EVALUATION OF PERSONAL PROTECTIVE EQUIPMENT UTILIZATION AMONG CONSTRUCTION WORKERS IN MOMBASA COUNTY, KENYA

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Evaluation of Personal Protective Equipment Utilization among Construction Workers in Mombasa County, Kenya

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

Signature…… Date……

Lilian Mwongeli Muema.

This thesis has been submitted with our approval as the University supervisors.

Signature…… Date……

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Signature…… Date……

Dr. Bernard Kirui
Egerton University, Kenya.

DEDICATION

I dedicate this work to my dear husband, my two daughters Mildred and Kate for their perseverance during this period of study and their continuous support. I also dedicate this study to my cousin Nelson and Rose for their support during data collection period. God bless all of you.

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ACRONYMS/ABBREVIATIONS

ANSI	American National Standards Institute
BCI	Building Construction Industry
BLS	Bureau of Labor Statistics
CI	Construction Industry
NCA	National Construction Authority
DOSHS	Director of Occupational Safety and Health Services
GDP	Gross Domestic Product
ILO	International Labor Organization
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Act
PPEs	Personal Protective Equipments
ROK	Republic of Kenya
WHO	World Health Organization

ABSTRACT

The construction industry is well known for being one of the most dangerous industries worldwide. It is labor intensive and requires much movement of materials and machinery within a confined area, leading to a high level of safety hazards. Building construction accidents bring about several adverse consequences such as loss of time, costs for medical treatment, injuries, disabilities and potential fatalities to the workers. Statistics on construction industry accidents prevalence show it is one of the most dangerous occupations in the world. Personal protective equipment can be used to reduce illness and injuries associated with it. This study aimed at evaluating utilization of personal protective equipment in construction industry in Mombasa County. The study employed a descriptive cross-sectional design. Purposive sampling method was used to select construction sites. The data was collected by questionnaires from 104 respondents giving a response rate of 100%. Majority of the respondents were male [89 (85.6%)]. All (100%) the respondents in this study were very much aware of the existence of injuries and ailments associated with working in the construction sites. Analysis showed that there was significant effect (χ^2=34.5, df=12, p=0.00) between awareness of the existence of injuries and ailments associated with working in the construction sites among the workers. The results showed that,(49)49.0% of the respondents confirmed the presence of the following Personal Protective Equipment in their workplace; safety boots, helmet, overall, heavy duty gloves, (2)2.0% dust masks, (5)5.0% ear masks, (10)10.0% helmet, (7)7.0% overalls, (3)3.0% used goggles and (2)2.0% heavy duty gloves. In total (79)76.0% of the respondents had never undertaken

any safety training especially on PPE use while (25)24.0% had undertaken safety training. There was no significant effect (χ^2=5.0, df=12, p=0.72) between training of workers on PPE use and any particular construction site.Though all workers indicated having knowledge on various health risks at the construction site, there was little evidence to show what had been done to reduce the extent to which workers are exposed to these hazards. Provision of PPE and safety training has not been adequately addressed by the contractors. The study recommended that contractors should provide PPEs to workers free of charge. Trained safety representatives should be employed in the construction sites; they should conduct regular safety training. This work has demonstrated the inadequacy on construction industry adherence to Personal Protective Equipment and the need for contractors to be regularly monitored by National Construction Authority to assure the safety of the workers.

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

The construction industry is one of the largest industries in any given society with many challenges of health and safety risks at the site. Construction workers face these risks because of exposure throughout the building process (Kirenga, 2004).A report by World Health Organization (WHO, 2002) identifies the risks faced by workers in the construction industry, detailing the work related diseases and injuries which have been aggravated, accelerated or exacerbated by workplace exposure and which may impair working capacity. It also notes that construction workers are exposed to a wide variety of health hazards at work and these exposures differ from job to job and this hazards are classified into three classes; Chemical, physical and biological hazards. In Kenya, it is noted that construction workers have continued to suffer from injuries and illness due to work related exposures (Makhonge, 2005).

Accidents are financially, physically and emotionally costly to individual workers, their families, their organizations and the nation as whole. These risks can be minimized by use of personal protective equipments if properly selected and worn by workers (Kirenga, 2004). Creating a safe and healthy workplace is therefore crucial hence occupational health and safety is important to everyone at workplace (Kirenga, 2004). Personal Protective Equipments (PPEs) plays a prominent role in ensuring overall health and safety on construction sites. PPEs includes the clothes offering protection against the weather which are intended to be worn or held against a person at work and which provides protection against risks to his health or safety (OSHA, 2007). According to annual report of Director of Occupational Safety and Health Services (DOSHS) report in Kenya (2009), the period between 2008 and 2009 recorded 3,099 (90.1%) accidents inclusive of fatality cases in the construction industry. This figure accounts only for the reported cases to the department hence does not give the real picture on the

ground. In the past Kenya's construction workers lost their lives and suffered severe injuries (DOSHS, 2009).

Kenya has put in place measures to reduce risks associated with workplace- including construction industry. In 2007, the Occupational Safety and Health Act was enacted. The Act has put in place specifications and measures that industries are expected to adhere to so as to improve health and safety at the work place by reducing the occurrence of accidents. National Construction Authority Act, Number 41 of 2011 is aimed at streamling, overhauling and regulating the construction industry in Kenya. The Act established the National Construction Authority which awards certificates of proficiency to contractors, skilled construction workers and construction site supervisors meaning that unqualified contractors are locked out of the industry. It is an offence to carry out any construction work without first having been registered with the Authority. The Act contains provisions on quality and safety standards of any construction work. The Authority is also charged with passing regulations from time to time on the quality of construction offered by contractors (NCA, 2011). The objective of the work was to evaluate the extent to which the contractors adhere to PPE provision in construction industry in line with NCA Act, 2011 and OSHA 2007 since recent statistics indicate an increase on accidents and incidents in construction sites.

1.2 Problem Statement

Unemployment and poverty are some of the major driving factors that make the residents of Mombasa County to work at construction sites. The job seekers will risk their lives by willing to work in life threatening environmental conditions unaware of the hazards involved or some just being ignorant. The construction industry being one of the major employer sectors in Mombasa County is coincidentally one of the highest risk sectors in the country predisposing workers to various harmful conditions (Swuste, 2008). There have been numerous accidents and incidences of fatalities in many construction sites as a result of failure to institute the requisite risk management

measures thereby leading to multiple accidents (DOSHS, 2009). Most accidents at the construction sites usually go unreported according to the directorate of safety and health services website. This is could be attributed to employee's lack of information and training about their rights. It is also difficult to obtain exact figures of individuals involved in an accident due to lack of documented information or records from either the project managers or relevant government agencies. The high demand for houses in Mombasa County has led to unplanned and uncontrolled development, demands for quick approval of building plans and lack of supervision in construction of buildings leading to poor standard buildings. Due to these factors, contractors sometimes compromise the safety of their workers by failing to provide them with proper PPEs or adhere to OSHA (2007) on safety of construction workers. The current prevalence of injuries due to inadequate use of PPE stands at 90.5% according to DOSHS website. There is also inadequate enforcement of Occupational Safety and Health Act (OSHA) on construction sites especially on the use of PPE. Information from the Ministry of Labour website (www.labour.go.ke/) indicates that the construction industry employs the largest number of both skilled and unskilled workers. These workers are employed either on permanent basis or on a temporary/casual basis and they are exposed to numerous accidents some of them being fatal and others leading to permanent deformities/disabilities. It is estimated by the International Labor Organization (ILO) that 10% of the gross domestic product (GDP) in the developing countries is lost as a result of occupation accidents and health hazards (ILO, 2007). In Kenya this might be attributed to employee's ignorance of their rights especially on PPE provisions (OSHA, 2007). This ignorance of the law has caused several fatal accidents in Kenya such as collapsing of buildings in major towns including Mombasa. It is against this background that the study evaluated the utilization of personal protective equipment among workers in the construction industry in Mombasa County which have been demonstrated to reduce the impact of accidents in construction sites (OSHA, 2007).

1.3 Justification of the study

This study assessed the type of PPE's used in relation to health conditions of the construction workers in order to propose recommendations that will help in proper usage of PPE's. The findings of the study will help protect the workers in these sites. It will recommend to contractors the need to improve use of PPE's hence promoting occupational safety and health (OSH) performance among the workers. Due to lack/inadequate documented accidents that occur at the construction sites in Mombasa county, this study will shed light on the level of awareness of the construction workers on the health and safety issues. The information that will be obtained from this study will enable the law enforcers and health officials in intensifying the implementation of Occupational Safety and Public Health Act. The results will also create awareness on the importance of training to the workers and the employers on the types of occupational health hazards at the construction sites and the types of the personal protective equipment that are supposed to be used while at work. Those who stand to benefit from recommendations of this study are workers and their families, enterprises, societies and the national economies as result of low impacts in case of accidents and incidences.

1.4 Objectives of the Study

1.4.1 Main Objective

To assess utilization of personal protective equipment in the construction industry in Mombasa County

1.4.2 Specific Objectives

1. To establish awareness of construction workers on occupational hazards, illness and injuries associated with construction industry in Mombasa County.
2. To evaluate the extent to which the workers are using the right Personal Protective Equipment in Mombasa County.
3. To investigate the training of construction workers on use of Personal Protective equipment in Mombasa County.

1.5 Research Questions

In order to achieve the objectives of the study, the following research questions were used to understand the levels of adherence to health and safety measures within the building construction industry.

1. What is the level of awareness of construction workers on occupational hazards and injuries associated with construction industry in Mombasa County?
2. What is the extent to which the workers are using Personal Protective Equipment in Mombasa County?
3. What is the level of training of construction workers on the use of Personal Protective Equipment in Mombasa County?

1.7Conceptual Framework

A conceptual framework is used in research to outline possible courses of action or to present a preferred approach to an idea or thought. They can act like maps that give coherence to empirical inquiry. A conceptual framework shows the interrelationship between independent variables and dependent variable. Independent variables are interrelated in one way or another and all influence the dependent variable. The current conceptual frame work will ensure that the objectives of the study are being achieved. The objective will be the guiding principal in the study and therefore will guide the methodology. The independent variable; Level of awareness, level of training, experience of workers, level of employment, supervision, policy/ legal provision, commitment of workers and project management will influence PPE utilization among the participants. All these variables were measured using questionnaire while some such as policy/ legal provision were analyzed during the site visit. In Kenya the policy/legal provision provides that every construction site should have a sign post which indicates the name of contractor, engineer, owner of the building, plot number and authorization by the local authority and the NCA.

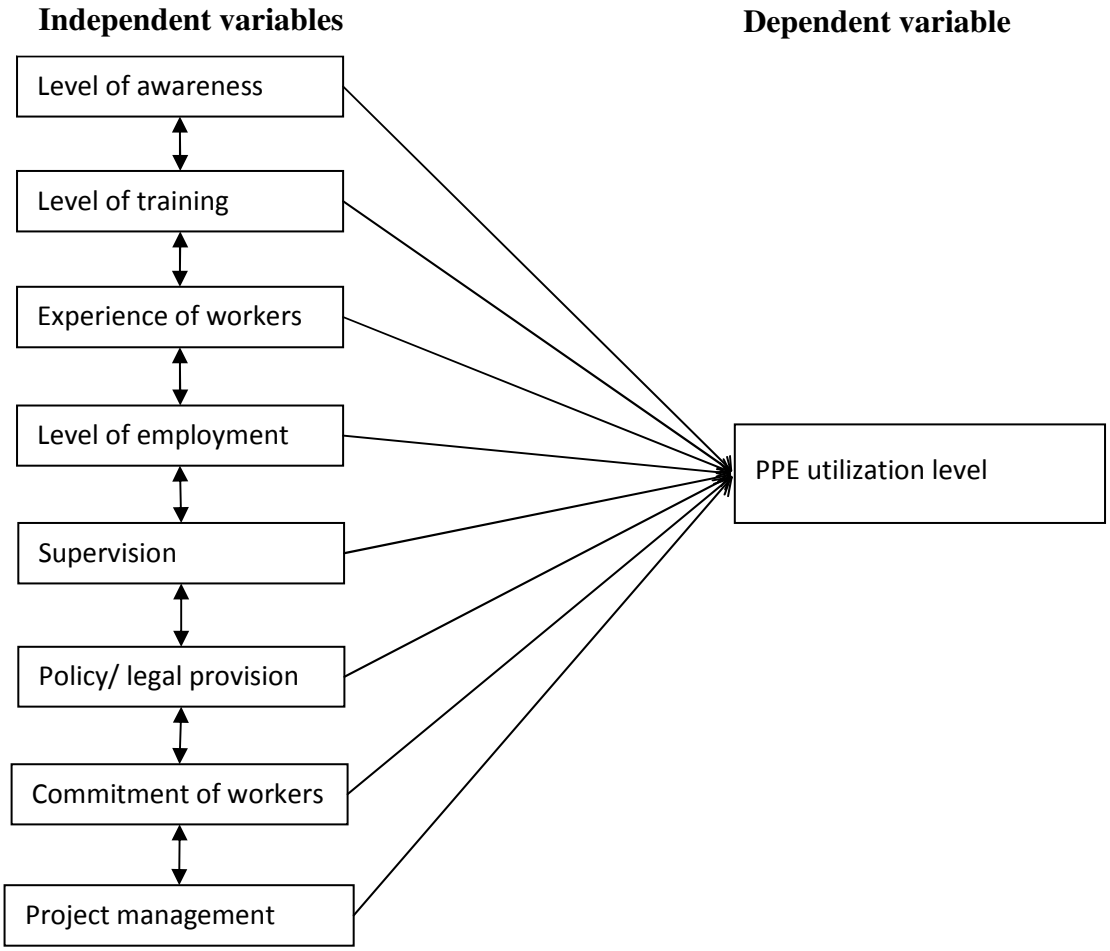

Figure 1.1: Conceptual framework adopted for the study

CHAPTER TWO
LITERATURE REVIEW

2.1 Theoretical principles

This study was anchored on Social Cognitive Theory, Health Belief Model, and Theory of reasoned action to evaluate utilization of personal protective equipment in construction industry in Mombasa County.

2.1.1 Social Cognitive Theory

This research compares theoretical constructs from social cognitive theory and other health behavior frameworks. This research assessed the potential contributions to health behavior intervention of self-efficacy/outcome expectancy Bandura (1997) and the stages of change Prochaska, DiClemente, & Norcross (1997), and compared the ability of self- efficacy/outcome expectancy versus stages of change to predict involvement in a behavior-based safety intervention process.

