

**UNIVERSITY OF GHANA**  
**SCHOOL OF PUBLIC HEALTH**



**FIRE EMERGENCY PREPAREDNESS AMONG STAFF OF TARKWA**

**MUNICIPAL HOSPITAL**

**BY**

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**DECLARATION**

I, Sylvester Sebbeh- Newton, do hereby declare that this dissertation research was written by me under the supervision of Dr. Uri Markakpo of the school of public health, University of Ghana. In places where references to other people's works have been made, full acknowledgements have been made. This research has not been presented either in whole or part to any other institution for the award of any degree.

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## **DEDICATION**

This work is dedicated to God, for His grace throughout the entire work. I also dedicate this work to my mum, Mary Arthur for her financial support throughout the course of this programme.

## **ACKNOWLEDGEMENTS**

I sincerely thank the almighty God for the strength to go through the MPH programme successfully. I appreciate all the people who supported me financially and emotionally when I was conducting this research.

Special thank you to my supervisor; Dr. Uri Markakpo of University of Ghana School of Public Health for his guidance and support throughout the work. My profound appreciation, also, goes to Dr. Frederick Sarpong, the Medical superintendent of Tarkwa Municipal Hospital for his immense support throughout the research work.

My final appreciation goes to all my MPH course-mates and colleagues especially George Asmah.

## ABSTRACT

**Background:** fire emergency preparedness is so important to hospital staffs in order to prevent avoidable fire outbreaks or prevent injury and death in the event of a fire outbreak.

**Aim:** The aim of this study, therefore, was to assess fire emergency preparedness among staff of Tarkwa Municipal Hospital.

**Methods:** A descriptive cross-sectional study was carried out using quantitative methods. The study assessed the recent status of fire emergency preparedness of staffs of Tarkwa Municipal Hospital using an interview-administered questionnaire and observational checklists. Data collection was done in April 2018. The study surveyed both clinical and non-clinical staff. A multistage sampling was used where staff were stratified into clinical and non-clinical staff, and then 176 participants were selected using simple random approach. Data were coded, cleaned and entered into Excel statistical package and then imported to STATA version 15 for analysis. The data were summarized and presented as frequency tables, percentages, proportions and figures.

**Results:** Overall, knowledge scoring of staff was low. 21.9% of the respondents had adequate knowledge on emergency fire preparedness. None of them had training as well as drills in fire emergency preparedness at the hospital. Only 34.2% of the respondents had knowledge on use of fire extinguisher. In addition, less than 12% of the respondents correctly knew the fire emergency number. Staff knowledge was also found to be significantly associated with cadre and duration of work at the current workstation ( $X^2 = 13.1733$ ;  $p\text{-value}=0.000$ ,  $X^2 = 8.1147$ ;  $p\text{-value}=0.017$  respectively). Most (87.1%) of the respondents felt electricity was the most likely source of fire. Furthermore, the majority (44.9%) of the respondents perceived a high need for training on fire emergency preparedness and a large proportion (75.8%) of them rated their fire emergency preparedness level as below average. Non-compliance issues noted included missing annual

fire drills and audit report, evacuation plan in each department, missing fire safety policy document and the use of only red colour coded fire extinguisher as the only fire fighting equipment.

**Conclusion:** Knowledge of staff on fire emergency preparedness was inadequate. Most of the respondents perceived their fire emergency preparedness level was below average and indicted that there was a high need for fire emergency preparedness training among them. Non-compliance to international and local regulations was attributable to unavailability of annual fire audit and drill report, the use of unsuitable type of extinguisher for their major perceived source of fire risk and the absence of other types of firefighting equipment.

To meet international and local regulations and guidelines, hospital management should ensure basic fire training for staff. There should be frequent fire emergency drills and fire audits. Appropriate firefighting equipment should be provided. Further research is recommended to extend the study to other institutions.

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**LIST OF ABBREVIATIONS**

GNFS	Ghana National Fire Service
ILO	International Labor Organization
OSHA	Occupational Safety and Health Act
RAs	Research Assistants
STATA	Statistics and Data

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background to study

Occupational hazards do occur in public institutions. These includes fire outbreaks. Fire outbreaks have in recent times been on the ascendency in the country. Fire outbreaks are the disasters caused directly or indirectly by actions of humans (Muindi, 2014). Fire is locally said to be a good servant but often a bad master. It is used for so many domestic and industrial activities such as cooking and iron smelting respectively. However, fire outbreaks are destructive and not useful, and a manifestation of uncontrolled combustion (Campbell & Levenstein, 2015). They occur either through accident as a result of inappropriate use of appliances, deliberate ignition and also through electrical equipment failure (Ogajo, 2013). According to the Ghana National Fire Service (2010), there has been fire outbreaks in most of the regions of Ghana as illustrated with the table below.

Table 1.1: Fire outbreak in the ten regions of Ghana for the year 2010

REGION	RESCUE			FIRE OUTBREAK		COST OF DAMAGE GH¢	COST OF SALV (GH¢)	DOMESTIC	INDUSTRIA L	VEHICULA R	INSTITUTIONA L	ELECTRICA L	COMMERCIAL	BUSH	OTHERS	TOTAL
	No.	Injury	Death	Injury	Death											
AR	123	163	38	0	0	2,175,481	0	249	23	97	26	26	79	51	13	564
BAR	23	65	6	6	4	443,207	40,610	76	8	27	1	18	4	53	15	202
CR	84	184	25	0	1	350,306,210	50,000	83	2	43	3	40	8	38	12	229
ER	80	396	47	1	6	25,800	0	79	7	36	0	21	9	12	4	168
GAR	16	7	2	10	0	-	0	232	1	53	31	56	90	17	20	500
NR	3	7	3	21	3	44,562	0	74	1	8	4	22	1	11	6	127
TR	35	155	16	3	5	1,506,100	0	71	19	33	6	22	19	23	25	218
UER	7	0	4	0	0	54,240	0	63	3	17	9	15	16	16	6	145
UWR	0	0	0	0	0	-	0	0	0	0	0	0	0	0	100	100
VR	0	0	0	0	0	-	0	0	0	0	0	0	0	0	20	20
WR	0	0	0	16	1	5,426,496	0	64	16	25	0	9	19	6	10	149
HQ	41	74	4	0	0	-	0	75	3	26	1	33	23	2	2	165
TOTAL	412	1,051	145	57	20	359,982,096	90,610	1,066	83	365	81	262	268	229	233	2,587
%								41.2	3.2							

<u>AR</u>	<u>Ashanti Region</u>	<u>NR</u>	<u>Northern Region</u>	<u>WR</u>	<u>Western Regionm</u>
<u>BAR</u>	<u>BrongAhafo Region</u>	<u>TR</u>	<u>Tema Region</u>	<u>HQ</u>	<u>Headquarters</u>
<u>CR</u>	<u>Central Region</u>	<u>UER</u>	<u>Upper East Region</u>		
<u>ER</u>	<u>Eastern Region</u>	<u>UWR</u>	<u>Upper West Region</u>		
<u>GAR</u>	<u>Greater Accra Region</u>	<u>VR</u>	<u>Volta Region</u>		

Source: GNFS (2010).

According to Philpott & Brompton (2009), London over the past two decades has had five hospital fires (Table 2) which required total or partial evacuation of these hospitals. This experience demonstrated the utmost importance of being adequately prepared for fire emergency.

**Table 1.2:** Fire outbreaks statistics in London.

<b>Hospital name</b>	<b>Type of hospital</b>	<b>Date of fire</b>
Royal Marsden Hospital	Specialist cancer hospital	2 <sup>nd</sup> January 2008
University College Hospital	London teaching hospital	25 <sup>th</sup> July 2008
Great Ormond Street Hospital	Paediatric tertiary referral centre	29 <sup>th</sup> September 2008
North London Forensic Service	District General hospital site	15 <sup>th</sup> October 2008
Northwick Park Hospital	District General Hospital	11 <sup>th</sup> February 2009

Source: (Philpott & Brompton, 2009)

Fires in hospitals generally originate from inflammable liquids such as alcohol containing solutions and other volatile chemicals used especially in the operating theatres. These become more fire prone in the presence of oxygen and nitrous oxide (Chowdhury, 2014). There is the need for hospitals to be prepared for fire outbreaks. A study in US shows that about 650 operating theatre fires occurred which were attributable to alcohol-based skin preparation fluid (Rocos & Donaldson, 2012).

Fires have gutted many key places in the country destroying properties, documents worth millions and lives. The places that have left much scar in the affairs of the country include; the Ministry of Foreign Affairs and Information, the Accra Metro Education office at Tudu, National Lottery office building, Tema Oil Refinery and Kejetia market. These places were ravaged by fire between 2006 and 2012 with 3,187 fires attended to in that period. (Ghana National Fire Service, 2013)

Hospitals are health institutions and are required to promote, maintain and restore people's health and not to rather cause injury or disease to people. Fire outbreaks in hospitals apart from directly causing harm to a large number of people, would also prevent the hospital from healthcare delivery services. It is therefore important that fire outbreaks are prevented from occurring in health institutions, but if they occur, there should be measures in place to prevent them from causing harm or minimize the destruction they might cause. There have been a handful of fire outbreaks in Ghanaian hospitals. These include the fire outbreak of Mankranso Government Hospital where the labour ward and the records room were completely ravaged with fire. Although, there were no casualties, patients records and hospital properties were lost (GhanaWeb, 2018). Another incidence of fire in the hospital was the fire outbreak at ridge hospital staff emergency quarters. The fire destroyed more than 75% of items in the quarters (Okertchiri, 2011).

If hospital staff have adequate fire prevention and fighting knowledge and skills, they could prevent many fire outbreaks from occurring or causing harm. For these reasons there is the need for hospital staff to be prepared against fire outbreaks.

## **1.2 Research Question**

- 1 What is the level of knowledge of staff about fire emergency preparedness at Tarkwa Municipal Hospital?
- 2 What are the attitudes and perceptions of staff of Tarkwa Municipal Hospital on fire emergency preparedness?
- 3 Are local and international regulations and guidelines on fire management followed?

### **1.3 Objectives of study**

#### **1.3.1 General Objective**

To assess the level of fire emergency preparedness among staff of Tarkwa Municipal Hospital.

#### **1.3.2 Specific Objectives:**

1. To determine level of knowledge of fire emergency preparedness among the staff of Tarkwa Municipal Hospital.
2. To assess the attitude and perceptions of staff on fire emergency preparedness
3. To describe the hospital's compliance with fire management procedures based on local and international regulations and guidelines.

### **1.4 Statement of the Problem**

Globally, fire outbreaks are noted to be a common disaster. Many institutions are not left out of this issue on fire. In U.S, fire departments responded to 1,345,500 fire emergencies from 2014 - 2017. These fires caused 3,280 civilian deaths and 15,700 civilian injuries (National Fire Protection Association, 2017).

Recent fires in the healthcare facility in Ghana include the fire outbreak at Korle-Bu teaching Hospital pharmacy department. Fortunately there were no injuries recorded but a lot of drugs were destroyed running into millions of Ghana cedis (Ghana News Agency, 2017). Another devastating episode of fire outbreak in the health sector was the Central Medical Stores located in Tema, Ghana, which was engulfed by fire which was claimed to be an extension of fire from a burning bush destroying properties of Ghana Health Service and World Health Organization (Ave, 2015). In one district in the northern part of Ghana, Bongo District, the theatre recorded a fire incident which consumed every property in the

building but there was no fatalities. The main identifiable cause to the fire was electrical fault (Gudu, 2014)

Recent fire outbreaks have taken place in state facilities that are of great strategic value, thereby making fires an issue of public concern and debate. Examples include, the Kumasi Central Market, which has suffered series of fire outbreaks. First was on May 28, 2009, with another occurring on January 2, 2010. In December 30, 2012, there was another outbreak within which more than 150 shops were gutted by fire. There are other important places gutted by fire in the country (Addai, Tulashie, Annan, & Yeboah, 2016) The healthcare delivery institutions are not left out of the menace of fire. The National Fire Protection Association (2017), also states that there have been 5,650 structure fires in healthcare properties per year in 2009-2013.

Research has shown that lack of fire emergency preparedness is a major factor contributing to the inability to stop fires at their early stages (Muindi, 2014).

There are individual and institutional factors affecting fire emergency preparedness accounting for the high level of fire outbreaks in the country. Inadequate financial support, poor linkages with fire emergency response teams, inadequate training of staff and unavailability as well as negligence of use of fire safety policy may account for some institutional factors leading to fires. Other factors that affect the occurrence of fire outbreak include; knowledge, attitude and perception of staff on fire, availability of fire emergency preparedness equipment, fire emergency preparedness procedures and compliance to building regulations on fire emergency preparedness (Muindi, 2014).

