure skills

Teaching Plan of Week Three

Subject: Environmental Health Education Programme

Topic: Hazards and Risk Management of Meat.

Duration: 45mins

Specific Objectives:

By the end of this lesson, the vendors should be able to:

Cognitive Domain

i. Identify hazards and risk management in meat.

Psychomotor Domain

i. State hazards that can occur from meat management.

Affective Domain

i. Appreciate risk management strategies for meat vendors.

Entry Behaviour: The trainer should:

a. Ask the vendors to name animals they know.

INSTRUCTIONAL PROCEDURE FOR WEEK THREE

Content Development	Trainer's Performance Activity	Vendors Performance Activity	Instructional Materials	Instructional Strategies and Skills
STEP 1 Introduction	The trainer presents a poster with drawings showing domestic and wide animals and then introduces the topic.	The vendors observe the poster with the drawing and jot down the topic.	Flipchart Marking pens Posters Visual aids	Set induction;
STEP 2 Hazard and Risk Management in Meat	The trainer explains to the vendors hazard and risk management in meat from wildlife, seafood and meat from aquaculture i. wildlife: Most wild animal carcasses are never subjected to formal meat inspection as they are usually sourced from kills (by hunters) or informal population reduction culls.	The vendors jot down the points and ask questions for clarification where they are confused.	White board, Flipchart Marking pens Posters Visual aids	Group discussion, Questioning, Reinforcement, Use of Examples.

	ii. Seafood: Mollusks are implicated more than any other marine animal in seafood-borne illnesses.			
STEP 3 Need for Risk Management Strategies for Meat Vendors.	The trainer guides the vendors to state the needs for risk management strategies which are as follows: • Closure of shellfish harvesting beds during red tide • Alert the public through the local media and through warning notices posted on beaches of closed areas found to be toxic • Moving of shellfish from contaminated harvesting waters to pristine waters for one to two weeks, but this may not provide full consumer protection • Proper storage of fish to prevent Scombroid illness linked to post-harvest contamination and spoilage • Freezing the fish prior to pickling or marinating to kill helmintic parasites. • Heat inactivation of parasites which is the single, most effective method for eliminating the risk of parasitic infections and which can be achieved during processing or by the consumer.	The vendors states the need for risk management strategies for meat.	White board, Flipchart Marking pens Posters Visual aids	Explanation, Questioning, Reinforcement, Use of Examples.

STEP 4 Evaluation	The trainer will ask the vendors the following questions: i. What are the risk management in meat? ii. What are the hazard that can occur from meat?	The vendors attempt the trainer's questions	White board, Flipchart Marking pens Posters Visual aids	Summary and closure skills

Teaching Plan of Week Four

Subject: Environmental Health Education Programme

Topic: Abattoir-Based Pollutants

Duration: 45mins

Specific Objectives:

By the end of this lesson, the vendors should be able to:

Cognitive Domain

i. Identify abattoir-based pollutants

Psychomotor Domain

i. List abattoir-based pollutants.

Affective Domain

i. Appreciate the need to reduce the health risk posed by abattoir-based pollutants.

Entry Behaviour: The trainer should:

a. Ask the vendors to mention types of pollution they know.

INSTRUCTIONAL PROCEDURE FOR WEEK FOUR

Content Development	Trainer's Performance Activity	Vendors Performance Activity	Instructional Materials	Instructional Strategies and Skills
STEP 1 Introduction	The trainer presents a poster with drawings showing different types of pollutants and then introduces the topic.	The vendors observe the poster with the drawing and jot down the topic.	Flipchart Marking pens Posters Visual aids	Set induction;
STEP 2 Abattoir-Based Pollutants	The trainer explains to the vendors the abattoir based pollutants as follows:	The vendors jot down the abattoir based pollutants as follows:	White board, Flipchart Marking pens Posters	Group discussion, Questioning, Reinforcement,

	i. Animal blood ii. Punch manure iii. Animal Faeces iv. Abattoir Effluent v. Animals Horns and Bones vi. Decomposing manure Pile	i. Animal blood ii. Punch manure iii. Animal Faeces iv. Abattoir Effluent v. Animals Horns and Bones vi. Decomposing manure Pile They also listen to trainers explanations and ask their questions where they are confused.	Visual aids	Use of Examples.
STEP 3 Health Risks posed by Abattoir - based Pollutants.	The trainer guides the vendors to state the risk management of abattoir-based pollutants as follows: Blood from beef cattle has a biochemical oxygen demand (BOD5) of 156,500mg/l and a chemical oxygen demand (COD) of 218,300mg/l. The implication of this fact is that discharge of animal blood into streams would deplete the dissolved oxygen (DO) of the aquatic environment. Improper disposal of paunch manure can therefore exert oxygen demand on the receiving environment or breed large population of decomposers (micro-organism) some of which may be pathogenic. Improper disposal of animal faeces can	The vendors jot down the health risk posed by abattoir-based pollutants. They also ask questions where they are confused.	White board, Flipchart Marking pens Posters Visual aids	Explanation, Questioning, Reinforcement, Use of Examples.