Throughout life, people strive to gain control of the various aspects of their environment. Individuals try to gain control over desired outcomes (or attainments) and achieve control over the undesirable events. From a social cognitive perspective Bandura (1997), people are exposed to various interdependent circumstances every day (i.e., reciprocal causation), determine the best approach to these situations, assess their perceived competence (i.e., self-efficacy) to carry out their intentions (i.e., human agency), determine if the behavior they perform will produce the desired outcome (i.e., outcome expectancy), and finally decide the importance of obtaining the outcome (i.e., outcome value)

Self-efficacy, originally defined as a person's belief in his or her ability to perform a specific behavior to produce an outcome Bandura (1997), has since been expanded by Bandura (1997) refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainment Efficacy beliefs can vary in level

(increasing difficulty of behavior), generality (similarity of behaviors), and strength (perseverance). From Bandura's (1997), people's self-efficacy influences many aspects of their every-day life. Once an individual's self-efficacy forms for a particular behavior or set of behaviors, these beliefs guide the person's aspirations, behaviors, efforts, and reactions. In other words, three interdependent factors, behavior, person, and environment, influence each other depending upon the situation. Construction industry is associated with a lot of occupational hazards hence the need to use proper PPE.

2.1.2 Health Belief Model (HBM).

The HBM has produced the largest body of health related research. It is also the only one that was specifically developed to explain health behavior. The HBM model has four basic components: (a) perceived susceptibility to the health problem or condition in question; in this study, occupational hazards are the key determinants (b) the perceived seriousness of the problem or condition; it refers to accidents, injuries and ailments associated with building construction industry (c) the perceived benefits associated with taking a particular action; benefits of using PPE in construction industry and (d) the perceived barriers associated with taking the action; how the PPE can prevent a workers from injuries (Becker,1974).

Published reviews of the HBM literature Becker (1974); Harrison, Mullen & Green, (1992); Janz & Becker, (1984) show considerable support for the model and offer some general conclusions about the relative importance of its major components. Perceived barriers have been shown to be the most powerful single predictor across all studies and behaviors. Perceived susceptibility and perceived benefits are also important, with susceptibility being more important for preventive than sick role behaviors. As might be expected, benefits are more important than susceptibility for sick role behaviors. In terms of the total literature, perceived severity appears to be the weakest of the four dimensions.

2.1.3 Theory of reasoned action

The TRA posits that behavioral intention is the immediate determinant of behavior and that all factors that influence a particular behavior are mediated through intention. Intention is determined by two components: (a) attitude toward the behavior, which consists of beliefs about the consequences of performing the behavior and the evaluation of those consequences; and (b) subjective norms, which consist of normative beliefs about what salient others think and the individual's motivation to comply with those wishes. According to the model, intention can be predicted by the linear combination of attitude and normative beliefs multiplied by motivation to comply with the beliefs. The model is expressed as a multiple regression equation, with the weights assigned to the major components determined by multiple regression procedures (Clearly, 1987).

The TRA has been applied with considerable success to a number of health behaviors, including PPE use, exercise, weight loss, child safety seats and condom usage Cleary (1987); Kirscht (1983); Sutton (1987). Besides its focus on behavioral intention, the most obvious difference between the TRA and HBM is that the TRA includes subjective norms as a major determinant of health-related behavior. The TRA also goes further in specifying how its constructs should be measured and how they combine to form behavioral intention. On the negative side, much of the research on the TRA has been confirmed to predicting behavior intention rather than actual behavior (Baranowski, 1993).

2.2 Legal frameworks

2.2.1 Legal frameworks in Kenya

In Kenya the Occupational Safety and Health Act of 2007 was enacted to safeguard construction and factory workers in terms of work place safety. In Kenya the health, safety and welfare of workers is the Occupational Health and Safety Act (OSHA) which was enacted in 2007. This Act was enacted to provide for the safety, health and welfare

of workers and all persons lawfully present at workplaces, and also to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The purpose of this Act is to secure the safety, health and welfare of persons at work; and to protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work. This Act applies to all workplaces where any person is at work, whether temporarily or permanently. Therefore the act and its provisions apply to the construction industry since the construction site is regarded as a factory. The Act provides for duties of both employer/occupier and the employees in ensuring the safety, health and welfare at work.

Health and Safety committee: The Act requires every occupier to establish a safety and health committee at the workplace in accordance with regulations prescribed by the Minister if there are twenty or more persons employed at the workplace; or the Director directs the establishment of such a committee at any other workplace

Health and Safety Audit: the Act in Section 11 requires the occupier of a workplace to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a safety and health advisor, and a copy thereof sent to the Director.

The OSHA Act (2007) part II 6 (1) states that every occupier shall ensure the safety, health and welfare at work of all persons working in his workplace. Without prejudice to the generality of an occupier's duty under subsection (1), the duty of the occupier includes;- (a) the provision and maintenance of plant and systems and procedures of work that are safe and without risks to health; (b) arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances; (c) the provision of such information, instruction, training and

supervision as is necessary to ensure the safety and health at work of every person employed (d) the maintenance of any workplace under the occupier's control, in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks to health; (e) the provision and maintenance of a working environment for every person employed that is, safe, without risks to health, and adequate as regards facilities and arrangements for the employees welfare. Therefore it is the duty of the employer to provide a safe working environment while the worker is required to work safely.

To ensure the greatest possible protection for employees in the workplace, the cooperative efforts of both employers and employees will help in establishing and maintaining a safe and healthful work environment. In general, employers are responsible for: Performing a hazard assessment of the workplace to identify and control physical and health hazards, Identifying and providing appropriate PPE for employees, Training employees in the use and care of the PPE, maintaining PPE, including replacing worn or damaged PPE, periodically reviewing, updating and evaluating the effectiveness of the PPE program. In general, employees should: properly wear PPE, attend training sessions on PPE, care for, clean and maintain PPE, and inform a supervisor of the need to repair or replace PPE (OSHA, 2007).

The history of OSH in Kenya dates back to 1950, with the introduction of the Factories Act. In 1990 this Act was amended to the Factories and Other Places of Work Act, to enlarge its scope. The Occupational Safety and Health Act (OSHA) and the Work Injury Benefits Act (WIBA) were enacted in 2007, and are now the principal laws that govern OSH in the country. Work Injury Benefits Act, 2007 (WIBA, 2007) is an Act of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes. It stipulates that every employer shall obtain and maintain an insurance policy, with an insurer approved by the Minister in respect of any liability that the employer may incur

under this Act to any of his employees. In Kenya, OSH is managed by the Directorate of Occupational Safety and Health Services (DOSHS). DOSHS is the designated national authority for collection and maintenance of a database, and for the analysis and investigation of occupational accidents and diseases, and dangerous occurrences. The Directorate's policy and legal mandate are provided by the National Occupational Safety and Health Policy of 2012, OSHA 2007 & WIBA 2007.

Building Operations and Works of Engineering Construction (BOWEC) Rules, 1984 of the Kenya laws states that the occupier should ensure the safety of the employee. It also states that engineering work should be in place in order to minimize the risks to the personnel and environment in terms of safety.

The Environmental Management and Coordination Act (EMCA), 1999, is the framework law on environmental management and conservation. The National Environment Management Authority (NEMA) was established as the principal instrument of government charged with the implementation of all policies relating to the environment, and to exercise general supervision and coordination over all matters relating to the environment. In consultation with the lead agencies, NEMA is empowered to develop regulations, prescribe measures and standards and issue guidelines for the management and conservation of natural resources and the environment. The Act provides for environmental protection through; Environmental impact assessment; Environmental audit and monitoring; Environmental restoration orders, conservation orders, and easements. Regarding EMCA's view on prosecuting workers, there are provisions in existing legislation for prosecuting workers for breaches of safety requirements. The Labour Department has been and will continue to enforce the relevant legislation and take out prosecutions against the workers concerned wherever necessary and appropriate (EMCA, 1999).

2.2.2 Legal frameworks in other countries

In USA, the OSHA Act also established the National Institute of Occupational Safety and Health (NIOSH), an independent research institute in the Department of Health, Education and Welfare now under-Centers for Disease Control (Ashford, 2009).The Act defines an employer to be any "person engaged in a business affecting commerce that has employees, but does not include the United States or any state or political subdivision of a State." The Act applies to employers as diverse as manufacturers, construction companies, law firms, hospitals, charities, labor unions and private schools (US-OSHA, 1999). The Occupational Safety and Health Act is the primary federal law which governs occupational safety and health in the private sector and federal government in the United States. It was enacted by Congress in 1970 and was signed into law the same year. Its main goal is to ensure that employers provide employees with an environment free from recognized hazards, such as exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress, or unsanitary conditions by providing them with protections such as PPE.

Other acts include the Personal Protective Equipment at Work Regulations 1992 which is set of regulations created under the Health and Safety at Work Act 1974 which came into force in Great Britain on 1 January 1993. The regulations place a duty on every employer to ensure that suitable personal protective equipment is provided to employees who may be exposed to a risk to their health or safety while at work.

Personal Protective Equipment (PPE) is defined in the regulations as "all equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work which protects them against one or more risks to their health and safety" (WHO, 2007). The PPE would include such things as hard hats, eye protection, safety harnesses, life jackets and safety footwear. The following are international regulations which stipulate that PPE should be used by workers for

protection; Control of Lead at Work Regulations 2002, Ionizing Radiations Regulations 1999, Control of Asbestos Regulations 2006, Control of Substances Hazardous to Health Regulations 2002, Construction (Head Protection) Regulations 1989 and The Control of Noise at Work regulations 2005 among others (ILO, 2012).

Safety culture is the ways in which safety is managed in the workplace, and often reflects the attitudes, beliefs, perceptions and values that employees share in relation to safety (Cox & Cox 1991). In other words, the way we do safety around here and within (ZCBI, 1991). The U.K. Health and Safety Commission developed one of the most commonly used definitions of safety culture: The product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management according to Flin, Mearns, O'Conner & Bryden (2000). Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety and by confidence in the efficacy of preventive measures according to Flin et al (2000). In Kenya where most of the contractors are chasing after profit, safety is always compromised. Again employees are most often than not employed as casual workers hence it is very difficult to entrench safety cultures (Frank bird, 1969).

2.3 Previous related studies

2.3.1 Safety and PPE utilization

Recent improvements in safety performance have taken place as a combination of efforts of owners, contractors, subcontractors, and designers. The owners' involvement has shown to favorably influence project safety performance by setting safety objectives and participating in safety management during construction (Huang & Hinze, 2006). Despite the dramatic improvements in safety that have taken place in recent decades, the safety record in the construction industry continues to be one of the poorest (Huang & Hinze, 2006).The industry is consistently ranked among the most dangerous

occupations accounting for a disproportionately large percentage of all work-related illnesses, injuries, and deaths in the United States Center to Protect Workers' Rights, 2005.According to the National Safety Council, the economic impact of fatal and nonfatal injuries amounted to $625.5 billion in 2005(NSC, 2005).Construction related injuries representing a substantial chunk of that number. The U.S. Bureau of Labor Statistics of 2005 shows that constructions overall lost-days, nonfatal occupational injury and illness incidences rate (239.5 cases per 10,000 full-time workers) has been higher than any other industry sector (Rizwan, Ahmed, Panthi & Azhar, 2010).

Construction industry is one of the booming industries in the world and also the most dangerous one. According to Richard (1999) dangers looming at construction industry sites dates back to the ancient times before the advent of Occupational Safety and Health Act. The researcher further states that responsibility to control hazardous conditions has been well documented during King Hammurabi of Babylonia in approximately 2200 BC who is credited in putting in place legislation to ensure there was control and prevention of hazards in the construction industry. Personal Protective Equipment (PPE) at work means all equipment which is intended to be worn or held by a person who is at work and which protects him or her against one or more risks to his or her health and safety. Personal protection is one of the important measures to safeguard workers from exposure to occupational hazards (OSHA, 2007).

According to ILO, (2005) China workers in construction sites are exposed to hazardous substances and physical agent's such as asbestos, lead, silica dust, organic solvents, welding fumes, radiation, noise and vibration. Excessive exposures to these substances can result in acute injuries, chronic illness, permanent disability or even death. Loss of concentration at work and fatigue arising from poor health condition may increase the risk of accidents. Personal Protective Equipment plays a prominent role in ensuring overall health and safety on construction sites if they are properly utilized by workers (ILO, 2012).According to a survey carried out in Hong Kong construction workers in

China, it was found out that awareness and understanding of the health and safety hazards is insufficient. Moreover, workers are not familiar with the risks involved in lack of use of PPEs. The lack of training on health and safety issues causes low awareness of health and safety which would make worker more vulnerable to illness, and thus low health and safety performance (Fung & Tam 2008; Schenker, Orenstein, & Samuel, 2002).

In UK studies showed that some construction site workers continue to have a rather low utilization of protective clothing, but even more worryingly, that little was being done in terms of training or education to rectify this situation. Some health and safety managers lacked knowledge about different PPE product specifications and which clothing would be most suitable for their workplace (Tylor, 2011).If the items of protective clothing are uncomfortable and slow down work process, then they are less likely to be worn, which increases the probability of accidents and heightens the risk that they will suffer injury. On the other hand, if clothes fit properly and do not impede the wearers' ability to do their job, they are much less likely to suffer a costly lapse in concentration or make a potentially lethal mistake (WHO, 2011; ILO, 2012).The PPE should be suited to the environment and properly selected for the individual and task, readily available, clean and functional, correctly used when required and maintained by appropriately trained staff in accordance with personal protective equipment maintenance and servicing program. These programs should be developed from manufacturers' recommendation in regard to servicing the equipment, if required (Taylor, 2011).

In survey carried out on knowledge attitude and practice on PPEs to rattan craftsmen in trade village in Vietnam showed that majority of the workers had low knowledge on PPEs and also the usage was low (Cong, 2008).In Hong Kong, the main contractors are legally responsible for the construction projects but 95 percent of construction projects were subcontracted to the individual subcontractors who are the actual employer of

those construction workers. In early years, construction workers were not well educated since most of them were not skilled hence did manual work. In practice, their friends or relatives recruited most workers. In the past, they would not be trained formally on safety while working in the construction sites. Lack of safety awareness and unsafe behavior are claimed common problems of site safety management (Zohar, 2000).

A study done in Nigeria by Joel (2007), found that PPE devices are designed to interpose an effective barrier between harmful object and environment. Personal protective devices should meet the following requirements before they are considered adequate; it should provide maximum comfort and minimum weight compatible with the protective efficiency, ensure adequate production from the hazards to which the workers will be exposed, be durable, impose no restriction on essential movements or work or objections, have maximum attractiveness in appearance and be constructed in accordance with acceptable standards for performance and for the materials. Another study on awareness and use of PPEs among workers in funeral homes in Lagos State found out that some workers (50%) had good knowledge about PPEs though the utilization of the same was low thus exposing them to workplace hazards (Adeleji, 2012).