Fires in hospital is of great concern not only due to the heat and flames generated but also smoke which can travel long distances and eventually cause substantial damage to the lungs (Philpott & Brompton, 2009).

In spite of this, staff of hospitals all over the country do not have the knowledge and skills needed to prevent fires from developing into outbreaks when they occur. In view of this, this proposed study sought to assess the level of fire emergency preparedness among staff of the Tarkwa municipal hospital.

## **1.5 Conceptual framework**

The conceptual framework explains and summarizes concepts, beliefs, assumptions and theories that support and guide the study (Maxwell, 2011). The figure 1 below represents the conceptual framework of the study.

### **1.5.1 Narrative to the conceptual framework**

The framework is made of background, proximate and outcome variables. The outcome variable is the fire emergency preparedness. All the other variables act directly and indirectly to affect this outcome variable.

Socio-demographic factors such as the duration of work in the current workstation and experience of fire at the workstation have been associated with fire emergency preparedness (Muindi, 2014). For instance, staffs that have had experience with fire outbreaks are in better positions to be prepared adequately for fire emergency. Also, the duration of work at the workstation may influence indirectly staff knowledge on fire emergency preparedness procedure and directly influence fire emergency preparedness.

Knowledge on fire emergency preparedness procedures is another determinant that directly influence fire emergency preparedness. This implies that staff with adequate knowledge in the procedures are more likely to be prepared adequately for fire emergencies. These procedures include informing people in the immediate area to evacuate, activating the nearest fire alarms and using fire extinguishers to extinguish small fires.

Training is one of the determinants that directly affect fire emergency preparedness. Adequate training will equip the staff to recognize fire hazards and know firefighting equipment to use, whom to contact in cases of fire outbreaks, the needed protocols to activate in cases of fire and how evacuation process is activated. Adequate training will influence staff ability to use firefighting equipment which will then influence how prepared they are for a fire outbreak.

Furthermore, financial support is another factor that directly influence fire emergency preparedness. Institutions that are financially sound will be able to procure the needed firefighting equipment. Also training programs can be organized for staff in order to increase their ability to use fire-fighting equipment. Financial support will improve the quality of training programs, which will also improve knowledge and skills of staff on emergency procedures

One most important determinant of fire emergency preparedness is the availability of firefighting equipment. Most common firefighting equipment include the fire extinguisher. This equipment is needed to fight small fire outbreaks. If they are available, the staff will be ready to fight fires when they occur, but their absence will limit the ability of the staff to fight fire if it occurs. Secondly, if they are available, the staff will use them in their training to enhance their knowledge and ability to quench fire at the onset.

Another factor that could influence fire emergency preparedness is linkages with emergency response team. In cases of fire outbreak, the urgency to which response teams get on site influences directly fire emergency preparedness. Some emergency response teams, such as the national fire service has linkages with institutions and offers training packages for them.

Compliance to building regulations is another factor that influences directly fire emergency preparedness. Some building regulations include; availability of escape route to facilitate

easy evacuation of staff, easy accessibility of fire extinguishers, emergency assembly points, fire outbreak warning alarms, available fire hydrants in the institution and easy accessibility to the building by fire emergency response teams in the event of a major fire outbreak. When building regulators ensure that the facility is compliant with fire regulations regarding buildings, fire outbreaks will be reduced drastically.

Finally, the attitude and perception of staff directly influence fire emergency preparedness. If staff perceive fire outbreaks to be disastrous and must therefore not be allowed to occur, they will put in the needed effort to prevent their occurrence or tendency to destroy life and property.

In conclusion, demographic factors such as duration of work at the work station and the experience of fire outbreak will also greatly influence the preparedness of staff against fire emergencies.

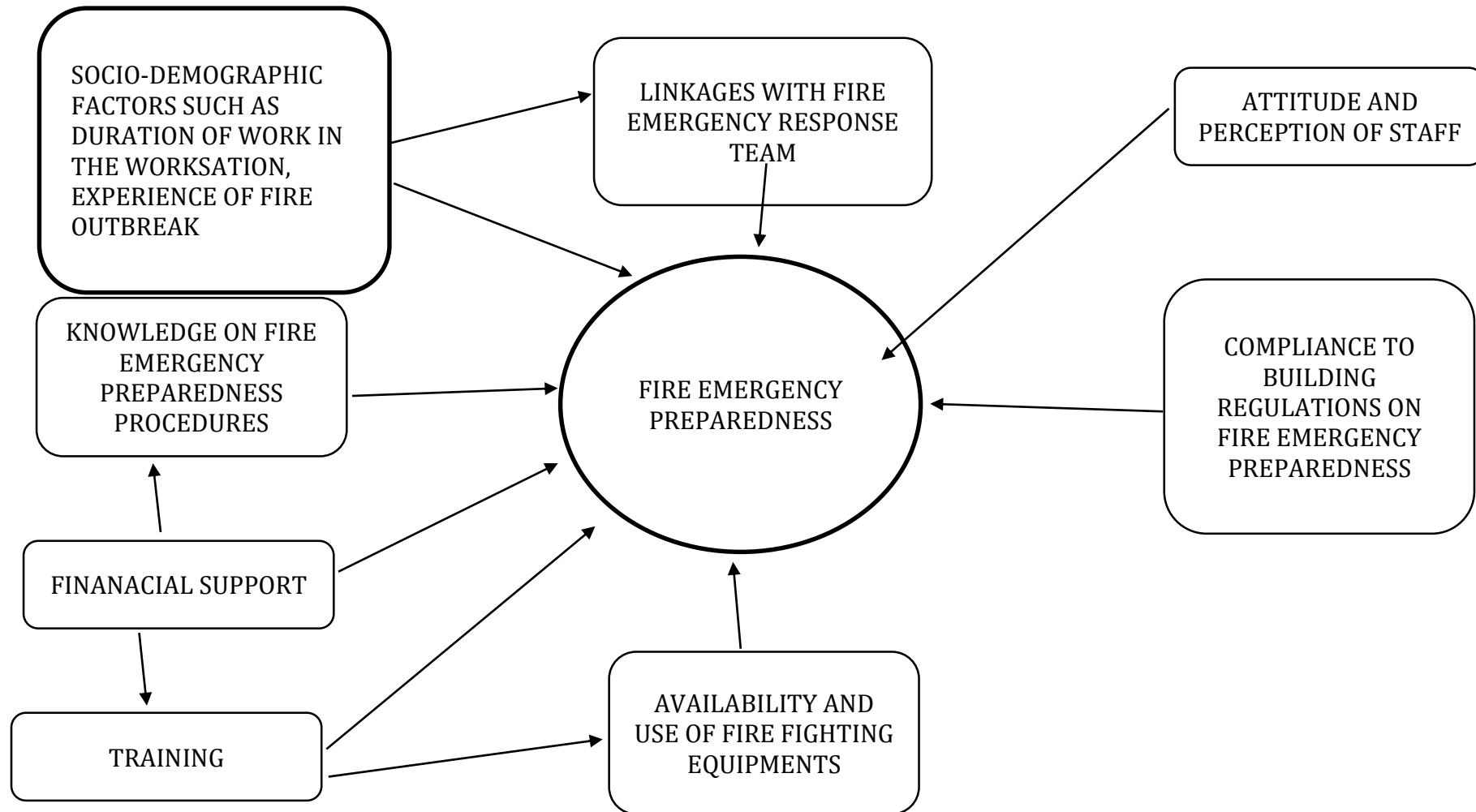


Figure 1.1: Conceptual Framework for Fire Emergency Preparedness (modified from Muindi, 2014)

## **1.6 Justification**

In the midst of recent fire outbreaks in the country, many institutions have no laid down requirements for fire emergency preparedness, therefore, people in various institutions, including hospitals in the country, continue to be at risk of fire. Most hospitals in the country should have fire emergency preparedness plan of action among the staff in order to achieve a safe working environment. But this hasn't been the case. When the medical doctors have limited knowledge and poor attitude to fire fighting and prevention in hospitals, it may adversely affect capacities of the hospital and staff to deal with fire emergencies.

Several studies have been done in the country to generate information to set regulations to curb the menace of fire outbreaks in the market. However, there is so far no study conducted in our hospitals on fire emergency preparedness. The study results and recommendations would, therefore, be used by management in reinforcing strategies to promote fire emergency preparedness in hospitals in other to prevent fire outbreaks, injuries, death and loss of properties

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter presents a review of various studies that have been done by other people on the topic under investigation. The different views and findings from studies on fire emergency preparedness have been dealt with in this chapter. The literature was obtained from journal articles both published and unpublished research papers as well as reports that have been compiled by relevant institutions following fire disasters.

#### 2.2 Fire Hazard

A hazard is any substance, activity or process that has the ability or potential to cause harm. Hazards can be physical, chemical, biological or ergonomic. Hazards take many forms and it includes fire (Hughes & Ferrett, 2007). Fire is the rapid oxidation of a material in a chemical exothermic reaction of combustion producing heat, light and various reaction outcomes. At some point in the combustion process, flame is produced (Schmidt-Rohr, 2015). There are four products of combustion; fire gases, heat, flame and smoke (Gasparini et al., 2012).

#### 2.3 Basic Principles of Fire

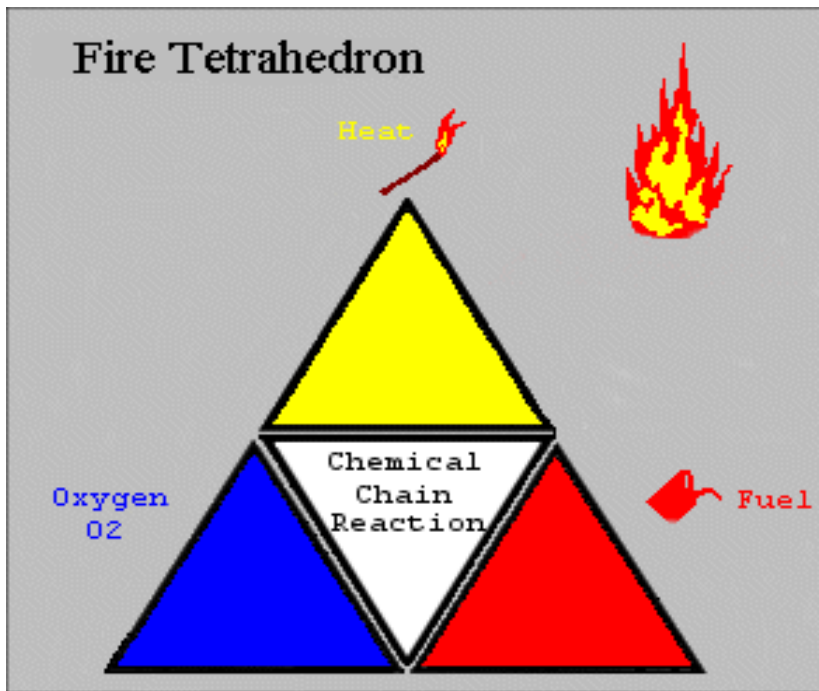
Fire is a serious hazard. Fire causes more serious accidents than explosions. Fire cannot occur unless three conditions are present. The absence of any one of these elements will prevent a fire from starting. These three factors include; fuel, an oxidant and heat (Hughes & Ferrett, 2007). These three conditions are represented as the fire triangle (figure 2.1). Fire is also extinguished when one of the elements is removed.



**Figure 2.1: The fire triangle**  
Adapted from (Devine, 2015)

Each side of the triangle represents one of the three components needed to have a fire (Consortium, 2007). An oxidant or oxidizer is a substance that gains electrons in a chemical reaction, which is a redox reaction. Many of the oxidizing agents that exist in the hospitals are found in the theatres. One example of an oxidant is nitrous oxide, which is a component of 50% oxygen and 50% nitrous oxide. Fuel is found everywhere in the hospital environment. Most common example of fuel in the hospital is alcohol. Common heat sources in the hospital include malfunctioning electrical equipment, defibrillators and lasers and diathermy in theatres (Blazquez & Thorn, 2010).

However there is a fourth element of fire called the chemical chain reaction. This reaction can occur when the above three elements are present in the right proportions. This chemical reaction results in fire. The addition of the chemical reaction to the three components of the fire triangle results in the fire tetrahedron (Nichols, 2010), which is represented in the figure 2.2 below.



