

**MANAGEMENT OF HEALTH AND SAFETY RISK FACTORS AT GHANAIAN
CONSTRUCTION SITES**

By



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DECLARATION

I hereby declare that, this submission is my own work towards the MSc in Construction Management and that, to the best of my knowledge, it contain no material previously published by another person nor material which has been accepted for the award any other degree of any university, except where due acknowledgement has been made in the text.

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ABSTRACT

The aim of this study was to explore the management of health and safety risk factors at construction sites in Ghana. With this aim, four (4) objectives were set which were to ascertain the awareness of health and safety risks at construction sites, to identify health and safety risk factors that occur at construction sites, to Identify the risk management approaches on construction sites and to ascertain the challenges in effective risk management on construction sites. The study adopted a quantitative research method in which structured questionnaire were designed and administered to D1K1 and D2K2 construction firms in Accra. The data was analyzed using the mean score ranking. From the analysis, it was realized that, construction firms have a satisfactory level of awareness on the health and safety risks on construction sites. Also, it was realized that, the most significant risk factor was working too close to other colleagues followed by noise. Furthermore, it was realized that, the most significant approach to risk management was reference to historical experience followed by brainstorming. With the final objective it was realized the most significant challenges to risk management was financial constraints followed by negligence or human error on the part of workers. Based on the findings, it was recommended that, flow charts should be mostly used to identify risks at construction sites. Every project is a unique engagement, and the risks of historic engagement may not be associated with the current project. However, the use of flow charts enables the identification of all activities that will take place in the delivery of a particular project; making it appropriate to identify the various risks that are inherent in the activities. Also, construction firms must develop and effectively implement safety policies, programmes and guidelines. This will enhance a structured supervision and an effective directive.

Keywords: Risk management, Health and safety.

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DEDICATION

The project work is dedicated to God Almighty and the Agbolosu-Amison family for their immerse support through this study.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Construction originates from the Latin word *construere* which means “to heap together”; it is the creation of buildings or infrastructure. Unlike manufacturing, where similar infrastructure is put up without a designated buyer, construction takes place at a specific location (construction site) with a designated buyer in mind (Halpin, 2010). Across the globe, construction is regarded as one of the predominantly viable industry in terms of socio-economic development. Danso (2010) indicated that the socio-economic contribution of the construction industry can be mapped to its procedural activities and final product such as; employment, infrastructure for both domestic and commercial purposes as well as facilities that aids commerce of products and services.

A study conducted by Ezeldin and Sharara (2006) shows that the construction milieu of developing countries tends to be very risky and, in some cases, pose health and safety threats to people, usually the workers. Ghana’s construction industry is no exception as it is regarded as a risky engagement, and one susceptible to accidents; Mbuya and Lema (2002) ranks the construction industry of Ghana as the next most dangerous industry to work, following the mining industry. In undertaking certain construction engagements such as building houses, roads, repair and maintenance of infrastructure; certain health and risk elements such as noise which may lead to hearing dysfunctions; fall from height, collapse of structures, equipment associated accidents which sometimes lead to deformities; chemical exposure and other sensitive material may lead to skin diseases; dust, gases or smoke which when respired may lead to lung illness; and other and others tend to show forth and affect people negatively (Smallwood and Ehrlich, 2001).

A study conducted by ILO (2001) reported that construction firms in developing countries take extreme advantage of casualization policies; thus, these firms engage a lot of casual employees in their construction activities, paying less and less attention to their health and safety issues. In Tanzania for instance, over 70% of casual staff of construction firms are not given protective materials to undertake construction activities on site; if given at all, they are substandard (Mitullah et al., 2003). This exposes them to diverse risks and in case of accidents, they find themselves in fatal conditions; in favorable situations, minor injuries will be endured.

A study conducted by Laryea (2010) on the state of health and safety on fourteen construction sites in Ghana during a one-year period (2009-2010), revealed the poor state of health and safety on Ghanaian construction sites. He stated the primary reason for this as being the lack of strong institutional framework for governing construction activities and poor enforcement of existing health and safety laws and policies in the country.

Health and safety performance in construction industries are usually measured using information about the current situation and the progress of strategies coined out by the organization (Prasad and Reghunath, 2011). This makes the management of health and safety in the construction industry reactive instead of being proactive.

1.2 PROBLEM STATEMENT

A number of studies conducted on risk and safety in the construction industry indicates that the said industry seems to have very high accident cases across the world (ILO, 2005; Kwarteng, 2015). A further detail in the ILO (2005) report has it that; about 60,000 fatal accidents are recorded at construction sites each year; around the world. A research conducted by Laryea et al. (2010)

revealed that in the year 2000, the Labour Department of Ghana reported 56 fatal and 902 non-fatal accidents in the construction sector (Amon, 2014).

The construction industry is unarguably delivering socio-economic benefits to individuals, companies and the country at large. Nonetheless, its health and safety risk factors seem to be actively endangering lives, resources and property. There is clear cut knowledge on numerous factors that pose risks to lives and livelihoods; it is however critical and essential for these factors to be effectively addressed and managed to make the construction industry of Ghana attractive in terms of safety to life.

Safe practices at construction sites have changed over the years at a dawdling pace. The working conditions and procedures as well as the people doing the work change continuously at construction sites. Such changes are evident in the demographics of staff, methods of undertaking activities, materials and equipment engaged. Because the development of safety practices is slowly catching up with the dynamics of the construction industry, the improvement of health and safety tends to be more reactive (Anderson, 1999).

The only way to achieve a safe and cost-effective construction site is through quality site management (Cariel, 1991), and in order to do this, measurement of safety and health performance of the various construction sites should be made a priority (Tarrant, 1980; Laufer and Ledbetter, 1986). This study would seek to explore the management of health and safety risk factors at construction sites in Ghana.

1.3 RESEARCH QUESTION

Outlined below are the research questions that will guide the efforts of this research towards achieving the predetermined objectives.

1. What is the level of awareness of health and safety risks at construction sites?
2. What health and safety risk factors occur at construction sites?
3. What are the risk management approaches on construction sites?
4. What are the challenges in effective risk management on construction sites?

1.4 THE AIM OF THE STUDY

The aim of this study is to explore the management of health and safety risk factors at construction sites in Ghana.

1.5 RESEARCH OBJECTIVES

The specific objectives that the study seeks to achieve are outlined below.

1. Ascertaining the awareness of health and safety risks at construction sites;
2. Identifying health and safety risk factors that occur at construction sites;
3. Identifying the risk management approaches on construction sites; and
4. Ascertaining the challenges in effective risk management on construction sites.

1.6 RESEARCH METHODOLOGY

The study adopted a purely quantitative research method. This study was conducted through the review of relevant literature and analyzing the research papers gotten. This aided in the development of a structured questionnaire. Their responses were coded in SPSS and subsequently

analyzed using mean score ranking technique. Furthermore, this research made use of only primary data as a source of information for the study. Primary data are collated by the researcher as such data may not be available. Therefore, the collection of primary data implies that, new data are added to existing store of social knowledge that are made available for use to the general research community. Details of the methodology are discussed in the Chapter three.

1.7 SIGNIFICANCE OF THE STUDY

Health and safety risks in Ghana's construction industry is very noteworthy, and finding deduced from the study will enhance in-depth understanding of the subject matter, as well as provide managers and consultants in the industry with proactive management approaches. Frontline workers or labourers on construction sites will benefit from the study, as measures to secure their safety and protection will be recommended. Research findings of the study will add to the existing body of knowledge on health and safety risk factors; and this will in turn aid fellow researchers who may undertake similar studies.

1.8 SCOPE OF THE STUDY

The study was conducted in the Accra Metropolis due to its span and location in the capital city of Ghana, making it worthwhile for the construction of commercial residential structures. The study is composed of building construction site workers in categories D1K1 and D2K2. The focus of the study is on the management of safety and health risk factors in construction sites.

1.9 LIMITATION OF THE STUDY

This study is faced with a number of limitations; however, these limitations do not negatively impact the quality of the analysis and findings of the study. Due to the limited time frame and inadequate resources, the study focused on construction companies that are classified as D1K1 and

D2K2. In addition, only building construction workers who fall into categories D1K1 and D2K2 in the Accra Metropolis were sampled as subjects of the study.

1.10 ORGANISATION OF THE STUDY

The study is presented in five chapters; chapter one details the background of study, the statement problem, objectives of the study, research questions, significance of study, scope of the study, the limitations of the study and definition of key terms. Chapter two details the literature that was reviewed to support the study and provide the necessary information needed to draw the final conclusions. Chapter three captures the methodology used in conducting the research, thus the research design, sources of data collected, sampling techniques, data collection and data analysis. In chapter four, the data collected is analyzed and a summary of the major findings, conclusion and recommendations coined from the data analysis and objectives are presented in chapter five.

1.11 CHAPTER SUMMARY

This chapter was structured under 10 sections. Section 1.1 brought to bear introductory knowledge about the direction of the study. The problem statement which fall under section 1.2, elaborated on the brain behind undertaking this study. Section 1.3 and 1.4 details out the aims and objectives of the study respectively, while section 1.5 outlines the questions that would aid the researcher meet the specific objectives of the study. The importance or significance for conducting the study is presented in section 1.6, the scope of the study is presented in section 1.7 and the limitations of the study is expressed in section 1.8 of the chapter. Section 1.9 provides a simple idea on how the whole document of the study has been structured, in terms of chapters and what they capture. The final section of this chapter summarizes the content of chapter one.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

To adequately facilitate a vivid understanding of the subject matter around which this study revolves, articles, publications and reports relating to health and safety risk factors at construction sites will be critically reviewed. In that regard, this chapter encompasses definitions of keywords in the study and literatures on health and safety risk factors, codes of conduct with respect to health and safety, health and safety legislations, challenges and managerial approaches and benefits associated with the proper management of health and safety risk factors.

2.2 DEFINITION OF KEYWORDS

2.2.1 Health

Hughes et al., (2008) defines health as the complete nature of people's mind and body, free from corruption or diseases associated with work activities, materials and equipment. According to the World Health Organization, WHO (2006), health is not the absence of disease or infirmity but it is the state of complete physical, mental and social wellbeing. For the purpose of this study, health is defined as the state of being free from illness, injury or pain caused by activities at the construction site.

2.2.2 Safety

According to Hughes et al., (2008), safety is the guarantee of people's security and safeguard from any sort of physical accident, injury or torture. To ultimately assure the safety of life and property, essential policies, suitable protective materials and strategic measures has to be in place.

2.2.3 Risk

According to Modarres et al. (1999), risk is the probability of an event occurring and the extent of its consequence. The occurrence of risks is associated with negative impacts to both life and property, depending on the context of the occurrence.

2.3 INTRODUCTION TO THE CONSTRUCTION INDUSTRY OF GHANA

According to Anaman et al., (2007) the construction industry refers to a cluster of companies that are associated with the construction of buildings, real estates, public and private infrastructure. Bennet (2003) demarcates the construction industry into two categories, namely; engineered construction and general building construction. He indicated that most construction companies focus on one of the afore-mentioned categories, if not both. Specialty trade contractor is regarded as the third category. This is usually a contractor who acts as a subcontractor for another contractor performing either of the main two construction engagement and responsible for the entire contractual project.