	therefore cause oxygen-depletion in the receiving environment. It can also cause nutrient-over enrichment of the receiving system. And the possibility of disease causation is also present. Generally, fresh abattoir effluent has been shown to contain solids, minerals, metals, and micro-organisms; and to exert oxygen demand. On the other hand, aged and decomposing abattoir effluent is often malodorous. Animal horns and bones when not disposed off properly are unsightly; they occupy useful space; are odorous and attract flies, and can cause nuisance. Manure piles are permanent sources of pollution within the market environment, as they are often foul-smelling, attract both flies and scavengers, and breed mosquitoes.			
STEP 4 Needs and Strategies for reducing health risks posed by abattoir-based pollutants.	The trainer leads the vendors to appreciate need for risk management strategies from wild animals. i. ante-mortem inspection. ii. Meat inspection by qualified inspectors. iii. keeping the animal under tick free condition.	The vendors write down the needs for risk management strategies for needs abattoir-based pollutants	White board, Flipchart Marking pens Posters Visual aids	Explanation, Discussion, Brainstorming, Questioning, Reinforcement.

	iii. strict avoidance of pre-slaughter handling stress such as by shooting the crocodile in the pen			
STEP 5 Evaluation	The trainer will ask the vendors the following questions: i. Discuss any five abattoir-based pollutants you know. ii. State any five health risks associated with abattoir-based pollutants. iii. In which five ways do you think a vendor can benefit from reduction of risks posed by abattoir-based pollutants.	The vendors attempt the trainer's questions	White board, Flipchart Marking pens Posters Visual aids	Summary and closure skills

Teaching Plan of Week Five

Subject: Environmental Health Education Programme

Topic: Hygienic Handling of Meat in Meat Stalls and Personal Hygiene for Meat Vendors.

Duration: 45mins

Specific Objectives:

By the end of this lesson, the vendors should be able to:

Cognitive Domain

i. Define basic terms in hygienic handling of meat.

Psychomotor Domain

i. List personal hygienic practices for meat vendors.

Affective Domain

i. Appreciate the process for proper handling of meat product.

Entry Behaviour: The trainer should:

a. Ask the vendors state different kinds of meat they sale.

INSTRUCTIONAL PROCEDURE FOR WEEK FIVE

Content Development	Trainer's Performance Activity	Vendors Performance Activity	Instructional Materials	Instructional Strategies and Skills
STEP 1 Introduction	The trainer presents a poster with drawings showing different kinds of meat and then introduces the topic.	The vendors observe the poster with the drawing and jot down the topic.	Flipchart Marking pens Posters Visual aids	Set induction; Questioning; Brains storming; Pre-test
STEP 2 Basic Terms in Hygienic Handling of Fresh Meat	The trainer explains to the vendors the following terms: **Meat** – all parts of food animal that are intended for, or have been judged as safe and suitable for, human consumption. **Meat Vendor** – any registered person who sells fresh and processed meat and meat products. **Fresh Meat**-meat that has not undergone any preserving process other than chilling, freezing or quick freezing. Fresh meat includes the following: **Warm meat** – is obtained from freshly slaughtered animals or poultry. The meat is not refrigerated at any stage of meat handling or at the point of sale. **Chilled meat** – is produced from freshly slaughtered animals or poultry and stored under refrigeration without being frozen. In the abattoir, carcasses are immediately chilled down to the recommended temperature of 1 – 3 OC by a rapid chilling	The vendors jot down the definitions of the terms and ask questions for clarification where they are confused.	White board, Flipchart Marking pens Posters Visual aids	Group discussion, Questioning, Reinforcement, Use of Examples.