**Figure 2. 2: the fire Tetrahedron**

Source; (Nichols, 2010)

### 2.3.1 Stages of fire

Every ideal fire goes through four stages. The ignition or incipient stage, the growth stage, fully developed stage and the decay stage (Black, 2013). Ignition stage is the earliest stage. Here the fuel, oxygen and heat together join to form a sustained chemical reaction. Flames are not detectable at this point. Smoke is released into the atmosphere. This stage approaches the growth stage. It is easily extinguished by a simple fire extinguisher. Next is the growth stage. Here the initial flame serves as a heat source to ignite additional fuel. The fire spreads to more surfaces usually through convection and radiation producing more smoke and hot gases that reaches the ceiling of houses or buildings, allowing fuels in the room to come closer to their ignition temperature. The fully developed stage is where the fire has spread over much of its available fuel. The temperatures reach their peak and oxygen is consumed more rapidly. In the decay stage also called the burnout stage, the fire gets less fierce as temperature decreases and the fuel and oxygen get consumed. Burning is reduced to glowing embers (Black, 2013; Gasparini et al., 2012).

## **2.4 Methods of Extinction of Fire**

There are four main methods to extinguish a fire. It includes; cooling, smothering, dilution or elimination of combustible element and interruption of the chain reaction. If the parts of the fire tetrahedron are kept in mind, dealing with small fires should be a matter of common sense. The principle states that a blaze will be extinguished if any of the four elements are removed (Hughes & Ferrett, 2007).

### **2.4.1 Cooling**

Cooling is the most widely used method, which involves lowering the temperature or removing the heat component. Example is using water to limit the temperature (Manuel, 2008).

### **2.4.2 Smothering**

It's the method that involves isolating the combustible element and oxygen. Example is smothering a frying pan blaze with a fire blanket reduces the oxygen to below the 16% required to react (Hughes & Ferrett, 2007).

### **2.4.3 Starving**

Limiting the fuel supply by removing the source of fuel. It can be achieved by activities such as switching off electrical power and isolating the flow of flammable liquid etc. (Hughes & Ferrett, 2007)

### **2.4.4 Interruption of chain reaction**

This approach modifies the chemical reaction, preventing the release of free radicals from combustion and so will delay its development. It is an anticatalytic process that breaks the chemical chain reaction that sustains a fire (Manuel, 2008)

## 2.5 Classification of Fire

According to Spearpoint (2008), the classification of fire depends on the fuel type. Five classes of fire can be identified as follows:

**CLASS A** - These are fires involving carbonaceous solids. Example is wood, cloth, paper, rubber and plastics. This type of fire burns with ember. It is best extinguished by removing the heat element of fire. Suitable extinguishers here include; water type, dry powder and foam displaying an A rating.

**CLASS B** – Fires involve liquids or liquefied solids including paints, oils or fats, spirits, petrol and diesel. The following types of extinguishers are used; foam, dry powder, carbon Dioxide. The strategy for extinguishing is to create a barrier between the fuel and the oxygen. Extinguishers are colour coded red. Water is not appropriate for this class of fire.

**CLASS C** – Fires, which involve gases such as butane or propane. They occur in energized electrical equipment. Water or water-based extinguishers are not used in this class. Extinguishers here are colour coded blue and include carbon Dioxide and dry chemical agents.

**CLASS D** – Fires include metals that are combustible. Example magnesium, aluminium, etc. special extinguishers are used here such as special dry powders. Specialist advice is needed here.

**CLASS F** – Fires of high temperature cooking oils and fats in large restaurants. Wet chemical extinguishing agents are used.

## **2.6 Principles of Fire Spread**

Fires spread very quickly to cover the whole burning area as well as outside. According to British Safety Council (2014), there are four main ways by which fire is transmitted. These are conduction, convection, radiation and direct contact. Conduction is the heat transfer through solid medium. Conductors can be good or poor. Poor conductors are also good insulators and are used for fire protection. Convection is based on the principle that heat rises upwards to ignite combustible materials in its pathway. Radiation is transfer of heat through air medium. Example is heat given off from the sun. Direct contact spread is where combustible materials catch fire when touched by fire (British Safety Council, 2014; Hughes & Ferrett, 2007)

## **2.7 Consequence of Fire**

Fire is never a gentle master. It causes a battery of issues. These issues of fire are very devastating. It is not only limited to individuals but the community and nation as a whole. One consequence of fire is lung injury from smoke inhalation that occurs during fires. Smoke inhalation is present in about 22% of all burn presentations, and in 60% where there are central facial burns (Toon, Maybauer, Greenwood, Maybauer, & Fraser, 2010). During a five-year period, out of 358,300 structure fires responded to by U.S fire department, there were 2,520 deaths, 12,720 fire related injuries and \$6.7 billion worth of property damage (Ahrens, 2016). An important pollutant of fires and burning is visible smoke that is a mixture of particulate matter and water. Other products are Carbon Dioxide, Carbon Monoxide, and some hydrocarbons. These products depletes the ozone layer contributing to the greenhouse effect (Ladrach, 2009).

## **2.8 Institutional factors and fire emergency preparedness.**

Numerous institutional factors adversely delay emergency preparedness. According to Muindi (2014), these factors include inadequate financial support, poor linkages with fire response teams, inadequate training and availability and use of fire policies.

### **2.8.1 Socio-demographic factors and fire emergency preparedness.**

Socio-demographic characteristics such as age, sex, cadre, job tenure and duration of work do affect the outcome of fire emergency preparedness (Muindi, 2014).

Women are less prepared for fire emergencies than men and this introduces a sex difference in preparations towards fire emergencies (Kano, Mileti, & Bourque, 2009).

Age is another important socio-demographic factor. According to Norris & Murrell (1998), elderly people were noted to be under prepared and more vulnerable to emergencies. But King (2001), said older people are more experienced and have a higher level of awareness of their surrounding so are better prepared to overcome disasters.

### **2.8.2 Knowledge on fire emergency preparedness.**

According to Addai et al. (2016), most fires in Ghana occur out of ignorance and negligence on the part of most Ghanaians.

In a study conducted in Amrita School of Dentistry, many undergraduates and the teaching staff did not know about the fire triangle and the different types of fires (Warren & McAuliffe, 2011).

According to Chittaro & Ranon (2009), knowledge about the basics of fire is very important in the evacuation process. Lack of knowledge can dangerously increase this evacuation time thereby subjecting victims to increase morbidities and mortalities.

### **2.8.3 Availability and use of firefighting Equipment**

According to Nwokedi, Panle, & Samuel (2017), equipment needed to manage fires include fire extinguishers, fire alarm systems, automatic fire suppression systems, smoke detectors and fire buckets.

In Spain, there were increased incidence of fire outbreaks in hotels which were attributed to defective smoke detectors, alarm devices and defective signage (Francisco, Juan, & Rubio, 2004).

Many buildings possess a variety of portable fire extinguishers which are designed to contain small fires before spreading to become uncontrollable (Ghana National Fire Service, 2013)

### **2.8.4 Attitude/ Perception and fire emergency preparedness.**

Research has shown that people's perception of risk at home varies according to individual subjective assessment of their vulnerable state, care level and protection as well as the potentially fatal consequences (Fire Reseach Series, 2008).

### **2.8.5 Adequate training**

A study conducted in Turkana district in Kenya showed a low fire emergency preparedness which was attributed to inadequacies of fire training and awareness programs. This study proved that knowledge on effective use of fire extinguisher was dependent on the effective training and awareness schedules in schools (Ronoh & Kyalo, 2009).

A systematic review by Jefferson & Carri (2008), also showed that there was no sufficient evidence to ascertain if training of healthcare providers were effective in improving their knowledge and skills in emergencies.

### **2.8.6 Financial support**

Socioeconomic factors are among the best known predictors of fire risk. For instance, it has been shown that lower levels of income directly or indirectly increased the risk of fire (Hastie & Searle, 2016). Adequate financial support is required for the purchase and maintenance of firefighting equipment. Therefore, if there is lack or insufficiency of funds, such activities are compromised and fire emergency preparedness is hampered or adversely affected. In a conference paper, it was stated that the cost of fire equipment inspections, fire drills and training equipment affect fire emergency preparedness since many institutions cannot support this financial obligations (Jeff, 2014).

### **2.8.7 Compliance with building regulations**

There are international and local standards to fire safety. According to the prescriptive standards were convenient for planning convenient buildings. The prescriptive standard in many countries surveyed was a two minimum means of escape for many rooms.

In New Zealand, an important building regulation is that all building with more than five persons should have a documented evacuation procedure in place (Walls, 2001)

According to Spinardi (2016), fire safety building regulations has been changing and these changes raise issues on the ability of regulators to provide adequate oversight of fire safety engineering.

A study in Malaysia by the Ministry of Education showed that most institutions in Malaysia had a fire safety compliance rating of 76%, proving that most learning institutions are not fully compliant to fire preparedness standards.

Another study in Nigeria also indicated that both private and public health institutions were not compliant. None of the hospitals surveyed had a comprehensive emergency plan and

adequate and functional protection equipment in place. In addition, the staff had insufficient awareness of availability of escape routes, and inadequate fire training and drills (Abdulsalam, Kabir, & Arafat, 2016).

## **2.9 Emergency Preparedness, Mitigation and Evacuations**

Preparedness is a study based set of activity that is followed by careful measures during disasters (Kent, 1994). Preparedness is a major component of emergency management. According to Drabek (1986), preparedness is how we modify behavior to reduce disaster events on people. Preparedness is a continuous process. It involves planning, managing, organizing training, equipping and evaluating and monitoring. Several plans of actions are developed during the preparedness phase. According to Ogajo (2013), there are common emergency preparedness measures which include: effective communication plans with terminologies that are (Nagel, 1985) well understood, adequate training and proper maintenance of emergency services, emergency warning methods and evacuation plans. The first step in planning during disaster management is understanding the status of disaster to ensure effective emergency response to hospital (Zhong et al., 2014). According to Duchossois, Michael, Garcia-Espana, & Flores (2009), there are seven ways to prepare for a home fire. These include: installing the right number of smoke alarms, training on what smoke alarms sound like and what to do when heard, ensuring that people know two ways to escape to assembly point, establish a communication plan and to know whom to contact during emergencies, drills on escaping from fire, making sure everyone knows the emergency numbers, and finally teaching members to stop, drop and roll if their cloths is on fire.

In fire mitigation, certain strategies need to be followed. These mitigation strategies should be either before or during the fire outbreak. Fire mitigation strategies before a fire include:

preparing escape routes from the site, ensuring that each room has a safety opening feature on windows for exit, placing fire extinguishers at various places in the building, having a ladder in a storeroom of the apartment for evacuation from other floors, storing flammable substances in approved containers (Evs assignment, 2012).