The main requirement of the PPE is that personal protective equipment is to be supplied and used at work wherever there are risks to health and safety that cannot be adequately controlled in other ways. The Regulations also require that PPE is properly assessed before use to ensure that they are suitable, maintained and stored properly. They should be provided with instructions on how to use it safely and should be used correctly by employees. Workers must wear protective clothing as a legal requirement (OSHA, 2007).

The status of occupational health and safety conditions in Kenya is an issue of growing importance to the industrial practitioners, the government and consumers. The issues

are anchored in the Ministry of Labour. In Kenya, a subsidiary legislation (legal notice no. 30) was enacted in 2004 and OSHA (2007) to ensure workers in risk work places wears PPEs. The utilization and knowledge of PPEs is low in Kenya. Workers are also not trained prior to employment by their employers. The Ministry of labor reports more than half of the industrial accidents and injuries go unreported and most of the reported ones are seeking for compensations under workman's Act. Occupations are injury prone while matters of safety are treated casually by both the employee and the employer. Decent work must be safe and there is a long way from achieving the goal especially in developing nations including Kenya. (www.ttl.fi/en/publications/.../african_ newsletter/pages/default.aspx, ILO, 2015).

In most literatures studied PPEs were not always provided. Even where PPEs were provided some did not fit the intended user in this study. In a different study among pesticide sprayers, PPEs were not provided to some staff. Even among those who were provided, some were either unfit (18%) or 29% were worn-out according to studies of Mekonnen & Agonafir (2002). In another study on paramedics in USA, lack of access to safety devices like PPE was identified as the major barrier to their use. Some studies associated improved use of PPEs to availability. Indeed there was up to 40% increase to its use when the devices were always available (Mathews, Leiss, Lyden, Sousa & Ratcliffe, 2008). This shows that provision of PPEs would improve its utilization. There are other studies where everyone had 100% access to PPEs and yet the utilization was not optimal. This is particularly observed in hospital settings (Visentin, Bondy, Schwartz & Morrison, 2009).

Other studies have shown that even during outbreaks, PPE was still not worn by all staff e.g. in outbreak of Severe Acute Respiratory Syndrome (SARS) the proportion of staff that always wore PPEs were as follows: 19.3% (eyewear), 91.5% (N95 respirator), 7.9% (open face hood), 35.7% (face shield), 41.0% (gown), 39.2% (double gloves) and 7.6% (airway filter) (Visentin *et al.,* 2009). Interestingly in such biological hazards, like

seen in hospitals, where the hazard is infectious, use of PPEs was observed to not only protect the worker but result in significant reduction in nosocomial infection among hospital staff e.g. during SARS epidemic (Chia, Koh, Fones, Qian & Ng, 2005; Shaw, 2006). The results of these other studies on PPE utilization concurs with what was observed in this study.

Many reasons have been identified for not wearing PPEs depending on the occupation and type of PPE. In a personal protective equipment report of 2009 (Tan, Goh & Lee, 2005), those who wear PPE gave the following reasons: my boss tells me to wear it (21%), I could get sacked if I do not wear it (19%), I want to protect myself (85%), I want to go home after work (30%); I do not want to be ill when older (18%). From the statement above, two important reasons for compliance with PPE are fear of Managers and fear of ill-health from work hazards (Salazar, Connon, Takaro, Beaudet & Barnhart, 2001). Salazar *et al.,* (2001) in industrial sector in Washington State identified several factors for nonuse of respirators, the commonest of which are that it affected their communication and vision and also caused discomfort. Other determinants they identified were risk of exposure and efficacy of the PPE. Geer, Ann, Curbow, Diener-West & de Joode (2007) also observed similar reasons for nonuse of PPE for dermal exposure amongst industrial workers in the US. Another study reported low use of respirator among farmers using pesticides in Australia (Macfarlane, Chapman, Benke, Meaklim, & Sim, 2008). Indeed if farmers believed that the health risk was low they were less inclined to wear respirators (Mitchell & Schenker, 2008). In the health sector the main reasons for not wearing PPEs are emergency situations and interference of the PPE with patient care (Nickell, Crighton, Tracy, Al-Enazy & Bolaji, 2003; Tan *et al.,* 2005). However, in some cases, the reason for not wearing it is non availability (Tan *et al.,* 2005).

Norkaew (2013) in a study suggested that regular public health education and training programs including how to use appropriate PPE should be organized for workers to

improve their ability to handle occupational safety practices and health. Similarly, 43.5% of workers in a similar study reported that they had not received formal information regarding PPE (Acharya, 2014). Elsewhere, earlier studies have suggested that safety training on workers have a positive effect on the occupational safety and health behaviour among the construction workers (Lingard, 2002; Tam, Zeng & Deng, 2004; Rossi, 2009). Contrary to usual norms a worker who has a PPE is about 8 times more likely to incur a hazard than a worker who doesn't have PPE due to carelessness (WHO, 2007).

2.3.2 Hazards in Construction Industry

Workers in a construction site may be exposed to various hazardous substances and physical agents including and not limited to; asbestos, lead, silica dust, organic solvents, sewer gases, welding fumes, radiation, noise and vibration. Excessive exposures to these substances/agents may result in acute injury, chronic illness, permanent disability or even death. Loss of concentration at work and fatigue arising from poor health conditions may increase the risk of accidents (Wignore, 2001; Tse, 2001). Health hazards in the construction industry can be grouped under chemical hazards, physical hazards and ergonomic hazards: Chemicals can affect the body via inhalation, ingestion, or skin absorption, physical hazards include noise, heat, vibration and radiation and ergonomic hazards include mainly manual handling of loads. Safety hazards include falls from tall buildings, Caught-between hazards, Struck-by hazards and Electrocutions (Tse, 2001).

2.3.3 Personal protective equipment

The PPE's is used to reduce or minimize the exposure or contact to injurious physical, chemical, ergonomic, or biological agents. A hazard cannot be eliminated by PPE, but the risk of injury can be reduced. For example, wearing hearing protection reduces the likelihood of hearing damage when the ear plugs or muffs are appropriate for the kind of noise exposure and they are used properly. As an interim (short term) measure before

controls are implemented, where pre-contact control technology is not available, where pre-contact controls are inadequate, during activities where pre-contact controls are not feasible or effective and during emergency situations (OSHA, 2007)**.** They should only be used if and only if exposures cannot be adequately controlled by Elimination, Substitution, Separation/isolation and Reduction in frequency and duration of exposure. They should be selected with care, training program should include selection, maintenance, and user training and supervision should be set to ensure PPEs reduce exposure to hazards which causes injuries and illness (OSHA, 2007; Taylor, 2011). The principle requirement is that PPEs are to be supplied and used at construction work because there are risks to health and safety that cannot be adequately controlled in other ways (WHO, 2007). The Management of Health and Safety at Work Regulations should set out a hierarchy of controls of health risks. The hierarchy is as follows: Elimination, Substitution, Separation/isolation and Reduction in frequency and duration of exposure, PPE and Signage/ information (Graves, 2000; Saari, 2006). The employer is responsible for ensuring that the PPE provided for use at work are fit for purpose, fits the person and provided free of charge (OSHA, 2007; Wignore, 2001; Cong, 2008; CCOHS, 2003; Bishop, 2006; Joel 2007).

CHAPTER THREE
MATERIALS AND METHODS

3.1 Study design

In this study, cross-sectional design was used which is a research strategy that was ideal for this study as it intends to present facts concerning the nature and status of a situation, as it exists at the time of the study and to describe present conditions, events or systems based on the impressions or reactions of the respondents of the research. A reconnaissance trip was carried out to determine the location and total number of registered construction sites in Mombasa County. This information was obtained from the Ministry of Labour in Mombasa County.

3.2 The study area

The study was conducted in Mombasa County located in the coastal region of Kenya. The county lies between latitudes 3°56' and 4°10' south of the equator and longitudes 39°34' and 39°46' east. According to the 2009 Census Mombasa County population stood at 939,370. The major development challenges include among others; poor road networks, rapid urbanization and housing problems, inadequate education facilities, inadequate health care delivery points, high unemployment levels among the youthful, insecurity, weak land ownership regime, perennial water shortages and growth of unplanned and informal settlements (KNBS, 2009). Administratively, the County is segregated into seven divisions, eighteen locations and thirty sub-location and hosts six constituencies namely Mvita, Changamwe, Jomvu, Likoni, Kisauni and Nyali (Figure 3.1). The choice of the site was based on the many unplanned buildings in the county and inadequate use of PPE among the workers in the construction sector in the County.

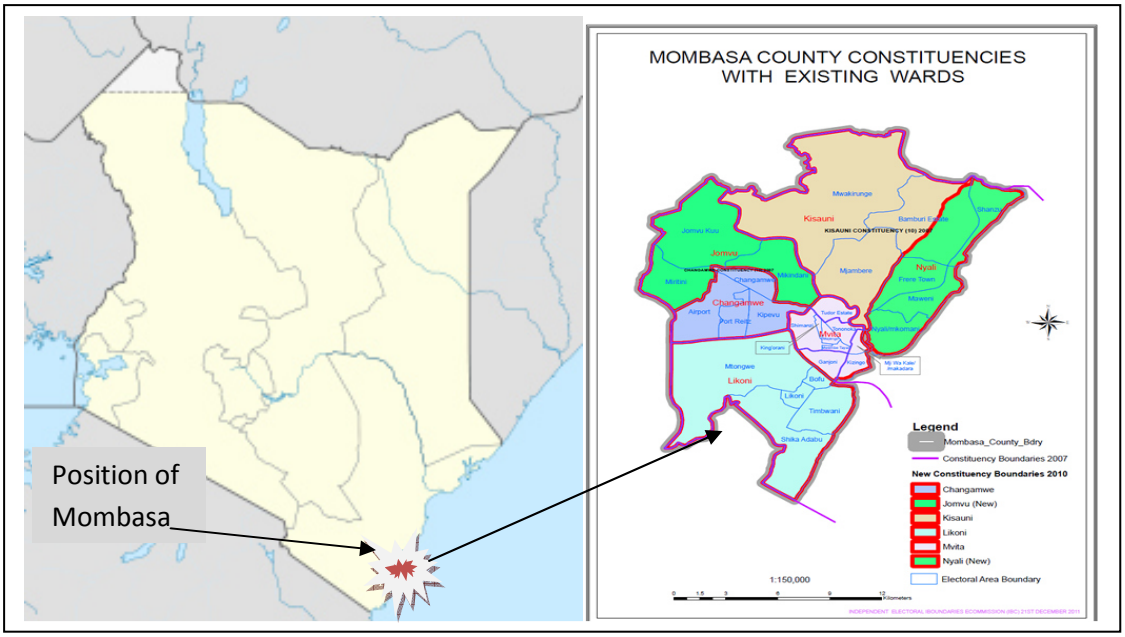

Figure 3.1: A Map of Mombasa County

Some of the registered construction companies operating in Mombasa includes; ANR Constructions, ANK Renovators Ltd, Ariay Builders, Betogo Contractors, Bhudia Construction Co.Ltd, Bilkon Builders, Capital Construction Co.Ltd, Cirago Builders, Coast Builders, Continental Flooring Works , Dadars & Heavens Ltd and Daje Enterprises Among Others (Ministry of Labour records, 2013). However, many others exists which do not adhere to the NCA (2011) and OSHA (2007) and were not considered on this study.

3.3 Target population

The study involved only the sites that were registered by DOSHS as per the time of the study (2013) with a target population of 800 workers as per the record. This target groups were employees working on permanent, temporary and casual basis.

3.4 Exclusion Criteria

The considered workers who were 18 years and above and excluded minors who were 18 years and below and those unwilling to participate.

3.5 Sample Size Determination

Sampling frame consisted of all construction workers aged above 18 years. Minimum sample size was calculated using the method of sample size determination derived by Bartlett, Kotrlik, & Higgins, (2001) as shown in Appendix 7. To select the participants in this study, construction workers were recruited randomly during lunch break. The total numbers of construction workers were 800 so the sample size was 104 considering data was continuous and at 95% confidence interval. There were26 construction sites in the study area during the study period, only 13 sites (50%) were selected for study according to Mugenda & Mugenda (1999) 50% is adequate for analysis and reporting. Purposive method was ideal because the study sampled the sites that had been authorised by the National Construction Authority (NCA). The selected sites had uniform PPE requirements because they were above two storeys. The 13 sites had been registered by the Mombasa County and certified by National Construction Authority and were two storeys and above. In each site, 8 participants were randomly selected to participate in the study because the number of construction workers in all the sites was almost the same.

3.6 Validity of research instrument

The term validity indicates the degree to which an instrument measures the construct under investigation. For a data collection instrument to be considered valid, the content selected and included must be relevant to the need or gap established. The validity of the instrument was tested using a pilot study where variance and acceptability was tested.

3.7 Reliability of research instrument

Reliability in research is affected by random errors. The reliability of the research tools was tested by subjecting the research instruments to various sites and obtained data analyzed within 95% confidence intervals (CIs).

3.8 Data management and analysis

Data forms were scrutinized for logical inconsistencies; skip patterns and missing values. The data was coded and double entered into a relational database on Microsoft Access. The data entry interface was designed to check for referential integrity, missing values and acceptability constraints. Errors identified at any level were referred back to the note books for correction. The percentages and their 95% confidence intervals (CIs) were presented. The data was analyzed using the statistical package for social scientist (SPSS) version 20. The factors that influence Occupational health and safety, research variables under investigation and data from different construction sites were compared using Chi Square Test. The results are presented in form of frequency tables, pie charts, photographs and bar graphs.

3.8 Research permission

Due to sensitivity issues matters of this study ethical issues were highly upheld to at all phases of the study. The permission for conducting this survey was obtained from the Mombasa Campus of Jomo Kenyatta University of Agriculture and Technology (Appendix 1).This study was conducted in a normal setting and the research questionnaires were coded to exclude the names of the respondents hence protecting their identity. Consent of the respondents was sought and an assurance of confidentiality affirmed. Questions were explained to the workers before the interview and they were given freedom to stop or withdraw from the interview at any time. All the questionnaires and the interview forms that were used in data collection were held in confidence.

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1 Response rate

All the respondents filled in and returned the questionnaires giving a response rate of 100%. Response rate was excellent and the respondents were willing to participate in the study. Babbie (2007) suggests that in research a response rate of at least 50% is considered adequate for analysis and reporting; a response of 60% is good; a response of 70% is very good; a response of 80% and above is excellent". According to Mugenda and Mugenda (1999) a response rate of 50% is adequate for analysis and reporting while 100% response rate is excellent.