Loushine et al., (2007) asserts that the construction engagements are traditionally made of three participants thus: the contractor, the designer /engineer, and the owner (end user/customer). The systematic construction builds up entails; the owner or sponsor hiring and architect or an engineering company to design the project, it is afterwards advertised for contractors to place bids for the construction of the project. The contractors undertake the actual construction work at the demarcated site (construction site).

In Ghana, Civil Engineering companies undertake heavy engineering projects such as the construction of roads, dams, railways and bridges, whereas Building Construction Firms (BCF)

embark on projects such as the construction of hospitals, schools, hotels, offices and health centers, etc. Construction companies in Ghana consists of large and small firms that are registered under and categorized by the Ministry of Water Resources, Works and Housing (MWRW&H) as D1K1, D2K2, D3K3 and D4K4.

These companies are categorized based on a number of factors. A number of these criteria are equipment holdings, annual turnover, and number of personnel. The D1K1 category of construction firms are noted as the larger firms, whereas D2K2 construction companies are regarded as the next largest. The D3K3 and D4K4 category of firms are small firms (Edmonds et al., 1984). The D1K1 construction firms under the MWRW&H are listed as financial class 1, proficient to undertake projects of any value, D2K2 construction firms; listed under financial class 2 are proficient to undertake projects up to US\$500,000 or GH¢750,000.00. D3K3 construction firms are listed under financial class 3, qualified to undertake construction projects up to US\$200,000 or GH¢ 300,000.00 and D4K4 firms listed under financial class 4 are qualified to undertake projects up to US\$75,000 or GH¢112,500.00 (Danso, 2010).

The construction industry of Ghana contributes significantly to the socio-economic development of Ghana. The industry provides jobs to both educated and non-educated individuals in the country.

2.4 HEALTH AND SAFETY RISKS AT CONSTRUCTION SITES

Across the globe, the construction industry has been regarded as on associated with numerous risks, and this has been much of a concern to researchers, investors, professionals and other stakeholders in the industry. Smallwood et al. (2008) indicated that the construction sector is one of the riskiest economic engagements in the world. This is due to the numerous risks inherent in the undertaking of construction activities on site. A report by the International

Labour Organisation (ILO) (2005) estimated a minimum of 60,000 accidents occurring in a year at construction sites across the world. It was further stated in the report that the construction industry contributes to about 25% to 40% of fatal accidents that occur in the world.

Murie (2007) asserted that, fatal accidents in the construction industry of developing countries surpasses that of developed countries. This was affirmed by Jason (2008) through an article indicating that; fatal construction accidents in developing countries are about 3 to 6 times more, as compared to developed countries.

2.5 HEALTH AND SAFETY RISK FACTORS

It is evident that a lot of risks are associated with work on construction sites. These risks that lead to accidents and usually impact health and safety are caused by certain factors. For the purpose of this study, the health and safety factors outlined by Toole (2002) will be reviewed in this subsection. They include; inefficient safety enforcement; inadequate safety equipment; poor safety attitude; unsafe procedures or activities; poor training or education; deviation from safety precautions; communication; and unsafe conditions of construction sites.

Chi et al., (2005) asserts that health and safety risks are influenced by two major factors, thus behavioral and environmental. The behavioral factors of health and safety risk are those associated with human, thus one's knowledge, attitude and skills, whereas the environmental factors constitute the non-human elements at construction sites, such as the nature of the construction site, outlined procedures, tools and equipment. A number of researchers have conducted health and safety risk associated studies in various countries in light of this.

It was discovered by Lubega et al. (2001) that most construction site risks in Uganda are affiliated to behavioral factors. Details of the research indicated that the engagement of unqualified or

inexperienced workers, inadequate training and knowledge on health and safety risks as well as poor safety attitudes are the dominant behavioral factors that fuel construction site accidents, other health and safety problems. A study conducted in the Republic of Lithuania showed that workers on construction sites tend to have little knowledge about the risks they are exposed to on construction sites. They also seem to be unqualified with regard to the undertaking of site activities, which makes them highly susceptible to risks on the site of construction (Dejus, 2007).

In light of environmental health and safety risk factors at construction sites, Holt (2001) ascertained that ineffective and unavailable policies and standards, poor quality control, financial constraints, incomplete connection of structures, variations of construction site floors or surfaces, and little room for different on-site teams to work freely are the major dictators of risks on construction sites. In addition to this environmental factor are weather conditions, location of construction site, specifications and features of work equipment and materials, as well as the physical arrangement of the construction area where work is being done (Sarah, 2011).

2.6 TYPES OF HEALTH AND SAFETY RISKS AT CONSTRUCTION SITES

Health and safety risks on construction sites can be divided into two separate categories, thus physical injury risks and ill-health risks (Davies & Tomasin, 1996; Murie, 2007). Physical risks consist of injuries, deformities and death consequences. Ill-health risks can only be seen after a relatively protracted time period and will result in sickness or death after a while (Murie, 2007). Outlined below are a number of health and safety risks that are common on construction sites:

2.6.1 Slips and Trips

Slips and trips are significantly common risks at construction sites with minimal results of death.

The most prominent result of slipping and tripping on site is backbone fracture (HSE, 2004).

Health and Safety Executive (HSE) (2003) noted that slips and trips are the frequently experienced risks on construction sites. Slips and trips usually occur when materials are poorly organized on the floor, when the floor is greasy or wet, when inappropriate foot wears are worn, poor control over one's balance, and when the lighting system is poor.

2.6.2 Dust and Air-borne Particles

The nature of material used at construction sites, are capable of being dusty. The health risks that may arise from dusty construction sites depend on the type of dust, such as; chemical, physical or mineralogical. This will determine the toxic nature of the dust, hence the resulting health impact. Dust is usually inhaled or enters the eye, if harmful substances or particles are constituents of it, it is most likely to cause internal health problems which may range from minor damage to permanent diseases and even life-threatening conditions (Huges and Ferrett, 2011).

2.6.3 Electricity and Fire Outbreak

Electricity is frequently used on construction sites for various activities. The risk associated with electricity is the exposure of naked wires or faulty plugs. Hughes and Ferrett (2011) indicated that 2% of fatal accidents that occur on construction sites in the United Kingdom are due to electric shocks. Risks emanating from electricity include poor maintenance of electrical equipment, proximity of construction sites to high tension power house or poles, contact with naked wires and the use of unsuitable materials.

The outbreak of fire is usually not a common risk at construction sites as compared to tripping and falling, they however need to be considered in all cases due to their devastating nature upon occurrence (HSE, 2003). Construction site fires may be caused by electrical faults, braising activities, underground gas and power lines, fuel and other inflammable chemicals.

2.6.4 Fall from Height

At construction sites, the most common occurring risk is the fall of objects or workers from heights. Such falls results in either severe injuries, internal bleeding or death on the spot. It has been noted that about 33% of recorded deaths at construction sites are resultants of falls (ILO, 2005). Various research have also indicated that fall from heights causes the most injuries at construction sites in (Bentley et al., 2006); Yung (2009) indicated that falls constitutes about 51% of construction site injuries in China; about 47% in Hong Kong (Chan et al., 2008) and; 30% in Taiwan (Chi and Wu, 1997).

These falls source from roof tops or roof structures, cranes, scaffolds, elevator shafts, and uncompleted floors in storey buildings. This may be due to the poor protection of personal while working on heights and poor safeguard of objects stored on heights. Painters, decorators, masons, and window cleaners and casual workers who have no experience or improper training and equipment have a high risk of falling (Murie, 2007).

2.6.5 Machinery and Equipment

Machines and equipment on construction sites in case of accidents result in death or fatal injuries that usually lead to deformities. Injuries sustained from machinery may result in internal injuries, fractures and amputation. Machines on site usually cause accidents when they become faulty and when the operator becomes negligent. Transport machinery such as trucks and excavators are known for knocking down workers behind or near them (HSE, 2004).

2.6.6 Manual Handling

Hughes and Ferret (2011) defines manual handling as the use of human effort only to carrying or move load. Certain loads carried on construction sites are not suitable to be handled by man;

preferably machines, forklifts, cranes should be used to cart such loads. The moment loads of such magnitude are handled by workers, they become exposed to various risks. Spinal cord injuries, sciatica, emasculatory disorders, and hernia could be resultants of carrying loads such as cement bags and blocks on site. Back injuries however constitute 25% of health disorders that emanate from the manual handling of loads.

2.6.7 Noise

Noise is referred to as unwanted sound. Noise usually causes health risks and sometimes may be the cause of other risks such as falling or knock down due to the inability to hear warnings. Noise may cause deafness, physiological imbalance and physical stress on workers. The expanse of damage noise inflicts depends on the volume of noise and the duration of exposure. High pitched noise has a high negative impact that low pitched noise (Shariff, 2005).

2.6.8 Chemical Substances

Various types of chemicals are used on different construction sites for different purposes. These chemicals are usually harmful to human health, for instance, solvents used in paints, varnishes, bonding materials and glues, adhesives and lacquers are very harmful when inhaled to an extent or when they come in contact with certain parts of the body (HSE, 2003; Murie, 2007). They can damage the central nervous system, cardiovascular system, liver and kidneys. Chemicals at construction sites can lead to headaches, irritation of the eye, faintness, and dizziness which may affect coordination and judgment. Some solvents increase the likelihood of cancer (Huges and Ferrett, 2011). Solvents can cause infertility, birth defects and miscarriages (Murie, 2007).

2.7 HEALTH AND SAFETY CODE OF CONDUCT ON CONSTRUCTION SITES

A code of conduct refers to a set of guidelines and principles that directs the operations and engagements of people in a professional body. The International Labour Organisation, ILO (1992) documents a number of codes that have been practiced in accordance with health and safety issues on construction sites. Outlined in the document are approaches to guide health and safety issues through the provision of personal protective equipment that are suitable for undertaking procedural activities on construction sites, assurance of safe conditions at the premise of work, and the availability of welfare amenities.

2.7.1 Personal Protective Equipment

Activities undertaken at construction sites have inherent health and safety risks associated with them. It is therefore indicated in the health and safety code of conduct for workers to be provided with protective equipment and clothing that are suitable to protect them from the potential risks on site. This protective item should however come at no cost to the workers but to the management of the construction site or the construction firm. It will be useless if workers have no knowledge on how to use these protective equipment's provided, hence management has to organize training sessions to prepare them for the unfortunate. It is also important that the personal protective equipment meet organizational or industrial standards, to assure security of protection.

2.7.1.1 Types of Personal Protective Equipment

The value of human life is unmeasurable; it is therefore obligatory for employers of construction site workers to provide them with the gadgets and materials that will preserve their lives in the case of accidents. A number of these personal protective equipment, materials and clothing include:

- a) Safety or crush helmets or tough hats that will protect site workers' heads from fall from

heights; flying or falling substances; and accidental contact with hard surfaces.