## **CHAPTER THREE**

### **METHODS SECTION**

#### **3.1 Introduction**

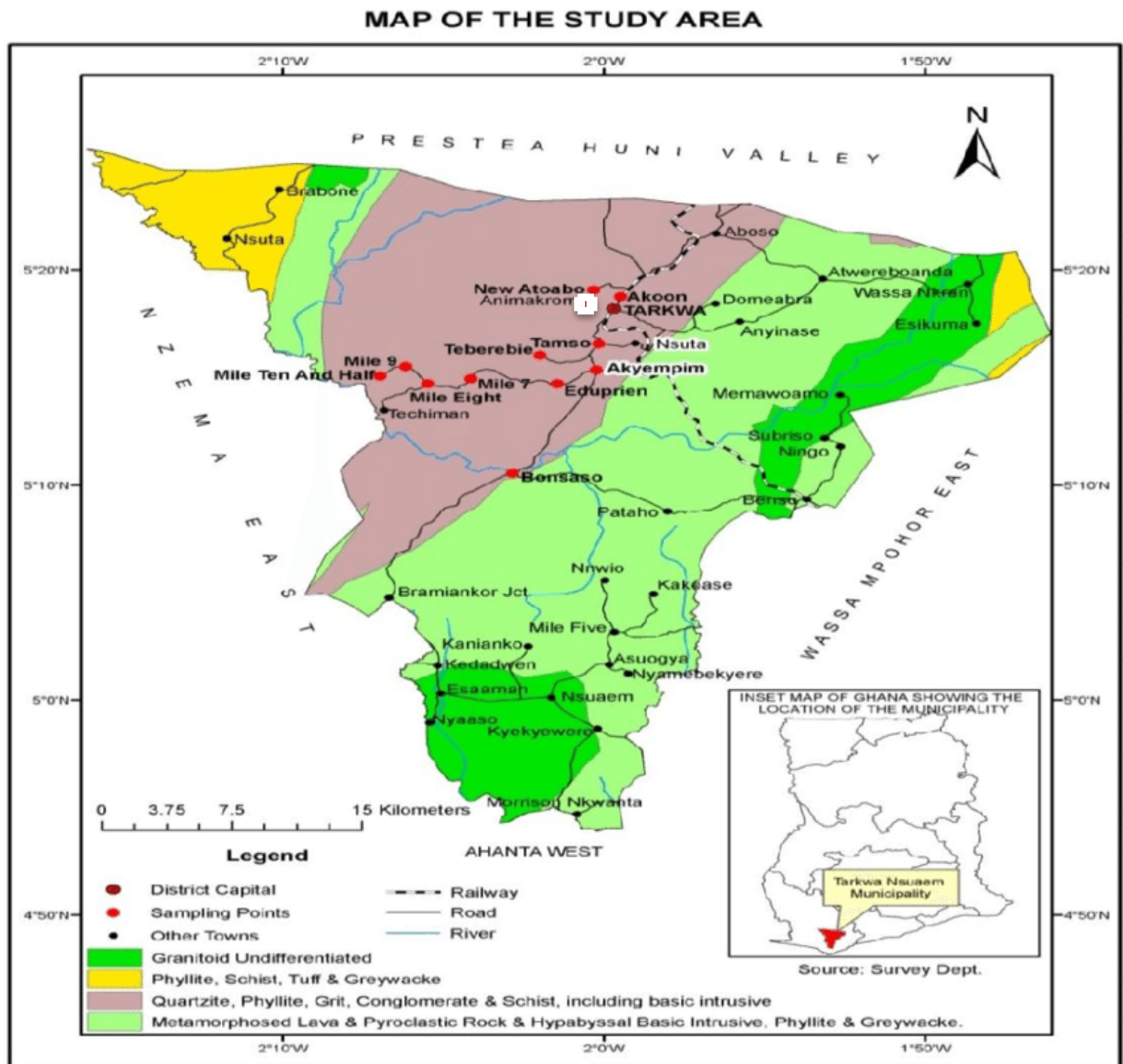
This section contains the narratives of the techniques used in the conduct of the research. It provides guidelines on data collection and analysis.


#### **3.2 Research design**

A descriptive cross-sectional study was conducted using quantitative methods. The study assessed the current status of fire emergency preparedness among staff of Tarkwa Municipal Hospital, using an interview-administered questionnaire. The questionnaire comprised both open and closed ended questions. An observational checklist was used to assess the availability and adequacy of firefighting equipment. Data collection was in April 2018.

#### **3.3 Study location**

The study was undertaken at Tarkwa Municipal hospital. It is located in the Tarkwa Nsuaem Municipality, on latitude  $4^{\circ}51'$  and longitude  $5^{\circ}51'$  (figure 3.1). It is bounded on the west by Wassa Mpohor East District, on the east by Nzema East District, on the north by Prestea Huni Valley District and on the south by Ahanta West District. The hospital is  $4^{\circ}51'N$  and  $5^{\circ}51'W$  situated at Bogrekrom, a suburb of Tarkwa. The hospital was built four years ago. The hospital is a 120 bed capacity facility with an administration block, outpatient department, accident and emergency block, a public health unit, diagnostic imaging block, a pharmacy unit, physiotherapy unit, wards and three operating theatres.



 This shows the area of location of Tarkwa Municipal Hospital on the above map.

**Figure 3. 1: Map of Tarkwa Nsuaem Municipal District, showing location of Tarkwa Municipal Hospital where the study was conducted.**

### **3.4 Study variables**

#### **3.4.1 Dependent variable**

The dependent variable is fire emergency preparedness.

#### **3.4.2 Independent variables**

The independent variables were as follows:

1. Socio- demographic characteristics of staff
2. Perception/attitude on fire emergency preparedness
3. Availability of fire emergency preparedness standard policy documents and equipment
4. Compliance with building regulations on fire emergency preparedness.
5. Knowledge about fire emergency preparedness.

##### **A. Determination of the level of knowledge of staff.**

The staff knowledge level was determined by using six knowledge variables which included:

- Assessment of staff knowledge of the use of fire extinguishers through description of the procedure
- The emergency numbers for reporting a fire outbreak
- Correct identification of the location of the closest fire extinguisher from one's workstation
- Identification of factors involved in starting and sustaining a fire.
  1. Ignition source
  2. Oxygen
  3. Fuel

The six knowledge variables were ranked from 1 to 6. Scores from 1 to 4 meant inadequate knowledge while scores of 5 and 6 meant adequate knowledge.

### **B. Assessment of staff perception**

Perceptions of staff on fire emergency preparedness was assessed by using a Likert scale of 0-5 to analyze respondent response to the following questions: sources of fires in the workplace, perceived importance of having a basic training on fire emergency preparedness, perceived level of fire emergency preparedness.

### **C. Availability of fire emergency preparedness equipment and procedures**

Checking for the presence of functional fire detection devices, warning systems, and fire-fighting equipment was used to assess the level of fire emergency preparedness among the staff, based on the availability and usability of the facilities.

In addition, fire emergency preparedness among the staff was assessed by checking the availability of documentary items such as annual fire audit report, institutional fire drills, and committees on fire management reports, regular fire preparedness training reports and policy documents on fire outbreak preparedness.

### **D. Evaluating compliance to building regulations on fire emergency preparedness**

In determining the compliance to building regulations regarding fire outbreak preparedness, buildings of the hospital were assessed based on the existing architectural designs including emergency exits to facilitate smooth escape during fire outbreaks. An observational checklist with these items was used to assess the means of escape: labeled exit doors, escape routes free from obstruction and readily opens from inside, exit paths with lighting. Rating systems ranging from “0 to 5” were used. A score of 4 to 5 meant compliant and a score of 0 to 3 represented non-compliant.

### **3.5 Sampling and sample size Calculation**

A total sample size of 176 respondents was calculated using deVaus (2002) formula below. 10% margin of allowance against attrition of respondents brought the total sample size to 176 plus 18. This gave the final total sample size as 194 respondents.

$$n = N/(1+N (\alpha^2) );$$

Where n = sample size, N = total population and  $\alpha$  = confidence of 95%

Total population = 315 of both clinical and non- clinical staff

### **3.6 Inclusion and exclusion criteria**

The eligibility criteria for the study participants were all staff employed by the municipal hospital and who had worked for more than 4 months. The exclusion criteria included national service personnel and orientation nurses. Staff who declined to participate were also excluded from the study.

### **3.7 Sampling Approach**

The sampling approach used was a multistage sampling. The staff were stratified into clinical and non-clinical staff in a ratio of 2:1. Then the participants were selected by simple random technique. The list of staff who met the inclusion criteria were used as sampling frames. This was inputted in an online simple randomizing software to select the sample. A 10% margin of allowance against attrition of respondents was considered on the sample size calculated. The principal investigator did the sampling.

### **3.8 Data collection approach**

A quantitative method of data collection was carried out.

### **3.9 Instrument for data collection**

An interviewer- administered questionnaires and an observational checklist were used. The observational checklist assessed the building regulations compliance and procedures. The questionnaire assessed staff demographic characteristics, knowledge of and perception on fire emergency preparedness. It was divided into three (3) sections capturing all the independent variables in the conceptual framework and specific objectives of study:

1. Socio – demographic characteristics
2. Knowledge on fire emergency preparedness
3. Assessment of perception on fire outbreak

The observational checklist was also used to assess the availability and quality of the infrastructural parameters below which are necessary for fire emergency preparedness:

1. Fire detection and warning systems
2. Firefighting equipment
3. Means of escape
4. Documentary items in the hospital

The questions were simple and straightforward to avoid ambiguity.

### **3.10 Data collection procedure/ technique**

The research assistants trained on the data collection instruments and the objectives of study. The principal investigator and research assistants administered the questionnaires through personal interviews.

### **3.11 Data Processing and Analysis**

The information captured on questionnaires were entered into excel spreadsheet and then exported into STATA- version 15 for further processing.

Chi square analysis was used to assess the association between staff knowledge and socio-demographic factors. A logistic regression analysis was carried out to determine the relationship between the independent and dependent variables in the conceptual framework of the study. Descriptive statistics was used to analyze and summarize the data into frequencies, percentages, proportions, charts and graphs. The principal investigator conducted the analysis.

### **3.12 Pre-testing**

The questionnaires were pre-tested among staff of Tarkwa Old Government Hospital to evaluate willingness of the respondents to answer the questionnaires, the reliability, consistency, coherence and clarity of the questions being asked, accuracy of the questionnaires and determine the success of the training given to the research assistants.

### **3.13 Quality control**

To improve the quality of the study, some faculty members as well as colleagues reviewed the data collection tools after the principal investigator had designed them. These tools were pre-tested in order to assess their reliability and validity as well as ability to answer the research question. The pre-testing determined how friendly the questions were to the respondents. After pre-testing, the questionnaires and the observational checklist were revised accordingly. Pre-testing was done using a sample outside the study population. Two research assistants were recruited and trained to help with data collection. The filled questionnaires were collected daily and crosschecked for quality control. Two data entry

personnel entered data to ensure accuracy. The study participants were randomly selected.

### **3.14 Ethical Clearance**

#### **3.14.1 Potential risk and benefit**

This study would increase the awareness of the possibility of fires in hospitals and understanding of the possible hazards that exist that increase the possibility of fires at the hospital. Furthermore this research may provide evidence to support the need for infrastructure in the hospital for preparing adequately for fire emergencies. In addition, the study may be used to formulate local and national measures to address the issues of fire outbreaks in the hospital and other healthcare institutions in general.

This study posed very minimal risks to respondents, as no harmful materials were used on them. Minimal risks involved included: feeling of uneasiness about some of the questions, minimal loss of confidentiality as well as time spent in the completion of the questionnaires.

#### **3.14.2 Privacy and confidentiality**

To ensure confidentiality and privacy, the questionnaires were not marked with study participant's names: rather they were coded identification numbers and kept in an encrypted file on a secure laptop. The materials and data were stored under lock and key by the principal investigator.

#### **3.14.3 Data storage and usage**

Materials for the study such as questionnaires and informed consent documents were labeled and given a unique identification numbers for easy processing of data and storage. The study materials were stored under lock and key in the office of the principal investigator Mr. Sylvester Sebbeh-Newton, School of Public Health, University of Ghana, Legon. The data was cleaned and entered into STATA version 15 software with the identification numbers. The electronic files generated were made available only to the research team.

#### **3.14.4 Consent Process**

Approval of the study protocol was obtained from the Ethical Review Committee of the Ghana Health Service (GHS-ERC) before commencement of the study. Permission for conduct of the study was also sought from the Regional and Municipal Health Directorate as well as the Management of Tarkwa Municipal Hospital, Tarkwa. Study participants were briefed about the purpose, risk and benefits of the study before signed the consent forms to partake in the survey.

#### **3.14.5 Voluntary consent/ withdrawal**

Participant's opinions and experiences were important to the success of the study, so they should be honest and truthful in answering the questions. They were also informed that participation is completely voluntary and that they may refuse to participate at any time. They had the liberty to stop the interview or observation at any point or decline to answer any question if it made them uncomfortable. Withdrawal from the study did not affect them in any way.

#### **3.14.6 Compensation**

There were no monetary compensation to participants but rather refreshment in the form of snacks were given to them. This served as appreciation for their time spent in participating in the study.

#### **3.14.7 Declaration of conflict of interest**

There were no conflict of interest in the study.

#### **3.14.8 Research funding**

The study was self-funded by the principal investigator.

## CHAPTER FOUR

### RESULTS

#### 4.1 Introduction

This chapter provides the analysis of the data collected in the study. It includes results, findings and interpretation from the analyzed questionnaires and observational checklist collected from the field. It also summarizes the distribution of the socio-demographic characteristics of the respondents as well as findings on fire emergency preparedness in the Tarkwa Municipal Hospital.

#### 4.2 Socio-demographic characteristics of respondents

Table 4.1 below, summarizes the socio-demographic characteristics of respondents.

Out of the 194 staff members who met the inclusion criteria for the study, only 178 successfully completed the study. The remaining 16 staff members declined to participate in the study thus bringing the response rate to 91.75%. The socio-demographic characteristics of the respondents is shown in the below table.