4.2 Respondent characteristics

4.2.1Participants gender

Majority of the respondents were male [89 (85.6%)] while female were very few [15(14.4%)] in this study (Figure 4.1). Most often than not, work in construction sites require strength and masculinity that's why it attracts more males than females as seen in this study. Hard work with high occupational risk is always done. The results on gender concur with a similar study by Acharya (2014) on Utilization Pattern of Personal Protective Equipment among Industrial Workers of Nepal, majority of the respondents were male (68.4%). Kimeto (2014) in his study on safety provision among tea factory workers reported that male workers in the factories were high (75.0%) compared to their female counterparts (25.0%). Ogula (2005) also observed similar results.

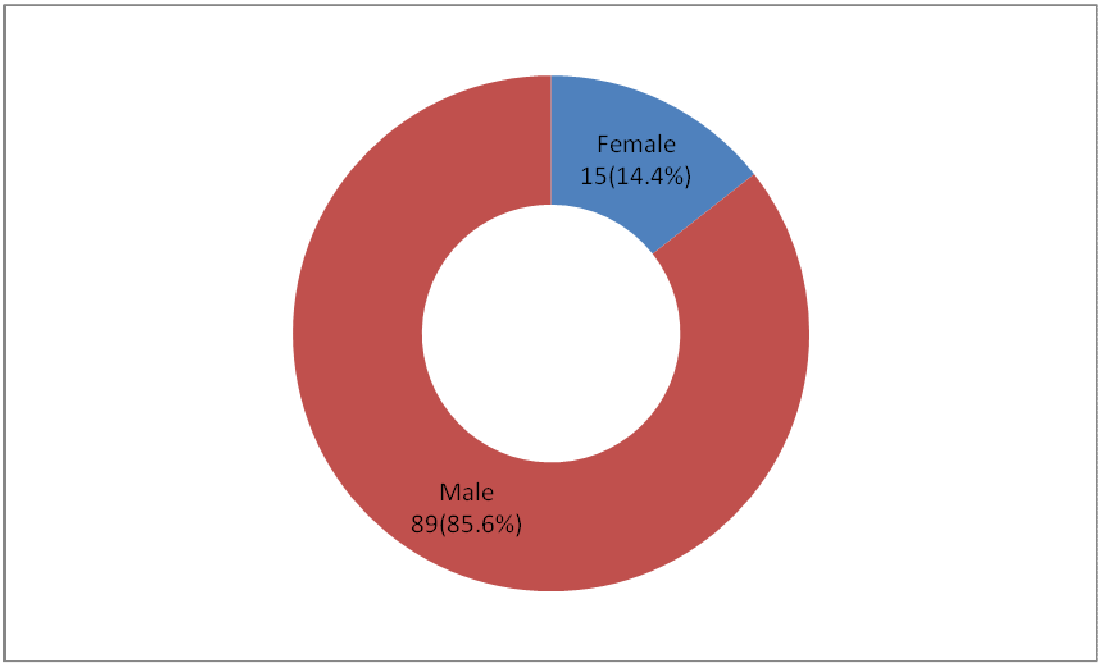

Figure 4.1: Gender of the construction workers (participants)

4.2.2 Participants' age

According to this study, 2(11.7%) respondents were aged between 18-20 years, 18(17.5%) were between 21-25 years, 20(19.4%) were aged between 26-30 years, 19(18.4%) were aged between 31-35 years, 22(21.4%) were aged between 36-40 years, 11(10.7%) were aged between 41-45 years and 1(1%) was over 46 years. Only one participant did not know his/ her age or was not sure since it was not indicated in the questionnaire (Figure 4.2).The results on age of participants concurs with a similar study by Khairuzzaman, Chowdhury, Zaman, Al Mamun & Bari (2014) who found workers age ranging being between 25 and 60 years with a majority being in the age group of 30–40 years.

Most of the employees (50.5%) were in the age group 31-45 years old and are considered to be middle age, age group 18-30 are considered to be young generation while 46 years and above are considered to be old age since working in construction site require a lot of energy according to (ILO, 2007). In this study construction work

attracted middle age people because of the need to feed their families. Acharya (2014) in a similar study in Nepal also found that majority of the construction workers were in age group 30-40 years and were more likely to use PPE compared to others. Guidotti (2011), in a similar study had similar observation.

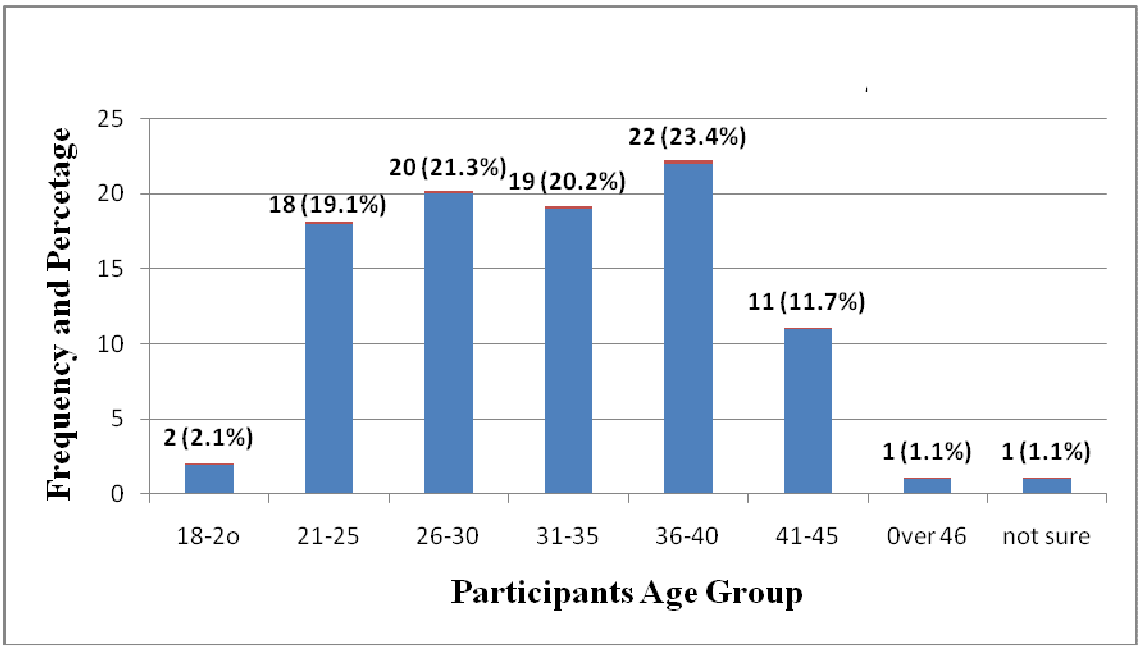

Figure 4.2: Age groups of the participants

Univariate analysis showed that the average age of participants was 31 years. The median age was 33 years during the study. Majority of the workers were 38 years old. The youngest person at the time of the study was 19 years old while the eldest workers was 48 years old (Table 4.1). Young workers tend to feel immune to hazards and do not take PPEs usage seriously while older workers feel they are used to certain types of equipments and that they have experience to work safely despite the hazard invoved.

Table 4.1: Univariate analysis of individual age of the workers

Workers age		Statistics
N	Valid	103
	Missing	1
Mean		30.93
Median		33.00
Mode		38
Std. Deviation		7.725
Variance		59.672
Skewness		.051
Std. Error of Skewness		.238
Range		29
Minimum		19
Maximum		48
Sum		3186

4.2.3 Marital status

The study showed that, 56(54.4%) participants were married, 12(11.7%) were divorced, 3(2.9%) were widowed while the remaining 32(31.1%) were single (Figure 4.3). Only one person did not respond to this question. Among the participants very few (31.1%) were single while majorities (69.0%) were either married or divorced. It is evident that all people, despite of their marital status are able to work in the construction industry.

Due to consideration, majority of the respondents were married (54.4%) worked in construction industry despite the work considered risky as a result of high incidences and accidents.

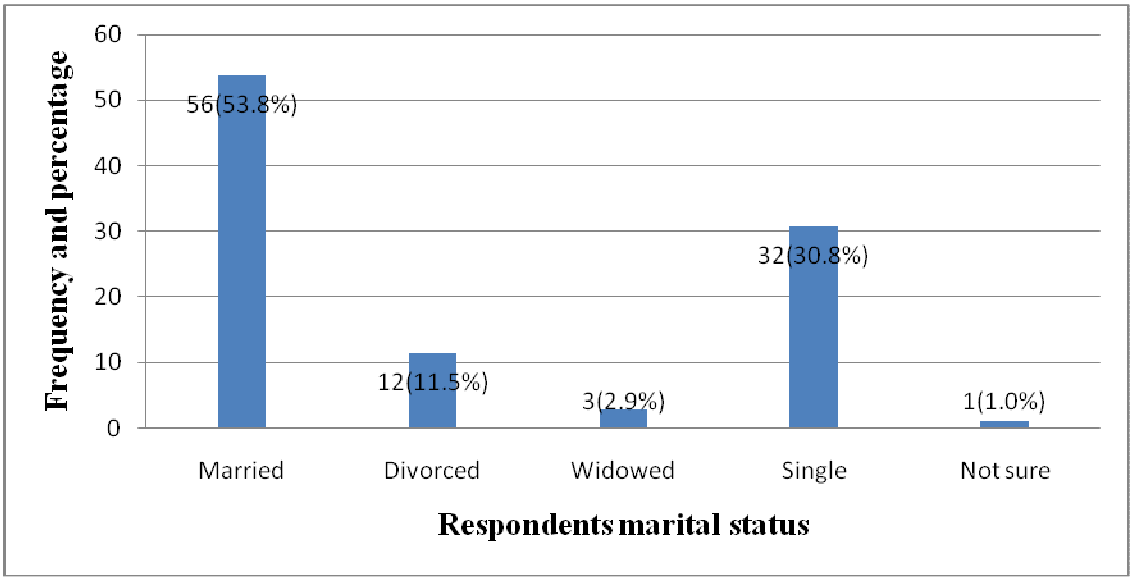

Figure 4.3: Marital status of the respondents

4.2.4 Working years' experience

The results showed that,48(46.2%) participants had worked between 0-5 years, 34(32.7%) had worked between 6-10 years, 15(14.4%) had worked between 11-15 years, 5(4.8%) had worked between 16-20 years while 2(1.9%) had worked for over 25 years. Majority (78.9%) of the participants had work experience of 10 years and below (Figure 4.4). These few who had worked for over 25 years can be considered as career/professional construction workers. Normally due to hazards associated with construction work, an employee does not work for long. Similar observations have been documented by ILO, (2007).Studies have demonstrated that the more a worker has experience, the more they are conscious in their work environment and less prone to accidents and incidences.

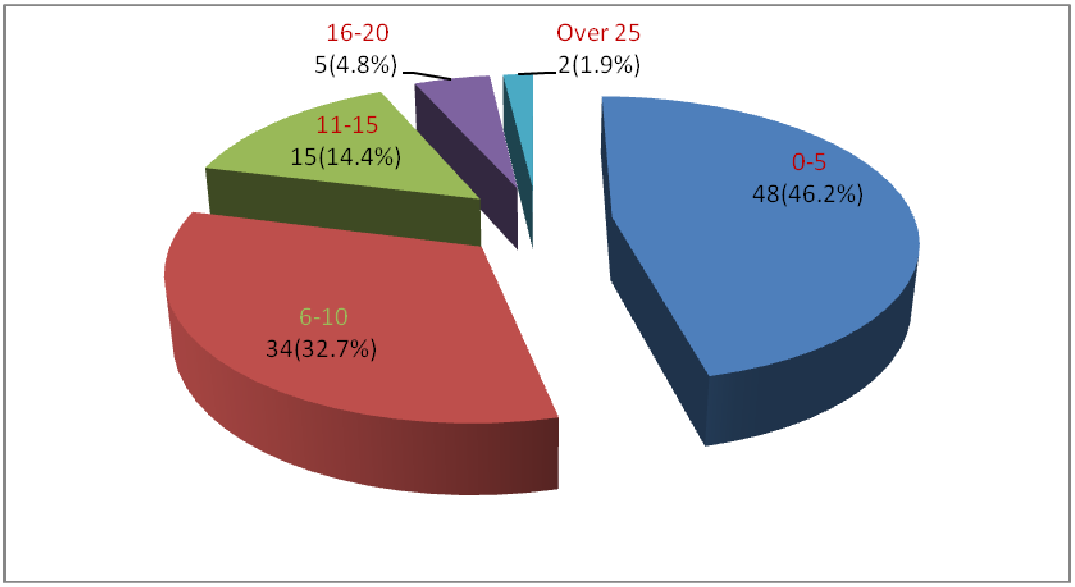

Figure 4.4: Number of workexperience in yearsby contruction workers

4.2.5 Nature of employment

The finding of this study showed that the respondents were employed as casuals, temporary or permanent. In total 7(6.8%) participants were employed permanently in their respective sites, 38(36.9%) were working on temporary basis while the remaining 58(56.3%) were working on casual basis (Figure 4.6). Casual workers performed manual work such as carrying construction materials and water. Only one person did not respond (not sure). Contractors, managers and foremen are sometimes engaged permanently by construction industry. For occupational health and safety issues in terms of training and implementation, workers employed permanently are better placed. This is because they are considered whenever training is being budgeted for; unlike temporary workers who are only engaged when need be. All employees regardless of their terms of employment must be trained on occupational health and safety including PPE utilization.