- b) Eye protective gadgets such as goggles that are clear or colored, and face shields and screens depending on the activity and preventive risk. This is to protect the eyes of workers from dust, small particles in the air, fire sparks, emitting radiations and other dangerous items that may harm or damage the eye upon contact.
- c) Materials such as gloves and gauntlets to protect the hands of workers from surfaces that may negatively affect them. These materials should be able to protect them from; heat, sharp items, dangerous chemicals and probably fire.
- d) Protective boots and footwear that are capable of preventing workers from slipping and a falling on site. They should also be able to protect them from dangerous chemicals, sharp objects such as nails and iron particles on the ground.
- e) Standard and suitable materials that protect the respiratory system of workers should be provided. These may include, nose masks and self-contained breathing tools; that will protect workers from smoke, dust and gases on construction sites.
- f) Suitable overalls and jackets should also be provided to protect workers from chemicals and substances that will negatively affect them upon contact, the weather and heat or chemical radiations that may be experienced on the construction site.

2.7.2 Welfare Amenities

Conducive welfare amenities base on the number of site workers and the varieties of procedural activities should be provided close to the construction site, and must be accessible by all workers. These amenities include washing/shower and sanitary facilities, changing and storage facilities and accommodation for eating and drinking, as well as safe logging in times of adverse weather conditions.

2.7.2.1 Washing and Sanitary Amenities

Deductions from the ILO (1992) code of conduct on health and safety implies that toilets, showers or washrooms should be provided or installed according to the demands of the laws in a particular jurisdiction. The sanitary provisions are essential to for the management of workers' bowels; and the provision of such a facility will prevent contamination and pollution at the site and its environs. The showers and washing equipment are essential in aiding workers wash off their skin after exposure to chemicals and other irritating substances. This helps prevent skin contaminations.

2.7.2.2 Safe Accommodation

This facility is to provide safety for workers in situations where adverse weather conditions are on the rise. In addition to this, the facility provides a venue where workers can eat foods and drink water and other substances that are free from the exposure of contaminants at the construction site. It is however essential that such facilities are strategically situated; not too far and not too close to the construction site, well ventilated and easily accessible by workers.

2.8 HEALTH AND SAFETY LEGISLATIONS OF GHANA

The National Labour Act of Ghana (Act 651, 2003) stipulates various mandatory undertakings with regard to employer – employee relationships. Section 118 of the capture's details on the health and safety conditions of employment in Ghana. A review of this section brought about the subsequent findings.

Employers are to guarantee every employed person safe, healthy and satisfactory conditions of service. Implying that employers are to oversee provisions and maintenance at work premises and

to ensure safety at the workplace as well as the avoidance or elimination of health risks. Also, employers are made available to workers, the necessary information, training, guidance and supervision with respect to the carrying out of activities and the health and safety measures.

Furthermore, the Act makes it the employer's duty to provide at no expense to the worker, appropriate safety gadgets and personal protective equipment. Separate, adequate and conducive toilets, shower amenities, storage and drying facilities on site for male and female workers; should be provided by the employer. Good drinking water is to be provided by the employer as well.

Workers are empowered by the Act to express their opinion and feelings regarding safety issues that may affect them. For instance, section 119 of the Act indicates that; when workers find themselves in situations that reasonably exposes them to danger or risk to life and health, they shall immediately alert their immediate superior or supervisor about the matter and have themselves excluded from that engagement. The employer in such a situation cannot dismiss or terminate the employment of the worker or cease the release of any remuneration due them.

2.9 HEALTH AND SAFETY CHALLENGES AT CONSTRUCTION SITES

Construction sites are exposed to various risks that need to be curtailed to enhance efficient and effective operation towards the attainment of productive results. However, attempts to minimize the occurrence and impact of these risks are associated with a number of challenges. If these challenges are not handled or taken care of, it will be difficult to manage the risks.

Kheni (2008) identified a number of challenges with regard to health and safety at construction sites. They include; inadequate skilled human capital, insufficient government backing for regulatory bodies and inefficient institutional structures responsible for the supervision and policy

formulation of health and safety standards and policies. It was further noted in the study that, construction industry of Ghana is dominated by small and medium scale enterprises; and within these construction firms is the significant existence of socio-cultural value systems most especially with extended family, traditional and religious systems. The research further discovered insights into the challenges inherent in the internal environment of SME construction firms in Ghana with regard to health and safety at their construction sites.

Hassouna (2005) conducted a study in Australia, out of which findings indicated that all respondents of the study were very much convinced that health and safety risks should be the responsibility of both the management of construction firms and the employed workers on the construction site. It was further implied from the study that even though this was the view in mind, it was not the same in practice as managers of construction sites usually fail to provide equipment and materials that are necessary to buttress safety at the construction site. Proactive safety programmes and policies are not in place, while those in place are not effectively implemented. The research work of Jannadi et al., (1998) in Saudi Arabia agrees with Hassouna (2005). However, the case of Saudi Arabia shared the responsibility of health and safety among more stakeholders, thus, the contractor, the designer or architect and the owner, but not the workers.

Tam et al. (2004) identified poor awareness of safety is the main challenge with construction site workers. They are either unaware of the risks on the site or they do not have the technical knowhow to perform activities in a way that will minimize the occurrence of such risks. Tam et al. (2004) further outlined a number of challenges at construction sites. They include a lack of safety awareness by top management; no or inadequate training; poor safety insight of supervisors; reluctance to provide safety precaution equipment; negligent operations; lack of certified skilled labour; less standard or poor equipment; unavailability of first aid measures and items; lack or poor

safety regulation implementation; no sense of commitment by the organisation; low education levels of construction site workers; poor attitude of workers towards safety.

2.10 MANAGEMENT OF HEALTH AND SAFETY RISK FACTORS AT CONSTRUCTION SITES

It is evident through the various dimensions of reviewed literature that construction firms are associated with enormous risks, and these risks affect both life and property; negatively impact productivity and financial resources. The construction industry is playing a significant role in the social and economic development of countries across the globe. However, these existing risks are hampering the progress of the sector and hence a need to manage or control their occurrence and impact. Subsequent paragraphs of this section review available literature that touches on the management of health and safety risk factors at construction sites in the construction industry.

Farooqui (2008) asserts that the management of health and safety risks that are associated with construction accidents generally requires the prediction of future events and their impact under certain situations. Thus, the making of such predictions is based on knowledge about past accidents. Accidents at construction sites are related to human behavior, poor safety management measures and poor conditions of the construction site. Farooqui further indicated that these relational risk factors amount to unsafe work procedures, materials and equipment. It is therefore essential for stakeholders of the industry to ensure that workers are equipped with the technicalities of the industry, through training and adoption of comprehensive health and safety programmes.

Furthermore, Tam et al. (1998) and Poon et al. (2000), pointed out that the engagement of safety programmes will improve safety performance on construction sites; which will in turn lead to a successful achievement of project goals within time and budget. However, an extensive

engagement and effort in safety policies, safety inductions, safety committees, safety inspections, and safety trainings will make put even the dominant factors of risk and safety at the background. A study conducted by Hassain (2007) in the United States of America showed that larger firms in the construction industry have more structured safety programs in place. As a result, these large companies experience the safest performance of activities on their construction sites. In addition to this, companies that made available detailed safety orientations to workers enjoyed minimum rates of injury and low turnover of workers.

In the same study focus, Hassain (2007) in a postal survey of contractors in Singapore made the following assertions. Accidents at construction sites are most likely to occur when companies do not have adequate safety policies in place. He further noted that, organisations that had health and safety policies were not measurable and hence, inherent implementation problems. It is therefore important for contractors to flow chart the activities engaged in on construction sites, identify the various risks that is likely to result from each activity and develop strategic measurable policies that can be clearly understood and implemented on site.

Finally, Hughes et al. (2001) indicated that insurance companies play a significant role in the health and safety issues at construction sites. From the year 1969, legal provisions have made it compulsory for employers to insure their workers against liabilities for injury or illness resulting from their engagement in employment activities. This is known as “employers’ liability insurance”. Other policies of insurance that employers may take advantage of are; public liability insurance, thus insurance to cover or protect public individuals who may be caught up in accidents and fire insurance. Premiums paid by employers with regard to the various policies of insurance are in conjunction with levels of risk, which is measured against the health and safety standards in place and the number of workers that may be under the covering of the insurance.

2.11 BENEFITS OF PROPERLY MANAGED HEALTH AND SAFETY RISK FACTORS

Risks and accidents at construction sites negatively affects workers, employers or contractors and the industry at large. It is in this light that health and safety risk factors have to be properly managed at construction sites. The proper management these factors will bring about various benefits.

First and foremost, cost and financial savings will be achieved. When accidents or injuries occur on construction sites due to these health and safety risks, numerous costs and damages such as compensation claims, legal fees, hospital bills and insurance claims are incurred. In a more controlled construction site, all these costs will be saved. Also, direct cost of low productivity issues in relation to workers excused from work due to accidents, few workforce operating on site and damage of materials or equipment in the occurrence of accidents will be eliminated when safety measures are in place. Safety and protection on construction sites will result in to less schedule disruptions which will curtail cost of production and promote productivity.

On the other hand, properly managed health and safety risks lifts the morale of workers and leads to increased efficiency, productivity and yield. Knowing that they are operating in a safe environment with protective equipment and clothing, workers are most likely to put in their best in carrying out assigned duties. The employer will also not experience absenteeism, high staff turnover and poor work quality.

2.12 CHAPTER SUMMARY

This chapter reviewed adequate literature on various dimensions of health and safety in the construction industry and on construction sites. The key words of the study; health, safety and risk were defined to enhance basic understanding of the prime pillars of the study. The chapter further introduced the construction industry of Ghana, the various categories and the basis of

categorization. It was discovered that the construction firms in Ghana are segregated into four classes, based on financial standing, technical holdings and human capital. The study further delved into the review of literature relating to health and safety risks and their associated factors at construction sites. Subsequent in the chapter are critical reviews of literature on the challenges and management health and safety risk factors as well as benefits of effectively managed safety risk factors.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

In this chapter, the methods that the researcher used to collect and analyze the data collected are discussed. The various types of research approaches, the survey methods, research designs and sampling types are discussed into detail and the final choices for this study is also explained and the reasons for the choice will be explained.

3.2 RESEARCH DESIGN

A research design is a set of rules and regulations put in place to guide the collection and analysis of research problems. A research design is defined by the study type (either description, correlation, semi-experimental and experimental) and the subtype (case study), the problem, hypotheses, dependent and independent variables, the experimental design and methods of data

collection and the statistical analysis plan. Not all research designs have all these features. The research design should be made in such a way that it provides results that answer the research questions. Yin (2003) described a research design as a way to move from one point to another, where one point is the question to be answered and there is the conclusion to be drawn from the answers provided. In the context of this study, the research design would seek to answer the question on the management of health and safety at construction sites in Ghana and draw conclusions on how to offer more proactive management practices.

A research design constitutes an arrangement of conditions. It can sometimes consist of just one condition but at other times a collection of different conditions. The research methods that consist of one condition are qualitative and quantitative methods, while the mix-approach contains more than one condition.