Majority 78 (43.82%) of the respondents were aged 26-35 years, 45 (25.28%) were < 25 years of age, 27 (15.17%) were of ages between 36-45 years and 15 (8.43%) had ages between 46-55 years. Only 13 (7.30%) were above the age of 55 years. As shown, majority 115 (64.6%) of the 178 participants surveyed were females while 63 (35.4%) were males. Most 134 (75.3%) of the study participants were clinical staff with the remaining being non-clinical staff. It was noted that 162 (91.01%) of the respondents were permanent and pensionable and casual staff formed 8.99% of the respondents. None of the respondents were contract staff. Only one respondent was noted to be working at the current workstation for more than 6 years. Majority of the respondents had been in the current workstation for 2- 5years making a percentage of 75.84%. The next group of respondents had worked

between 1-23months (23.6%). None of the respondents had worked more than eleven years in their workstation.

**Table 4.1: Demographic Characteristics of respondents**

<b>Variable</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Age Groups</b>		
≤ 25	45	25.28
26-35	78	43.82
36-45	27	15.17
46-55	15	8.43
>55	13	7.30
<b>Sex</b>		
Male	63	35.39
Female	115	64.61
<b>Cadre</b>		
Clinical	134	75.28
Non- Clinical	44	24.72
<b>Job Tenure</b>		
Permanent/pensionable	162	91.01
Contract	16	8.99
Casual	0	0.00
<b>Duration of work at current workstation</b>		
1-23months	42	23.60
2-5 years	135	75.84
6-10 years	1	0.56

Source: Field Survey, 2018

### **4.3 Fire Emergency Preparedness Procedures at the Tarkwa Municipal Hospital**

Table 4.2 below, summarizes the results of the assessment of fire emergency preparedness procedures that were available at the Tarkwa Municipal Hospital.

The preparedness procedures studied included staff training on fire emergency, priority list for evacuation, person responsible for fire emergency management and fire drills. All the respondents reported that the hospital did not performed fire emergency drills. Also, none of the respondents had training in fire emergency preparedness at the hospital. There were no planned fire emergency preparedness trainings done for the staff at the hospital. In addition, all the respondents had never seen any priority list to be used for evacuation in cases of fire outbreaks. None of the workstations had experienced fire outbreaks. Although the hospital had not undertaken fire emergency preparedness drills 8.9% of the respondent had participated in different form of fire drills outside the hospital while 91.1% had not participated in any form of fire drills. Majority, (60.11%) of the respondents knew the medical superintendent was responsible for fire emergency management in the hospital. Only 3.93% of the respondents said the clinical coordinator is responsible for fire emergency preparedness in the hospital. The rest of the respondents didn't know the responsible person for fire emergency preparedness.

**Table 4. 2: Fire emergency preparedness procedures at Tarkwa Municipal hospital**

Fire Emergency preparedness procedure variables	Number of respondents		
	Yes	No	Don't know
	Freq (%)	Freq (%)	Freq (%)
Hospital performed fire emergency drills	0 (0.00)	178 (100)	0 (0.00)
Staff trained on fire emergency preparedness	0 (0.00)	178 (100)	0 (0.00)
Have copy of the priority list to be used for evacuation	0 (0.00)	178 (100)	0 (0.00)
Have copy of staff and their specific responsibility during a fire emergency	23 (12.92)	155 (87.08)	0 (0.00)
Experienced any fire outbreak in the hospital	0 (0.00)	178 (100)	0 (0.00)
Person responsible for fire emergency management	107 (60.11)	7 (3.96)	64 (35.96)

Source: Field Survey, 2018

#### **4.4 Knowledge on fire Emergency preparedness among staff of the Tarkwa Municipal Hospital**

When asked about the knowledge of how to use a fire extinguisher in cases of fire outbreak (Table 4.3), majority of the respondents 65.73% did not know how to use the fire extinguisher. The remaining 61 respondents forming 34.27% have knowledge in the use of fire extinguishers.

All the respondent 178 responded that they are aware of the closest fire extinguisher to asses in cases of fire outbreaks.

Majority of the respondents got the fire emergency number wrong. The greatest number of respondents 67 (37.64%) reported 191 was the fire emergency number. 33.71% of the respondents indicated they didn't know the emergency number while 16.85% indicated 193

to be the emergency number. However, 11.8% of the respondent correctly indicated 192 to be the emergency number.

The components of fire included the source of ignition, fuel and oxygen. Overall, less than 15% (13.48%) did not know source of ignition is a component of fire. Majority, (55.62%) of the respondents revealed that source of ignition was a component of fire, only 30.9% of them said the source of ignition was not part of fire component. Respondents were asked to indicate if fuel is a component of fire. Majority, 174 (97.75%) respondents indicated fuel as a component needed for fire to start. 4 (2.25%) revealed fuel was not a component of fire. More than eighty percent (80.34%) of the respondents answered yes to oxygen as a component of fire. 3.37% didn't know oxygen as a component of fire. Also 16.29% of the respondents said oxygen is not a component of fire.

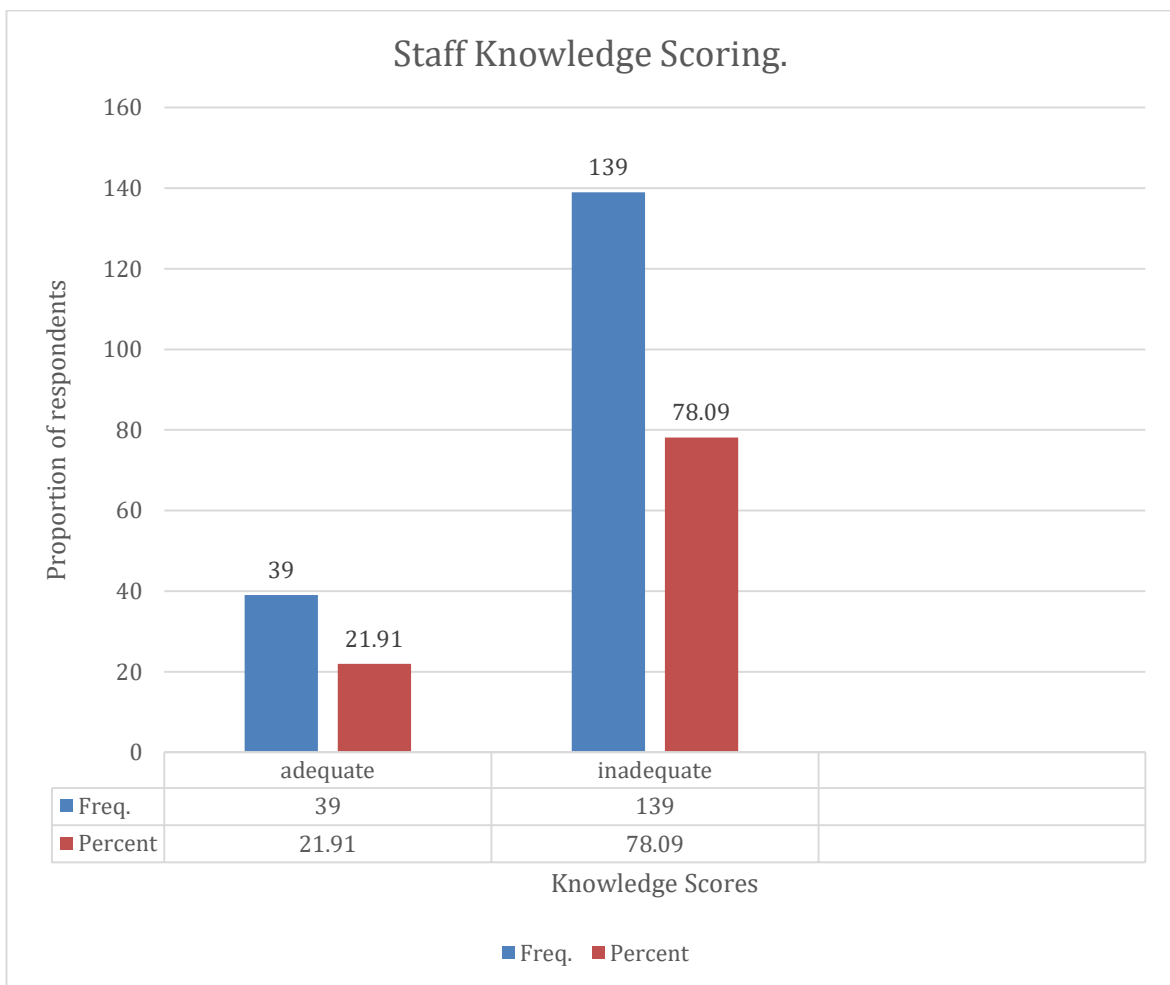
**Table 4. 3: Assessment of Knowledge of fire emergency preparedness measures among participants**

Knowledge variables	Number of respondents		
	Yes	No	Don't know
	Freq (%)	Freq (%)	Freq (%)
Use of fire extinguishers	61 (34.27)	117 (65.73)	0 (0.00)
Location of closest fire extinguisher	178 (100)	0 (0.00)	0 (0.00)
Fire emergency telephone number to report a fire outbreak	21 (11.80)	97 (54.49)	60 (33.71)
Components to start and sustain fire			
Source of ignition	99 (55.62)	55 (30.90)	24 (13.48)
Fuel	174 (97.75)	4 (2.25)	0 (0.00)
Oxygen	143 (80.34)	29 (16.29)	6 (3.37)

Source: Field Survey, 2018

#### 4.4.1 Overall assessment of knowledge of staff about fires at the Tarkwa Municipal Hospital

An overall scoring of the six knowledge variables indicated that less than half (21.91%) of the respondents scored between 5 and 6 scores on the knowledge rating scale, representing the proportion of respondents with adequate knowledge (Figure 4.1). Majority of the respondents 78.09% have inadequate knowledge on fire emergency preparedness. This is shown in the figure below.



**Figure 4.1: Staff Knowledge Scoring.**  
**Source: Field Survey, 2018.**

**4.4.2 Comparison of respondents’ knowledge about fire emergency preparedness in relation to cadre.**

Table 4.4 below summarizes the comparison of the respondents’ knowledge about fire emergency preparedness in relation to staff cadre. As shown, most, (71.64%) of the clinical staff had inadequate knowledge on fire emergency preparedness while 28.36% of the clinical staff had adequate knowledge. However, with the non-clinical staff, a higher percentage (97.73%) of them had inadequate knowledge on fire emergency preparedness while approximately 2% had adequate knowledge. Therefore, there was a statistically significant association between staff knowledge and their cadres ( $X^2 = 13.1733$ ; p-value= 0.000).

**Table 4. 4: Comparison between respondents’ knowledge about fire emergency preparedness in relation to cadre (n=178)**

Cadre	Knowledge rating		Total	$\chi$ square	p- value
	adequate knowledge	inadequate knowledge			
Clinical		38	96	13.1733	0.000
	%	28.36	71.64		
Non-clinical		1	43		
	%	2.27	97.73		
Total		39	139		
	%	21.91	78.09		

Source: Field Survey, 2018.

**4.4.3 Comparison between staff Knowledge about fire emergency preparedness in relation to their duration of work in their current workstation.**

As summarized in Table 4.5 below, a greater number (100%) of staff who had worked for six to ten years had adequate knowledge compared to those who have worked for less than five years. Respondents who worked for two to five years have the least (17.78%) level of adequate knowledge. Also, staff who worked for two to five years at their current workstation had the highest number (82.22%) of respondents with inadequate knowledge. Statistically, there was a significant association knowledge of staff and their duration of work at the workstation ( $X^2= 8.1147$ ; p-value 0.017) (table 4.4).

**Table 4. 5: Comparison between respondents’ knowledge about fire emergency preparedness in relation to duration of work at current workstation (n=178)**

Knowledge rating (n=141)						
Work duration current station	Proportion	Adequate knowledge	Inadequate knowledge	Total	$\chi$ square	p –value
1-23 months		14	28	42	8.1147	0.017
	%	33.33	66.67	100.0		
2-5 years		24	111	135		
	%	17.78	82.22	100.0		
6-10 years		1	0	1		
	%	100	0.00	100.0		
11-20 years		0	0	0		
	%	0.00	0.00	0.00		
>20 years		0	0	0		
	%	0.00	0.00	0.00		
Total		39	139	141		
	%	21.91	78.09	100.0		

Source: Field Survey, 2018.

#### **4.4.4 Association between knowledge of respondents, cadre and duration of work at current workstation.**

Table 4.6 below summarizes the association between respondents' knowledge about fire emergency preparedness in relation to cadre and duration of work at the current station.