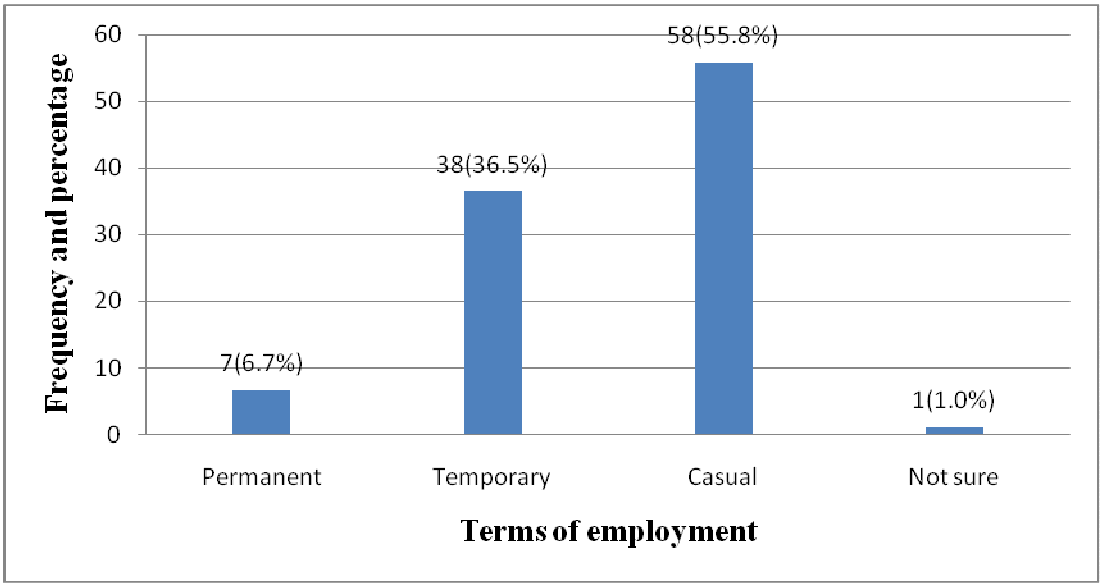

Figure 4.5: Workers terms of employment

4.3 Awareness of construction workers on occupational hazards and illness/injuries

4.3.1 Awareness of construction workers on occupational hazards

All the construction sites [12(92.3%)] had fumes/VOCs hazard except site 001 [1(7.7%)] according to the response from the participants. All the construction sites [13(100%)] in this study had dust hazards, radiation hazards and excessive noise hazard. Majority of the construction sites [12(92.3%)] had falling debris hazard while one [1(7.7%)] did not experience falling debris hazards. Welding fumes and paints were present in some construction sites. The following are types of fumes; caulks, sealants, and coatings, adhesives, paints, varnishes and/or stains, wall coverings, cleaning agents, fuels and combustion products, carpeting, vinyl flooring, fabric materials & furnishings. Radiation sources include welding, building materials, combustible fuels, including gas though their levels were not measured in the current study.

Fumes/VOCs and dust are associated with chest pain and respiratory infections reported by the workers in this study. Fire was also recognized as a hazard in the construction sites according to the checklist. Electricity used for welding and fire which is used to burn rubbish and debris in the construction sites were recognized as fire hazards. Only five (001, 003, 005, 012 and 013) construction sites were free from fire hazards in this study.

Only one construction site [1(7.7%)] did not experience vibration hazard while the rest [12(92.3%)] had vibration hazard. This is because construction in this site was almost complete and there were no machinery that produces vibration hazards. Construction site 001 did not experienced heat hazards while the rest [12(92.3%)] experienced heat hazard. Only construction site 013 did not experienced manual handling hazards of loads while majority [12(92.3%)] experienced manual handling of loads hazard according to the response of the participants.

Accidents are caused by unsafe acts or practices (the human element that results from poor attitudes, physical conditions and lack of knowledge or skills to enable one to work safely) as explained by Muchemedzi *et al.* (2012) in a similar study. According to a study by Frank (1969)on accident ratio, 88% of accidents are caused by unsafe acts of persons, 10% are caused by unsafe mechanical or physical conditions and the remaining 2% are unpreventable. Muchemedzi and Charamba (2006) established that the majority of accidents (98%) do not just happen, instead; people who perform unsafe acts and create unsafe conditions cause them and therefore accidents are preventable. When accidents are prevented injuries/illness are also gotten ride off. Use of PPE can protect a worker from potential injuries/ illness as a result of accidents.

There was no significant association (χ^2=20.5, df=12, p=0.37) between not experiencing falling debris has hazard and any of the construction site in this study except site 013. Analysis revealed that there was no significant association (χ^2=20.5, df=12, p=0.37)

between experiencing fire hazards and any particular construction sites in this study. In this study there was no significant association (χ^2=20.5, df=12, p=0.37) between experiencing manual handling of loads hazards and any particular construction site except construction site 013. There is was no significant association between their knowledge of use of PPE and awareness of these hazards among the workers according to Kirenga, (2004). In this study all (100%) the participants were aware of all these hazards in their respective construction sites (Table 4.2).

Table 4.2: Chi square analysis

Variables analyzed by chi square test	**χ^2**	**df**	**p-value**
Awareness of the existence of injuries/ailments and PPE utilization	34.5	12	0.00
Type of injuries/ailments and any particular construction	19.8	12	0.10
Having fumes vs. Construction sites	20.5	12	0.37
Falling debris has hazard vs. not experiencing falling debris has hazard	20.5	12	0.37
Fire hazards vs. Construction sites	20.5	12	0.37
Vibration hazards vs. Construction sites	20.5	12	0.37
Manual handling of loads vs. Construction sites	20.5	12	0.37
Not using PPE vs. Construction site	5.5	12	0.30
PPE matching the hazards vs. Construction sites	5.5	12	0.30
PPE maintenance vs. Construction sites	5.5	12	0.30
Securing construction site vs. Construction site	5.5	12	0.30

4.3.2 Awareness of construction workers on illness and injuries

All [104(100%)] the respondents in these study were very much aware of the existence of ailments and injuries associated with working in the construction sites. The safety levels in all the sites were uniform because they were almost in the same construction levels. Safety officers were not present in all the sites. Workers could be aware of the hazards associated with their work but they cannot do anything to reduce the hazards

because it is the responsibility of the occupier (contractor) to provide a safe working environment to the employees. Muchemedzi *et al.* (2006) noted in his study that accidents result from unsafe conditions, equipment or materials in the work environment. A similar study conducted among cement workers in United Arab Emirates by Ahmed & Smith (2010), showed that only 52.9 % of the workers knew the hazards other than the dust that were associated with their work.

From all the construction sites under investigation, 42(46.2%) of the participants had injuries, 11(12.1%) had fallen from abnormally high heights which is above 3 meters high, 12(13.2%) had muscular back/ neck pain, 3(3.3%) had hearing impairment, 21(23.1%) had chest problem while the remaining 2(2.2%) had dermatitis problems. These injuries could have been caused tools and machinery due to lack of awareness or ignorance on hazards associated with them. Fall from height could be due to lack or inadequate PPE such as safety harness. Muscular, back and neck pain are caused by lifting heavy load. Hearing impairment is caused by exposure to excessive noise beyond the accepted exposure limits of 8 Decibels per hour. Chest pains are caused by fumes exposure. Dermatitis is caused by exposure to corrosive substances like cement and sometimes are caused by exposure to fungi/molds in the environment (Table 4.3).

Table 4.3: Injuries/illness experienced by the Participants

Sites	Injury-n (%)	Fall from heights	Muscular pain-back/ neck	Hearing Impairment	Chest Problem	Dermatitis
001	3 (2.9)	2 (1.9)	0 (0.0)	1 (1.1)	1 (1.1)	0 (0.0)
002	4 (3.8)	1 (1.1)	1 (1.1)	0 (0.0)	0 (0.0)	1 (14.3)
003	2 (1.9)	2 (1.9)	0 (0.0)	1 (1.1)	2 (1.9)	0 (0.0)
004	4 (3.8)	2 (1.9)	0 (0.0)	0 (0.0)	2 (1.9)	0 (0.0)
005	1 (1.1)	0 (0.0)	1 (1.1)	0 (0.0)	5 (4.8)	0 (0.0)
006	5 (4.8)	0 (0.0)	0 (0.0)	0 (0.0)	3 (2.9)	0 (0.0)
007	4 (3.8)	0 (0.0)	1 (1.1)	0 (0.0)	1 (1.1)	0 (0.0)
008	5 (4.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.1)	1 (1.1)
009	1 (1.1)	0 (0.0)	5 (4.8)	1 (1.1)	1 (1.1)	0 (0.0)
010	2 (1.9)	2 (1.9)	1 (1.1)	0 (0.0)	2 (1.9)	0 (0.0)
011	4 (3.8)	0 (0.0)	2 (1.9)	0 (0.0)	1 (1.1)	0 (0.0)
012	3 (2.9)	2 (1.9)	1 (1.1)	0 (0.0)	1 (1.1)	0 (0.0)
013	4 (3.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.1)	0 (0.0)
Total	42(40.4)	11(10.6)	12(11.5)	3(2.9)	21(23.1)	2(1.9)

Key: Frequency-n, Percentage (%)

Despite the high incidences and accidents (88.5%), all workers (100%) were aware of illness and injuries associated with construction work. This is because the utilization of PPEs was very low (45.2%). Utilization of PPEs was low because contractors didn't provide them to workers and they were expensive.

Construction workers working in abnormal high heights without taking any safety precautions are shown in Plate 4.1.

Plate 4.1: Employees working in abnormally high heights (site 4)

Working in construction sites is a risk factor for illness/injuries since occupational safety and health are compromised sometime if not always. Majority (88.5%) of the participants had suffered from either injuries or illness or both in their respective construction sites. These imply that all the construction sites investigated had almost equal characteristics in terms of occupational safety of the workers. Acharya (2014) in a similar study reported almost similar results regarding the prevalence of injuries/ailments among construction site workers. Studies of Aguwa (2013) on workplace personal protective equipment also reported similar results on the type of injuries/ailments experienced by industrial workers.

In total 12(11.5%) participants in this study had never suffered any illness or injuries in the course of their duties while 92(88.5%) had suffered from either injuries or illness or both in their respective construction sites (Figure 4.6). The respondent confirmed (100%) that they were aware of the risks, hazards, illness and injuries associated with construction work.

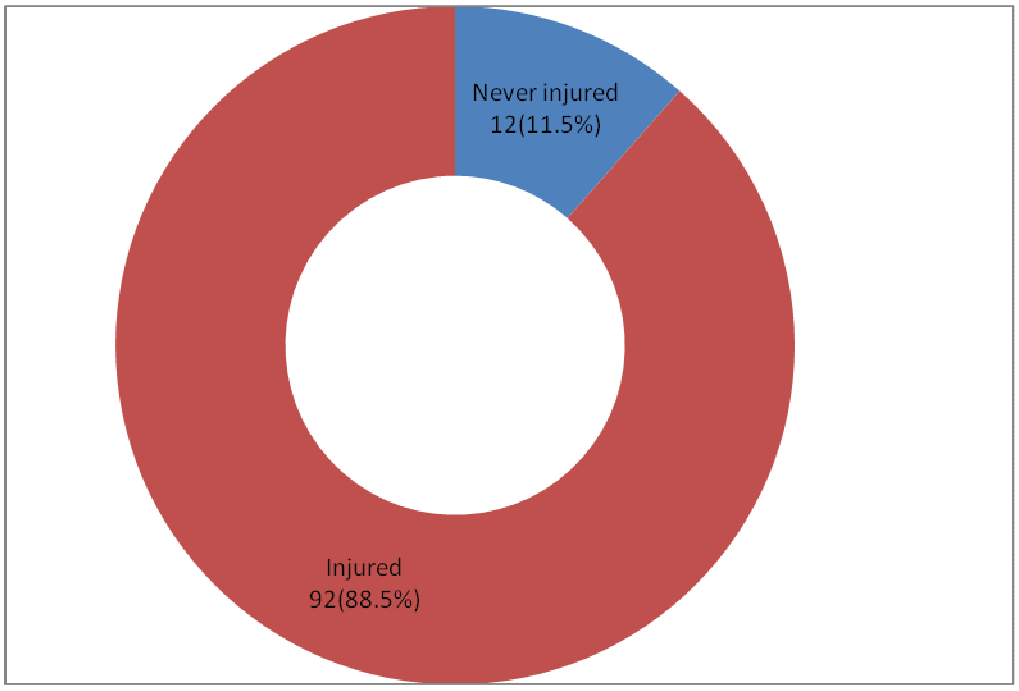

Figure 4.6: Number of participants ever suffered from injuries or ailments

4.4 Extent to which the workers were using the right PPE

The finding of this study showed that, 3(2.9%) participants had no knowledge of any personal protective equipment in use in their respective construction sites compared to 101 (97.1%) who were aware of the existence of these equipment in their respective construction sites. There was significant association (χ^2=13.9, df=12, p=0.00) between awareness of the existence of PPE's by the construction workers and the construction sites in this study. Only 3(37.5%) participants in construction site 009 were not aware of any PPE's in use in their construction site. The results are as shown in Table 4.4.

Table 4.4: Knowledge of existence of PPE's among the participants

Sites	Knowledge of Personal Protective Equipment			χ^2	df	p-value
	No (n) (%)	Yes (n) (%)	Total (n) (%)			
001	0 (0.0)	8 (100.0)	8 (100.0)	13.9	12	0.00
002	0 (0.0)	8 (100.0)	8 (100.0)			
003	0 (0.0)	8 (100.0)	8 (100.0)			
004	0 (0.0)	8 (100.0)	8 (100.0)			
005	0 (0.0)	8 (100.0)	8 (100.0)			
006	0 (0.0)	8 (100.0)	8 (100.0)			
007	0 (0.0)	8 (100.0)	8 (100.0)			
008	0 (0.0)	8 (100.0)	8 (100.0)			
009	3 (37.5)	5 (62.5)	8 (100.0)			
010	0 (0.0)	8 (100.0)	8 (100.0)			
011	0 (0.0)	8 (100.0)	8 (100.0)			
012	0 (0.0)	8 (100.0)	8 (100.0)			
013	0 (0.0)	8 (100.0)	8 (100.0)			
Total	3 (2.9)	101 (97.1)	103 (100.0)			

Key: n - Frequency, (%) – percentage

Majority had knowledge of the existence of PPE yet they were using the wrong PPE. Instead of helmets they were using improvised helmets made from locally available materials (Plate 4.2).

Plate 4.2: Workers using improvised PPE at construction sites (site 13)

There was a significant association (χ^2=34.5, df=12, p=0.00) between the existence of injuries and ailments associated with working in the construction sites and PPE utilization among the construction workers. Some workers were not utilizing them (PPE) due to some challenges. Some were not provided with PPE by the management of the construction sites. A similar study by Tylor (2011) in UK showed that some construction workers continue to have a rather low utilization of protective clothing, despite the fact that they were very much aware of the association between PPE utilization and associated injuries/ailments. The results of another study by Cong, (2008) which was carried out on knowledge attitude and practice on PPEs to rattan craftsmen in trade village in Vietnam showed that majority of the workers had low knowledge on PPEs and also the usage was low. There was no significant association (χ^2=20.5, df=12, p=0.37) between not having fume hazard and any particular construction site except site 001. Again there was no significant association between

(χ^2=20.5, df=12, p=0.37) not experiencing vibration hazards and any particular construction site except construction site 012.

4.4.1 Social demographic characteristics and PPE utilization

The Pearson's chi square test showed that there was no significant association (χ^2=3.66, df=6, p=0.30) between any particular age group of the workers and PPE use in this study (Table 4.1). In ideal situation age of participants is directly proportional to knowledge on PPE utilization in that the older workers due to exposure to hazard for a long time are aware of the need to utilize PPE, contrary to the results of this study. Utilization of PPE had no relationship with any particular age in the current study. According to a similar study by Guidotti (2011), young workers tend to feel immune to hazards and do not take PPE usage seriously while older workers feel that they are used to certain types of equipments and that they have experience to work safely despite the hazards involved hence there was no significant association between any age group and PPE utilization.