	process using advanced refrigeration technology. The chilling temperature is maintained throughout the subsequent processing, handling, transport, storage, distribution and retail. Chilled meat should feel cold. Chilled meat keeps its freshness for 3 – 5 days in display chiller or home refrigerator. **Frozen Meat** - is similarly processed from freshly slaughtered animals or poultry. The meat which is in peak condition and freshness is preserved by rapid freezing at -18OC or lower and is then stored and distributed in frozen form. Frozen meat should be solid. Inspected and Passed – a condition wherein the carcasses or parts of carcasses so marked have been inspected and found to be safe, wholesome and fit for human consumption. **Meat Cold Storage Warehouse** – a type of meat establishment for the storage of local and imported frozen meat products. **Meat Handler** – person directly involved in the preparation, transport and sale of meat and meat products. **Meat Markets** – premises where meat, meat products, and/or processed meat products are sold, catered, or			

	served, in public or clandestinely, for human consumption. **Meat Shop** – a meat outlet owned by private company wherein product being sold is produced by the same company. **Public market** – a market owned, operated and/or managed by the government intended to serve the general public. **Private market** – a market owned, operated and/or managed by private individuals or entities, cooperatives, institution or corporation intended to serve the general public. **Meat Product** – any product capable of use as human food which is made wholly or in part from any meat or other portions of the carcass of any food animals, excepting products which contain meat or other portions of such carcasses only in a relatively small proportion or historically have not been considered by consumers as products of the meat industry, and which are exempted from definition as meat products by the Secretary under such conditions as he may prescribe to assure that the meat or other portions of such carcasses contained in such product are not			

	adulterated and that such products are not represented as meat products. **Potable water**– water suitable (both health and aesthetic considerations) for drinking, preparation and cooking purposes of meat products . **Primary Packaging** – refers to first layer food grade wrapping materials in direct contact with the product to protect it from contamination. **Meat Handlers** - Meat handlers like meat vendors and butchers are key players in handling clean, safe and wholesome meat. They are required to comply with the following:			
STEP 3 Personal Hygienic Practices for Meat Vendors	The trainer guides the vendors to state the Personal Hygienic Practices for Meat Vendors which are as follows: Taking a bath before attending to work; b. Wearing clean apron and hairnet during work; c. Keeping nails trimmed, clean and without nail polish; d. No wearing of jewelries/accessories and application of perfumes; e. Suitable protective clothing must be worn by all meat handlers and shall be changed every day or as often as necessary. All personnel should be	The vendors states the personal hygienic practices for meat vendors and ask questions where they are not clear.	White board, Flipchart Marking pens Posters Visual aids	Explanation, Questioning, Reinforcement, Use of Examples.

	aware and adopt the proper hand washing practices: a. Steps in hand washing: i. Wet hands with potable water ii. Soap, lather and scrub all parts of the hands, fingers and wrists iii. Rinse and dry with clean cloth or towel b. Wash hands frequently to prevent contamination of the meat, including but not limited to the following: i. Before, during and after work; ii. Immediately after using the toilet; iii. After coughing and sneezing; iv. After contact with dirty objects and materials; v. Before and after eating To prevent contamination of meat and meat products, the following but not limited to, shall be strictly prohibited, while at work: a. Smoking; b. Drinking; c. Spitting; d. Chewing or eating; e. Sneezing or coughing over meat and meat products; f. Urinating in the meat stall; g. Infected with diseases (eg jaundice, diarrhea, vomiting, fever,			

	sore throat with fever; visibly infected skin lesions (eg boils, cuts etc), discharges from eye or nose); and h. Handling fresh meat, money, and receipts at the same time.			
STEP 4 Process for Proper Handling of Meat Products	The trainer explains to the vendors the processes for proper handling of meat products such as: **B. Meat Packaging** • Food grade plastic bags and wrappers should be used. • Packaging or wrapping materials should be free from any form of impurities or contaminants, without defects or pinholes. • Wrapping/packaging materials must be properly handled and kept clean. • Printed packaging materials like newspaper must not be used. • Recycling of previously used wrapping/packaging materials should not be practiced. **C. Warm Meat** • Meat shall be properly handled during unloading.	The vendors write down the process for proper handling of meat products and ask questions where they are confused.	White board, Flipchart Marking pens Posters Visual aids	Explanation, Discussion, Brainstorming, Questioning, Reinforcement.

	• Meat shall be displayed in manner where the drip from one piece does not come in contact with another piece. • Use tongs in handling meat products to avoid direct contact. Use of plastic gloves may also be used by the meat handler. • Due care should be taken to prevent fresh products from falling to the floor. • Care should be taken to prevent contamination at all times. • Products should not be handled unnecessarily by buyers. • No additional processing or preparing of the food is to occur at the market site without written permission from the Office of the meat inspector. **D. Chilled and Frozen Meat** The following precessions shall be strictly observed in the handling of Chilled, frozen meat products			

	intended for sale in the meat markets. • All persons and entities engaged in the handling and sale of frozen meat and meat products in meat markets shall be accredited/ licensed. • Chilled or frozen meat products must not be removed from cold storage/freezers until required for serving or display. • Frozen meat and meat products shall be displayed and sold in the meat stalls in sealed primary • packaging. • Thawing and repacking from bulk packaging shall be done in an accredited meat establishment and under temperature controlled environment of 10°C. The meat establishment officer shall inspect and certify as to the products' fitness for human consumption. • Retail packaging material shall ensure traceability and bear the identity of the original source (eg name, address, accreditation number.) as well as			