3.3 RESEARCH METHOD

Quantitative research method adopts a deductive and objective view of research undertakings, this is characterized by tangible data thus; counts, weight, mass and other physical measures (Fellows and Liu, 2003). Quantitative research design is the best method to prove or disprove a hypothesis, it is able to filter out external factors that may influence the results of the experiment, and this makes the results unbiased. It is based on survey and experimentation; a survey involves the administering of questionnaires and /or interviews to respondents. Experimentation involves observations under controlled conditions put in place by the researcher. The quantitative research method has the ability to measure the reactions/responses of a large sample of respondents using a limited set of questions. This facilitates comparisons and statistical aggregation of the data gathered.

However, qualitative research method is used mostly by scientists and researchers to study human behavior and habits. It starts with an understanding to be tested, and more often, the hypothesis dictates the form, quantity and scope of required data. Through direct quotations and a systematic description of programmes, situations, people, qualitative data provides an in-depth analysis into their behavior (Cresswell, 2003). Yin (2003) stated that, a respondent has the opportunity to speak freely and provide information that would otherwise not be made available under the quantitative method.

On the other hand, mixed research method involves the collection of analysis and the addition of quantitative and qualitative methods either simultaneously or in a sequence (Cresswell and Clark, 2006). In this study, the mixed research method was used for the pilot study while the quantitative method (survey) was used for the main work. This provided the researcher the opportunity to get information on the perceptions of stakeholders such as the site managers, supervisors and crew members on health and safety risks at the construction sites. The final work, used numbers and frequency to represent the data obtained from the survey.

3.4 RESEARCH STRATEGY

The survey approach was adopted for the study, this enabled the researcher to gain an understanding of the real-life activities taking place at construction sites from any interference (Yin, 2003). This approach is used to answer ‘How’ and ‘Why’ an event occurs; it aids the researcher make operational links rather than merely providing frequencies.

The nature of the study is exploratory, this seeks to find out how health and safety is managed at construction sites in Ghana and investigates how the risks are assessed, communicated and controlled and the factors that cause these risks.

3.5 POPULATION OF THE STUDY

A research population is a large collection of individuals or objects that have some common characteristics. The research was conducted using the Greater Accra Region of Ghana as its target population. Most of Ghana's development is largely found in the region, about 60% of all registered building contractors are found in the region (Ahadzie, 2007). The study limits its scope to D1K1 and D2K2 construction firms because, a majority of the construction firms are registered under the financial class of D1K1 and D2K2 and the researcher believes that a majority of the health and safety risks occur in this class. This is because, they are regarded as small firms and have limited resources, hence health and safety risk management are not prioritized at these construction sites.

3.6 SAMPLING TECHNIQUE

In order to achieve the objectives of the study, the researcher has to choose a number of respondents, this is achieved through sampling. Sampling is the method of taking part of a whole, the part or sample taken should be representative of the whole (target population). A nonprobability sampling technique was employed for the study. The purposive sampling was used to sample 6 D1K1 and D2K2 construction firms. The target population was 13 D1K1 and D2K2 construction firms in Accra.

Each of these construction firms was given thirty-nine (39) questionnaires making a total of two hundred and thirty-four (234) respondents. The composition of the sampling frame comprised of; one hundred and eighty (180) construction workers (labourers), eight (8) health and safety officers, ten (10) health and safety supervisors, eight (8) construction site supervisors, eight (8) construction

site engineers, eight (8) project managers, eight (8) assistant project managers and for (4) project coordinators.

3.7 SAMPLE SIZE

A sample is a representation of a population and represents the characteristics of the population, a sample size is how large or small the sample must be for it to be representative of the whole (Sarantakos, 2005). Choosing the right sample size is a major issue that often confronts social investigators. The Fisher, Laing, Stoeckel and Townsend (1998) formula was used in determining the sample size for the study.

The
formula; $n = \frac{z^2pq}{d^2}$

n = desired sample size (population < 10,000) z = standard deviation, usually

set at 1.96 p = proportion of target population estimated to have a particular

characteristic $q = 1.0 - p$ d = degree of accuracy desired, usually set at 0.05

The study assumes a certain proportion for the target respondents and then works it out. Assuming the target population of project managers at a construction site (p) is 90% which is equivalent to 0.90, z is 1.96 and d is 0.05. The significant value of the research was at 0.05, which means that this research expected that the degree at which responses from respondents to research questions are likely to be false is at 5%; as a result of the comprehensive nature of the questionnaire, the practicality of the questions in line with their job description and their anonymity protection.

The sample size (n) for the communities was found to be as follows:

$$n = \frac{(1.96)^2(0.90)(0.10)}{(0.05)^2} = 138.30$$

An estimated sample size (n) of 138 respondents was arrived at.

3.8 DATA COLLECTION AND ANALYSIS

3.8.1 Data Collection

A self-administered questionnaire was used as the primary means of data collection. A questionnaire is a tool in which a set of standard questions are set for a group of respondents to answer, it can be self-administered or the researcher can aid the respondents, (Creswell, 2003).

Just as any other data collection technique, the use of the questionnaire is not without problems. Questionnaire surveys have been associated with low response rates and biases in responses. To avert such interference, the researcher personally administered the questionnaire in order to obtain high response.

The questionnaire was made up of both open-ended and close-ended questions in order to provide a good representation of the views of the respondents. Open-ended questions are questions which give respondents the total freedom to express themselves whilst the close-ended questions restrict respondents in their responses by providing a set of predetermined answers. A bit freedom is, however, provided by occasionally asking respondents to specify or add their own response where applicable.

3.8.2 Data Analysis and Presentation

Descriptive and inferential statistics was used to analyze the primary data collected. Questionnaires that were incomplete, that is, those that had 80% and above un-answered questions were taken out of the dataset. The results were analyzed using Statistical Package for Social Sciences (SPSS, IBM version, 20) and to facilitate the data entry. The numbers that were assigned to the responses in the close-ended questions were retained as codes and the responses from the open-ended questions were grouped based on their meanings and were also coded. Frequencies, means and percentages were generated using the SPSS and then analyzed.

3.9 RELIABILITY AND VALIDITY

There are three tests that can be used to measure the quality of a research design, these are internal validity, external validity and reliability (Yin, 1994). Internal validity determines whether a conclusion drawn considers the relationship between two or more variables (Bryman, 2004). External validity determines whether the conclusions drawn beyond the specific research context can be generalized and finally reliability is when the procedures leading to a conclusion can be replicated to give the same results.

To ensure reliability and validation, the study employed different approaches; survey, open and close-ended questionnaires and also using the same unit of analysis, the researcher was able to cross-check one result against the other to increase the reliability of the findings. As a means of reducing data collection and constraints in data analysis, the triangulation method was used to ensure the use of a large source of evidence which includes observation and assessment of documents and multiple interviews (Stoecker, 1991).

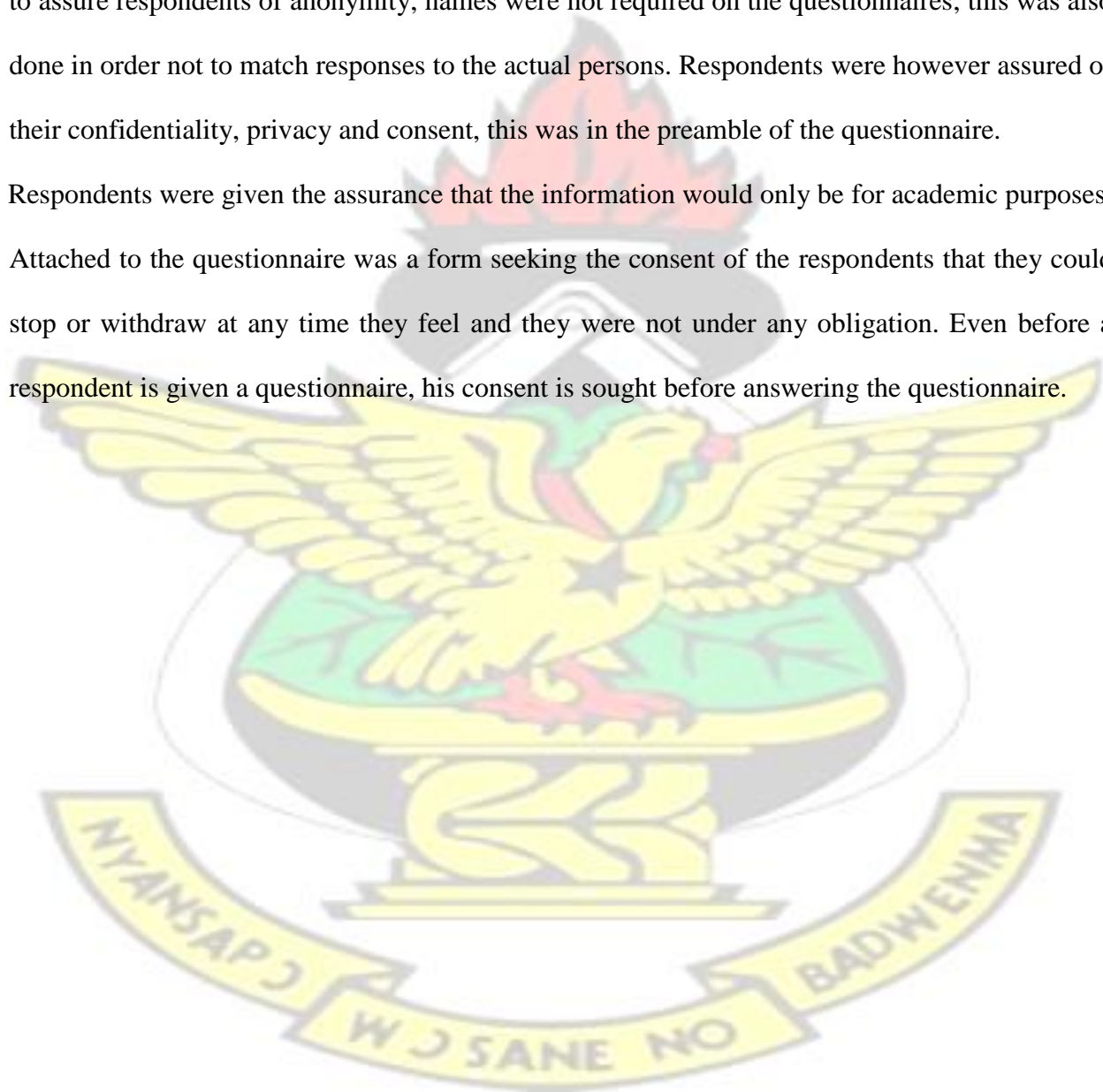
A data collection matrix was prepared to present the key findings, sources of information and the instruments used in data collection.

3.10 ETHICAL CONSIDERATION

In order to abide by the ethics of research, the study took ethical issues into consideration. In order to assure respondents of anonymity, names were not required on the questionnaires; this was also done in order not to match responses to the actual persons. Respondents were however assured of their confidentiality, privacy and consent, this was in the preamble of the questionnaire.

Respondents were given the assurance that the information would only be for academic purposes.

Attached to the questionnaire was a form seeking the consent of the respondents that they could stop or withdraw at any time they feel and they were not under any obligation. Even before a respondent is given a questionnaire, his consent is sought before answering the questionnaire.