The results showed that there was no significant association (χ^2=2.37, df=4, p=0.50) between the highest education level attained and PPE utilization by the workers (Table 4.1). Training can have direct relationship to knowledge acquisition by workers in ideal situation. Again workers with higher educational level are expected to be trained easily especially on PPE utilization. A person with secondary school level of education and above in Kenya is considered literate while those with primary school level of education and below are considered semi-literate or illiterate. This observation contradicts the general knowledge that educated workers are likely to utilize PPE as compared to those with low education. A similar study by Kimeto (2014) showed that there was no significant association between educational level of workers and PPE utilization among Tea factory workers.

Regarding the workers marital status, analysis showed that there was no significant association (p=0.07) with PPE utilization (Table 4.1). People who are married are expected to be more vigilant in safeguarding their health by using PPE all the time while working. Personal protection is one of the important measures to safeguard workers from exposure to occupational hazards (OSHA, 2007). According to ILO, (2005) China workers in construction site are exposed to hazardous substances and physical agent's because they lack knowledge on PPE utilization.

In this study there was no significant association (χ2=2.37, df=6, p=0.25) between experience of the workers and the utilization of PPE among the respondents. This could be due to the fact that those workers who have worked for long period consider themselves more experienced hence do not see the need to use PPE. Data analysis revealed that there was no significant association (χ^2= 16.0, df=12, p=0.9) between workers employment terms and PPE utilization (Table 4.5).

Table 4.5: Analysis of social demographic characteristics and PPE utilization

Workers characteristics and PPE Utilization	χ^2	df	p-value
Age group of participants vs. PPE utilization	3.6	6	0.30
Highest education attained vs. PPE utilization	2.37	4	0.50
Workers years' experience vs. PPE utilization	2.37	6	0.25
Terms of employment vs. PPE utilization	16.0	12	0.90
Marital status vs. PPE utilization	1.17	12	0.07

4.4.2 Educational level of the participants

The results showed that 10(9.6%) workers had no formal education, 34(32.7%) had up to primary school level of education, 45(43.3%) had up to secondary school level of education, 11(10.6%) had other forms of tertiary college education and the remaining 4(3.8%) had university level of education (Figure 4.7). Majority (57.7%) of the respondents were literate with above secondary school level of education. Very few

were illiterate (9.6%) and semi-literate (32.7%), respectively. In normal circumstances people seeking employment in the industries have low level of education because work in the construction industries does not require much education. A similar study by Acharya (2014) on PPE utilization among construction workers also found that majority of the respondents (87.1%) in his study was literate hence concur with results of this study. A similar study by Khairuzzaman *et al.* (2014) found that the level of education achieved by his participants was comparatively low hence does not concurs with the results of this study in terms of educational level.

Education and experience is considered a human resource asset in any given organization. Training on PPE utilization is mostly conducted in English hence most workers were able to benefit from these training due to their literacy level. There was no significant asociation between work place safety among the workers and their educational level. This is contradicts general expection whereby workers who are relatively knowledgeble are expected to embrace the work safety measures than the rest of the workers. Studies of Karwowski and Marras (2010), acknowledges that education of both workers and foremen in the construction industry is key in informing and training the construction crew of the necessary equipments, in addition this help in selecting competent workforce, the views are equally shared by Reese and Eidson (2006) in their study on occupational safety of construction workers in relation to their educational level.

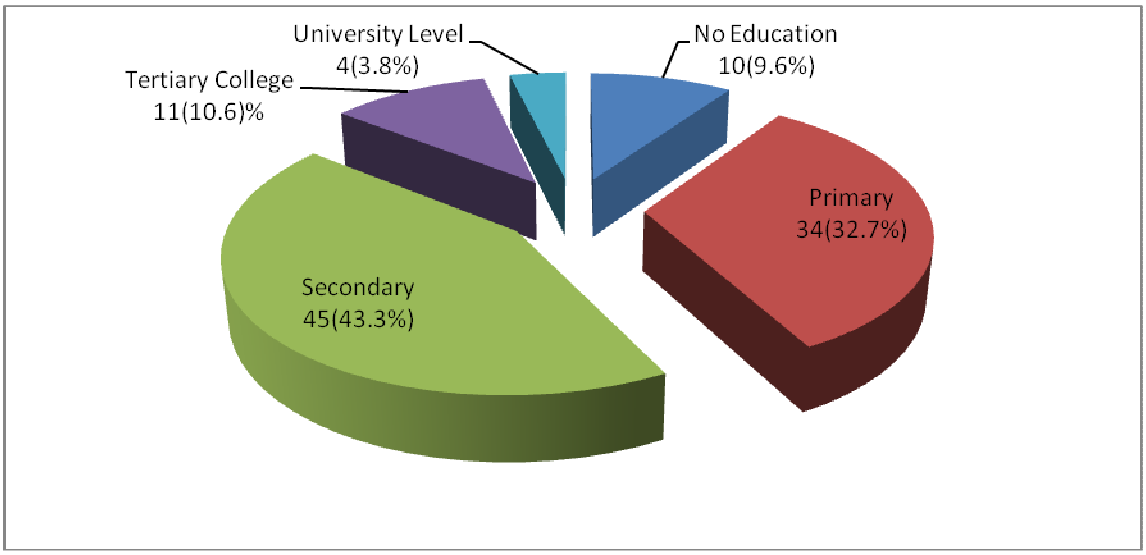

Figure 4.7: Respondents educational level

4.4.3 PPE available at construction sites as confirmed by the workers

The results showed that, 49(49%) participants affirmed availability of the following PPE; safety boots, helmet, overall, heavy duty gloves, 2(2%) dust masks, 5(5%) ear masks, 10(10%) helmet, 7(7%) overalls, 3(3%) goggles, 2(2%) heavy duty gloves, 1(1%) safety harness/ belts and other equipment respectively while the remaining [20(20%)]affirmed the availability of all the above equipment (Figure 4.8). The availability of PPE's was in line with the type of work and hazards one was exposed at any particular time. In this study construction workers reported to be using the following PPE's; safety boots, helmet, overall, heavy duty gloves, dust masks, ear masks, helmet, overalls, goggles, heavy duty gloves and safety harness/ belts. Each PPE's is used for a different work in the construction sites. Safety boots are used to protect foot from injuries. Goggles are used to protect eyes from strong light during welding and also protect from dust. Overalls are used to protect one's clothing from getting dirty. Helmets are used against head injuries. Ear muffs are used to protect ears against excessive noise in the construction sites. Safety harness/belts are used to protect workers from falling from heights. The OSHA (2007) stipulate that it is the responsibility of the occupier to provide a safe working environment to the workers

including the provision of proper and working PPE's. In this study different workers were using different PPE's for different jobs.

In this study workers who confirmed that they had PPE's were 47(45.2%). Some workers are provided with PPE and yet they were not using them especially goggles and face masks as observed in this study. These workers said that the PPE were not comfortable. Hence concur with the results of similar studies (Ziauddin, 2006; Yu, Lee & Wong, 2005; Paramasivam, Raghavan & Kumar, 2010; WHO, 2007). It was observed that some workers working in welding department were provided with goggles for eye protection but they were not using them properly as shown in Plate 4.3.

Plate 4.3: A worker with goggles but not utilizing properly (Site 1)

Other workers were not provided with PPE at all yet they were expected to work and perform as per the contractor's expectation (Plate 4.4).

Plate 4.4: Employees working without PPE's (site 4)

4.4.4 Observation on PPE use among the workers

The checklist revealed that, 13(100.0%) construction sites had PPE in place in this study. Similarly, 7(53.8%) construction sites had helmet in their respective sites while 6(46.2%) did not have helmets. The construction sites which did not have helmets were 001, 004, 007, 008,012 and 013, respectively. There was no significant association (χ^2=20.5, df=12, p=0.30) between helmet presence and any particular construction site (p>0.05) in this study (Table 4.12). On the issue of face/eye protection, 5(38.5%) construction sites had face/ eye protection while 8(61.5%) did not have this kinds of PPE's. Those construction sites with face/eye protection were 002, 003, 006 009 and 010, respectively. A total of 8(61.5%) construction sites had gloves while 5(38.5%) sites did not have gloves as one of their PPE's. The sites without gloves were 001, 004, 007, 011 and 013, respectively. Only 4(30.8%) construction sites had nose masks/respiratory protection materials while 9(69.2%) had none of these PPE's. The sites with nose masks/respiratory protection were 002, 003, 006 and 010, respectively. Regarding ear plugs/ muffs, only 4(30.8%) construction sites had ear plugs/ muffs while 9(69.2%) did not have. The sites with ear plugs/ muffs were 002, 006, 009 and 010, respectively. Majority [11 (84.6%)] of the construction sites did not have safety belts/

harness while only 2(15.4%) construction sites had safety belts/ harness. The sites which had the safety belts/ harness were 002 and 010.

A total of 6(46.2%) construction sites had PPE that match the purpose in their respective sites while 7(53.8%) had PPE that did not match the hazards. The sites with PPE that match the hazards were 002, 003, 005, 006, 009 and 010, respectively. There was no significant association (χ^2=20.5, df=12, p=0.30) between having PPE's that match the hazards and any particular construction site in this study (Table 4.14).

In this study the sites which used PPE's were 7(53.8%) while 6(46.2%) were not using PPE's despite having them. The construction sites that were not using PPE's were 001, 004, 007, 008, 011 and 013, respectively. There was no significant association (χ^2=20.5, df=12, p=0.37) between not using PPE's and any particular construction site in this study (Table 4.6)

Table 4.6: Analysis of the checklist and PPE use/maintenance in the construction sites

Variables analyzed with Pearson chi square test	χ^2	df	p-value
Not using PPE vs. Construction site	20.5	12	0.37
PPE matching the hazards vs. Construction sites	5.5	12	0.30
PPE maintenance vs. Construction sites	5.5	12	0.30

Key: n - Frequency, (%) – percentage, χ^2 - Pearson chi square test, df – degree of freedom.

4.4.5 Provision of PPE by the construction companies

The study showed that, 57(54.8%) participants did not have any PPE's while 47(45.2%) confirmed to be in possession of these equipment in their respective sites for use during work (Table 4.7). This explains the illness/injuries reported earlier which could be prevented by the use of PPE's. There was no significant association (χ^2=1.0, df=12, p=0.21) between any particular construction site and the use of PPE's by the construction workers. There was also no significant association (χ^2=12.0,df=12,p=0.82) between PPE use and the prevalence of accidents/injuries among the constructions workers in this study (Appendix 5). In a similar study conducted in Vishakapatnam Steel plant of India showed that 27.50% of the workers were using PPE (Ziauddin, 2006). A study carried in a sample of 501 male printing workers from 28 factories in Hong Kong showed that 22.05% of workers were using PPE (Yu et al., 2005). Another study among dyes printing workers found that 34% of the workers were using PPE (Paramasivam *et al.,* 2010). The results of these other studies are similar to the one reported in the current study in that the use of PPE's among the workers was below 50.0%.

Table 4.7: Participants who had personal protective equipments

Sites	Having and not having PPEs			χ^2	df	p-value
	No (n) (%)	Yes (n) (%)	Total (n) (%)			
001	2 (25.0)	6 (75.0)	8 (100.0)	1.0	12	0.21
002	5 (62.5)	3 (37.5)	8 (100.0)			
003	3 (37.5)	5 (62.5)	8 (100.0)			
004	5 (62.5)	3 (37.5)	8 (100.0)			
005	5 (62.5)	3 (37.5)	8 (100.0)			
006	5 (62.5)	3 (37.5)	8 (100.0)			
007	5 (62.5)	3 (37.5)	8 (100.0)			
008	3 (37.5)	5 (62.5)	8 (100.0)			
009	6 (75.0)	2 (25.0)	8 (100.0)			
010	2 (25.0)	6 (75.0)	8 (100.0)			
011	3 (37.5)	5 (62.5)	8 (100.0)			
012	6 (75.0)	2 (25.0)	8 (100.0)			
013	7 (87.5)	1 (12.5)	8 (100.0)			
Total	57 (54.8)	47 (45.2)	104 (100.0)			

Key: n - Frequency, (%) – percentage

4.4.6 PPE acquisition by construction workers

In this study 16(34%) participants who confirmed to have PPE's had safety boots, 3(6.4%) had dust masks, 2(4.3%) had ear masks, 9(19.1%) had helmets, 10(21.3%) had overalls, 5(10.6%) had goggles, 1(2.1%) had heavy duty gloves while the remaining 1(2.1%) had no response to this question. On acquisition of PPE's 11(23.4%) had obtained them by borrowing, 7(14.9%) were provided by their respective employers while the remaining 29(61.7%) bought these equipment by themselves. Table 4.8 shows that majority of the workers from all the construction sites bought PPE's by them. This implies that the contractors have not taken into consideration in their budgets to ensure safety measures for the workers are in place. The workers were asked to name the reason for not having the PPE and most of them cited the cost of the PPE as a problem, although this should not be a real problem if the employers could adhere to the OSHA regulations or rather the employees should be educated on their rights or safety conditions as stipulated by the OSHA, 2007.There was no significant association

(χ^2=1.1, df=12, p=0.92) between acquisition of PPE's by the construction workers and any particular construction site one comes from as shown in Table 4.8.