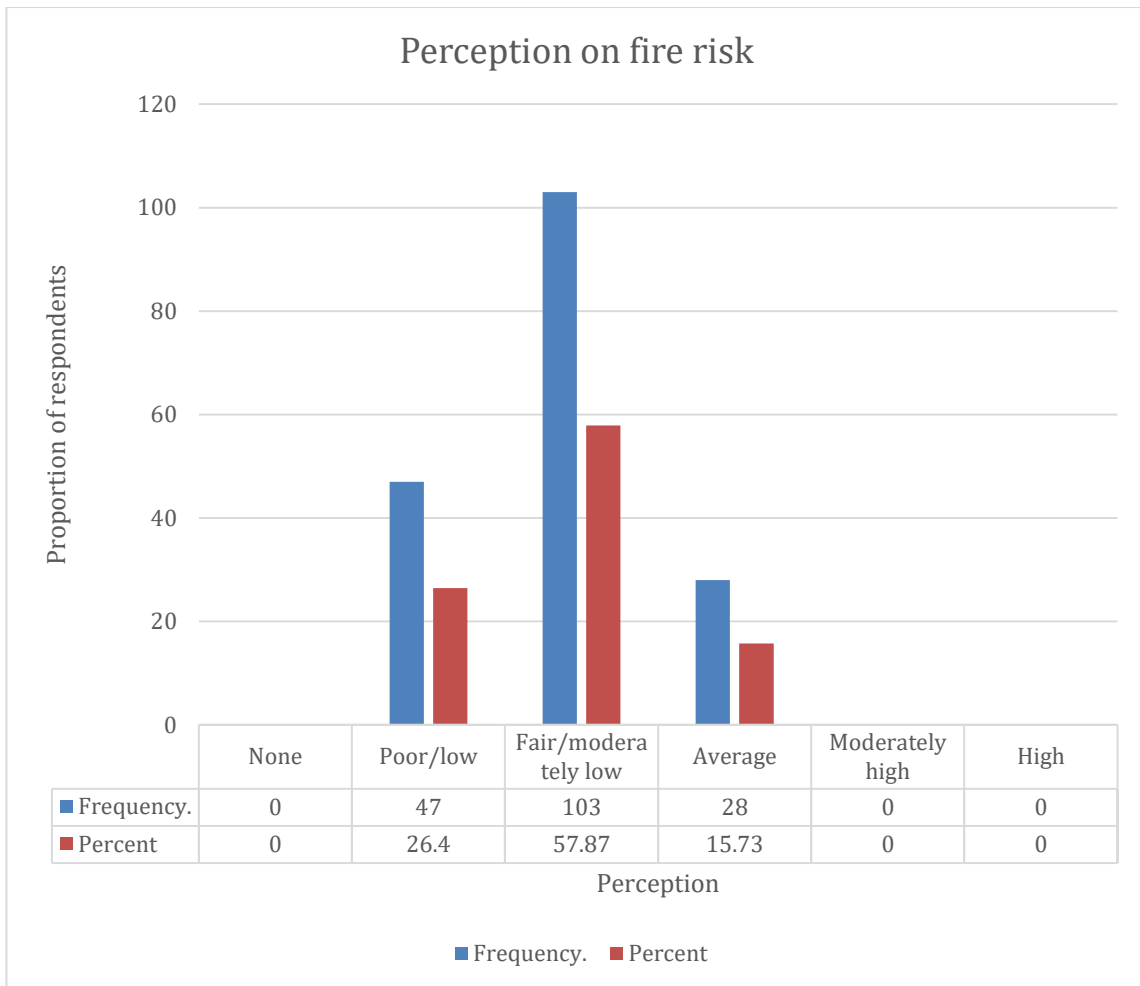
The model recorded an R<sup>2</sup>-Adjusted of 0.09. This suggest that about 9% of the variations in the impact of knowledge of fire emergency preparedness can be explained by cadre of the respondents and work duration. Thus, 91% of the variations are being affected by factors not included in this model.

On individual basis, the cadre of the respondents ( $t=4.10$ ,  $\text{sig} < 0.001$ ) and the working duration of the respondents ( $t=2.33$ ,  $\text{sig.} = 0.021$ ) have positive effect on the knowledge of fire emergency preparedness. This causal relationship was statistically significant at 0.05 (all the independent variables have p-values less than the 0.05).

#### **4.5 Attitude and Perceptions of staff on fire emergency preparedness.**

##### **4.5.1 Staff perception on risk of fires in the hospital**

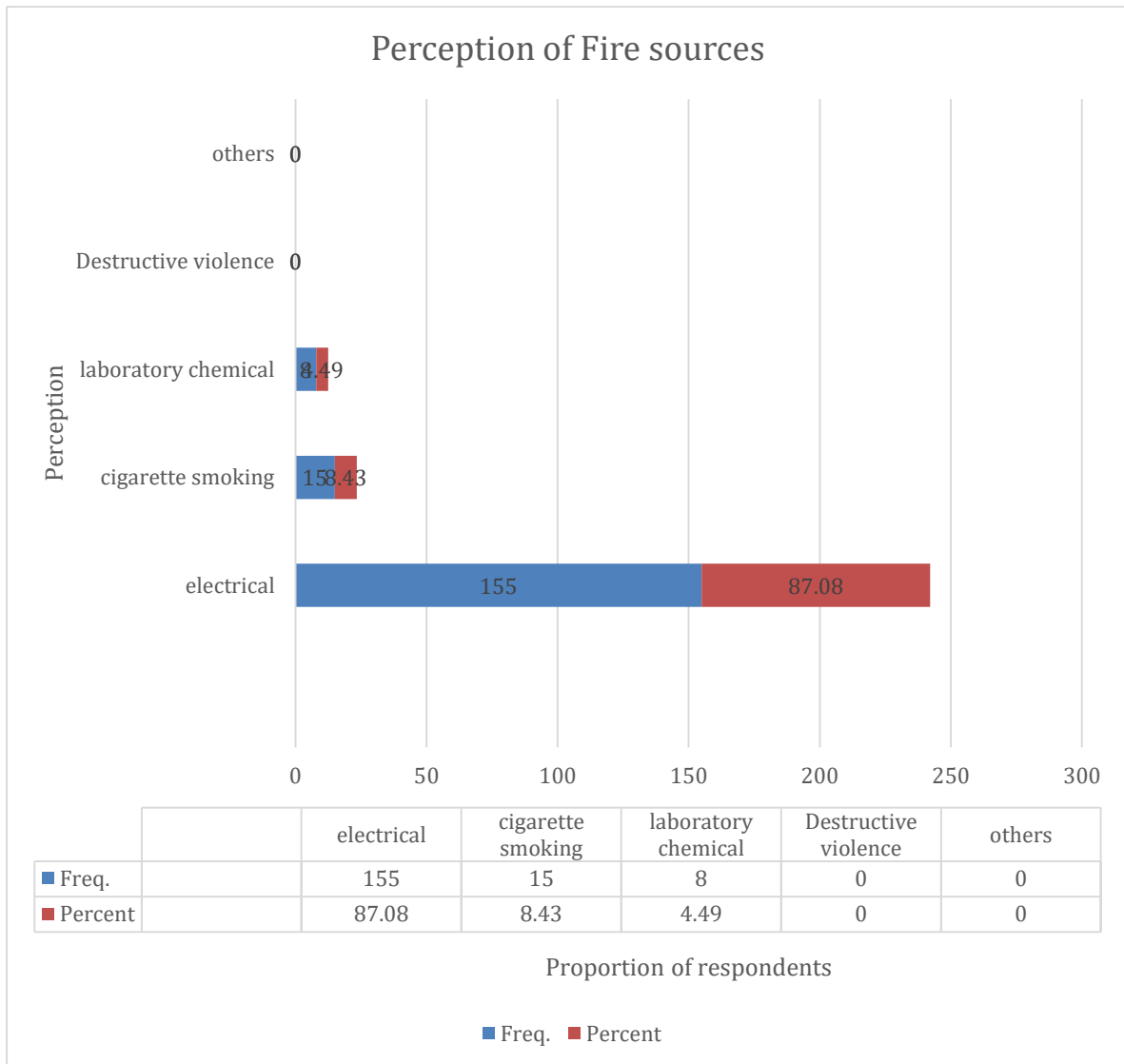
Staff perception on risk of fire in the hospital was assessed using the Likert scale of 0 to 5 to represent no fire risk to high fire risk (Figure 4.2). More than half (57.87%) of the respondents perceived the risk of fire in the hospital to be moderately low followed by 26.4% of the respondents indicating the risk of fire in the hospital to be low. The remaining 26.4% of the respondents indicated the risk of fire to be average. The various respondents' perception on fire risk at the hospital is illustrated on figure 4.2.



**Figure 4.2: Perception of staff on risk of fire in the hospital**  
**Source: Field Survey, 2018.**

**4.5.2 Perceived sources of fire in the hospital**

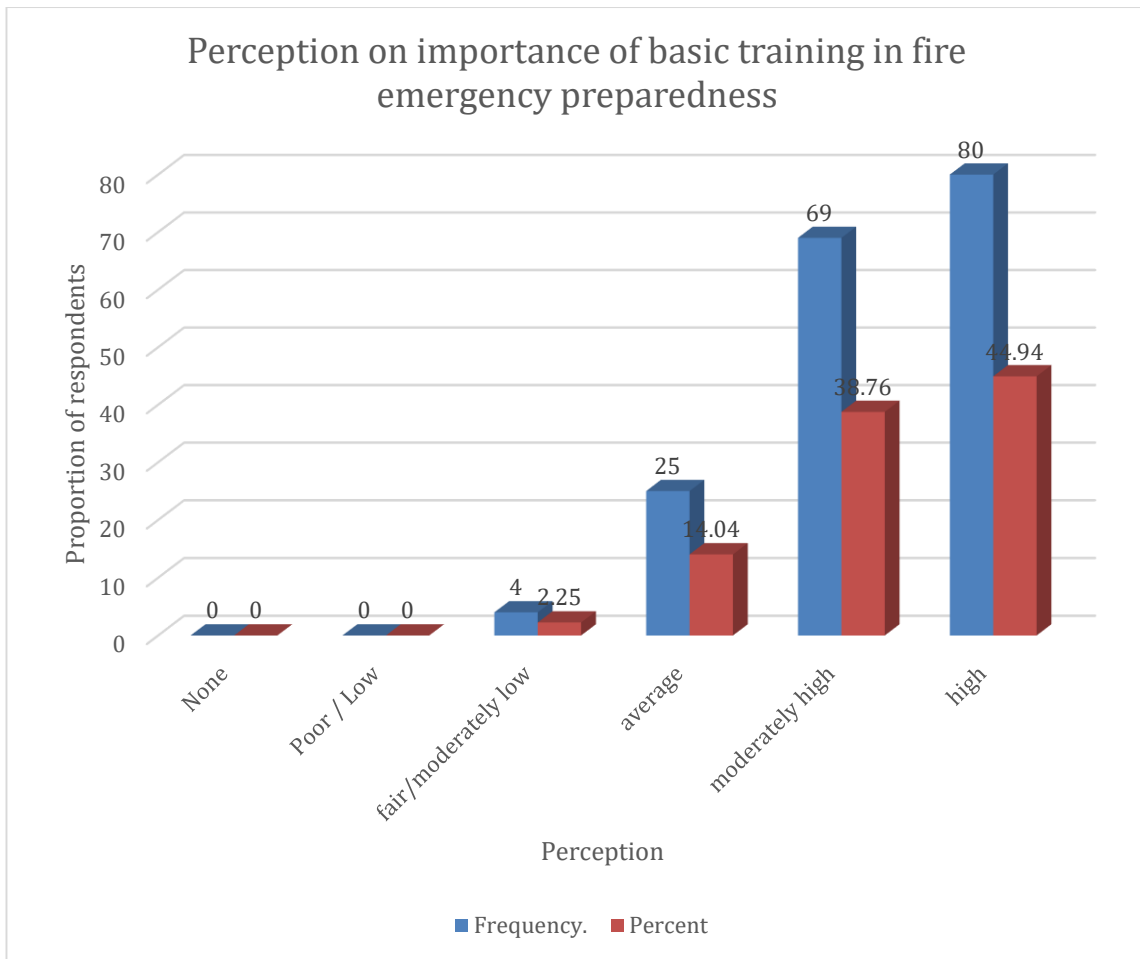
Figure 4.3 below, summarizes the perception of the respondents about the sources of fire in the hospital. As shown, faults from electrical gadgets were perceived as the most possible source of fires in the hospital with 87.1% of the respondents agreeing to this. The least of the perceived sources (4.49%) of fire was laboratory chemicals. Cigarette smoking (8.43%) was notably the second most perceived source of fire in the hospital.