CHAPTER FOUR

ANALYSIS AND PRESENTATION OF FINDINGS

4.1 INTRODUCTION

Analyzed data collected from the field study will be presented and interpreted in this chapter. Presentations will take the forms of tables with frequencies, percentages and mean scores, and charts which were developed with Microsoft Excel and the interpretations will be based on analyses derived from the Statistical Package for Social Science (SPSS) software. Analyzed and presented data in this chapter are obtained from 180 workers and supervisors/managers of 6 construction companies which fall under the D1K1 and D2K2 categories in Accra, Ghana.

4.2 DEMOGRAPHICS OF RESPONDENTS

The demographic information of respondents to the study are detailed under this section of the chapter. The demographic details of respondents captured in this section includes their sex, age, level of education, basis of employment, position, years of work experience. This has been tabularized in table 4.1 below.

4.2.1 Sex Distribution of Respondents

It was ascertained that all respondents of the study are males, thus 138 respondents (100%). This could be as a result of the nature of work activities engaged in on construction sites. This is presented in table 4.1 below.

4.2.2 Age Distribution of Respondents

It was ascertained that 65 respondents (47%) being the majority had their ages ranging from 18 to

25 years, followed by 61 respondents (44%) who belonged to the 26 to 35 years' age group. Also, 8 respondents (6%) had their ages ranging from 36 to 35 years and 4 respondents (3%) happened to be 45 years old and above. This information is presented in table 4.1 below.

Table 4.1: Demographics of Respondents

VARIABLES	RESPONSE	FREQUENCY	PERCENT
Sex	Male	76	55%
	Female	62	45%
	Total	138	100%
Age (years)	18 – 25	65	47%
	26 – 35	61	44%
	36 – 45	8	6%
	45 and above	4	3%
	Total	138	100%
Level of Education	Basic	70	51%
	Secondary	66	47.5%
	Tertiary	2	1.5%
	Total	138	100%
Basis of Employment	Full time	25	18%
	Contract	43	31%
	Casual	70	51%
	Total	138	100%
Position	Manager/Supervisor	41	30%
	Frontline Workers	97	70%
	Total	138	100%
Work Experience (years)	1 – 5	50	36%
	6 – 10	29	21%
	11 – 15	56	41%
	16 and above	3	2%
	Total	138	100%

Source: Field Study, (2019)

4.2.3 Level of Education

One criteria employee consider in the employment of personnel into their organization is educational background. The study therefore sought to find out the educational level of employees. It was discovered that majority being 70 respondents (51%) have basic educational qualifications, followed by 66 respondents (47.5%) who possess a secondary level education. It was found that, as low as 2 respondents (1.5%) have been through tertiary education. This can be seen in table 4.1.

4.2.4 Basis of Employment

Upon employment, individuals are detailed on their terms of engagement with the company; either as a fulltime staff, contract staff or casual staff. In the case of the respondents of the study, as presented in table 4.1, it was ascertained that majority being 70 respondents (51%) had been economically engaged by their respective companies as casual staff, 43 respondents (31%) were employed as contract staff and the remaining 25 respondents (18%) being fulltime staff of their respective companies.

4.2.5 Position in Organization

Every organization ranks its employees hierarchically and assigns duties and responsibilities to them. With regard to the study, majority of respondents were frontline workers or labourers who directly performed construction activities on sight with their hands and energy. Statistically, 97 respondents (70%) are frontline workers while the remaining 41 respondents (30%) are managers or supervisors of the frontline workers. This can be seen in table 4.1 above.

4.2.6 Work Experience

The study sought to find out how long respondents have been working in the construction industry. As presented in table 4.1, it was ascertained that; 56 respondents (41%) have 11 to 15 years of experience in the construction sector; 50 respondents (36%) possess 1 to 5 years of experience; 29 respondents (21%) have been in the industry for a period of 6 to 10 years; and 3 respondents (2%) had 16 and more years of experience in the construction sector.

4.3 AWARENESS OF HEALTH AND SAFETY RISK FACTORS

Respondents of the study have chosen or have more or less found themselves pursuing economic activities in the construction industry; on construction sites. It is evident that they are exposed to a number of health and safety risk factors in carrying out their day to day activities on the construction sites. The study in this regard sought to find out whether they had knowledge or have been enlightened on the health and safety risk factors that may affect them negatively on construction sites. As shown in table 4.2, frontline workers generally were not being exposed to health and safety education on site. They also indicated that they had been involved in various incidents of site accidents and other injuries while working on construction sites. Again, it was discovered that some supervisors and managers were not adequately educated on site hence their involvement in various accidents and injuries on site during construction. Feedbacks derived from respondents are presented in table 4.2. Across the globe, the construction industry has been regarded as one associated with numerous risks, and this has been much of a concern to researchers, investors, professionals and other stakeholders in the industry. Smallwood et al. (2008) indicated that the construction sector is one of the riskiest economic engagements in the world. This is due to the numerous risks inherent in the undertaking of construction activities on site. A report by the International Labor Organization (ILO) (2005) estimated a minimum of 60,000 accidents

occurring in a year at construction sites across the world. It was further stated in the report that the construction industry contributes to about 25% to 40% of fatal accidents that occur in the world.

Table 4.2: Knowledge and Experience of Health and Safety Risk Factors

POSITION	QUESTIONS	Mean	Std. Dev	Rank
A. FRONTLINE WORKERS	1) Have you been educated on the health and safety risks on construction sites?	4.38	0.879	1 st
	2) Is there a time where you were involved in a fatal accident on site?	4.35	1.024	2 nd
	3) Have ever experienced a minor injury while working on site?	4.29	1.223	3 rd
	4) Are you of the view that wearing personal protective equipment influences productivity?	4.26	0.784	4 th
B. SUPERVISORS/ MANAGERS	1) Have you been educated on the health and safety risks on construction sites?	4.21	0.653	5 th
	2) Is there a time where you were involved in an accident on site?	4.17	0.864	6 th
	3) Have ever experienced a minor injury while working on site?	4.11	1.023	7 th
	4) Are you of the view that wearing personal protective equipment influences productivity?	4.09	0.879	8 th

Source: Field Study, (2019)

4.3.1 Knowledge of Health and Safety Risk Factors

Analysed data from the field study shows that an extreme number of frontline workers or labourers have not been educated on the health and safety risks they face on construction sites. However, the majority of the construction workers had not been enlightened on the subject. Statistically, 61 workers (44%) has been through education on safety and health risks on site, the remaining 77 respondents (56%) have not had that enlightenment, training or education with respect to health and safety risks on the construction site. This is presented in figure 4.1 below.

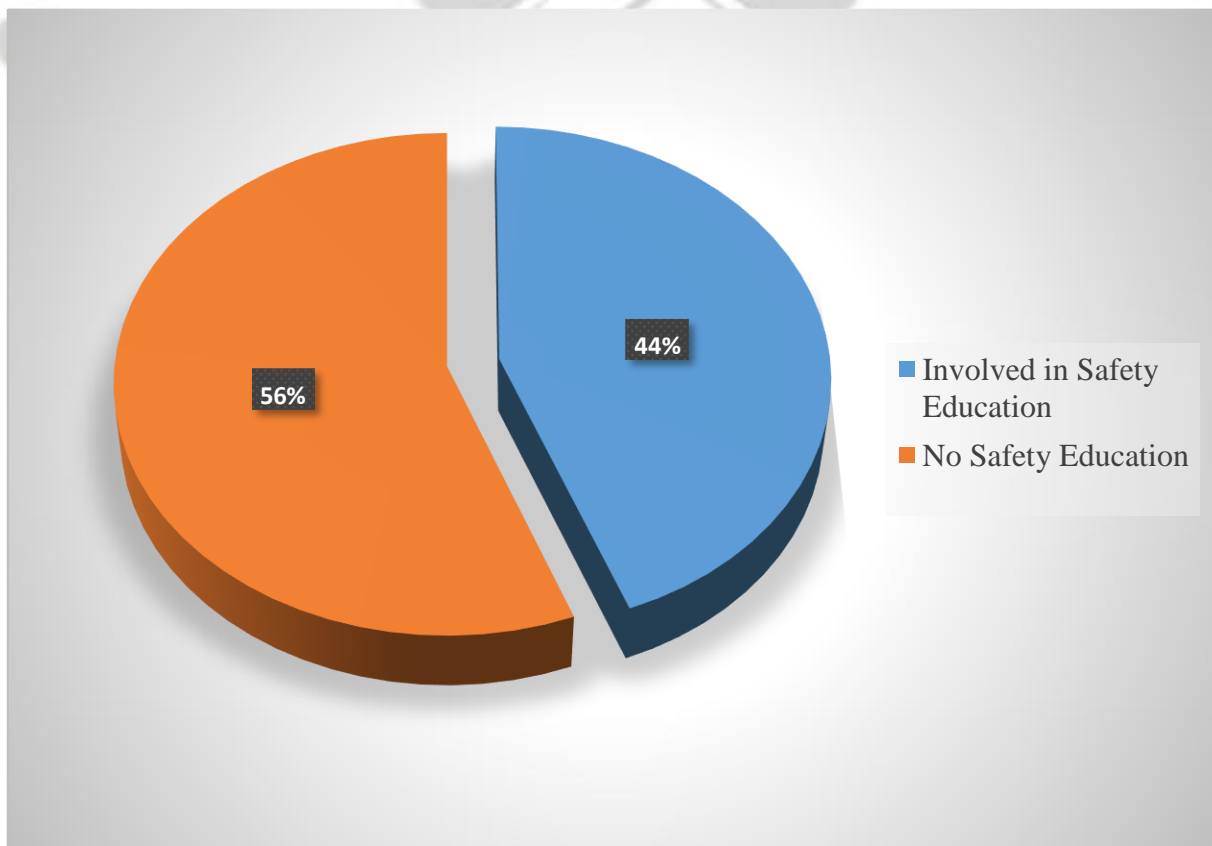


Figure 4.1: Level of Safety Education of Respondents

Source: Field Study, (2019)

It was also deduced that, 34 supervisors/managers (63%) have been educated on risk factors associated with construction sites but 20 of them (37%) have not had that opportunity. This is presented in figure 4.2 below.