	that of the licensed repacker. • The retail packages shall be stored in refrigerated facilities and transported in vehicles that are able to maintain temperature not higher than 4°C. • In the meat stall, the retail-packed frozen 349 meat and meat products shall be kept in sanitary containers made of approved materials preferably stainless steel or food grade plastic. • Be kept in temperature not higher than 10°C.			
STEP 5 Evaluation	The trainer will ask the vendors the following questions: i. Define five basic terms in hygienic handling of fresh meat. ii. List ten personal hygienic practices for meat vendors. iii. Why do we need the knowledge of proper handling of meat products?	The vendors attempt the trainer's questions	White board, Flipchart Marking pens Posters Visual aids	Summary and closure skills

Teaching Plan of Week Six

Subject: Environmental Health Education Programme

Topic: Environmental Hygienic Practices for Meat Vendors.

Duration: 45mins

Specific Objectives:

By the end of this lesson, the vendors should be able to:

Cognitive Domain

i. Identify Hygiene/Sanitation Practices for Meat Vendors.

Psychomotor Domain

i. State Hygiene/Sanitation Practices for Meat Vendors.

Affective Domain

i. Appreciate environmental hygienic practices for meat vendors.

Entry Behaviour: The trainer should:

a. Ask the vendors to list personal hygienic practices they know.

INSTRUCTIONAL PROCEDURE FOR WEEK SIX

Content Development	Trainer's Performance Activity	Vendors Performance Activity	Instructional Materials	Instructional Strategies and Skills
STEP 1 Introduction	The trainer presents a poster with drawings showing waste product and introduces the topic.	The vendors observe the poster with the drawing and jot down the topic.	Flipchart Marking pens Posters Visual aids	Set induction; Questioning; Brains storming;
STEP 2 Hygienic Practices for Meat Vendors.	The trainer explains to the vendors that abattoir waste include waste product generated in slaughter houses and thereafter explains to the vendors the hygiene/sanitation practices.	The vendors jot down the Hygiene/Sanitation Practices for meat vendors.	White board, Flipchart Marking pens Posters Visual aids	Group discussion, Questioning, Reinforcement, Use of Examples.
STEP 3 Explanation of Hygiene/Sanitation Practices for Meat Vendors.	The trainer guides the vendors to state hygiene/sanitation practices for meat vendors which as follows: • Animals must not be allowed in any meat stall area. • Infestations of insects or rodents must be reported	The vendors states the hygiene/sanitation practices for meat vendors and ask questions where they are confused.	White board, Flipchart Marking pens Posters Visual aids	Explanation, Questioning, Reinforcement, Use of Examples.

	immediately to the Market Administrators or Superintendents. • The meat stall, its surroundings and equipment or tools should be kept clean, free of litter and odors, in good repair and condition and free from vermin at all times. • The meat stalls shall be free from personal belongings, such as clothes, footwear, blankets, tobacco and other forms of contaminants. • Meat markets should be cleaned and disinfected regularly. • Vermin free meat markets should be in place and the Vermin Abatement Program shall be regularly implemented. • The growth of bushes, weeds and grass shall be controlled to prevent harborage of ticks, bugs and other insects. • When not in use, the meat stalls should be covered. • Meat stall including floor and surrounding areas should be properly			

	cleaned and disinfected before and after use. • Cutting and chopping blocks for meat shall be made of even, impervious, non-fibrous, and easily cleaned materials and free of cracks and crevices. • Knives, tables and meat hooks should be thoroughly cleaned and disinfected. • Disposal/Trash containers should be clean.			
STEP 4 Hygiene/Sanitation Practices for Meat Vendors.	The trainer guides the vendors to appreciate the following environmental hygienic practices: • **Animal Blood**: Animal blood should not be discharged into streams to avoid water pollutant which can cause human or animal diseases. • **Paunch Manure**: Animal paunch should be treated and disposed into deep holes to avoid breeding decomposers which may be pathogenic. • **Animal Faeces or Manure**: Animal faeces or manure should be treated and disposed into deep pits to avoid meat contamination and the	The vendors write down the needs for hygiene/sanitation practices for meat vendors.	White board, Flipchart Marking pens Posters Visual aids	Explanation, Discussion, Brainstorming, Questioning, Reinforcement.