**Figure 4. 3: Perception of staff on sources of fire in the workplace.**  
**Source: Field Survey, 2018.**

**4.5.3 Perceived importance of basic training in fire emergency preparedness.**

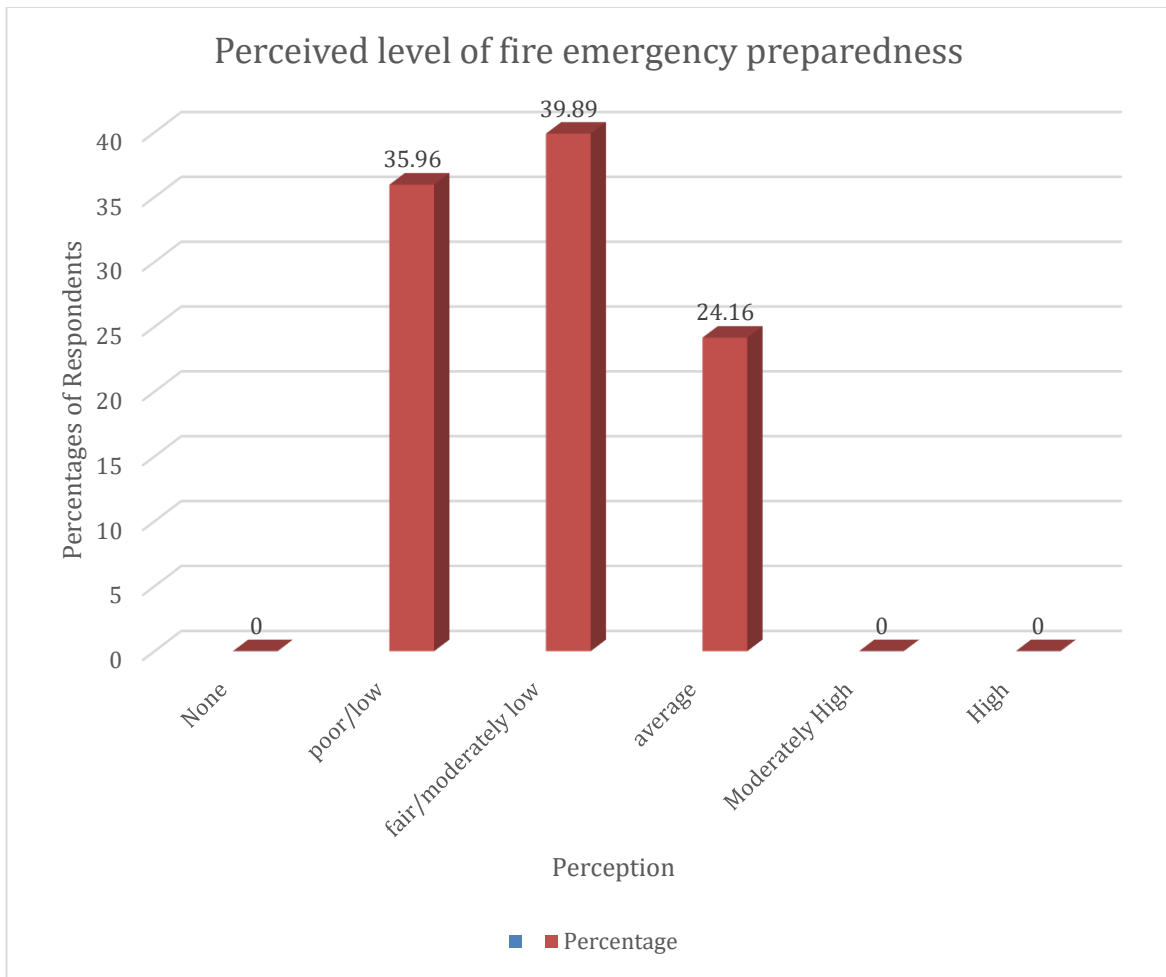
Questions were asked to determine the perceived importance for staff training on fire emergency preparedness (Fig.4.4). Majority (44.94%) of the respondents in the hospital felt a high need for training on fire emergency preparedness. Approximately 2.25% of respondents perceived a moderately low importance for staff training in fire emergency preparedness. None of the respondents felt there was poor need for staff training on fire emergency preparedness. (Figure 4.4).



**Figure 4. 4: perception on importance basic training in fire emergency preparedness. Source: Field Survey, 2018**

#### 4.5.4 Perceived level of respondent’s fire emergency preparedness.

Figure 4.5 below, summarizes the results of the assessment of the perceived level of respondents fire emergency preparedness. As shown, approximately 24.26% of the respondents rated their level of fire emergency preparedness as average. A total of 75.85% of the respondents rated their level of fire emergency preparedness as below average. This included all the respondents who discerned that their level of fire emergency preparedness was nil, poor/low and fair/moderately low. (Figure 4.5)



**Figure 4.5: Perceived fire emergency preparedness level**  
**Source: Field Survey, 2018.**

#### **4.6 Compliance with fire emergency preparedness equipment, systems and infrastructure**

An observational checklist was used to determine compliance of Tarkwa municipal hospital by observing the availability of fire detection and warning systems, availability of firefighting equipment, means of escape and availability of documentary items in the hospital. Four distinct observational area included the wards, the administration block, the laboratory and the pharmacy.

#### **4.6.1 Availability of fire detection and warning systems**

All four observational areas had automatic smoke detectors/sensors with alarms installed in the rooms and on the corridor. These systems were in a good working condition.

All of the observed areas were noted to have fire alarm bells in the building. All the fire detection and warning systems were electrically powered and had a backup power supply.

However, the smoke and fire alarms were not connected to fire emergency response teams such as the fire brigades.

#### **4.6.2 Availability of firefighting equipment**

All the departments observed had a fire extinguisher in a working condition. Only red colour coded fire extinguishers were available. None of the departments had other colour coded fire extinguishers.

None of the fire extinguishers were inspected and tagged annually by a licensed fire protection services company.

However, there were no other types of firefighting equipment in the hospital. There were no sand buckets, fire blankets, automatic sprinklers and hose reels with water.

#### **4.6.3 Means of escape**

All the department observed had exit doors and exist corridors clearly labeled. These exit routes were free from obstructions and opens from both inside to outside without the use of a key. All the four departments were observed to have a good lighting on the exit routes which was functioning effectively. The staircases and the exit routes had balustrades and handrails in all the four observational areas.

#### **4.6.4 Availability of Documentary items in the hospital**

This observational checklist item sought to find out if the four observational areas had annual fire audit report, evacuation plan posted in each workroom, fire drill reports and fire safety policy document. None of these items were seen in the observational areas.

## CHAPTER FIVE

### DISCUSSIONS

#### 5.1 Introduction

This chapter discusses the key findings of the study. The study sought to assess the level of knowledge, and attitude and perception about fire emergency preparedness among staff of Tarkwa Municipal Hospital. In addition, the study sought to determine the compliance of the hospital to fire emergency management procedures based on local and international regulations and guidelines.

#### 5.2 The level of knowledge of fire emergency preparedness among the participants.

Preparedness is a major component of emergency management. Preparedness is a study based set of activity that is carefully monitored during disasters (Kent, 1994). Preparedness is a continuous process. It involves planning, managing, organizing training, equipping and evaluating and monitoring. The study found that staff of the Tarkwa municipal hospital had inadequate level of knowledge about fire emergency preparedness. ( $X^2 = 13.1733$ ; p-value = 0.000)

This finding was consistent with the fire emergency preparedness situation among the staff of the Tarkwa Municipal Hospital, as majority (91.1%) of the respondents indicated that they had not undergone any training or drills at all on fire emergency preparedness at the hospital. Additionally, the assessment of the availability of documentary materials on fire emergency preparedness also indicated that none was available. Training and reference manuals are very essential for the improvement of knowledge among the staff. Therefore, as these factors were lacking at the hospital, it was not surprising that their level of knowledge about fire emergency preparedness was low and inadequate.

Furthermore, this finding corroborated that obtained by Ronoh & Kyalo (2009), from a study conducted in the turkana district in Kenya, which indicated the staff had a low level of fire emergency preparedness which was attributable to the inadequacy of training on fire emergency preparedness among them.

According to Ogajo (2013) , there are common emergency preparedness measures which include: effective communication plans that the terminologies are well understood, adequate training and proper maintenance of emergency services, emergency warning methods and evacuation plans. The findings of this study deviated from those of Ogajo (2013) and could have also contributed to the observed inadequate level of knowledge of fire emergency preparedness among staff of the Tarkwa Municipal Hospital.

According to Muindi (2014), preparedness for fire is prevented if institutions fail to have fire emergency policy in place to orient the staff on alertness and ensure the awareness of persons in charge of fire management in the institutions.

Therefore, the observation that fire emergency policy documents were not available at the hospital suggested that there was poor or inadequate fire emergency preparedness among the staff.

The findings from the study also indicated that majority (60.11) of the staff knew the responsible person for fire outbreak in the hospital and approximately, 62% of them knew how to use fire extinguisher

However, the fact that inadequate knowledge of fire emergency preparedness was recorded among the staff suggest that perhaps, other factors such as training of staff and availability of documentary items for guidance on fire emergency preparedness had a more over-riding influence on the level of knowledge of the staff than knowing how to use fire extinguishers

and responsible persons for fire outbreak management at the hospital.

A similar study conducted by Ampofo (2015), among women at the makola market in Accra, Ghana, however showed that most of them did not know how to use fire extinguisher correctly.

The fact that majority of the hospital staff in this current study answered they could use fire extinguisher correctly, suggest that probably, they learned the technique from somewhere else. However, since the study had a limitation of not being able to assess the practical ability of the participants to use fire extinguishers correctly, it was difficult to make any inference from this observation or finding.

This current study also found that greater number (71.38%) of the participants did not know the fire emergency number to dial in the event of an outbreak. This observation implied that in the event of a fire emergency, there could be delayed report and response which in turn, could increase the severity of the destruction or harm that might be caused to life and property. In an earlier study conducted by Adu (2017), a similar finding was obtained and it was reported that response to fire emergencies in Ghana are generally delayed by several factors which include late report of incidence of fire.

According to Hughes & Ferrett (2007), knowledge on the components of fire is important to prevent fire from starting and also understand the principle of fire extinguishing. From the study, majority of the respondents had sufficient knowledge on the components of fire, therefore, it is expected that this knowledge would be harnessed to prevent fires from occurring or control them from the onset once they are noticed.

### **5.3 The attitude and perception of staffs on fire emergency preparedness.**

The major cause of fire outbreak in Ghana according to Anaglatey (2013), is an electrical fault resulting from faulty wiring and electrical gadgets misuse. This was evidently seen in this study where majority (87.1%) of the respondents indicated electrical fault as the perceived source of fire risk in the workplace.

Since greater parts of respondents rated their level of fire emergency preparedness as poor, many (44.94%) of them perceived the importance of having a basic training on fire emergency preparedness.

### **5.4 Compliance to fire emergency preparedness; documentary items, procedures, and equipment.**

There were automatic smoke detectors/ sensors with alarm available in the rooms and the corridors in a good working conditions. The study also revealed that all the departments had fire alarm bells available which were electrically powered and also had a backup power supply. However, the smoke/ fire alarms were not connected to fire emergency teams such as fire brigades. This situation suggests that there could be delays in reporting and responding to fire emergencies if there should be any. Therefore, considering the gravity of the devastation that could result if fires are reported late, it is important that all factors that could contribute to delayed response to fire emergencies are identified and resolved as soon as possible, if not immediately.

Furthermore, unlike the study by Ampofo (2015), which found that fire fighting equipment were not available at the makola market, the results of this current study showed that all the departments of the hospital facility had been equipped with fire fighting devices.

In effect it will delay the fire emergency response time to fire outbreak in the facility. Adu (2017), found out from a study in Kumasi on emergency fire response in Ghana that, fire

emergencies are delayed for multiple reasons including contacting the fire response teams.

All departments had firefighting equipment. A recent study by Ampofo (2015) at the makola market in Ghana showed that firefighting equipment are not available at this market places which contradicts what this study found. Apart from the red colour coded fire extinguisher, there were no other types of firefighting equipment in the facility. According to Hughes and Ferrett (2007), all workplaces where risk of fire is high should be provided with suitable firefighting equipment which are in good condition and tailored to the common source of fire risk in the facility. In respect of this, recognizing that the major source of fire risk in the hospital facility was electrical installations, blue colour coded fire extinguishers which were in good condition should have been provided in the hospital facility. However, the findings of the study indicated that only red colour- coded fire extinguishers were available and had expired and needed to be serviced or changed. In addition, other fire control devices such as sand buckets, fire blankets, automatic sprinklers and hose reels with water necessary for fighting other types of fire were also not available in the facility. The implication of these laxes and failures in the fire safety standards in the hospital facility is that minor fires at the hospital which could be easily controlled would be left to progress into complicated dimensions which be life-threatening and devastating.