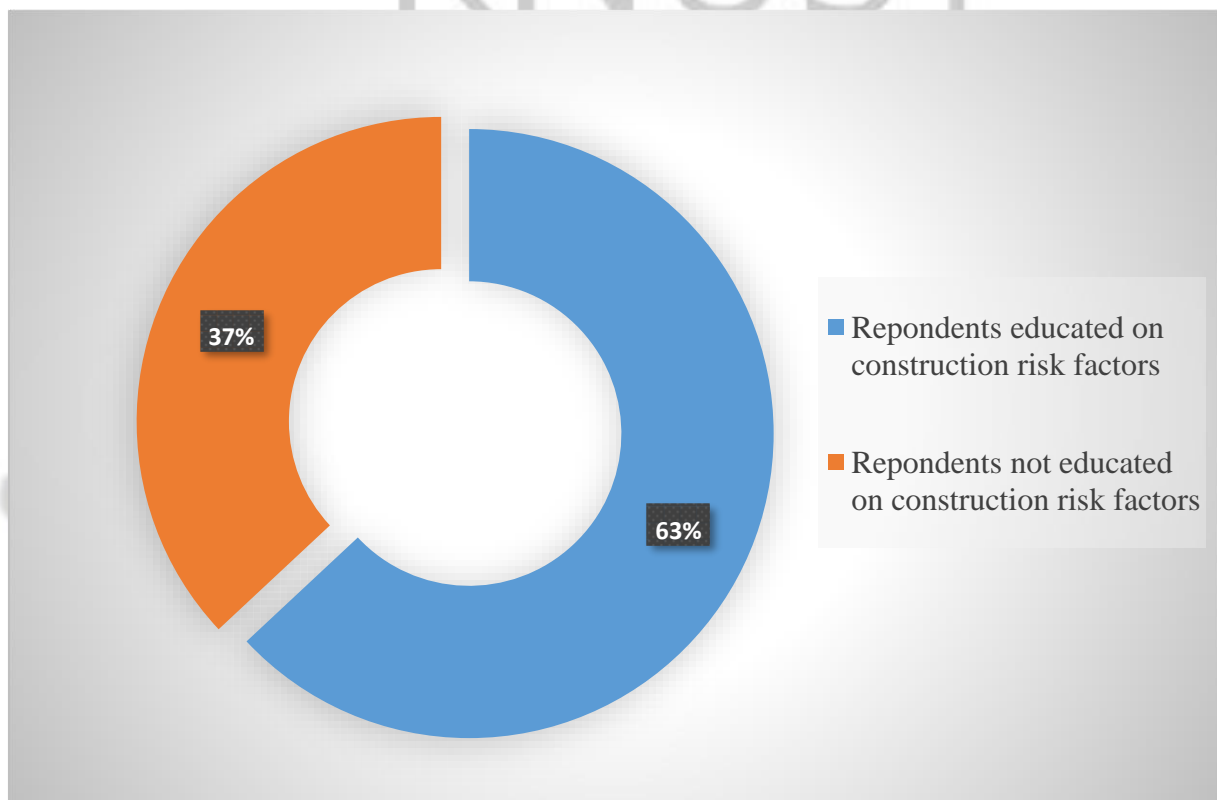


Figure 4.2: Level of education of risk factors

Source: Field Study, (2019)

The study further probed to find out where those who had been enlightened on the subject matter had their information. It was ascertained that majority of them were cautioned or enlightened by their colleagues, thus; out of the 138 respondents who gave positive feedback, 19 of them (34%) had their enlightenment from the co-workers on the site, 12 of them (21%) were directed or educated by their supervisors, 10 respondents (18%) claimed their construction firm trained them on safety at the site, 6 of them (11%) had been to training sessions relating safety risk in

construction and 9 of the 56 respondents (16%) educated themselves due to their self-cautious attitude. This is presented in the figure 4.3 below.

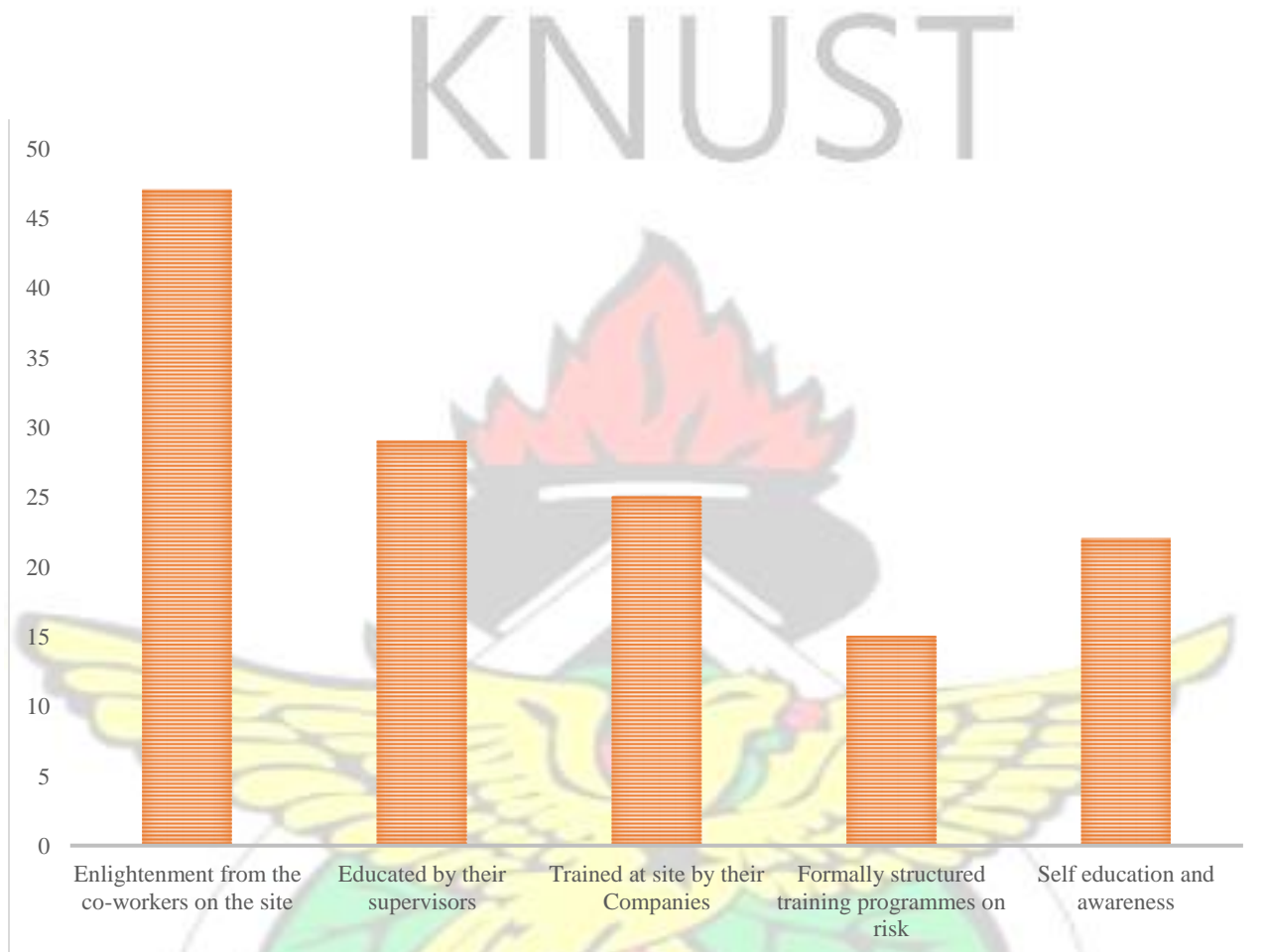


Figure 4.3: Sources of Training for workers

Source: Field Study, (2019)

4.3.2 Experience with Health and Safety Risks

The study further sought to find out if respondents have had an encounter with any health and safety risks through major and minor accidents. With regard to fatal accidents, it was ascertained that 6 workers (5%) have had fatal accident encounters on construction sites whereas the remaining 120 workers (95%) have had no fatal accidents on site. With regard to supervisors, 44 supervisors

(81%) have been involved in fatal accidents on site whereas 10 supervisors (19%) have never been involved in any fatal accident on construction sites.

In view of minor accidents, it was ascertained that 68 workers (58%) have been involved in minor construction site accidents whereas 58 workers (46%) have had no such experience as minor accidents. Feedback from supervisors showed that all of them (100%) have been involved on minor accidents on construction sites. This feedback has been tabularized in table 4.3 v above.

4.3.3 Personal Protective Equipment and Productivity

The opinions of respondents were sought to find out whether the provision and wearing of personal protective equipment will have a positive influence on the productivity of workers on construction sites. It was ascertained that all frontline workers (100%) are of the view that if they are provided with personal protective equipment, their productivity on the site will increase substantially. Furthermore, 90 supervisors (65%) being the majority are of the view that productivity is not influenced by personal protective equipment; the remaining 48 supervisors (35%) were convinced that the provision of personal protective equipment for frontline workers will positively influence productivity on construction sites.

4.4 NATURE OF HEALTH AND SAFETY RISKS AT CONSTRUCTION SITES

Unarguably, there are diverse risks at the construction site. It was therefore enquired of respondents to indicate the various risks they are exposed to on the site. The study therefore sought to know the nature of those risks; how workers who are prone to those risks feel assured or comfortable towards those risks while carrying out their day to day activities.

4.4.1 Risk Exposure on Construction Sites

It was enquired of respondents to indicate the risks they are exposed to on construction sites, while undertaking their normal duties. Respondents rated their rate of exposure to seven risks that are usually recorded on construction sites. Feedback derived is presented in Table 4.3.

Table 4.3: Risk exposure on construction sites

Risk Exposure on Construction Sites	Mean	Std. Dev	Rank
Respiratory problems	4.20	0.83	1st
Object falling from height	4.13	1.01	2nd
Skeleton disorder, back and neckbone problems	3.96	1.26	3rd
Hearing injury or problems	3.74	0.96	4th
Slipping and tripping	3.56	0.63	5th
Falling from height	3.42	0.87	6th
Machine aided accidents	3.16	1.08	7th

Source: Field survey, (2019).

Taking the very high and high responses into consideration (in ranking the exposure of risks), it was ascertained from table 4.4 above that workers at construction sites are mostly exposed to respiratory related problems which was ranked first with a mean score 4.2 followed by falling objects from height with a mean score of 4.13. Respondents also indicated that they are exposed to some skeletal disorder, back bone and neck bone injury which was ranked third with a mean score of 3.96. The fourth risk highly encountered by workers is hearing related problems due to loud noises from construction equipment, and other activities. It was ranked fourth with a mean score of 3.74. The fifth risk highly encountered by workers is slipping and tripping. It accounted

was ranked fifth with a mean score of 3.56. Machine and equipment related accidents was ranked the sixth risk with a mean score of 3.42 with machine aided accidents ranked seventh with a mean score of 3.16.

4.4.2 Level of Safety around Activity Inherent Risks

The study further ascertains how safe respondents working at construction sites feel around the risks inherent in the activities they have been assigned. Their response to safety may be influenced by their preparation, protection or cautiousness. Feedback derived is presented in table 4.4 below.

Table 4.4: Safety of Inherent Risks

Risk Factors Experienced on Construction Sites	Mean	Standard Deviation	Ranking
Working too close to other colleagues	4.23	1.00	1st
Noise (using block/brick cutting machine)	4.13	0.67	2nd
Slippery and Tripping floors	4.02	0.59	3rd
Bending and twisting e.g. while laying blocks	3.66	0.93	4th
Handling heavy load e.g. Carrying cement bags, blocks, etc.	3.66	0.96	5th
Working from a height	3.42	1.03	6th
Chemicals such as paints, lacquers, solvents etc.	3.69	0.84	7th
Dust (mortal/ cement)	3.51	1.06	8th

Source: Field survey, (2019).

It can be ascertained from table 4.4 above that working around colleagues with limited space is a risk worker are comfortable with. It was therefore ranked first as it attained a mean mark of 4.23, which happened to be the highest. The second ranked risk around which workers are comfortable around is the noise that emanate from machinery and equipment such as block cutting machines

and drills. Workers indicated that they are safe around such noise as it was ranked second with a mean mark of 4.13. In third is slippery and tripping floors at the site, it had a mean mark of 4.02. Workers are probably safe around this risk because it has less fatal consequences. In fourth is bending, stretching and twisting associated risks in the course of their duties. This risk element had a mean mark of 3.66, which was same as the mean of handling heavy load. However, the risk of bending and twisting came fourth due to it having a smaller standard deviation figure as compared to that of handling heavy load.

Workers at construction sites noted that they have some level of safety when it is work relating to the handling of heavy loads such as carrying cement bags, blocks and other building materials. This was ranked fifth as it assumed a mean mark of 3.66. In sixth is working from height, it assumed a mean figure of 3.42. The last but not least risk that workers somewhat feel safe around is chemicals, the use of chemicals in their activities. This safety association was ranked 7th with a mean mark of 3.69 and finally, working around dust was ranked 8th; as the least risk element workers feel safe around. It assumed a mean figure of 3.51, which was the least of the eight items.

Kheni (2008) identified a number of challenges with regard to health and safety at construction sites. They include; inadequate skilled human capital, insufficient government backing for regulatory bodies and inefficient institutional structures responsible for the supervision and policy formulation of health and safety standards and policies. It was further noted in the study that, construction industry of Ghana is dominated by small and medium scale enterprises; and within these construction firms is the significant existence of socio-cultural value systems most especially with extended family, traditional and religious systems. The research further discovered insights into the challenges inherent in the internal environment of SME construction firms in Ghana with regard to health and safety at their construction sites.

4.5 IDENTIFICATION AND MANAGEMENT OF HEALTH AND SAFETY RISK

FACTORS

This section is focused on feedback derived from managers and supervisors with regard to the identification of health and safety risk factors that affect workers on the construction site, how they manage them after identification, and the challenges that are associated with managing them.

4.5.1 Identification of Health and Safety Risk Factors at Construction Sites

Before supervisors and managers of construction sites can manage the health and safety risks on the site, they have to be able to identify the peculiar risks that is associated with the range of activities being held on their site. As indicated by Farooqui (2008) in the literature review section of this study; managers have to be able to predict the particular risks that are likely to occur, before they can put measures in place to manage them in the form of prevention, mitigation and contingencies. In light of this, the supervisor and managers of the study were asked to determine the mode by which they identify risk factors on their construction sites.

Table 2.5: Identification of Risk on Construction Sites

Risk Identification on Construction Sites	N	Mean	Std. Deviation	Ranking
Reference to historical experience	138	3.68	1.11	1st
Brainstorming	138	3.62	1.28	2nd
On-site assessment	138	3.36	0.95	3rd
Judgement/Realisation during activities	138	2.71	1.18	4th
Checklist	138	2.35	1.31	5th
Flow chart	138	2.07	1.23	6th
Assessment by risk department	138	1.90	1.00	7th
Engagement of external consultants	138	1.33	0.47	8th

Source: Field survey, (2019).

It could be ascertained from the table that eight risk identification methods were presented for the respondents to express their opinions with regard to their application in their course of duty.

Reference to historical experience was ranked first as it attained the highest mean score of 3.68.

This indicates that most of the respondents are of the view that risk on construction sites is mostly identified by paying attention to encounters and experiences of previous construction engagements, as well as those encountered during the early stage of the project undertaking.

Brainstorming was however ranked second with a mean score of 3.62; as the next approached engaged in the identification of risks on construction sites. This approach is usually engaged at the planning stage of the construction project. Ranked third is on-site assessment of risks, which attained a mean score of 3.36. This signifies that a number of the respondents are of the view that risks on construction sites are identified by supervisors during the course of carrying out the project. Ranked fourth is Judgement/realization during activities, with a mean score of 2.71. It can further be sighted on the table that Checklist attained a mean score of 2.35 and ranked the 5th approach usually used for the identification of risks on construction sites. This was followed by the use of Flow chart which was ranked sixth by a mean score of 2.07. The remaining two approaches, Assessment by risk department and engagement of external consultants were ranked seventh and eighth respectively, as they both attained mean scores of 1.90 and 1.33 respectively.

Source (Field Study, 2017)

4.5.2 Management Approaches towards Identified Risks

After risks have been identified, they have to be managed properly in order to prevent or reduce their impact upon occurrence. Further probing was therefore done to deduce from management, the approaches used in the management of identified risks. Six risk management approaches were presented to respondents to express their views with regard to their use on construction sites; these

include: the complete provision of first aid materials; the provision of personal protective equipment; provision of adequate warning posters and boards on construction sites; transfer of risks to insurance companies; organizing health and safety trainings for workers; and implementation of documented health and safety policies or programmes.

Table 4.6: Management Approaches to Risk Factors

Management Approaches to Risk Factors	N	Mean	Std. Deviation	Ranking
Complete provision of first aid materials	138	3.45	1.14	1st
Provision of personal protective equipment	138	3.16	1.40	2nd
Provision of adequate warning posters and boards on construction sites	138	3.09	1.34	3rd
Transfer to insurance companies	138	2.71	1.34	4th
Organising health and safety trainings for workers	138	2.57	1.43	5th
Implementation of documented health and safety policies or programmes	138	2.52	1.31	6th

Source: Field survey, (2019).

It was deduced from the study and presented in table 4.6 above that supervisors and management ensured that first made materials and kits are adequate on construction sites to cater for possible risks; as complete provision of first aid materials was ranked first with a mean score of 3.45. Provision of personal protective equipment was ranked second with a mean score of 3.16, which

indicates that a reasonable number of the respondents attest to the fact that management provides them with clothing outfits to protect them from site risks. Ranked third is the provision of adequate warning posters and boards on construction sites, as it attained a mean score of 3.09. This approach is adopted by management to caution site workers and visitors on possible dangers that may exist around their location and they may include; slippery floors; falling objects and noise to mention but a few. Transfer to insurance companies was ascertained from the opinions of respondents as the fourth most adopted approach in the management of risks on construction sites; and attained a mean score of 2.71. Organising health and safety trainings for workers and the implementation of documented health and safety policies or programmes attained mean scores of 2.57 and 2.52 respectively and hence ranked fifth and sixth accordingly.

4.5.3 Challenges Associated with the Effective Management Identified Risks

A health and safety risk on construction sites has gained much attention by researchers and contractors. It is therefore undeniable that managers and supervisors have been trying their best to manage the situation, but certain challenges may be hampering their efforts. Based on this assumption, the study delved into finding out what challenges' management seem to be facing in the implementation of effective management of the health and safety factors that occur on their construction sites.

Table 4.7: Challenges in effective risk management

Challenges in Effective Risk Management		N	Mean	Standard Deviation	Ranking
1	Financial constraints	138	4.65	1.00	1st
2	Negligence or human error on the part of workers	138	4.32	1.00	2nd

3	Less standard/quality site equipment	138	4.31	1.32	3rd
4	Unavailable risk policies or programmes	138	3.88	1.27	4th
5	Oversight of supervisors/managers	138	3.67	1.21	5th
6	Poor attitude of supervisors/managers towards risks	138	3.65	1.12	6th
7	Limited knowledge of supervisors in addressing risks	138	3.59	1.04	7th

From table 4.7 it can be deduced that the major challenge facing construction firms and their management is financial constraints. This challenge was ranked first as analyses from collected data indicated its mean mark to be 4.65, which was the highest among the list of challenges.

Negligence or human error on the part of workers was ranked second with a mean mark of 4.32. Supervisors are of the opinion that the negligence of the workers themselves impact their effort to manage health and safety risks on construction sites. In third is the provision of less standard or quality equipment that is provided for work on the site; it attained a mean mark of 4.31.

The unavailability of risk policies and programmes attained a mean of 3.88, hence ranked fourth among the challenges. This challenge is of the opinion that construction firms do not have structured policies regarding health and safety matters on their construction sites. In fifth is oversight of supervisors/managers, it attained a mean score of 3.67. This challenge refers to supervisors mostly undermining the impact of certain risks on the site, and ignoring the necessary precautions that has to be adhered to. The sixth challenge with a mean score of 3.65 is poor attitude of supervisors/managers towards risk; where supervisors are not really concerned about the risks on the site and when they become unresponsive to matters of risk to workers on site. The last but not least ranked is the limited knowledge of supervisors and managers in construction site risks and their management. It attained a mean score of 3.59 and ranked seventh on the list. **Source**

(Field Study, 2017)

4.6 CHAPTER SUMMARY

This chapter encompasses the analysis and interpretation of all data collected from respondents on the field. The direction of the detailed presentation of analysis in the chapter is towards the achievement of the set objectives outlined in chapter 1 of the study. In summary, majority of respondents were frontline workers or labourers from 40 D4K4 construction firms sampled for the purpose of the study. Majority of the respondents had their ages ranging from 18 to 25 years, and their level of education to be at the basic level. Most of the respondents have been employed as casual workers and the majority of the respondents have had 11 to 15 years of experience in the construction industry.

Most of the labourers on the construction sites have had no training or education on the subject of health and safety risks on the construction, unlike the supervisors and managers; majority of which had been enlightened on health and safety risks. It was ascertained that, while the frontline workers believed that having personal protective equipment will enhance productivity, the supervisors thought otherwise. It was further deduced from the report that respiratory related problems are dominant at most construction sites, probably due to the nature of materials they use for their engagements. Feedback from respondents also indicated that the kind risk with which they feel safe is working closely with co-workers, sometimes overcrowded areas.

Later in the chapter, it was ascertained that, supervisors and managers identify risks on construction sites mainly by making reference to historical occurrences, and what supervisors usually do towards managing identified risks on the site is to provide workers with first aid kit with all the necessary items in. Financial constraint was identified to be the major challenge supervisors and managers face in their effort to put more effective measures in place, towards the management of health and safety risks that are likely to arise on construction sites.

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CHAPTER FIVE

RECOMMENDATIONS AND CONCLUSION

5.1 INTRODUCTION

This is the final chapter of the study, and presents a summary of the findings analysed and interpreted in chapter four. Conclusions arrived at from the data analysed will as well be presented in this chapter. The study needs to satisfy a set of objectives in order for the endeavor to be successful, in that regard, the objectives that was set at the inception of the research will be reviewed in detail. Most importantly, recommendations based on the findings and purpose of the study will also be shared in this chapter.

5.2 SUMMARY OF FINDINGS

Analysis of data collected revealed that all respondents of the all respondents of the study were males. This is can be attributed to the nature of work and risks that are associated with construction. Most of the respondents have had only basic education, followed by those with secondary education. That notwithstanding, a lot of them have adequate years of experience in the industry. It was also ascertained that construction firms employ majority of their workers on construction on casual basis.

With the first objective, it was realized that, most of the supervisors have gained some level of training in health and safety risks than the workers who are being engaged with the actual on-site

activities that has these risks. A contrasting feedback was realized between the supervisors and the frontline workers with regard to the provision of personal protective equipment; management claimed it has no influence on productivity but the workers thought otherwise. From the analysis, it was realized that, construction firms have a satisfactory level of awareness on the health and safety risks on construction sites.

With the second objective, it was realized that, frontline workers are exposed to numerous risks on the construction site. These risks in order of impact include; respiratory related problems, skeletal disorders such as back and neck bone problems, falling from height, hearing related problems, slipping and tripping on the floor, machinery induced injuries, and objects falling from heights. It was also ascertained that workers have some level of safe assurance when undertaking certain duties. They include; working in close proximity to colleagues, noise from site machines and slippery and tripping floors. From the analysis, it was realized that, the most significant risk factor was working too close to other colleagues followed by noise.

With the third objective, it was realized that, supervisors and managers make use of historical experiences, on-site assessment, brainstorming, checklists, flow charts and others to identify risks on construction sites. After identification, measures such as provision of personal protective equipment, health and safety trainings, compliance-based supervision, provision of warning posters and boards to manage them. However, construction firms in their approach to managing these risks face challenges like financial constraints, employee negligence, less standard equipment and poor attitude of supervisors. From the analysis, it was realized that, the most significant approach to risk management was reference to historical experience followed by brainstorming.

With the final objective it was realized the most significant challenges to risk management was financial constraints followed by negligence or human error on the part of workers.

5.3 CONCLUSION

From the findings of the study, most of construction workers are engaged under casual employment terms. This informs the assertion that, construction firms will have significant variations in the caliber of workers they engage on different projects; making it difficult to maintain a risk inclined workforce. In that same vein, the numerous casual workers will discourage construction firms to undertake health and safety risk training for the workers; as the investment in that training will be useless right after the project or casual employment terms.

Supervisors and managers are of the view that, personal protective equipment does not have any influence on productivity. This informs the claim that, supervisors have a short-sighted perspective on the personal protective equipment, as they claim it has insignificant impact on productivity. They do not seem to know that the safety of the workers inspires morale, which goes a long way to impact productivity.

A number of challenges indicated by supervisors to be hampering their effort to manage health and safety risk factors actually source from their prerogative. The provision of site equipment is done by management sometimes through the request of supervisors, the documentation of safety policies, program and oversight with regard to health and safety risks are not external to management and supervisors, hence they are not pressing hard to eradicate these risk factors.

5.4 REVIEW OF OBJECTIVES

The study sought to meet certain objectives which were outlined beforehand, at this point, they will be reviewed to ensure that they have been accomplished.

To effectively manage something, adequate knowledge must be available to individuals of concern.

The study therefore sought to find out whether workers and supervisors who undertake their economic activities on construction sites are well informed on matters of health and safety risks that exist on sites. This objective was achieved after an analysis of the feedback collected from respondents.

It is after when health and safety risks existing on construction sites have been identified that proper measures can be put in place by managers and supervisors to manage them; either to prevent, mitigate or set contingencies. This objective has been equally met as frontline workers identified the risks that are being experienced on their various construction sites. They also indicated the inherent risks that they have some level safety assurance with.

As the adage goes, “there is no smoke without fire”. Every risk that occurs on the construction site is instigated by an elementary cause or challenge; and this is what the study sought to identify from the respondents of the study. Supervisors and managers of the study indicated a number of them, and rated them on a Likert scale.

The prime aim of the study is to identify proactive ways by which management and supervisors at construction sites can manage health and safety risk factors. Collected and analysed data presented a number of measures by which construction firms, managers and supervisors manage these risks on their construction sites. Furthermore, the recommendation of the study will throw more light on proactive measure that will enhance the management of health and safety risks.

5.5 LIMITATIONS OF THE STUDY

A number of limitations were experienced on various stages of the study. Nonetheless, the quality of the research findings derived and recommendations made are not negatively affected by these limitations. The duration under which the study was engaged was very limited; hence the scope of the study was reduced. Only D1K1 and D2K2 construction firms were engaged to meet the objectives of the study. There were some challenges in retrieving questionnaires from respondents, due to the sample size. Also, a number respondent did not fill their questionnaires as expected, reducing the number of viable questionnaires for analysis.

5.6 RECOMMENDATIONS

5.6.1 Recommendation for Direct Stakeholders

Based on the research findings and conclusions of the study, the following recommendations have been asserted:

- Flow charts should be mostly used to identify risks at construction sites. Every project is a unique engagement, and the risks of historic engagement may not be associated with the current project. However, the use of flow charts enables the identification of all activities that will take place in the delivery of a particular project; making it appropriate to identify the various risks that are inherent in the activities.
- Construction firms must develop and effectively implement safety policies, programmes and guidelines. This will enhance a structured supervision and an effective directive.
- Casual workers have to be totally trained with regard to health and safety on the site; convenient measures however must be put in place to keep them around for a long while for other projects, in order to benefit from the safety training investment.

- Construction firms, managers and supervisors should concede that the safety of workers on the field directly impacts productivity, and should hence be committed to ensuring their protection.
- Health and safety training and provision of personal protective equipment should be the two major risk management approaches engaged; as they are more preventive.
- A number of challenges that impede the effective management of health and safety risks source from their prerogative. In that respect, construction firms and their officials should develop commitment and endeavor to nullify that challenges that source from their end.

5.6.2 Recommendation for Further Research

Further research engagements should widen the scope of the research to encompass all the four categories of construction firms in the country. Focus group discussions and semi-structured interviews should be considered in the collection of data from respondents; as it may aid in the discovery of a more detailed information on the health and safety risks at construction sites.

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APPENDIX A

QUESTIONNAIRE FOR WORKERS

Dear Respondent,

This questionnaire is part of a research study to investigate “managing risks to health and safety at the workplace: a survey of construction workers” In partial fulfillment for the award of

Postgraduate Diploma in Occupational Health, Safety and Environmental Management. Please you are therefore assured of absolute confidentiality, hence do not provide your name on the script.

Instructions: Please choose your answers from the options provided or provide your own answer in the spaces provided if required. Thank you.

Section A: Demography 1)

Your Sex

Male ☐ Female ☐

2) Your age

20-35 ☐ 36-45 ☐ 46-55 ☐ above 55 ☐

3) Level of education

Basic (Primary to JSS) ☐ Secondary ☐ Tertiary ☐

4) Are you employed on the basis of

Full Time ☐ Contract ☐ Casual (daily) ☐

5) Experience in construction site activities (in years)?

1-5 ☐ 6-10 ☐ 11-15 ☐ 16 and above ☐

Section B: Awareness of Health and Safety Risks on Construction Sites

1) Please respond “Yes” or “No” to the tabularised questions.

Awareness of Health and Safety Risks		YES	NO
1.	Have you been educated or guided on the health and safety risks on construction sites?		
2.	Is there a time where you were involved in a fatal accident on site?		

3.	Have ever experienced a minor injury while working on		
4.	site? Are you of the view that wearing personal protective equipment influences productivity?		

2) If “Yes” to question 1 in the table, where did you get your guidance?

Self-caution ☐ from organization ☐ Short training ☐ My co- workers ☐ My supervisor ☐

Section C: The Nature of the Health and Safety Risks on the Construction Site

1) How safe are you feeling when you are working with your task (1=very safe, 2 =safe, 3=moderate safe 4 =not safe, 5= not safe at all)

Risk Factors Experienced on Construction Sites		1	2	3	4	5
1	Working at height					
2	Overcrowded site					
3	Handling of heavy load (carrying cement bags or blocks, etc)					
4	Chemicals such as paints, lacquers, solvents etc.					
5	Noise (using block/brick cutting machine)					
6	Dust (mortal/ cement)					
7	Bending, twisting while laying blocks/ bricks					

2) In your experience how probable do you think the following risk will occur in the task performance (5=very high, 4=high, 3=moderate, 2= low, 1= very low)

Risks Exposed to on Construction Sites		1	2	3	4	5
1.	Falling from height (Serious injury of fatal injury)					
2.	Falling object (blocks, bricks, debris) heating head body including feet					
3.	Skeleton disorder, back or neck problems from manual handling (carrying cement bags or bricks/blocks) arm injury					
4.	Machine and equipment aided accidents, injuries or fatalities.					

5.	Hearing problem from noise (eg. using block/brick cutting machine)					
6.	Respiratory problems (eg. Inhalation of dust from cement and chemicals)					
7.	Slipping and tripping					



APPENDIX B

QUESTIONNAIRES FOR MANAGERS

Dear Respondent,

This questionnaire is part of a research study to investigate “managing risks to health and safety at the workplace: a survey of construction workers” In partial fulfillment for the award of

Postgraduate Diploma in Occupational Health, Safety and Environmental Management. Please you are therefore assured of absolute confidentiality, hence do not provide your name on the script.

Instructions: Please choose your answers from the options provided or provide your own answer in the spaces provided if required. Thank you.

Section A: Background Information

1) Your Sex

Male ☐ Female ☐

2) Your age

20-35 ☐ 36-45 ☐ 46-55 ☐ above 55 ☐

3) Level of education

Basic (Primary to JSS) ☐ Secondary ☐ Tertiary ☐

4) Are you employed on the basis of

Full Time ☐ Contract ☐ Casual (daily) ☐

5) Experience in construction sector (in years)?

1-5 ☐ 6-10 ☐ 11-15 ☐ 16 and above ☐

Section B: Awareness of Health and Safety Risks on Construction Sites

1) Please respond “Yes” or “No” to the tabularized questions.

Awareness of Health and Safety Risks		YES	NO
1.	Have you been educated or guided on the health and safety risks on construction sites?		
2.	Is there a time where you were involved in a fatal accident on site?		

3.	Have ever experienced a minor injury while working on site?		
4.	Are you of the view that wearing personal protective equipment influences productivity?		

SECTION C: Identification and Management of Health and Safety Risk Factors

1) How are risk factors on construction sites identified?

Please rank your response on a scale 1 to 5 (1=not used, 2=least used, 3=not sure, 4=occasionally used, 5=mostly used)

Risk Identification Methods Used		1	2	3	4	5
1	Brainstorming among colleagues/superiors					
2	Reference to historical experiences					
3	Assessment by risk department					
4	Checklist					
5	Flow Chart					
6	On-site Assessment					
7	Judgment/Realisation during activities					
8	Engagement of external consultants					

2) What approach is adopted to manage identified risks?

Please rank your response on a scale 1 to 5 (1=not used, 2=least used, 3=not sure, 4=occasionally used, 5=mostly used)

Risk Management Approach		1	2	3	4	5
1	Provision of Personal Protective Equipment					
2	Provision of adequate warning posters and boards on construction site.					
3	Compliance based supervision with regard to risk and safety precautions					

4	Transfer to insurance companies					
5	Organising health and safety trainings for workers.					
6	Implementation of documented health and safety policies or programmes.					
7	Complete provision of first aid materials					

3) Challenges associated with the effective management of health and safety risk factors on construction sites.

Please rank your response on a scale 1 to 5 (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree)

Challenges in Effective Risk Management		1	2	3	4	5
1	Financial constraints					
2	Negligence or human error on the part of workers					
3	Poor attitude of supervisors/managers towards risks					
4	Unavailable risk policies or programmes					
5	Limited knowledge of supervisors in addressing risks					
6	Less standard/ poor quality site equipment					
7	Oversight of supervisors/managers					