	possibility of disease causation. • **Abattoir Effluent:** Abattoir effluents such as animal blood, fat and suspended solids should not be channeled into running water. Such effluents can be channeled into a dip pit where they can be disinfected. • **Animal Horns and Bones:** Horns and bones of slaughtered animals should not be littered in the slaughter house or around meat shops. They should rather be gathered at a place where they could be burnt and used as raw materials for ceramics, fish feeds etc. • **Decomposing Manure Pile**: Animal manures should not be allowed to pile up and decompose thereby attracting both flies and scavengers and bread mosquitoes. They should be properly treated and disposed of into deep pits and cover them with sand.			
STEP 5 Evaluation	The trainer will ask the vendors the following questions: i. Identify any hygiene practices for meat vendors. ii. State and discuss any	The vendors attempt the trainer's questions	White board, Flipchart Marking pens Posters Visual aids	Summary and closure skills

	five advantages of hygienic practices for meat vendors. iii. Why do we need environmental hygienic practices for meat vendors?			
Post- Test (Evaluation)	Trainer's Performance Activity	Vendors Performance Activity	Evaluation Materials	Evaluation Strategies and Skills
Preparation for Post-Test	The trainer arranges the vendors for the post-test.	The vendors will sit according to the trainers' arraignment.	Paper and Pen, Posters Visual aids	Explanation and re-inforcement
Administration of Post-Test	The trainer will administer the post-test on the vendors.	The vendors will attempt the post-test	Paper and Pen, Posters Visual aids	Evaluation skills
Termination of intervention	The trainer will thank the vendors for their cooperation and bring the programme to an end.	The vendors will express their satisfaction over the entire programme.		Closure skills.

Appendix L

Post-Test

ENVIRONMENTAL HEALTH KNOWLEDGE TEST (EHKT)

Part A: Background Information

Instruction: Please, you are required to provide the needed information by ticking (√) in the column that best describes you.

Sex: (a) Male ☐ (b) Female ☐

Area of Business: (a) Onitsha main market Abattoir ☐

(b) Awka Amikwo abattoir ☐

(c) Nnewi Abattoir ☐ (d)Amansea Nwakama Abattoir ☐ (e) Nteje Abattoir ☐

Educational Level: (a) FSLC ☐ (b) WAEC/NECO ☐

(c) NCE/OND ☐ (d) Degree ☐

Year in Business: (a) 1-2yrs ☐ (b) 3–4yrs ☐

(c) 5yrs and above. ☐

Part B: Environmental Health Knowledge Test (EHKT)

Instruction: The items below are on environmental health knowledge. You are therefore expected to answer the questions below by ticking (√) in the column of the option that you take as the correct response to the question or statement made.

1. One's environmental health cannot be affected negatively by (a) air pollution (b) water pollution (c) land pollution (d) cross-pollination
2. Personal hygiene can help us (a) Attract vectors; (b) Spread diseases (c) Reduce the spread of diseases (d) Improve revenue base.
3. One of the following is abattoir-based pollutant (a) Animal horns and bones (b) meat freezing (c) Seafood (d) Water for washing meat.
4. Environmental sanitation in the abattoir deals with all these **except one** (a) Control of vector (b) disposal of animal waste (c) prevention of meat contamination (d) Regular supply of meat.
5. Cross-contamination of meat can result from (a) Regular washing of hands (b) Eating bad meat (c) Eating bad fruits (d) Touching meat with dirty hands.
6. All these diseases can result from eating contaminated meat **except** (a) Cholera (b) Dysentery (c) Diarrhea (d) Pneumonia
7. Which of the following is abattoir-based pollutant: (a) Animal blood (b) Paunch manure (c) Abattoir effluent (d) All of the above.

8. Industrialization, urbanization and ignorance are the major causes of (a) environmental education (b) environmental pollution (c) environmental sanitation (d) environmental health
9. Which of these diseases can be contacted by eating unhygienic meat? (a) Dysentery (b) Leprosy (c) Malaria (c) Measles.
10. Dust and smoke especially in the abattoir are the major causes of (a) air pollution in abattoir (b) water pollution in abattoir (c) land pollution in abattoir (d) noise pollution in abattoir.
11. The failure of a meat vendor to wash his hands after using the toilet may lead to (a) Meat contamination (b) Personal hygiene (c) Quarrel (d) Food borne diseases.
12. Poor sanitary practices in meat handling can lead to (a) bacterial infection (b) food poisoning (c) all of the above (d) none of the above.
13. Defecating around the abattoir can lead to (a) Meat pollution(b)Paunch manure (c) Animal faeces (d) Meat contamination.
14. The main objective of health education is to (a) change an individual's own health behavior positively (b) eliminate waste (c) promote social services (d) maintain monthly sanitation exercise.
15. The provision and control of all factors in people's physical surrounding which can affect their health is known as (a)pollution (b) environmental health (c) portable water (d) waste disposal.
16. Environmental sanitation does not include (a) provision of adequate and safe water supply (b) proper disposal of wastes (c) elimination of environmental hazards (d) washing of hands after using the toilet.
17. Which of these is **NOT** a correct method of refuse disposal in abattoir: (a) Burning (b) Composting (c) Dumping animal wastes into gutters in the abattoir (d) Dumping animal wastes into pit toilets in the abattoir

Please, answer "True" or "False" in the following questions by ticking (√) in the blank spaces provided:

18. Animal waste should be properly treated and disposed of into dip pits and cover them with sand. True ☐ False ☐

19. Animal manures should not be allowed to pile up and decompose in the abattoir. True ☐ False ☐

20. Horns and bones of slaughtered animals should not be littered in the slaughter house or around meat shops. True ☐ False ☐
21. Piled up animal wastes in the abattoir should be properly treated and disposed of into dip pits and covered with sand. True ☐ False ☐
22. Dumping animal horns in open spaces in the abattoir can breed decomposers which may be pathogenic. True ☐ False ☐
23. Animal paunch should be treated and disposed into shallow holes.
    True ☐ False ☐
24. Animal blood should be channeled into dip pit where they can be disinfected.
    True ☐ False ☐
25. Animal blood should not be discharged into streams to avoid water pollution.
    True ☐ False ☐

Appendix M

POST-TEST, ENVIRONMENTAL HEALTH PRACTICE SCALE (EHPS)

Instruction: Please, indicate your practices in the abattoir/ meat shop by ticking (√) in the spaces provided.

S/N	Practices in Abattoir/ Meat Shop	Strongly Agree	Agree	Disagree	Strongly Disagree
26	I always keep my nails trimmed to avoid meat contamination.				
27	I gather animal horns and bones together in the abattoir.				
28	I normally clean and disinfect meat knives, tables and hooks.				
29	I wash and scrub the table with soap before putting slaughtered meat on it.				
30	I do not expose meat to excessive sun light.				
31	Bushes and weeds are not allowed to grow around our meat stalls or abattoir.				
32	After coughing and sneezing, I normally wash my hands before touching meat.				
33	While cutting meat, I do not spit.				
34	When not in use, we normally cover meat stalls.				
35	I do not channel abattoir effluents into running water in the abattoir.				
36	I sweep my meat stall every morning before I start my business.				
37	I do not urinate in meat stall or around the abattoir.				
38	I always clean and disinfect my meat stall properly before and after use.				
39	I wash my hands very well after using toilet before touching meat.				
40	Animal faeces in our abattoir are properly treated and disposed of				

	into deep pits and cover them with sand.				
41	I do not display meat in my meat stall on dirty surface.				
42	Gathered animal horns and bones in our abattoir are sold to people who use them as raw material for ceramics or fish feed.				
43	I treat and dispose animal faeces into deep pits and cover them.				
44	I do not smoke in my meat stall.				
45	I always wear clean apron and hairnet before cutting slaughtered meat.				

Appendix N

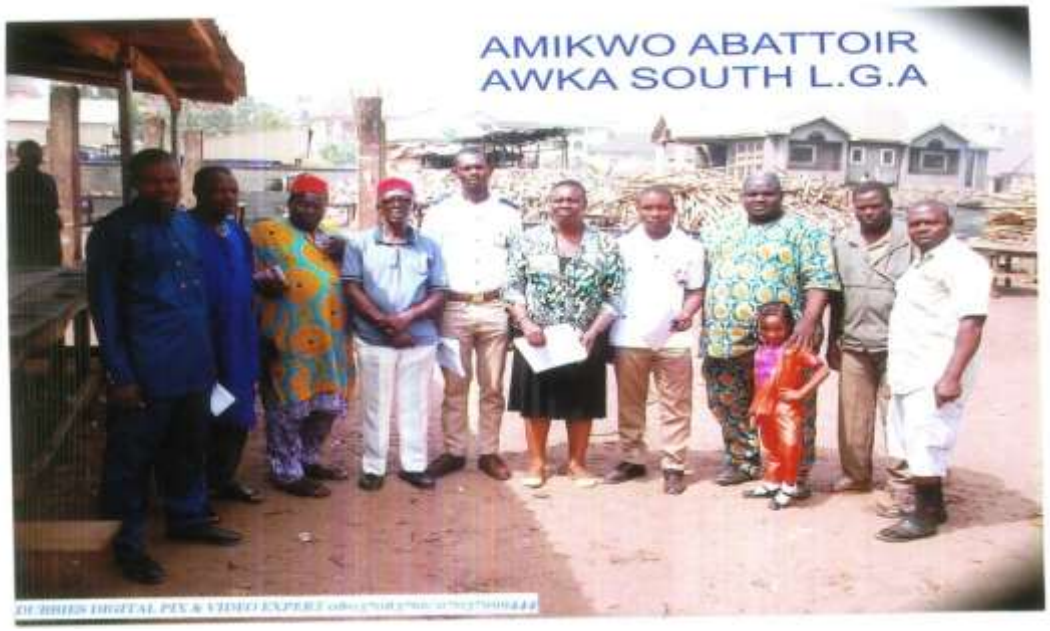
Post Test

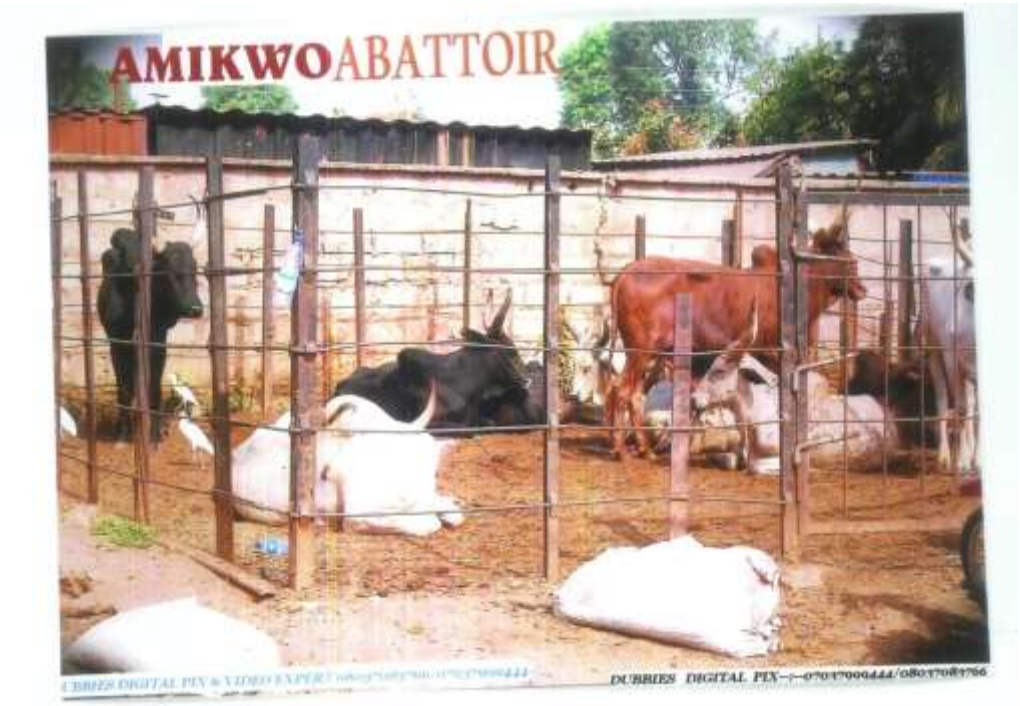
Marking Scheme for Knowledge Test

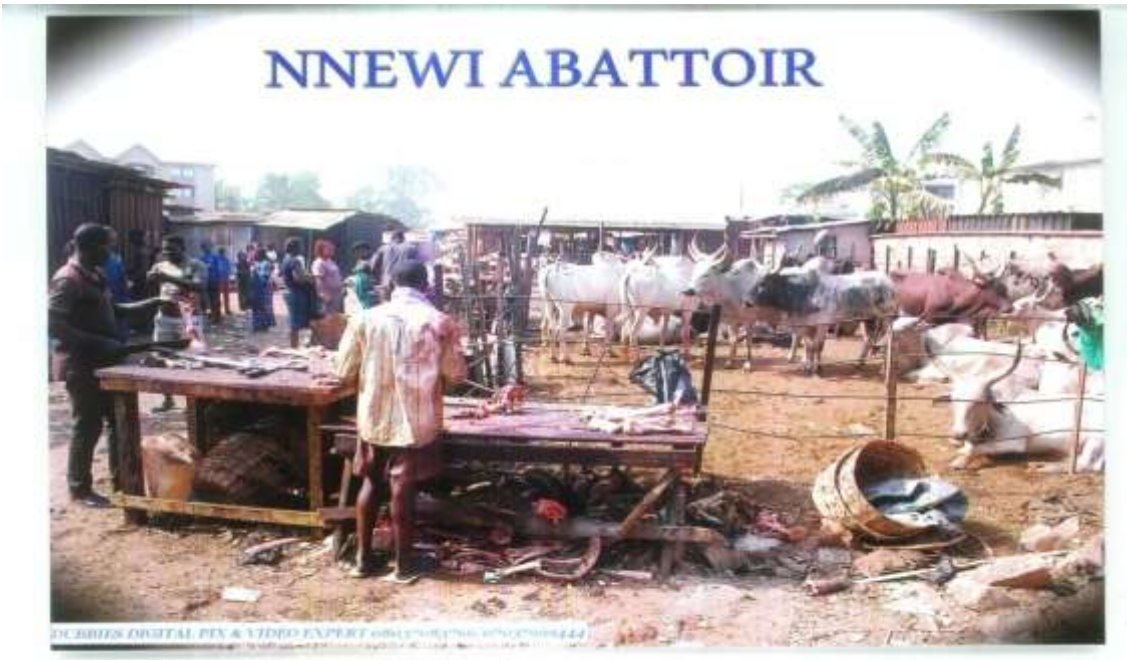
Items	Answer
1	D
2	C
3	A
4	A
5	D
6	D
7	D
8	B
9	A
10	A
11	A
12	D
13	D
14	A
15	D
16	D
17	C
18	True
19	True
20	True
21	True
22	True
23	False
24	True
25	True

Appendix O

Pictures Taken During The Sections






NNEWI ABATTOIR


NNEWI ABATTOIR
IN GOD WE TRUST


NTEJE ABATTOIR


NTEJE 2 ABATTOIR
IN GOD WE TRUST

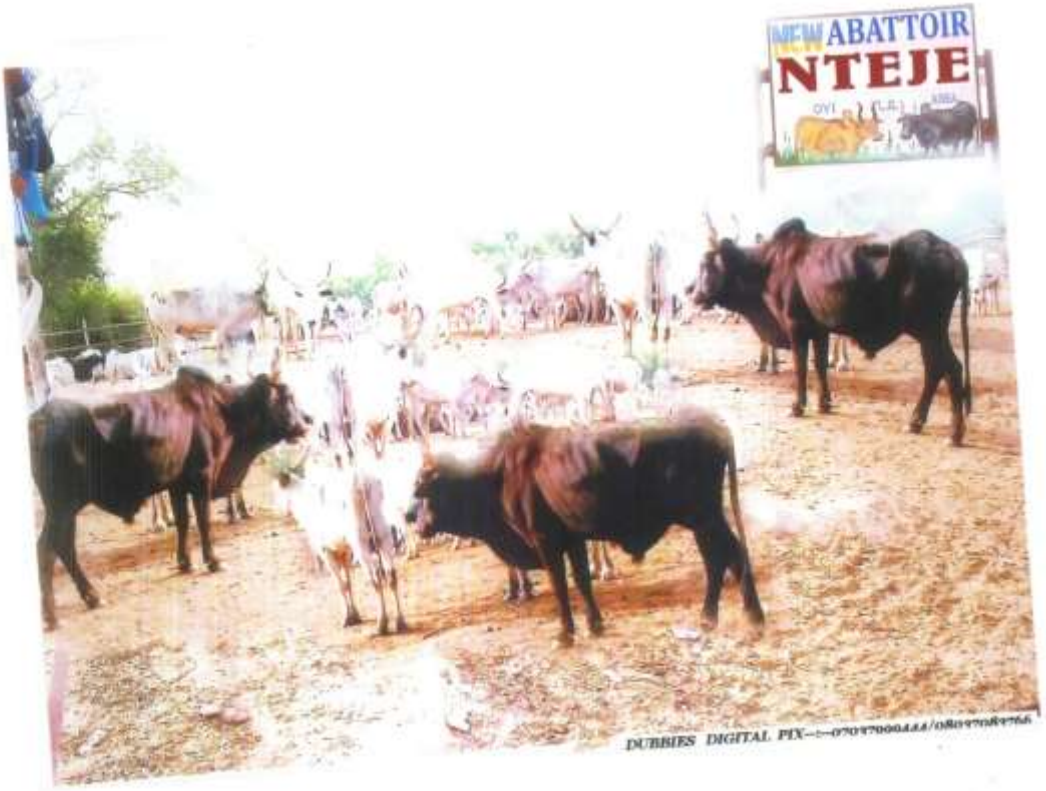

NEW ABATTOIR
ONITSHA


NEW ABATTOIR
onitsha
DUBBIES DIGITAL PIX & VIDEO EXPERT
DUBBIES DIGITAL PIX--:--07037999444/08037083766


NWAKANWA ABATTOIR


DUBBIES DIGITAL PIX~:~07037999444/08037083766


ONITSHA ABATTOIR


NEW
ABATTOIR
NTEJE
DUBBIES DIGITAL PIX