Table 4.8: PPE's acquisition by the construction workers

Sites	Means of acquiring PPEs				χ^2,df,p
	Borrowed (n) (%)	Provided by employer (n) (%)	Bought myself (n) (%)	Total (n) (%)	p-value
001	0 (0.0)	1 (16.7)	5 (83.3)	6 (100.0)	1.1, 12, 0.92
002	1 (33.3)	1 (33.3)	1 (33.3)	3 (100.0)	
003	0 (0.0)	1 (20.0)	4 (80.0)	5 (100.0)	
004	1 (33.3)	0 (0.0)	2 (66.7)	3 (100.0)	
005	1 (33.3)	0 (0.0)	2 (66.7)	3 (100.0)	
006	0 (0.0)	1 (33.3)	2 (66.7)	3 (100.0)	
007	1 (33.3)	0 (0.0)	2 (66.7)	3 (100.0)	
008	1 (20.0)	1 (20.0)	3 (60.0)	5 (100.0)	
009	1 (50.0)	1 (50.0)	0 (0.0)	2 (100.0)	
010	2 (33.3)	0 (0.0)	4 (66.7)	6 (100.0)	
011	2 (40.0)	1 (20.0)	2 (40.0)	5 (100.0)	
012	1 (50.0)	0 (0.0)	1 (50.0)	2 (100.0)	
013	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)	
Total	11 (23.4)	7 (14.9)	29 (61.7)	47 (100.0)	

Key: n - Frequency, (%) – percentage, χ^2 - Pearson chi square test, df – degree of freedom

4.4.7 Reasons for not utilizing PPE by the workers

The respondents gave varied reasons why they did not use the available PPE's in their work place. This study showed that some participants did not have them because they did not see any importance of them; others did not have them because they were feeling uncomfortable to use them. Others also did not have the equipment because they were expensive to buy/afford. Data analysis revealed that there was no significant association (χ^2 =11.5, df=12, p=0.40) between any response and the construction site as seen in Table 4.9.Observation showed that some workers had PPE's but they were not using them. In another similar study, more than two quarters did not feel uncomfortable using PPE hence it influenced the increase in the use of PPE in workplace (Truong, Siriwong & Robson, 2009). Study conducted in Saudi Arab showed that 12% of the participants

used PPE all the time while, 60% did not use any type of PPE. The main reasons given for not using PPE were non-availability of equipment and that the equipment was too heavy causing inconvenience. A variety of preventive measures and PPE were mentioned, their use however, was unsatisfactory (Taha, 2003). Elsewhere it has been recommended that the workers need to be trained on proper use of PPE to reduce the occupational health hazards (Parimalam, Kamalamma & Ganguli, 2007).

Table 4.9: Reasons for not using PPE's by the participants

Sites	Reasons for not using PPEs				χ^2 (df)	p-value
	Not Important (n) (%)	Uncomfortable to use (n) (%)	Expensive (n) (%)	Total (n) (%)		
001	0 (0.0)	1 (50.0)	1 (50.0)	2 (100.0)	11.5(12)	0.40
002	0 (0.0)	2 (40.0)	3 (60.0)	5 (100.0)		
003	0 (0.0)	0 (0.0)	3 (100.0)	3 (100.0)		
004	0 (0.0)	0 (0.0)	5 (100.0)	5 (100.0)		
005	1 (20.0)	0 (0.0)	4 (80.0)	5 (100.0)		
006	0 (0.0)	1 (20.0)	4 (80.0)	5 (100.0)		
007	2 (40.0)	2 (40.0)	1 (20.0)	5 (100.0)		
008	0 (0.0)	0 (0.0)	3 (100.0)	3 (100.0)		
009	3 (50.0)	0 (0.0)	3 (50.0)	6 (100.0)		
010	0 (0.0)	0 (0.0)	2 (100.0)	2 (100.0)		
011	1 (33.3)	1 (33.3)	1 (33.3)	3 (100.0)		
012	1 (16.7)	1 (16.7)	4 (66.6)	6 (100.0)		
013	1 (14.3)	2 (28.6)	4 (57.1)	7 (100.0)		
Total	9 (15.8)	10 (17.5)	38 (66.7)	57 (100.0)		

Key: n - Frequency, (%) – percentage, χ^2 - Pearson chi square test, df – degree of freedom

4.4.8 When to use PPE

Of all those who had PPE's 40(85.1%) used them always when they were on duty while 7(14.9%) only used them when they felt so. There was no significant association (p=0.23) between any reason given on the use of PPE's by the construction workers and factors influencing the injuries/illness associated with not using PPE as shown in Table 4.10.

Table 4.10: Participants reasons on when they use PPE's

Sites	Reasons against PPE use			χ^2	d.f	p-value
	When on duty always (n) (%)	When I feel like so (n) (%)	Total (n) (%)			
001	6 (100.0)	0 (0.0)	6 (100.0)	15.7	12	0.23
002	2 (66.7)	1 (33.3)	3 (100.0)			
003	5 (100.0)	0 (0.0)	5 (100.0)			
004	3 (100.0)	0 (0.0)	3 (100.0)			
005	2 (66.7)	1 (33.3)	3 (100.0)			
006	3 (100.0)	0 (0.0)	3 (100.0)			
007	2 (66.7)	1 (33.3)	3 (100.0)			
008	5 (100.0)	0 (0.0)	5 (100.0)			
009	2 (100.0)	0 (0.0)	2 (100.0)			
010	5 (83.3)	1 (16.7)	6 (100.0)			
011	3 (60.0)	2 (40.0)	5 (100.0)			
012	2 (100.0)	0 (0.0)	2 (100.0)			
013	0 (0.0)	1 (100.0)	1 (100.0)			
Total	40 (85.1)	7 (14.9)	47(100.0)			

Key: n - Frequency, (%) – percentage, χ^2 - Pearson chi square test, df – degree of freedom

4.4.9 Number of injuries in relation to PPE usage among the workers

On whether using PPE's prevented one from getting any form of injury/ailments at the time of injury; 67(64.4%) participants who suffered some forms of injury/ illness, did not have any personal protective equipment while 37(35.6%) still suffered injuries/ illness despite having PPE. There was no significant association (χ^2 =29.1, df=12, p=0.14) between suffering from any form of injury / illness in relation to use/disuse of PPE's and any particular construction site in this study as shown in Table 4.11.

Table 4.11: Suffering from injury/illness and use of PPE's

Sites	Suffered injury or illness vs. use of PPE			χ^2	df	p-value
	Suffered No PPEs (n) (%)	Suffered Had PPEs (n) (%)	Total (n) (%)			
001	6 (75.0)	2 (25.0)	8 (100.0)	29.1	12	0.14
002	4 (50.0)	4 (50.0)	8 (100.0)			
003	2 (25.0)	6 (75.0)	8 (100.0)			
004	5 (62.5)	3 (37.5)	8 (100.0)			
005	7 (87.5)	1 (12.5)	8 (100.0)			
006	5 (62.5)	3 (37.5)	8 (100.0)			
007	7 (87.5)	1 (12.5)	8 (100.0)			
008	3 (37.5)	5 (62.5)	8 (100.0)			
009	7 (87.5)	1 (12.5)	8 (100.0)			
010	4 (50.0)	4 (50.0)	8 (100.0)			
011	5 (62.5)	3 (37.5)	8 (100.0)			
012	5 (62.5)	3 (37.5)	8 (100.0)			
013	7 (87.5)	1 (12.5)	8 (100.0)			
Total	57 (64.4)	47 (35.6)	104 (100.0)			

Key: n - Frequency, (%) – percentage, χ^2 - Pearson chi square test, df – degree of freedom

All the construction firms in this study had operated for an average period of 3 years. The median firm had been in operation for a period of 2 years. Majority of the firms had been in operation for a period of 3 years. Some firms had been in operation for up to 15 years while some other new ones had been in operation for only 1 year (Appendix 4). Duration of operation determine the use or presence of PPE in the construction site in this study. It is expected that contractors which have been operating for many years to be compliant to OSHA, 2007 at all the times. Under Kenya's Environmental Management and Coordination Act (EMCA) 1999, an Environmental Impact Assessment (EIA), outlining the likely environmental implications a project may have, must be conducted and submitted to the authorities. The EMCA states that any member of the public can request to see an EIA, and has the right to submit comments. The authorities have the right to demand further EIAs from the project proponent, and can refuse permission for exploration if they are not satisfied. Furthermore, the authorities

have the right to enter any land where construction is taking place, in order to carry out their own audit or monitoring (EMCA, 2009).

4.5 Training of construction workers on PPE's use

The study showed that, 79(76%) participants had never undertaken any safety training especially on the use of PPE on construction sites while 25(24%) had undertaken safety training and PPE use. From the results of this study the workers whose answer was no were many in all the construction sites compared to those with yes as their answers. There was no significant association (χ^2 =5.0, df=12, p=0.72) between training of workers on safety issues and any particular construction site in this study (Table 4.12). This implies that the contractors of these sites are not keen on occupational safety of their workers. Safety training especially the use of PPE is very important among construction workers. This is because their work involves a lot of hazards and most of them have educational level of secondary school and below as reported earlier in this study. Any industry which involves high risk activities like construction work should practice safety culture.

Table 4.12: Participants trained on safety issues and PPE use

Sites	PPE use against training			χ^2, df	p-value
	Not trained on PPE use (n) (%)	Trained on PPE use (n) (%)	Total (n) (%)		
001	5 (62.5)	3 (37.5)	8 (100.0)	5.0, 12	0.72
002	6 (75.0)	2 (25.0)	8 (100.0)		
003	7 (87.5)	1 (12.5)	8 (100.0)		
004	6 (75.0)	2 (25.0)	8 (100.0)		
005	4 (50.0)	4 (50.0)	8 (100.0)		
006	6 (75.0)	2 (25.0)	8 (100.0)		
007	7 (87.5)	1 (12.5)	8 (100.0)		
008	6 (75.0)	2 (25.0)	8 (100.0)		
009	7 (87.5)	1 (12.5)	8 (100.0)		
010	5 (62.5)	3 (37.5)	8 (100.0)		
011	6 (75.0)	2 (25.0)	8 (100.0)		
012	8 (100.0)	0 (0.0)	8 (100.0)		
013	6 (75.0)	2 (25.0)	8 (100.0)		
Total	79 (76.0)	25 (24.0)	104 (100.0)		

Key: n - Frequency, (%) – percentage, χ^2 - Pearson chi square test, df – degree of freedom

4.5.1 Importance of training

Evaluating the importance of training was valuable in understanding the PPE utilization among the participants. Workers who underwent safety training on their respective construction sites were 25(100%). Only 1(4%) employee who underwent safety training on their respective construction sites stated that training was not of help to him while 24(96%) agreed that the training was of help to them (Table 4.13). There was significant association (χ^2=9.2, df=1, p=0.01) between training on safety issues and the number of workers who confirmed that safety training on PPE use, cleaning and maintenance was important to them.

Table 4.13: Importance of safety training to workers in the construction sites

Response	Training on PPE use		χ^2	df	p-value
	Frequency (n) (%)	Percent (n) (%)			
Not important	1	1.0	9.2	1	0.01
Important	24	23.1			
Total	25	24.0			
Missing System	79	76.0			
Total	104	100.0			

Key: n - Frequency, (%) – percentage, χ^2 - Pearson chi square test, df – degree of freedom

4.5.2 Safety briefs to construction workers

The results of this study showed that,86(82.7%) participants disagreed that they were given briefs before commencing any work on their daily basis while 18(17.3%) affirm that they were given briefs before commencing any work on daily basis (Table 4.14). The result of this study confirms that most of the construction sites studied does not give safety briefs to their workers. There was no significant association (p=0.49) between giving safety briefs to construction workers and any particular construction site investigated. The result of this study confirms that most of the construction sites studied does not give safety briefs to their workers. This is because the employer assumes that the workers are conversant with their work since they have been doing them over and over again. According to a study by Garcia, Boix & Canosa (2004), workers' perceptions and experience in relation to occupational health and safety are scarcely considered in programs for the prevention of work related injuries and diseases. Healthy environments and healthy behaviors are key determinants of occupational health. Cohen, Colligan, Sinclair, Newman and Schuler (1998) in their studies found out that interventions over workers' behavior intended to risk prevention are usually based on specific training programs. These programs are generally devoted to increasing workers' knowledge of job hazards and promoting safer work behaviors. Lindell (1994) in his study reported that organizational factors related to safety and health at work,

including management's policies and practices regarding occupational risk prevention, affect implementation of workers' safety training.

Table 4.14: Safety briefs before commencement of work in the construction sites

Sites	Safety briefs against PPE use			χ^2	df	p-value
	No briefs (n) (%)	Briefed (n) (%)	Total (n) (%)			
001	5 (62.5)	3 (37.5)	8 (100.0)	1.0	12	0.49
002	8 (100.0)	0 (0.0)	8 (100.0)			
003	8 (100.0)	0 (0.0)	8 (100.0)			
004	7 (87.5)	1 (12.5)	8 (100.0)			
005	7 (87.5)	1 (12.5)	8 (100.0)			
006	6 (75.0)	2 (25.0)	8 (100.0)			
007	6 (75.0)	2 (25.0)	8 (100.0)			
008	8 (100.0)	0 (0.0)	8 (100.0)			
009	7 (87.5)	1 (12.5)	8 (100.0)			
010	5 (62.5)	3 (37.5)	8 (100.0)			
011	6 (75.0)	2 (25.0)	8 (100.0)			
012	7 (87.5)	1 (12.5)	8 (100.0)			
013	6 (75.0)	2 (25.0)	8 (100.0)			
Total	86 (82.7)	18 (17.3)	104 (100.0)			

Key: n - Frequency, (%) – percentage, χ^2 – Pearson chi square test, d.f – degree of freedom

4.5.3 Construction firms years of operation

Regarding the number of years the construction firms had worked, 4(30.8%) had been operational for a period of 1, 2 and 3 years, respectively while the remaining [1(7.6%)] had worked for a period of 15 years in Mombasa County (Figure 4.8).

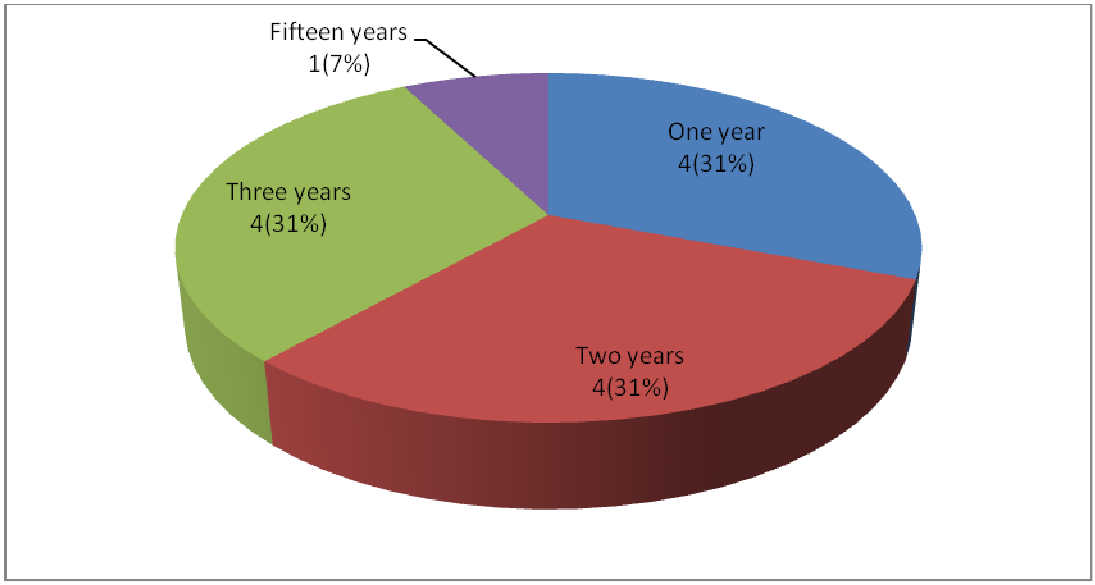

Figure 4.8: Number of year's construction firms has been operational

In this study, the construction firms had been in operation for an average period of 3 years. The median firm had been in operation for 2 years. Most of the firms had been operational for at least 3 years. Some of the firms had been operational for at most 1 year while other had been operational for up to 15 years (Table 4.15). The more the years of operation by construction site the more experience its management has in terms of occupational safety and health. Head injuries are very common in construction sites and there are many hazards present on construction sites that can lead to these types of injuries and other injuries. In more serious cases, workers being struck on the head by falling objects can suffer from traumatic brain injuries and even death according to studies of Cong (2008). Management of construction site with many years of operation should be very much aware of this injuries/hazard and should be prepared for any eventualities (OSHA, 2007). This study also observed high incidences of incidences of injuries as a result of low utilization of PPEs.

Table 4.15: Measure of central tendency of construction sites operational years

Years in operation (construction site)		Statistics
N	Valid	103
	Missing	1
Mean		3.01
Median		2.00
Mode		3
Std. Deviation		3.588
Variance		12.875
Skewness		2.923
Std. Error of Skewness		.238
Range		15
Minimum		1
Maximum		15
Sum		310

CHAPTER FIVE
CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

All workers were aware of hazards, injuries and illness associated with construction work. Most (80%) workers had suffered illness or injuries in the course of their duties. The prevalence of injuries remain high although there was no significant association (p=0.10) between the type of injuries/ailments and any particular construction sites under study. The null hypothesis which states that there is no relationship between utilization of PPEs by construction workers and reduction of injuries and illness associated with construction work is rejected in favor of the alternative hypothesis.

Among the participants 45.0% were using the right PPE. The extent of PPE use especially the right ones was wanting since it was below 50%.The following are the PPE in use in the construction sites in this study; safety boots, helmet, overalls and heavy duty gloves alongside dust masks, ear masks, helmet, overalls, goggles, heavy duty gloves and safety harness/ belts. More than half of the workers did not have any Personal Protective Equipment's (PPEs).Most (more than 60%) workers, who suffered some forms of injury / illness, did not have any personal protective equipment. There was significant association (p=0.00) between awareness of the existence of PPE's by the construction workers and the construction sites in this study.

About 76.0% of participants had not been trained on PPE use and any other safety training. There was no significant association (χ^2 =5.0, df=12, p=0.72) between training of workers on PPE use and safety issues and any particular construction site.

5.2 Recommendations

Constant awareness of all hazards, injuries and illness associated with constructions should be maintained. All sorts of injuries to workers should as much as possible should be minimized while on duties.

All workers should use safety boots, helmet, overalls and heavy duty gloves alongside dust masks, ear masks, helmet, overalls, goggles, heavy duty gloves and safety harness/belts while on duty whenever necessary to minimize injuries and illness associated with construction work. The Ministry of Labour officials should implement OSHA, 2007 especially on provision of free PPEs to all workers.

The management of construction sites should regularly conduct helpful safety training on a construction sites and also give workers briefs before commencing any work on their daily basis.

NCA to contact regular monitoring of contractors in order to ensure safety of workers is assured.

5.3 Areas of further studies

The building and construction industry presents various hazards that have been least investigated by researchers in Kenya; further studies are required to examine the major cause of injuries/illness among workers and extent to which the OSHA Act is implemented as well as NCA Act on safety in construction industry.

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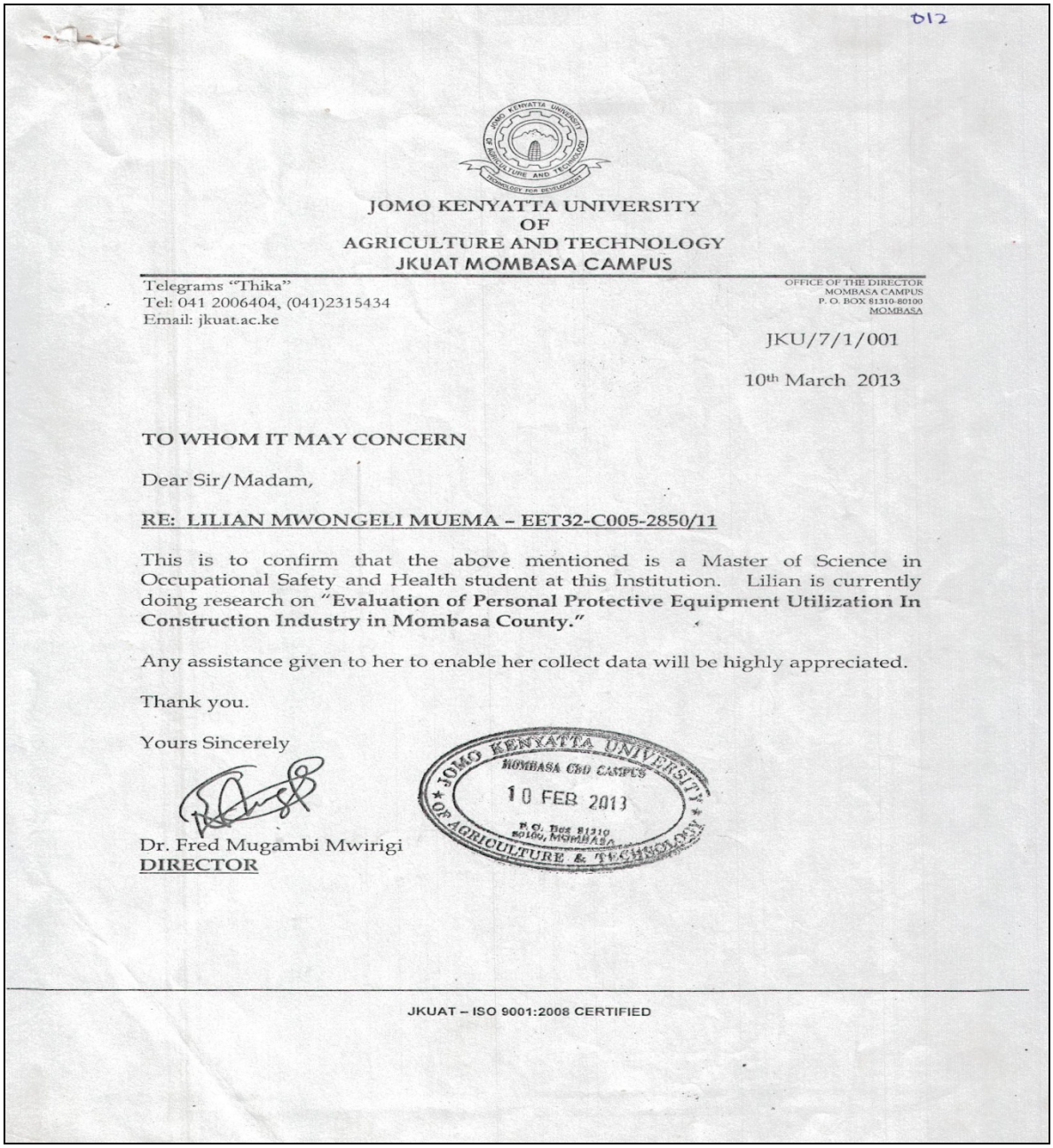
APPENDICES

Appendix 1: Introductory letter from the university



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JKU/7/1/001

10th March 2013

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: LILIAN MWONGELI MUEMA – EET32-C005-2850/11

This is to confirm that the above mentioned is a Master of Science in Occupational Safety and Health student at this Institution. Lilian is currently doing research on "**Evaluation of Personal Protective Equipment Utilization In Construction Industry in Mombasa County.**"

Any assistance given to her to enable her collect data will be highly appreciated.

Thank you.

Yours Sincerely

Dr. Fred Mugambi Mwirigi
DIRECTOR

JOMO KENYATTA UNIVERSITY OF AGRICULTURE & TECHNOLOGY
MOMBASA CBD CAMPUS
10 FEB 2013
P.O. Box 81310 80100, MOMBASA

JKUAT – ISO 9001:2008 CERTIFIED

Appendix 2: Informed consent

Hello, my name is Lilian Mwongeli Muema a Master of Science in Occupational Safety and Health student at Jomo Kenyatta University of Agriculture and Technology. I am carrying out a study to evaluate personal protective equipment utilization among construction workers in Mombasa County. In line with these clear objectives, I would like to ask you some questions related to the research title. The information that you'll tell me on this questionnaire will be kept strictly confidential. You don't need to write your name.

a) Do I have your permission to proceed? Yes □ No□.

Thank you in advance for your cooperation.

Appendix 3: Questionnaire for workers

SECTION A

1. Gender

Male ( ) Female ( )

2. Age bracket

18 – 20 years ( ) 21 – 25 years ( ) 26 – 30 years ( ) 31 – 35 years ( )

36 – 40 years ( ) 41 – 45 years ( ) Over 46 years ( )

3. Highest level of education

Primary ( ) Secondary ( ) Tertiary college ( ) University level ( ) No education ( )

5. Marital status

Married ( ) Divorced ( ) widowed ( ) Single ( )

6. Number of years worked in building construction industry

0 – 5 years ( ) 6 – 10 years ( ) 11 – 15 years ( ) 16 – 20 years ( ) Over 25 years ( )

7. In what terms are you employed on site?

Permanent ( ) temporary basis ( ) Casual basis ( )

8. Have you ever undertaken any safety training on a construction site?

Yes ( ) No ( )

9. If the answer to question no. 8 is yes, was the training of help to you?

Yes ( ) No ( )

11. Are there any safety briefs given to you before commencing any works on a daily basis?

Yes ( ) No ( )

12. Do you know of any injuries and illness associated with construction?

Yes ( ) No ( )

13. If the answer to question no.12 above is YES, which ones do you know of

Injury ( ) Fall from heights ( ) Muscular pain/injury ( ) Hearing impairment ( ) Chest problem ( ) Dermatitis ( ) All the above ( ) Any others specify ……

14. Have you ever suffered any illness or injury in your course of work?

Yes ( ) No ( )

15. If question 14 is yes, which ones?

Injury ( ) Fall from heights ( ) Muscular pain/injury (back or neck) ( )

Hearing impairment ( ) Chest problem (bronchitis or pneumonia) ( ) Dermatitis ( )

All the above ( ) Any others specify…….....

16. Do you know of any Personal Protective Equipment?

Yes ( ) No ( )

17. If question Q 17 is YES which ones are used in construction industry?

Safety boots ( ) Dust masks ( ) Ear masks ( ) Helmet ( ) Overalls ( ) Goggles ( ) Heavy duty gloves ( ) Safety harness/ belts ( ) Others specify.....

18. Do you have any Personal Protective Equipment?

Yes ( ) No ( )

19. If YES in question 18, which ones do you have?

Safety boots ( ) Dust masks ( ) Ear masks ( ) Helmet ( ) Overalls Goggles ( ) Heavy duty gloves ( ) Safety harness/ belts ( ) others specify.....

20. If YES in Q18, How did you get them?

Borrowed( ) Provided by Employer ( ) Bought myself ( ) others specify.....

21. If NO in question no.18 above why?

Not important ( ) Uncomfortable to use ( ) Expensive ( ) others specify.....

22. If YES in question no. 18 above when do you use them?

When on duty always ( ) when supervisor is around ( ) when it's cold ( )

When I feel like so ( )

23. If you have suffered any form of injury or illness, did you have any personal protective equipment? Yes ( ) No ( )

Appendix 4: Publication certificate

Appendix 5: Observation checklist

Observation	**Yes**	**No**
Occupational hazards		
Fumes		
Dust		
Excessive noise		
Falling debris		
Vibration		
Radiations		
Heat		
Manual handling of loads		
Utilization of PPE		
PPE present		
PPE in use		
PPE type in the site		
Helmet		
Face/eye protection		
Gloves		
Respiratory protection		
Earplugs/muffs		
Apron		
Safety belt/harness		
Does PPE match to hazard?		
Proper utilization of PPEs		
Maintenance of PPEs		

Appendix 6: Data analysis

i) Pearson chi square for the checklist and workers characteristics

Workers characteristics	χ^2	**df**	**p-value**
Age group of participants vs. PPE utilization	3.6	6	0.30
Highest education attained vs. PPE utilization	2.37	4	0.50
Workers years experience vs. PPE utilization	16.0	12	0.25
Terms of employment vs. PPE utilization	7.04	12	0.9
Awareness of injuries/accidents vs. PPE utilization	34.5	12	0.00
type of injuries/ailments vs. construction sites	19.8	12	0.10
Construction sites vs. PPE utilization by workers	1.0	12	0.21
PPE use vs. Accidents prevalence per site	12.0	12	0.82
PPE acquisition vs. Construction sites	1.1	12	0.92
Checklist			
Having fumes vs. Construction sites	20.5	12	0.37
Falling debris has hazard vs. not experiencing falling debris has hazard	20.5	12	0.37
Fire hazards vs. Construction sites	20.5	12	0.37
Vibration hazards vs. Construction sites	20.5	12	0.37
Manual handling of loads vs. Construction sites	20.5	12	0.37
Not using PPE vs. Construction site	5.5	12	0.30
PPE matching the hazards vs. Construction sites	5.5	12	0.30
PPE maintenance vs. Construction sites	5.5	12	0.30
awareness of injuries/ailments and PPE utilization among the workers	34.5	12	0.00
injuries/ailments and any particular construction sites	19.8	12	0.10

Key: p – probability value, df- degree of freedom, χ^2-Chi square value

Appendix 7: Sample size table a given population

Population size	Sample size					
	Continuous data (margin of error=.03)			Categorical data (margin of error=.05)		
	alpha=0.10 t=1.65	alpha=0.05 t=1.96	alpha=0.01 t=2.58	p=0.50 t=1.65	p=0.50 t=1.96	p=0.50 t=2.58
100	46	55	68	74	80	87
200	59	75	102	116	132	154
300	65	85	123	143	169	207
400	69	92	137	162	196	250
500	72	96	147	176	218	286
600	73	100	155	187	235	316
700	75	102	161	196	249	341
800	76	104	166	203	260	363
900	76	105	170	209	270	382
1,000	77	106	173	213	278	399
1,500	79	110	183	230	306	461
2,000	83	112	189	239	323	499
4,000	83	119	198	254	351	570
6,000	83	119	209	259	362	598
8,000	83	119	209	262	367	613
10,000	83	119	209	264	370	623