Finally, the results showed that fire emergency preparedness documentary materials such as training manuals and records, safety protocols and guidelines and evacuation plans as well as policy documents were not available in the hospital facility.

Even though this finding corroborated the study by Muindi (2014) which also indicated that documentary items were not available at the medical training campuses, the fact that they are needed to ensure fire emergency preparedness among the staff emphasizes their importance and the risk associated with their availability.

## CHAPTER SIX

### CONCLUSIONS AND RECOMMENDATIONS

#### 6.1 Introduction

This chapter presents the conclusion of the study as well as the recommendations for the study.

#### 6.2 Conclusion

The general objective of the study was to assess the fire emergency preparedness among staffs of Tarkwa Municipal Hospital. Based on the findings from the study, these conclusions were made on the specific objectives:

1. In response to specific objective one where the study sought to determine the knowledge of staffs on fire emergency preparedness; the knowledge of staff on fire emergency preparedness was inadequate due to the fact that majority of the staffs did not know how to effectively use fire extinguisher in fire emergencies, most staff did not know the fire emergency number to call during fire outbreak situations and the facility did not undertake fire emergency trainings and drills.
2. In describing the attitude/ perception of staff on fire emergency preparedness, majority of the staff perceived a high need for basic training on fire emergency preparedness and a greater number rated their fire emergency preparedness as below average.
3. In regards to objective three (to assess the compliance of the hospital to fire management based on local and international regulations and guidelines); Tarkwa Municipal Hospital were not compliant to local and international regulations. The compliance issues identified were that; the hospital did not procure the type of extinguisher suitable for their major perceived source of fire risk, the hospital did

not have other types of firefighting equipment such as the sand buckets, fire blankets, automatic sprinklers and hose reels with water. Also the fire extinguishers were not inspected and tagged annually by licensed fire Protection Company. Another compliant issue was that, documentary items such as annual fire audit report, evacuation plan, fire drill report and fire safety policy document were not available in accordance to international fire safety standards.

### **6.3 Recommendations**

In view of the findings of the study, the following recommendations are made.

Firstly, the hospital managements should ensure adequate basic fire emergency preparedness training for all staff. This should be included in the induction and orientation protocols. Also regular in house training on fire emergency preparedness should be organized for staff.

Secondly, there is the need for frequent fire emergency drills and fire drill audits. These audit should be documented to meet international standards.

Furthermore, the hospital management should provide appropriate firefighting equipment. The fire extinguishers provided should be appropriate for extinguishing the perceived type of fire in the hospital facility.

Finally, similar research is recommended in the other institutions of state so as to understand the overall picture in the country. This will enable the nation to develop its own fire compliance policy, necessary for minimizing fire outbreaks and their consequences in various institutions in the country.

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## APPENDICES

### Appendix A: Informed Consent Form

#### Research Title

Fire Emergency Preparedness among staff of Tarkwa Municipal Hospital, Tarkwa.

Name and Address of Principal Investigator

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#### Introduction

I am a master's student of the school of Public Health, University of Ghana conducting a research on fire emergency preparedness among staff of Tarkwa Municipal Hospital. Please you would be required to fill the questionnaire. All information provided will be treated as confidential.

#### General Information about study

Hospitals are noted to be one of the institutions threatened by fire outbreak. The purpose of the study is to gather information on fire emergency preparedness among staffs of Tarkwa Municipal Hospital in terms of staff Knowledge, attitude/ perception and institution's compliance on fire safety preparedness guidelines. This information will be obtained from the staff using interviewer- administered questionnaires with both closed and open-ended questions.

#### Risk and Benefits

This study will increase our understanding regarding the possibility of fires at the hospitals as well as better understandings of the possible hazards that exist that increase the possibilities of fires at the hospital. Furthermore this research may provide evidence to

support the need for infrastructure in the hospital for preparing adequately for fire emergencies. To add the study may be used to formulate local and national measures to address the issue of fire outbreaks in the hospitals and other similar institutions.

This study will not pose any risk to respondents, as no harmful materials will be used on the respondents.

### **Privacy and Confidentiality**

To ensure confidentiality and privacy we will not mark the questionnaires with study participants' names: rather we will code numbers to the questionnaires and keep an encrypted file that coordinates numbers to names on a secure laptop. The study materials and data will be stored under key by the principal investigator.

### **Compensation**

Compensation will be given at the time of data collection. Compensation is not payment for participating in this study but serves as a token of appreciation for participants' time as these workers will in a normal working day earn more than the compensation reward. A payment of GH 6.00 cedi's will be given to study participants who complete all aspects of the study

### **Voluntary participation and withdrawal**

Participant opinions and experiences are important to us, so we want you to be honest and truthful in answering our questions. Your participation is completely voluntary and you may refuse to participate at any time. You may ask me to stop the interview or observation at any point or you may decline to answer any question if it makes you uncomfortable.

### **Research participant's right**

This research has been reviewed and approved by the Ghana Health Service Ethical Review Committee (GHS-ERC). If you have any questions about your right as a research participant

you can contact GHS-ERC or the principal investigator.

**Clarifications before consent**

Do you have any questions you wish to ask about the research? (if yes, please indicate the questions below)

.....

**Statement of Consent**

I..... declare that the purpose, procedures and all other information of the study have been read by me and all question (s) and clarifications have been sought and answered. I therefore give my consent to participate in the study.

Signature of participant..... Date. .... / ..... / .....

**Statement of Researcher**

I have provided all information, explanations and clarifications about the study to participant as well as answering any questions concerning the study. I agree to answer all questions that may arise in the course of the study and stick to approved study protocols

Signature of researcher ..... Date..... / ..... / .....

**Appendix B: Questionnaire for Project Work**

**QUESTIONNAIRE**

A CROSS-SECTIONAL STUDY ON FIRE EMERGENCY PREPAREDNESS AMONG STAFF OF TARKWA MUNICIPAL HOSPITAL.

Please kindly complete the questionnaire by circling the appropriate number that corresponds to the answer and /or writing in the space provided.

Date: ...../...../.....

Form NO.

Demographic Data		
NO.	QUESTIONS	RESPONSE
1	Sex of respondents	1. male 2. female
2	Age of respondents	1. < 25 2. 26-35 3. 36-45 4. 46-55 5. >55
3	Cadre	1. Clinical 2. Non-clinical
4	Job tenure of respondents	1. Permanent and pensionable 2. Contract 3. Casual.
5	Duration of work in current work station	1. 1-23 months 2. 2-5 years 3. 6-10 years 4. 11-20 years 5. >20 years
6	During your stay in the current workstation, have you experienced any fire outbreak	1. Yes 2. No.
7	<b>If No in Q.6, skip to 8</b> <b>If yes in Q.7</b> How many times have you had fire outbreaks	1. 1 2. 2 3. 3 4. 4 5. 5 or more
8	Do you have a copy of staff and their specific	1. Yes

	responsibilities during a fire emergency?	2. No
9	Who is responsible for fire emergency management in the hospital	
10	Do you a copy of the priority list to be used for evacuation in case of a fire outbreak	1. Yes 2. No
11	Does your hospital undertake fire emergency preparedness trainings?	1. Yes 2. No
12	<b>If No in Q.11, skip to Q.14</b> <b>If Yes in Q.11, how often are the fire emergency preparedness trainings done?</b>	1. Quarterly 2. Bi-annually 3. Annually
13.	Have you ever been trained on fire emergency preparedness	1. Yes 2. No
14	Does your hospital perform fire and safety drills	1. Yes 2. No
15	<b>If No in Q.14, skip to Q.16</b> <b>If Yes in Q14, How often are the fire drills done</b>	1. Quarterly 2. Bi-annually 3. Annually
16	Have you ever participated in any fire drills	1. Yes 2. No
	Assessment of knowledge	
17	Do you know how to use a fire extinguisher in case of a fire outbreak	1. Yes 2. No ( a Yes answer= 1 score)
18	Are you aware of the closest fire extinguisher from your workstation?	1. Yes 2. No
19	What is the emergency number to dial in order to report a fire outbreak	
20	For a fire to start and be sustained, this/these component/s need to be present	
20-a	Source of ignition	1. Yes 2. No 3. Don't know
20-b	Fuel	1. Yes 2. No 3. Don't know
20-c	Oxygen	1. Yes 2. No 3. Don't know
	Assessment of attitude/perception	
21	On a scale of 0-5, how do you rate the risk of fires in your workplace	0. None 1. Poor/ low 2. Fair/ moderately low

		<ul style="list-style-type: none"> <li>3. Average</li> <li>4. Moderately high</li> <li>5. High</li> </ul>
22	<p><b>If None in Q.21, skip to Q.23</b></p> <p>What are the sources of fire risk in the workplace</p>	<ul style="list-style-type: none"> <li>1. Electrical</li> <li>2. Cigarette smoking</li> <li>3. Laboratory chemicals</li> <li>4. Destructive violence</li> <li>5. Others</li> </ul> <p>specify.....</p>
23	<p>On a scale of 0-5, how do you rate the importance of having a basic training on fire emergency preparedness?</p>	<ul style="list-style-type: none"> <li>0. None</li> <li>1. Poor / low</li> <li>2. Fair / moderately low</li> <li>3. Average</li> <li>4. Moderately high</li> <li>5. High</li> </ul>
24	<p>On a scale of 0-5, how do you rate your level of fire emergency preparedness?</p>	<ul style="list-style-type: none"> <li>0. None</li> <li>1. Poor / low</li> <li>2. Fair / moderately low</li> <li>3. Average</li> <li>4. Moderately high</li> <li>5. high</li> </ul>

**Appendix C: Observational Checklist**

Serial no.....

Date:

**Observation area:** 1. Ward 2. Administration block 3. Laboratory  
4. Pharmacy

Item	Action	YES _____	NO
<b>Availability of Fire detection and warning systems</b>			
1a	Automatic Smoke detectors/ sensors with alarms available In the Rooms		
ii.	On the Corridors		
b.	i. Fire/ smoke detectors in the rooms are in working condition	_____	
	ii. Fire/ smoke detectors on the corridors are in working condition		
2	Fire alarm bells available in the building	_____	
3	If the fire-detection and warning system is electrically powered, does it have a back-up power supply?		
4	Are the smoke/ fire alarms connected to fire emergency response teams e.g. fire brigades	_____	
<b>Availability of Firefighting equipment</b>		_____	
5 a.	Fire extinguishers		
b.	Color code Blue _____		
	Black		
	Red		
	Cream		
c.	Fire extinguishers are inspected and tagged annually by a licensed fire protection services company		
d.	Fire extinguishers are in working condition		
6	Sand buckets		
7	Fire blanket		
8	Automatic sprinklers		
9	Hose reels with water		
<b>Means of escape</b>			

10	Exit door/ exit corridor present		
11	Labeled exit doors		
12	Emergency escape route with labeled signs/ illustrations on the walls	_____	
13	Exit routes are free from obstruction		
14	Exit doors readily open from inside without the use of a key		
15 a.	Lighting provided on the exit route	_____	
b.	Exit route lighting in working condition	_____	
16	Staircases and exit routes have balustrades and handrails		
<b>Availability of Documentary items in the college</b>			
17	Annual fire audits reports	_____	
18	Evacuation plan posted in each workroom/ office		
19	Fire drill reports	_____	
20	Fire safety policy document	_____	

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

*In case of reply the  
number and date of this  
Letter should be quoted.*



Research & Development Division  
Ghana Health Service  
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Email: [ghserc@gmail.com](mailto:ghserc@gmail.com)  
4<sup>th</sup> May, 2018

MyRef. GHS/RDD/ERC/Admin/App 18/200  
Your Ref. No.

Sylvester Sebbeh-Newton  
University of Ghana  
School of Public Health  
Legon, Accra

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	<b>GHS-ERC047/02/18</b>
Project Title	Fire Emergency Preparedness among Staff of Tarkwa Municipal Hospital
Approval Date	4 <sup>th</sup> May, 2018
Expiry Date	3 <sup>rd</sup> May, 2019
GHS-ERC Decision	<b>Approved</b>

**This approval requires the following from the Principal Investigator**

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol!

SIGNED.....

DR. CYNTHIA BANNERMAN  
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra