DETERMINANTS OF COMPLIANCE TO OCCUPATIONAL HEALTH AND SAFETY GUIDELINES AMONG MILL PLANT WORKERS OF ROOFINGS ROLLING MILLS, PHASE III – NAMANVE

BY

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DEDICATION

This work is dedicated to the family of Mr and Mrs Kiggundu and to my children; Ms.Valerie Kabiite, Ms. Kirabo Verina and Mr. Lutaaya Israel.

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LIST OF ACRONYMS

ANOVA	Analysis of Variance
AOR	Adjusted Odds Ratio
CCOHS	Canadian Centre for Occupational Health and Safety
CI	Confidence Interval
GS	Galvanized sheets
HFRG	Human Factors in Reliability Group
HSE	Health Safety Executive
ILO	International Labor Organization
O level	Ordinary Level
OHAS	Occupational Health and Safety
OHS	Occupational Health and Safety
PPE	Personal protective equipment
PPGI	Pre-painted galvanized sheets
SRS	Simple Random Sampling
STIL	Steel &Tube Industries Ltd
TMT	Thermo Mechanically Treated
TPB	Theory of Planned Behavior
WHO	World Health Organization
WHP	Workplace health promotion

OPERATIONAL DEFINITIONS

Compliance: The act of being disposed to agree with others or obey rules, especially to an excessive degree.

Determinant: A factor which influences the nature or outcome of something

Institutional determinants: These are characteristics inherent to the steel factory, that influence compliance to occupational health and safety guidelines among factory workers

Individual determinants: These are characteristics inherent to steel factory workers, which influence compliance to occupational health and safety guidelines

Work-related: Operationally defined for purposes of this study as pertaining to an action taking place during the course of performing work, or during the hours of work.

Mill plant: The part of the factory, where smelting and rolling of steel is done.

Mill plant worker: The employee working in the mill plant. This excludes the administrative staff of the factory.

Safety Climate: Operationally defined for purposes of this study as the collective attitudes and behaviors associated with the state of safety at a particular moment. (Zohar, 1980)

Hazard: The inherent potential to cause physical injury or damage to the health of people.

Occupational safety: working situations where injury risks or production loss have not begun, or unsafe act, poor work environment, or non-ergonomic practices are minimized by safety measures and adopting ergonomic means to control work hazards.

Occupational Safety and Health: Occupational safety and health should aim at the promotion and preservation of the highest degree of physical, mental and social well-being of laborers in all employments; the avoidance amongst workers of departures from health caused by their working conditions; the safeguarding of workers in their employment from risks resulting from factors adverse to health; the placing and preservation of the worker in a working environment adapted to his functional and psychological competences; and hence, the adaptation of work to man and of each man to his job.

Personal Protective Equipment: Personal Protective Equipment or PPE is designed to protect employees from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Personal Protective Equipment includes face guards, safety goggles, hard hats, safety boots, coveralls, gloves, ear morphs, vests and breathing apparatus. (OSHA Fact Sheet, 2009)

ABSTRACT

Background: The workplace has been established as one of the priority settings for health promotion in the 21st century. This is because it directly influences the physical, mental, economic and social well-being of workers and in turn the health of their families, communities and society. At the center of work place health promotion therefore are employees, who have to comply with a number of occupational health and safety guidelines put in place by their employers. This is even more imperative in the steel industry because it inherently harbors a high degree of work environment related risk because of the presence of a variety of physical, chemical, mechanical, and electrical hazards. While this calls for maximum compliance to safety guidelines on the part of the factory workers, it also calls for institutional action to ensure a safe work environment.

Objective: The purpose of this study was to assess compliance to occupational health and safety guidelines and its determinants thereof among mill plant workers

Method: The study adopted a mixed methods approach. Roofing's factory Phase III was purposively sampled. At the mill plant, stratified sampling was used to group the plant into five strata by department. To sample the factory worker simple random sampling (SRS) was used. The participants for the in depth interviews were purposively sampled. One quantitative method was used that is structured interviews. Key informant interviews were used to collect data from administrative staffs at the factory. Structured questionnaires and interview guides were used to capture the data. The quantitative data collected were analyzed using SPSS version 21, while qualitative data was thematically analyzed.

Results: The study found that the majority of the factory workers at steel rolling mill – phase III factory were compliant to the OHAS safety guidelines (n = 195, 70%).

It was found that workers who agreed that supervision was done to see if workers complying to OHAS, were three times as likely to be compliant to OHAS (AOR = 3.10, CI = 1.58 - 4.10). Factory workers who agreed that they were trained on the effective use of hearing-protection devices, were 4 times more likely to be compliant (AOR = 4.42, CI = 2.23 – 5.75).

Factory workers who had high knowledge about OHAS (AOR = 2.53, CI = 1.31 – 5.90), those who had worked for less than a year in the factory, (AOR = 4.22, CI = 2.00 - 7.49), those who worked for 6 - 10 hours per day (AOR = 4.42, CI = 1.25 – 6.70), those who perceived that the factory management gave enough work safety support (AOR = 7.28, CI = 2.16 - 11.48), and those who had attained secondary education (O level),(AOR = .23, CI = .09- .61), were more likely to be compliant to safety guidelines.

Conclusion: Compliance to occupational health and safety guidelines among factory workers at still rolling mills factory phaseIII is fairly high but not satisfactory. Only 7 out of every 10 workers are compliant to the safety guidelines. The level of compliance was majorly determined by individual characteristics of the factory workers, but also to a smaller extent influenced by institutional obligations such as training and supervion of workers to see if guidelines are being followed.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

The workplace has been established as one of the priority settings for health promotion in the 21st century (WHO, 2017). This is because it directly influences the physical, mental, economic and social well-being of workers and in turn the health of their families, communities and society (WHO, 2018). Health in the work place thus forms one of the Sustainable Development Goals; a healthy working life reduces poverty and stimulates economic growth, supporting achievement of Sustainable Development Goal 8 (Decent Work). The workplace offers an ideal setting and infrastructure to support the promotion of health of a large audience (WHO, 2018).

Whatever is done by employers, employees and/or society to improve the health and wellbeing of persons at work constitutes work place health promotion. Work place health promotion basically includes the improvement of the way work is organized, improvement of the working environment, reassuring employees to get involved in health promoting activities, and boosting personal development (WHO, 2017). It thus follows that employees form the core of work place health promotion, who then have to comply with a number of occupational health and safety guidelines put in place by their employees. This is even more imperative in the steel industry, given its international acclaim as one of work places with relatively higher risks of occupational hazards. The world steel association report of 2015, noted that the industry directly employs more than 2,000,000 people globally, plus 2,000,000 contractors and 4,000,000 people in supporting industries (World Steel Association Report, 2012).

The steel industry presents one of the most puzzling work settings due to the presence of a variety of bodily, chemical, mechanical, and electrical hazards (Frost and Sulivan, 2015). There

is hardly an area, process or type of work in an iron and steel plant that can or cannot be accident free. Thus, safety so much hinges on the employee's reaction to prospective dangers. The responsibility of the administration is to offer the safest probable physical conditions. However, for safety, it is always necessary to obtain everyone's cooperation in the safety programs (Satyendra, 2015).

1.1 Background of the study

Employees responsibilities towards safety in the steel industry include; working in line with their training, and the guidelines and means given by the administration, and complying with the set safety standards and measures (Satyendra, 2015). An employee has to take all steps to eradicate or control hazards or risks to themselves and to others arising during manufacture, including taking appropriate care to use personal protective equipment (Satyendra, 2015). Occupational safety and health compliance at the basic level means complying with occupational safety and health laws and regulations (Frost and Sulivan, 2015), and in the steel industry, it involves the aforementioned actions.

Some safety measures for workers in steel and metal fabrication industries include wearing high density eye goggles; face masks, gloves, ear plugs, apron, and air filters (Voke, 2007). However, it is possible that all not these are complied to by all factory workers given the reports of injury. Annually there are 2.3 million deaths, attributable to occupational diseases and injuries (Takala et al, 2014) and 4% of Gross Domestic Product (GDP) is lost due to occupational diseases and injuries (Aliyu, 2014). Globally, there are 2.9 billion workers who are exposed to hazardous risks at their work places (Meswani, 2012), and thus need to optimally comply with safety guidelines set in their respective work places. Kalejaiye (2013) reported that there was been annual work

related mortality rate of 1,249 per 100,000 workers in Nigeria in the past decade. In Ethiopia, the injury prevalence rate was reported to be 33.3% per year in the steel industry (Kifle, 2014).

In Uganda the occupational safety and health policy (2016), and the WHO declaration on occupational Health, 1994 demand that workers health be at the centre of every activity at any work place. For purposes of promoting health at the work place, occupational health and safety guidelines are pre requisites for operation of any organization in Uganda. Due to the high likelihood of risk in factory work environments, they are required to have a safety department. Both the WHO declaration on occupational Health (1994) and the OHAS policy of Uganda (2016) charge the employers with the responsibility to provide an enabling environment for health and the employees with the responsibility to abide by prescribed safety guidelines, move away from dangerous situations, and report dangerous situations.

Nonetheless, compliance to OHAS guidelines among mill plant workers in steel industries are not well documented in Uganda, there have been numerous reports of rampant occupational accidents where; excavations have caved in, roof tops of structures collapsed (34 fatalities), fire outbreaks among others (Occupation safety and health issues in Uganda, 2008). The Ugandan steel industry is made up of a number of companies majorly including; Roofings Limited launched in December 1995, BM Technical Services in Mbarara, Tembo Steel Mills, Steel &Tube Industries Ltd (STIL), Madhivani group run East African Steel Corporation in Jinja, Steel Rolling Mills ltd under the Alam Group of companies in Jinja established in 1987. Over the years to date, there have been reports of occupational work hazards in these industries both fatal and non-fatal (Kakama, 2014). Although a study has been carried out the occupational health and safety practice among workers in some of these industries (Kakama, 2014), the determinants of compliance to OHAS guidelines have not been extensively studied.

1.2 Statement of the problem

Steel rolling mills in Uganda have registered high incidences of occupational injuries and fatalities. On Friday 21st July 2011, a popular newspaper reported that a maintenance engineer had died in a factory accident when he was crushed during the machine maintenance at roofing steel mills plant in Namanve industrial area. Tuhairwa (2011) reported that a melting furnace had exploded at roofing steel mills plant in Namanve industrial park and 6 technicians who were at the basement to ensure proper running had sustained severe injuries on their faces, arms, heads and legs. These are safety lacunas that have been reported albeit the fact that there could be more of such that are not captured by media. Nonetheless, evidenced and anecdotal reports of occupational safety mishaps in this phase of steel rolling mills could be symbolic of non-satisfactory compliance to occupational health and safety practices in a steel industry among employers and employees at Roofing's phase 3 factories in Namanve.

Given that the human factor is involved in between 80% – 90% of accidents in factories (Flemming and Lardner, 2002), a question is posed as to the extent to which the industry workers in Roofing's phase III– Namanve comply to OHAS guidelines. This is in view of the fact that the industry has implemented OHAS guidelines according to OHAS act of Uganda (2006) and world steel association. The fatalities and injuries affect the quality of the work force, reduce productivity, increase cost of maintenance of workers, and finally affect development. To the affected individuals' family, the fatalities mean loss of a bread winning member of the family while the injuries mean morbidity, hence reduced work days and reduced income. To both, this means reduced quality of life.

1.3 Objectives of the study

1.3.1 General objective

To assess the determinants of compliance to occupational health and safety guidelines among mill plant workers of roofing's rolling mills phase III, – Namanve

1.3.2 Specific objectives

1. To establish level of compliance to OHAS guidelines among mill plant workers in factory phase III, roofing's steel rolling mills
2. To establish the individual determinants of compliance to OHAS guidelines among mill workers in factory phase III, roofing's steel rolling mills
3. To identify the institutional determinants of compliance to OHAS guidelines among mill plant workers in factory phase III, roofing's steel rolling mills

1.4 Research questions

1. What is level of compliance to OHAS guidelines among mill plant workers in factory phase 3 roofing's steel rolling mills?
2. What are the individual determinants of compliance to OHAS guidelines among mill plant workers in factory phase 3 roofing's steel rolling mills?
3. What are the institutional determinants of compliance to OHAS guidelines among mill plant workers in factory phase 3 roofing's steel rolling mills?

1.5 Justification of the study

There are five action areas for health promotion as identified in the Ottawa charter, and among these there are; building of healthy public policy, the creating supportive environments and the

development of personal skills. However, these salient action areas, hadn't yet received enough research attention in the sense of studying determinants of adoption of health behaviors that are in some way associated with those action areas. This was especially true in the context of work places with high risk occupational environments like the steel rolling mills, in which short of establishing work safety behaviors of staff and their determinants, health promotion and/or implementation of the key action areas of health promotion can be challenging. Therefore, it was rational to assess the determinants of compliance to occupational health and safety guidelines among mill plant workers of roofing's rolling mills so as to suggest targeted interventions to reduce risk at the work place and improve wellbeing of workers, their dependents and the society.

1.6 Significance of the study

This study served to identify the factors that facilitate or hinder the compliance to occupational health and safety guidelines and could be used to inform workplace health promotion development and implementation in Uganda, to promote safer work environments, as a social determinant of health, and reduce the incidence of, and socioeconomic costs of work related injury.

This study endeavored to determine the variations in conformity to occupational health and safety guidelines with demographic characteristics of the workers, thereby informing the industry management on how different categories of factory workers are practicing safety and how different categories of factory workers perceive safety. This allowed for proposing specific and focused safety improvement interventions, meant to meet the safety needs of the categories of mill workers that deserve those most. To the mill worker, if the findings are put to use by the policy makers and the Roofing's' industry, they will result in reduced fatalities and injuries and

hence an improved quality of life. To the management on the other hand, if findings of this study are implemented, they will help them make appropriate safety interventions on how to improve the compliance levels found. These results have the potential to reduce injuries and fatalities that would have occurred due to noncompliance, as well as to reduce associated costs.

Finally, the study yielded data or information that can be used by professionals and other agencies. It will serve as a reference point for people who may want to carry out similar studies in work health promotion.

1.6 Scope of the study

1.6.1 Geographical scope

The study was carried out at Phase III factory of Roofing's limited in Namanve. Roofing's Rolling Mill is a leading steel manufacturer in East Africa having three-Phased projects. Comprising a wire galvanizing line, reinforced TMT bars rolling mill, Continuous Galvanizing line and Colour Coating line located in Namanve Industrial and Business Park, Kampala, Uganda. Phase III of the steel rolling industry is a cold rolling mill with a capacity of 120.000 metric tonnes per annum for the production of galvanized sheets (GS) and pre-painted galvanized sheets (PPGI).

The headquarters of Roofing's group and two of its manufacturing companies and factories are located on 39 acres (16 ha) at Lubowa, Wakiso District, on the Kampala-Entebbe road (RGU, 2016), approximately 10 kilometres (6.2 mi) south of Kampala, the capital and largest city of Uganda (Otage, 2013).

1.6.2 Content scope

The study was restricted to studying two groups of determinants of compliance to use of personal protective equipment; these were work environment (institution) or employer related factors and individual mill plant worker related factors. This is because to achieve compliance to personal protective equipment use, both the employee and the employer must have met their obligations. Scope of awareness of occupational health and safety guidelines in the steel industry was regarded as adequate at least 75% awareness of the recommended safety guidelines.

1.7 Theoretical framework

The Theory of Planned Behavior (TPB) was used as the framework to explore the relationship between individual mill worker factors and employer/ institution related factors that may have affected decisions of the individual mill plant worker to follow prescribed safety protocols (Montano, Kasprzyk, & Taplin, 1997). Constructs of the theory of planned behavior shown to affect health decisions at individual level are: attitudes, subjective norms, and perceived behavioral control (Montano et al., 1997).

Attitudes

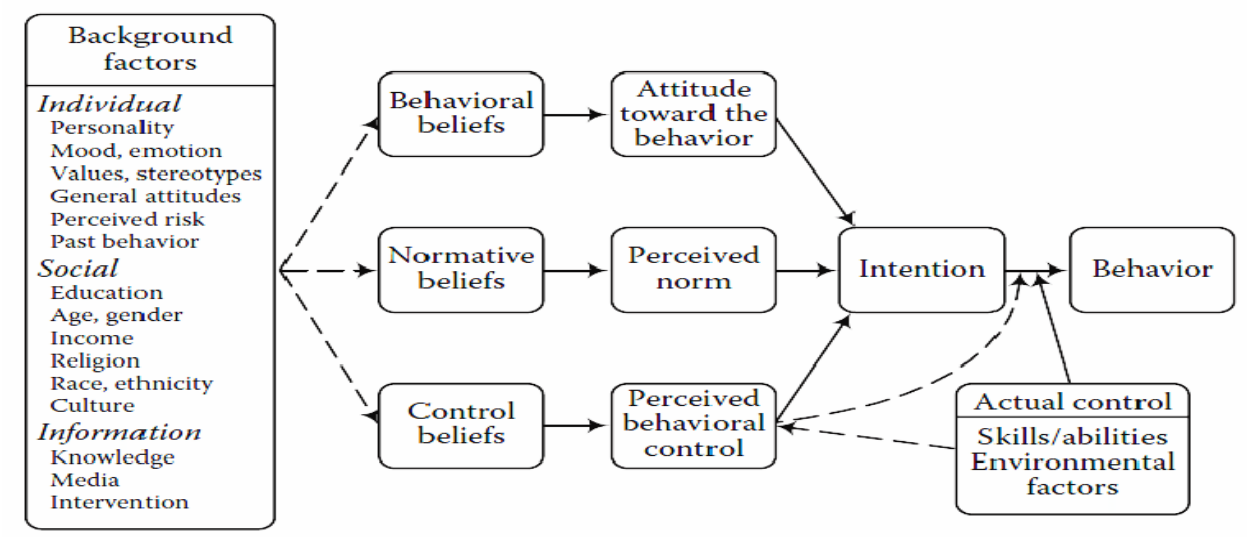
Behavioral beliefs associate the individual behavior with expected outcomes. The behavioral belief in this study is conformity to OHAS guidelines. The study will find out if the workers think that compliance to OHAS guidelines is beneficial to them (positive attitude) or if they think it is not beneficial to them (negative attitude). The individual's subjective value of the expected outcome leads to formation of an attitude toward the behavior. The strength of the attitude is determined by the behavioral belief, which is weighted by the evaluation of the outcome, in this case, conformity to OHAS guidelines

Subjective Norms

Subjective norms pertain to the perceived social pressures to perform or not perform the behavior. In this study, the social pressures may include supervision for use of PPE, pre work meetings conformity to OHAS guidelines for example the use of PPE by either superiors or other workers, and penalties for non-conformity to OHAS guidelines. The social pressures are derived from important referent individuals or group's approval / support or disapproval of performing a behavior.

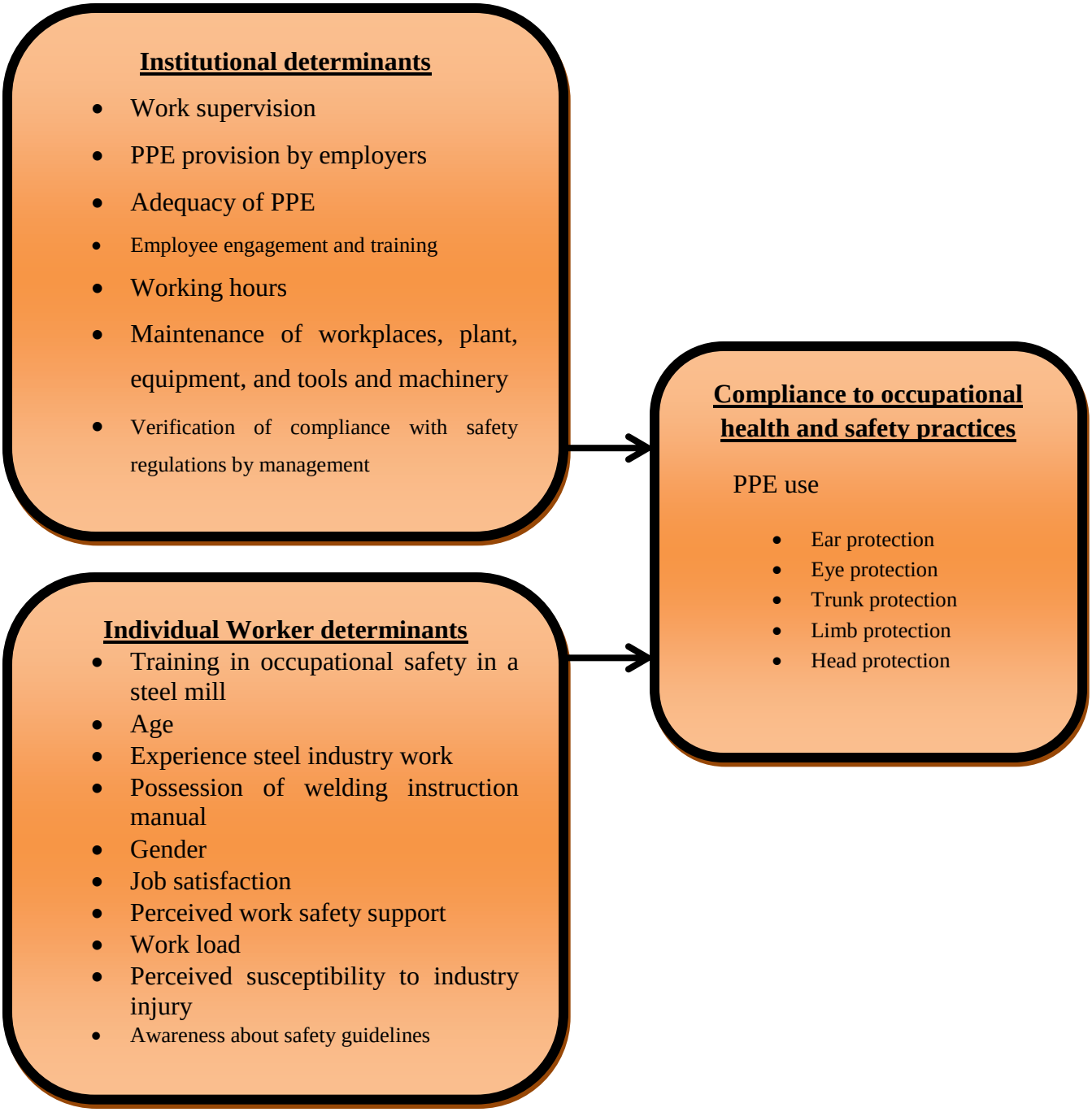
Perceived Behavioral Control

Perceived behavioral control refers to the perceived ease or difficulty of performing the behavior for example conformity to OHAS guidelines like use of PPE, and it is assumed to reflect past experience as well as anticipated barriers. This set of beliefs is related to the presence or absence of OHAS guidelines and PPE, and ease or comfort using the equipment, in relation to compliance. The control beliefs may have origin in past experiences with the behavior, but more likely to be influenced by information learned from others. Thus, the more resources or opportunities individuals believe they possess, and the fewer barriers they anticipate, the greater their perceived control over the behavior (Ajzen & Fishbein, 1980). Each control belief (c) is multiplied by the perceived power (p) of the control factor to facilitate or inhibit performance of the behavior, which is conformity to OHAS, in this study. The components of the theory interact to enable or hinder conformity to OHAS guidelines but are moderated by background characteristics.



1.8 Conceptual framework

The conceptual framework below shows the variables that were studied; with three constructs that were obtained from the theory of planned behavior. First was the construct of behavior, which in the conceptual framework has been illustrated as compliance to OHAS. Second is the theoretical construct of background characteristics and personal traits, which were conceptualized as individual determinants. This was the theoretical construct of subjective norms, which have been conceptualized as institutional determinants. Thus, the conceptual framework includes two independent variables and one dependent variable. The independent variables are Institutional determinants of a health promoting work place in a mill and individual factors while the dependent variable was compliance to safety rules and guidelines.


Institutional determinants
Work supervision
PPE provision by employers
Adequacy of PPE
Employee engagement and training
Working hours
Maintenance of workplaces, plant, equipment, and tools and machinery
Verification of compliance with safety regulations by management
Individual Worker determinants
Training in occupational safety in a steel mill
Age
Experience steel industry work
Possession of welding instruction manual
Gender
Job satisfaction
Perceived work safety support
Work load
Perceived susceptibility to industry injury
Awareness about safety guidelines
Compliance to occupational health and safety practices
PPE use
Ear protection
Eye protection
Trunk protection
Limb protection
Head protection

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter presents a review of literature specifically related to the study and systematically arranged according to each of the specific study objectives. The literature has been sourced from various online data bases like Pubmed and BMC as well as academic repositories like CINHAL, newsletters, University of Cape Town repository and the Human Factors in Reliability Group (HFRG). Given that few studies have been carried out to investigate the determinants of OSH in the steel industry, and the fact that the available studies date from 2012 and below, the literature was cited in generic terms covering other industries as well

2.1 Level of compliance to occupational health and safety practices among factory workers

Compliance to occupational health and safety is very important to the public health realm as it helps employees directly participate in their safety, helps companies and businesses in protecting their workers and thereby reduces the number of workplace injuries, medical illnesses and death. It can foster and nourish a healthy and safe work environment for all individuals in the work field. Besides the employers and employees, compliance to OHAS guidelines could also help protect co-workers, the members of the family, customers and other individuals who might possibly be affected in the workplace environment.

In terms of behavior change, the level of compliance can motivate the implementation of new or enhanced health and safety management systems, undergoing of workplace inspections, promotion of programs that enforce health and safety in the workplace, Keeping record and

reporting employer's requirements, and the development of training programs for the occupational safety and health team.

Health promotion at the work place aims at protecting the safety, health and well-being of people engaged in work or employment, through implementation of occupational health and safety guidelines (Manjunatha, 2013). It ensures a safe and healthy work environment, protects co-workers, family members, employers and customers from hazards. The achievement of a healthy and safe place of work is the responsibility of everyone employed in an organization as well as those working there under contract (Armstrong, 2009). Health promotion at the work place is concerned with protecting employees and other people affected by what the company produces and does, against the hazards arising from their employment or their links with the company (Jackson et al., 2009).

Safety programmes deal with prevention of accidents and with minimizing the resulting loss and damage to people and property; they relate more to systems of work than the working environment (Fleishman, 2013). Compliance to safety guidelines is considered the best way to promote health at the work place and prevent or control exposure to harmful substances or situations at work, although the method may not always be practical in many work situations, it is also not clear what level of compliance can achieve work place safety. In steel industries, elimination may involve the removal of the risk factor completely by robotisation of the process (Fleishman, 2013); a technique not well developed yet. Therefore it is important to find the individual and work environment related gaps so that they can be addressed as determinants of compliance.

The iron and steel industries are particularly hazardous places of work (Manjunatha, 2013). Common working sections or departments in iron and steel production are melting and rolling, cork and can section, nailing and fencing, mechanic and maintenance, crane operation, assembling, fabrication, engraving and electroplating, welding section, forging, grinding, foundering, packaging, painting and stamping (Villanueva, 2011). Routing operations in the iron and steel industry may expose its labor force to a wide range of dangers (Code of practice on safety and health in the iron and steel industry, 2005). As such, with low compliance to occupational health and safety guidelines among the industry workers, the odds of being injured are heightened. The most common occupational hazards include physical hazards, chemical hazards, lack of effective supervision on usage of personal protective equipment's (PPE), manual handling and repetitive work, inadequate workplace inspections and accident/ incident prevention programs, inadequate emergency rescue facilities, inadequate occupational safety and health training and lack of effective communication and coordination among the various professional groups (Code of practice on safety and health in the iron and steel industry, 2005; Murty, 2007).

In the iron and steel industry, great amounts of material are treated, transported and carried by massive apparatus that supersedes that of most industries. Steel works typically have refined safety and health programmes to address risks in an environment that is potentially highly dangerous. A combined approach including engineering control and maintenance practices, safe job techniques, worker training and use of personal protective equipment (PPE) is usually essential in the control of hazards (Aghilinejad, 2012). At many points in in the steel-making process bodily harm like burns may occur. These points may include at the front of the furnace during tapping from molten metal or slag; from spills, spatters or eruptions of hot metal from

ladles or vessels during processing, teeming (pouring) or transporting; and from contact with hot metal as it is being processed. (Aghilinejad, 2012).

Molten metal or slag may entrap water which heats up, vaporizes and generates an explosive force that blastoff hot metal or material over a wide area. Inserting a damp implement into molten metal may also cause violent eruptions. While powered conveyance is essential in iron and steel manufacturing it exposes workers to potential struck-by and caught- between hazards. (Malik, 2010).

It is imperative therefore that proper clearance for passage of large industrial tractors and other equipment is maintained and care is taken to avoid unexpected machine start-up and movement in order to reduce struck-by, struck-against and caught-between hazards to equipment operatives, pedestrians and other vehicle operators (Elizabeth, 2014). Programmes are also necessary for inspection and maintenance of equipment safety appliances and passageways. Frequent tidying up is essential for maintaining safety in iron and steel works since floors and passageways can quickly become obstructed with materials and implements posing a tripping hazard. The large quantities of greases, oils and lubricants used, if spilled can easily become a slipping hazard on walking or working surfaces (*Ibid*).

Due to heavy wear of tools in a steel industry, they soon become compromised and maybe dangerous to users. Although power operation has significantly reduced manual handling in the industry, ergonomic strains may still occur on many occasions. Steel products being sharp edged pose tear and perforation risks to workers involved in finishing, shipping and scrap-handling jobs. Heavy duty, cut-resistant gloves and wrist guards are often used to eliminate injuries.

Protective eye-wear is also important as foreign body eye injuries are common in the steel industry especially in sections where grinding, welding and burning occur (Elizabeth, 2014).

Alloy additions to furnaces making special steels sometimes poses potential exposure risks from chemical being added. Due to the prolonged exposure to hot environments in some sections, heat-illness prevention programmes must be effected (Eijkemans, 2004). Since furnaces may cause glare that can injure eyes unless suitable eye protection is provided and worn, manual operations, such as furnace bricklaying, and hand-arm vibration in chippers and grinders may cause ergonomic problems. Similarly, blower plants, oxygen plants, gas-discharge blowers and high-power electric furnaces produce non permissible levels of noise and may cause ear damage. Despite engineering controls like enclosing the source of noise with sound-deadening material or construction of sound-proofed shelters, hearing protectors (earmuffs or earplugs) are required in high-noise areas due to the unfeasibility of obtaining adequate noise reduction by other means (Malik, 2010).

Safety organization is thus of major significance in the iron and steel industry, where safety hinges so much on workers' response to possible hazards. The first responsibility for administration is to offer the safest possible physical conditions, but it is usually indispensable to obtain everyone's cooperation in safety programmes. Health and safety committees, workers' safety delegates, safety incentives, competitions, suggestion schemes, slogans and warning notices can all play an important part in safety programmes (ILO, 2010). However, few studies have attempted to determine the influence of these committees on compliance to safety guidelines. For the committees to be effective however, it is imperative that the employee exercise satisfactory level of compliance to the safety guidelines. A concerted effort, involving all persons in site hazard preventive measures can promote positive safety attitudes and focus

work forces to preventing work related injuries and illnesses. An examination of accident statistics in a particular wok setting can reveal areas that need more attention and evaluate the significance of different types of protective clothing (ILO, 2010). Regardless of the aforementioned suppositions about how safety in a steel industry can be maintained, some studies have revealed great variations in compliance to safety guidelines among staff.

In a study conducted by Kirti (2008) in India, the workers working in one of the steel pipe production units in Gujarat were considered. It was found that only one quarter of the workers (25%) were using some form of personal protective device. This was deemed to be a harmful practice as these workers are exposed to welding fumes, ionizing radiation and heat by virtue of their occupation. Out of 200 workers, 172(86.00%) were using safety shoes. Helmet was used by 79 (39.50%) workers. 82 (41.00%) workers were using gloves. Mask and goggles were used by 06 (03.00%) and 10(05.00%) workers respectively. Only One worker (0.50%) was using safety belt.

A study by Akanksha (2015) established various reasons for not using the protective devices among respondents. Out of 200 workers, 24 (12%) said that devices were not available for them, 23 (11.50%) said that they do not consider necessary to use the protective device during their work, 22 (11.00%) said that they do not require protective device in their work while 16(08.00%) were not comfortable with using the device. Regarding training for the use of protective devices out of 200 workers, 94 (47.00%) said that they got the training for the use of personal protective devices while 106 (53.00%) denied of any training for the use of personal protective equipment's. It had been observed that out of 57 (52.63%) workers who were not using the personal protective device (PPE) 30(52.63%) had history of injury. It was also observed that out of 143 workers who were using PPE, 93 (65.03%) had history of injury. No significant

difference was found between nonuse of PPE and occurrence of injuries (X^2=7181, df-1, p= .3968). In the above mentioned studied, no analysis was done to evidently confirm the cause effect relationships that were purported, but rather the reasons behind nonuse of PPE were analysed univariately.

With regard to the steel industry, compliance to use of PPE, is required to prevent hazardous exposures from head to toe. For eye and face protection, a helmet, hand shield and goggles are required. Eye protection needs to be fitted with the right type of filter lenses to protect the eyes from radiation. Respirators or face masks protect the metal fabricators respiratory system. It is important that the respiratory PPE is fitted with the correct type of cartridge or filter for the chemicals (i.e. welding fumes and gases) or substances (i.e. dust) in the work environment. Exposed skin of the body trunk can be protected by means of fire/flame resistant clothing and aprons. Rubber soled safety boots and insulated gloves protect the welder's feet and hands, respectively. In addition, ear plugs or ear muffs are required to protect the hearing of the factory workers (Canadian Centre for Occupational Health and Safety, 2015). These were all included in the content scope of the current study, to have a holistic picture of compliance to OHS.

Welding screens can be used to prevent the people working in the same area where welding is taking place from exposure to stray welding arc rays. Use of personal protective equipment (PPE) entails reliance on active cooperation and compliance by the worker (Alli, 2008). Therefore, it is cardinal that the workers are aware of the health hazards present in their work environment and the reason why they should protect themselves. In addition, for PPE to be effective, it is important to ensure that the workers know the right type of PPE to be used and that it is used in the correct way for the periods when the worker is exposed to harmful substances or situations (Alli, 2008).

2.2 Individual determinants of compliance to occupational health and safety guidelines among factory workers

According to Bhattacherjee (2003,p.390), in a study conducted to assess the associations of some individual factors and occupational injuries in North-Eastern France concluded that job categories also influenced likelihood of having accidents with the executives and professionals having accident rates of 1.2% whilst labourers had an accident rate of about 8.3%. Gyekye and Saminen, (2009, p.171) also found an association between educational level and safety behavior of workers using multivariate analysis the study concluded that higher educated workers were the most compliant with safety procedures and recorded the lowest accident involvement rate. In a study to investigate workers' perceptions of workplace safety in an African environment, specifically Ghanaian work places Gyekye (2006, p.32), observed that workers with positive perceptions about safety climate have been reported to have greater job satisfaction better safety practices and thus lower accident rates. This shows that a positive perception or attitude is a cue to better safety practices, because it creates a health belief.

According to Alli (2009) employers have a responsibility of ensuring a safe work environment through the prevention and protection of workers from occupational hazards. They also need to ensure workers are complying with laid down safety protocols and procedures. Although it is a policy requirement for any organization to ensure a safe work environment through the prevention and protection of workers from occupational hazards according to ILO, it is only moral that employees who come to work in healthy condition go back to their families in the same condition, enabling them to continue earning a living.

Bosak et al. (2013) studied the correlation of risk behavior with factors such as age, function (maintenance and production), contract type (permanent and temporary), and service length in a

chemical manufacturing organization in South Africa. Although there was a significant negative correlation of age with risk behavior, and significant positive correlation of function with risk behavior, these correlations were small (-0.09 and 0.12, respectively). However, when the researchers used multiple regression models including management commitment to safety, safety priority on plant, and pressure for production and their interactions as predictor variables, and age, function, contract type, and service length as control variables, with risk behavior as the dependent variable, they found a significant positive standardized partial regression coefficient (0.13) in all models, implying that an increase in the variables led to an increase in risk behavior. Contact type was only significant in one model (0.08). When the model included only the control variables, the regression coefficients were as follows: age (-0.16), function (0.10), and service length (0.15) meaning that age had an inverse relationship with risk behavior while function and service length had directly proportional relationships with risk behavior.

The occupational injuries increased with age at first and then declined making a U-shaped curve. Furthermore, after controlling age and tenure in the multiple regression model, some attitude scales (pressure from management/supervisor, team leader practice, and team leader knowledge with the safety system for the accident rates; and level of safe working behavior for the occupational injuries) predicted safety performance.

In a 2009 study carried out by Vinodkumar and Bhasi to determine the factors affecting the safety climate in the chemical industry in Kerala, India, a questionnaire was distributed among 2,536 employers of eight major accident hazard industrial units. The population consisted of workers and first line supervisors at the lowest end of the management personnel. One objective of the study was to assess the relationship of safety climate with personal characteristics such as age, experience, qualification, and job category. The researchers grouped the workers based on

age (up to 35 years, between 36 and 50, and above 50 years), education level (up to 10th standard, above 10th standard and up to degree, and degree and above), work experience (10 years, 11-20 years, and above 20 years), and job category (supervisory staff and workmen). One way analysis of variance (ANOVA) showed significant differences among age groups and also among experience groups for the employees' perception of four safety climate factors (management commitment and actions for safety, workers' knowledge and compliance to safety, workers' participation and commitment to safety, and risk justification).

Significant differences were found among qualification groups for all factors (except safeness of work environment and risk justification), and between two types of jobs for all factors (except workers' participation and commitment to safety and risk justification). The results showed that factor scores reduced at first and then increased with age and experience. Age and experience were highly correlated ($r= 0.86$, $p<0.01$). Vinodkumar and Bhasi stated that "it is not possible to say whether it is the age that influences the factor scores or the length of experience in the company". The younger and less experienced group had higher factor scores than the middle group. The researchers indicated that the younger group and those with shorter tenure behave positively toward safety attitudes. Furthermore, the improvement observed in the older group can be attributed to their experience. There was a positive relationship between factor scores and qualification because the highly qualified workers may be more responsive to safety rules and regulations. Finally, supervisors had better scores than the workmen because the supervisors enforce safety rules. This could be explained by the fact that the best way to enforce a practice is to live it.

Wu et al. (2007) studied the effect of individual factors on safety climate in Taiwan industries. The researchers distributed a self-administered questionnaire among employees of 100

universities and colleges. Multivariate analysis of variance was conducted to determine the effect of organizational category of ownership, the presence of a safety manager and safety committee, gender, age, job title, accident experience, job tenure, and safety training on the climate. Among individual factors, job tenure and work site did not influence safety climate significantly. There was a significant difference between male and female employees' perceptions regarding safety climate in emergency response. Males had stronger emergency response than females. Employees of various ages significantly differed in their perceptions regarding safety climate.

There was significant difference in safety climate perception among employees of various job titles. Managers had a higher perception of safety climate than faculty and staff. A significant difference was observed among employees with several accident experiences. Employees who had not experienced an accident had a stronger perception of safety climate than employees who experienced an accident. Finally, employee safety training level was found to be significant. The perceptions of employees having safety training were higher than the employees with no safety training.

A study that was carried out among Chinese Migrant Workers about occupational Injury Occurrence and Related Risk Factors showed that sex has significant influence on the occurrence of occupational injury. Compared to females, the likelihood of occupational injury is 10% higher for male migrant workers. Age also has a significant effect. This study also showed the likelihood of occupational injury is increased by 12% among respondents with no occupational training (Zhang, 2013). The study on small and medium scale industries in Gondar, Ethiopia showed Age, job categories and work experience were major socio-demographic determinants of work-related injury but monthly income and educational level showed no association. According to Aderaw, Engdaw, & Tadesse (2011, p. 7), in a study done in Ethiopia on the determinants of

occupational injuries among textile factory workers, men had a higher risk of occupational injury than women in manufacturing industries. Males were about 2.5 times more likely to sustain injuries at work due to their tendency to engage in risky behaviour. Working at younger age increases the risk of sustaining more occupational injury among factory workers compared with older workers (Bhattacherjee et al., 2003).

The study on large scale metal manufacturing industries in Addis Ababa, Ethiopia showed sex, age, educational status, employment pattern, health and safety supervision, weekly working hours, presence of danger signs and cigarette smoking are statistically associated with the occurrence of injury (Kanten, 2014). Another study on iron and steel manufacturing industries in Addis Ababa shows education and marital status of worker, number of night shifts, weekly working hours, work stress, excessive heat alcohol intake during working days, daytime sleepiness, job satisfaction and PPE use are associated with occurrence of injury (Kiflea, 2010).

In general the studies indicated from socio demographic factors that workers with young age are more susceptible to injury than their counter parts (Tadesse, 2007; Yiha, 2010; Serkalem, 2014) and other study shows the reverse (Villanueva, 2011). Similarly the magnitude of injury is high in male workers than female workers (Villanueva, 2011; Kanten, 2014).

Similarly workers with less work experience are in risk of work related injury (Tadesse, 2007). However Injury risk is high in initial years of employment diminishes when an individual acquires sufficient work experience, and rises again with aging (Vivek, 2012). Similarly low education level is related to more injury in some studies (Employer-Reported Workplace Injuries and Illnesses, 2012; Tadesse, 2007). In contrary one study shows high educational level is related with high injury occurrence (Kiflea, 2014). Two of the review literature indicates workers in

marriage are at less risk than divorced, separated and single workers (Kiflea, 2014; Serkalem, 2010).

From behavioral factors literatures show that the magnitude of work related injury is high in workers not using personal protective equipment/device compared to workers using PPE/PPD (Kiflea, 2014; Serkalem, 2010). Similarly workers with sleeping disturbance at working time are more injured than workers without sleeping disturbance (Tadesse, 2007; Serkalem, 2010; DeArmond, 2009). Similarly workers satisfied by their job are less injured than those dissatisfied by their job. (Tadesse, 2007; Serkalem, 2010) Also studies show that workers take alcohol more days than their counter parts have less compliance and a high injury rate (Yiha, 2010; Serkalem, 2010; Tadesse, 2007) one study shows worker smoking cigarette are more susceptible to injury and the other study shows workers chewing chat are more get injured than workers not chewing chat.

In a study by Akanksha (2015), efforts to find out why workers were not compliant to PPE use revealed that, regarding training for the use of protective devices out of 200 workers, 94 (47.00%) said that they got the training for the use of personal protective devices while 106 (53.00%) denied of any training for the use of personal protective equipments. It had been observed that out of 57 (52.63%) workers who were not using the personal protective device (PPE) 30(52.63%) had history of injury. It was also observed that out of 143 workers who were using PPE, 93 (65.03%) had history of injury. No significant difference was found between nonuse of PPE and occurrence of injuries in that study. This study did not use relationship statistics to establish the influence of the independent variables on compliance to PPE, but rather relied on frequencies, which did not bring out evidence of findings.

The concepts knowledge, attitude and practice are related to each other, and it is not easy to separate them. If an individual has knowledge about something, he or she will develop either a positive or negative attitude towards that thing. Good practice or acceptable practice is usually the result of appropriately acquired knowledge. The primary aim of work health promoting policy is the prevention of accidents and illness, which employs knowledge as the principal tool. Only accurate knowledge of the risks and adequate training in preventing and handling them can enable the worker to adopt appropriate behaviour in a hazardous working environment (Hatting, 2013). However, varying levels of awareness about occupational health and safety have been found in various studies for example, a study by Kiprotich (2015) also established that most workers of the seven tea factories he sampled were not aware of safety measures in case of fire, while Adebola (2014) found that a high proportion of respondents (68.3%) had a high level of awareness of hazards control in the depot. In 2008, a cross-sectional analytic study to assess the level of knowledge, attitude and practice of PPE use was conducted amongst rattan craftsmen in Vietnam. Four hundred and three participants consented and completed the research questionnaire. The results showed that 78.2% had low knowledge about PPE, 18% had moderate knowledge while only 3.7% had a high knowledge. Four per cent had a positive attitude towards PPE, 69% had a neutral attitude and 26.8% had a negative attitude. The majority of participants indicated a fair level of practice of PPE as opposed to a more than a good level of practice (Troung, Siriwong & Robson, 2009). Musa et al., (2012) in a study he carried out among cement factory workers at obajana, Kogi state, Nigeria, found that most of the respondents 261(96.3%) were aware of protective measures while 10(3.7%) of them were not aware of these measures.

2.3 Institutional determinants of compliance to occupational health and safety guidelines among factory workers

Researchers have increasingly recognized that industrial accidents are caused by a dynamic interaction between factors in the social and physical environments, that is, characteristics of the individual and the organization as well as technical forces (Kanten, 2010). A study in USA indicated working in jobs with overtime schedules was associated with a 61% higher injury hazard rate compared to jobs without overtime. Working at least 12 hours per day was associated with a 37% increased hazard rate coupled with working at least 60 hours per week was associated with a 23% increased hazard rate (Dembe, 2005).

The large number of occupational accidents in developing countries has significant human cost and severely affects the economic potential and productivity of the country. Genuine safety culture requires a change of mentality and a reliable commitment from the top management, where everyone participates and commits to occupational health and safety along with the stronger institutional pressure (Fernández-Muñiz *et al.*, 2009). Managers of the firms are the key actors in the safety management systems of the firms as they can make the decisions to invest in the prevention or not. Adherence to health and safety in welding site can be linked to top management commitment to worker safety.

Management commitment to delivering a good safety policy, better management-worker relationship, safety representative, frequent toolbox talks on safety among others can help adherence of health and safety (Aksorn and Hadikusumo, 2008). This notion is true because employers own the business and their level of commitment to health and safety will determine how the ordinary laborer or employee adheres. According to Health and Safety Executive

(2003), a committed management will stop all activities to attend to safety matters irrespective of the cost involved.

According to Health and Safety Executive (2003), a good communication relationship between employer and employee provides good updates on current matters day to day and in formal safety meetings, listening and feedback. The health and safety practice in the construction industry has to be well communicated amongst all the workers who have direct involvement in the construction process. Whenever health and safety policies are produced or revised, the members forming part of the companies must come to the knowledge in order to diligently observe them. This can only be appropriated when there is a sustained flow of safety and health related information amongst all the concerned workers.

It has been noticed in various hazardous incidences on welding sites that workers are often not aware of safety practices and equipment at their disposal in times when they are needed. It therefore becomes the prime duty of the management team to ensure that whatever level of health and safety commitment and practices that the company is operating at, the workers are aware and ready to engage them. Communicating vital health and safety information to workers effectively can help address critical health and safety matters (Tutt et. al., 2011). If the work site management can make health and safety communication an integral part of their operations, it can increase compliance reduce accident drastically. The mode of the communication would have to be set properly so that the workers would benefit fully. The language used will have to be understood by every worker to generate interest in complying to both literate and semi-literates.

According to HSE (2007), effective communication about health and safety rules and guidelines relies on information coming into the organization, flowing within the organization and going out from the organization. All these information flow can be properly addressed if management is committed. One of the duties given to the employer by the Occupational Safety and Health Act, 2006 is to provide and maintain the plant, systems and procedures of work that are safe and without risk to the health of workers. Fuller and Vassie (2004) stated that since the employer decides on the technology to be used at the workplace, they are expected to be responsible for managing the risks and ensuring compliance of the workers to risk control measures.

Provision of safety incentives to factory workers by management to motivate safe practices at work

One area in hazardous industries like that of steel firms that is controversial in adhering to safety practices by employees is provision of safety incentives (Bizell, 2008). Incentives like bonuses paid to operatives can lead to attaining greater production through conducting work safely at site. Jobs where workers are paid hazard money are mostly those that come with higher risk of accidents (Lund and Aaro, 2004). Due to the nature of steel work and the risk involved, it will not be out of place to set up safety bonus for workers; for example, when they have conducted their site work the whole year without recording any accidents. This in turn sparks interest in operatives to conduct duties safely and prompt co-workers.

Choudhry and Fang (2008) opined that when productivity bonuses are encouraged, it achieves high production at the detriment of safety and thus compliance to safety increases. Lee (2003) in similar research stated that issues concerning bonus payment creates problem for management

therefore paying safety bonuses rather than productivity bonuses relatively impact positively on productivity and safety performance as a whole.

Furthermore, bonuses for workers help as one of the many ways used to inspire the observation and practice of health and safety on construction sites. The award is granted to the workers to show their stern following of health and safety procedures at the work place periodically to motivate them to sustain such practices even if more. They are also awarded to workmen who obtain exceptional safety and health performance and can augment particular safe behaviours, promote good construction site culture and participating in safety initiatives. It is imperative to communicate the reward scheme to all the workmen who are covered by such arrangements so that the companies can benefit from the competition. That is to say, what it takes to be able to win the awards should be clearly delineated unto all the workers so that there is no such bias entertained. One of the easiest and most cost effective means to provide a safety incentive for the workers is to recognize them in some way for undertaking their work tasks safely (Choudhry and Fang, 2008).

Pre-work meetings to re-emphasize importance of safety practices

Pre-work safety meetings are work site practices that may encourage safety performance (Irizarry and Abraham, 2006). Pre-work meetings address daily activities and hazards workers may be exposed to at the beginning of each day throughout the cycle of the project (Nighswonger, 2001). A pre-work meeting helps heighten workers' safety awareness and it is a constant reminder to operatives that their companies care about their safety (Bizzell, 2008).

Supervision by management to ensure adherence to safety practices

Supervision can be defined as co-ordination by someone taking responsibility for the work of others (Mintzberg, 1979). According to HSE (2003), supervision when properly conducted can increase compliance to guidelines and eliminate some site accidents. Management can institute a proper supervision system in the roofing companies' right from the period materials are delivered on site, throughout the project duration and after completion. It will go a long way to create adhesion to health and safety with workers knowing very well management is concerned about their site activities. Constant supervision can bring to light all the peculiar challenges roofers face so as to mitigate risk, identify areas operative need training and improve site conditions through the design stage.

A quantitative study was conducted at Foskor Mine in the Limpopo Province, South Africa to establish which problems were encountered during the use of personal protective equipment. The findings revealed that workers were using protective equipment but still encountered injuries and occupational diseases. The reported problems included too heavy, very hot or cold, wrong size, unavailable and unsuitable. A total of 98% of the respondents confirmed that they were supplied with PPE and they were using them. Of the majority of respondents (82%) who knew about the importance of PPE, 46% stated that there was no monitoring of PPE use during working hours (Pilusa & Mogotlane, 2008).

When it comes to safety procedures, provision of personal protective equipment's and regular safety training are essential for occupational safety and is the responsibility of the employer. The employer also has a responsibility to provide necessary first aid facilities should accidents and emergencies occur. Adequate arrangements should also be made by the employer for

compensation of work-related injuries and diseases, as well as for rehabilitation and to facilitate a prompt return to work.

Signs and symbols

Warnings in the forms of signs and symbols have been recognized as one of the effective tools to influence behavior and improve the risk perception and compliance of recipients. However, there has been no work done on this area concerning construction. Understanding signs will provide valuable information in fine-tuning the safety management strategies for the construction industry and can perpetual safety compliance if properly installed. Safety signs usually contain four components: signal words, hazard statement, noncompliance statement and some instructions, (Edworthy and Adams, 2006).

There are many kinds of warnings in the forms of verbal, bells, beep sounds, etc.Among these, safety signs are one of the most common types used in the welding industry. It contains other information-telling observers what can be done and what cannot be done. Normally, safety signs contain four components: signal words such as caution, a hazard statement, and a statement informing the observers what may happen for noncompliance and a statement telling the observers how to avoid the hazard, being informed by management on these signs can increase compliance to safety guidelines Ma et al (2007).

From workplace variables some of the literatures show that workers working more hours in the week are more injured than workers working only standard weekly working hour (Yiha, 2010; Tadesse, 2007; Serkalem, 2010). Also extended work hours increased the risk of occupational injury. Especially working over 12 hours per day doubled the risk of injury. Similarly workers who have trained on health and safety are less injured than those who didn’t train on

occupational health and safety (Aderaw, 2011), Also the studies show that workers in environment not regularly supervised on safety and health issue are more likely injured than workers whose job is regularly supervised on safety and health matters (Aderaw, 2011; Tadesse, 2007). Crosses sectional study in Japan shows Temporary workers are less compliant to safety guidelines and are more prone to injury than permanent workers (Sakurai, 2013).

2.4 Literature Gap

This chapter revealed a gap in the literature available as regards level of compliance to OHAS guidelines and its determinants in fully fledged steel rolling industry. The literature available and cited majorly entails compliance to safety among various sectors related to the steel industry and not the steel industry in its specificity. For the studies that made that attempt, few of them had analytical evidence to the effect that a certain variable was significantly responsible for the nonuse of safety equipment. This study was carried out in a steel rolling factory to bridge the gap specific to the industry and it sought to establish cause effect relationship between compliance and its determinants. Secondly, few studies assessed compliance as a composite measure yet, to be compliant to OHAS, there are a number of rules that have to be adhered to. This study attempted to assess compliance using different PPE. Important to note too, is the fact that Uganda as a country has meager literature to this effect. Few or no recent studies have been carried out in the steel industry related to either occupational health and safety, compliance or its determinants among the employees, hence the knowledge and literature gaps, that this study sought to reduce.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This section describes the research design, target population, eligibility criteria, sample size estimation, data collection tool and methods that were used, applied and how validity and reliability of the data collection instrument was ensured, plus quality control techniques. Also discussed in this chapter are the data management and analysis techniques, measurement of variables, and ethical considerations and how the collected report will be disseminated after completion.

3.1 Research design

The study adopted a mixed methods approach in an effort to collect data and answer the research questions of the study from both quantitative and qualitative perspectives. In this mixed methods design, both quantitative (Analytical cross-sectional approach) and qualitative components were incorporated and data was concurrently collected. Adopting a mixed methods design for this study increased the reliability of the study results (Cresswell & plano, 2007), given that various data collection methods were used in the design to achieve triangulation. The quantitative methods were used because they allowed for the counting and analysis of the data obtained by the study statistically. The quantitative component helped to generate quantifiable, reliable data, generalizable to the study population (Weinreich, 2000). It allowed the researcher to engage with a large number of people and enhanced the results.

On the other hand, qualitative methods enabled the researcher to understand the variables under study in greater opinionated detail that quantitative methods could not. The qualitative component helped to understand the deeper context of compliance to occupational health and safety guidelines and its determinants among mill workers of factory phase III, roofing's rolling mills – Namanve. This triangulation was important to cross-check data provided by the quantitative tool, explain behavior and give a more detailed and balanced picture of the situation.

3.2 Study population

The primary study population was mill plant workers at Roofing's factory Phase III – Namanve. These responded to the quantitative data collection tool. The secondary study population was the safety managers and section supervisors who engaged in the key informant interviews.

3.2.1 Inclusion criteria

Mill plant workers as well as their supervisors and safety managers at the roofing's factory and who were willing to participate in the study

3.2.2 Exclusion criteria

The study excluded mill plant workers who were not available for interview on more than two occasions after being sampled during the field survey, and mill plant workers who had spent less than a month as official employees of roofing's factory phase III

3.3 Sample size calculation

Kish Leslie formula to estimate the sample size was used.

$$n=\frac{Z^2 pq}{d^2}$$

Where: Z=standard normal deviation at the required confidence interval of 95%

p=proportion in target population with characteristics being used.

q=1-p

d=margin of error set at 5% or 0.05

p = 0.5 as recommended by Fisher et al which assumes 50% of characteristics of interest that are unknown (compliance level among the factory workers in factory phase 3)

q=1-p = 0.5

Z=1.96 at 95% confidence interval

$$n=\frac{1.96^2 \times 0.5 \times 0.5}{0.05^2}$$

n= 384

Since the target population of factory workers for Roofing's factory Phase III, was less than 10,000, the anticipated sample size adjustment formula (Mugenda and Mugenda, 2003) was used as follows:

$$nf = \frac{n}{1 + n/N}$$

Where;

nf = the desired sample size (when the target population is less than 10,000)

N = the estimate population (1000)

n = desired sample size (when the target population is less than 10,000)

Therefore, the study involved 277 factory workers.

Therefore using the formulary by Mugenda and Mugenda (2003) to estimate the required sample size

$$nf = \frac{384}{1+384/1000}$$

The study sample size = 277 factory workers.

3.4 Sampling procedures

A sampling method is the process of selecting the sample from a population in order to obtain information regarding a phenomenon in a way that represents the population of interest (Brink 1996:133). A sampling method is thus a way devised to select the population eligible for the research study (Polit et al 2001). In this study, random and non- random sampling techniques were used to arrive at the respondents as shown and explained below. Roofing's factory Phase III, was purposively sampled. Purposive sampling (also known as judgment, selective or subjective sampling) is a sampling technique that occurs when "elements selected for the sample

are chosen by the judgment of the researcher (Black, 2010). Therefore the researcher sampled Roofing's factory Phase III, on the premise that it is the factory under roofing's Ltd with the highest reported number of occupational injuries among the workers.

At the mill plant, stratified sampling was used to group the plant into five strata i.e.; pickling, cold Rolling, Batch Annealing, Galvanizing and color coating plant departments. Given that the researcher targeted conducting interviews during the day coinciding with the time when the factory staffs are always on duty, she requested the human resource manager of the plant to compile for her a list of factory workers that are available in each of the five departments of the factory mentioned above. On availing the list, the researcher further requested that she is availed the factory workers in those respective departments, one department at time in order for the sampling process of potential respondents to commence. This was done in order to avoid interrupting the day to day activities of the workers, which could have happened had they been sampled at once.

To arrive at the number of respondents required from each department, a simple calculation was done based on the estimated number of workers who were available during the day shifts in each section by using the formula; $\frac{N1}{N2} \times n$

Where;

N1 = Number of workers available per section

N2 = Target population size for the time the researcher anticipated to conduct interviews (531)

n = Study sample size

Department	N1	N2 (531)	N	Required number
Pickling	101	531	277	53
Cold Rolling	131	531	277	68
Batch annealing	84	531	277	44
Galvanizing	102	531	277	53
Color coating	113	531	277	59

Therefore, on the lists compiled, the researcher chose a name of a factory worker, who was then called upon from the factory to come outside where the interviews were to be conducted. To sample the factory worker called upon, simple random sampling (SRS) was used. In the SRS method, an opaque polythene bag containing 1 blue and 1 red pen cap was presented to each of the respondents so that they could randomly pick one of the caps. However, caution was taken to ensure that the pen caps were not visible to the factory worker by asking them to just dip their hand in the bag and pick any cap at random.

The blue cap represented “sampled in” and the red cap represented “not sampled in”. The bag contained a collection of 2 pen caps in a ratio of 1 red: 1 blue so as to give each cap equal chance of being picked. Simple random sampling was used to sample the factory workers because with it, sampling bias was eliminated and secondly it allowed for fast sampling of factory workers outside the factory, which minimized work interruption. The factory worker who picked the blue cap was briefed about the study, and requested to consent, upon which interviews were done. Factory workers who picked red caps were thanked for their time and requested to return to their factory duties.

Selection of key informants

The participant for the in depth interviews were purposively sampled to provide a detailed picture of health and safety in the mill as well as measures in place to ensure compliance to health and safety guidelines. These were safety managers, and heads of departments at roofing's factory phase.

3.5 Data collection methods

Two types of data collection methods were used to collect data in this study aiming at ensuring triangulation and thus reliability of the study results.

Structured interviews

One quantitative method was used that is structured interviews. Structured interviews are a method of collecting data where respondents are asked questions which have predetermined response options. Structured interviews consist of a series of pre-determined questions that all interviewees answer in the same order. Structured interviews were particularly conducted because they provide precise responses from the respondent's thus increasing accuracy. This type of data collection method was also used because of the ease with which interviewing can be done if questions are close ended, and because of the relatively little time that is required for conducting a structured interview, which is of an advantage especially if large sample sizes are required, yet there is limited time. As mentioned earlier, the respondents were sampled when majority were still on duty, as such engaging them in any other form of interview would have required a lot of time which could not be feasible, hence the choice of structured interviews.

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Key informant interviews

Key informant interviews were used to collect data from staffs at the factory that were considered as having administrative information by virtue of their positions at the factory. A total of 5 interviews were conducted although the researcher realized that between the fourth and fifth interview, saturation had set in, hence considering 4 interviews for analysis. Key informant interviews were carried out face to face so that a rapport could be created with respondents. Key informant interviews are very flexible and can be used to study a great variety of areas in the social sciences. Key informant interviews are particularly suited to situations where the nature of enquiry is exploratory (probing, investigative) especially when the source population is very small as was the case for this study. Key informant interviews do not just find out what people think but also how they think and why they think in a certain way, and so they were used to find out what safety managers and department heads/supervisors at roofing's thought about compliance to OHAS guidelines among the factory workers and what they thought determines compliance to the safety guidelines.

3.6 Data collection tools

Following the two data collection methods mentioned in the above section, two sets of tools were used to capture the required data. These were structured questionnaires for primary respondents and unstructured questionnaires (interview guides) for key informants.

Structured questionnaires

The structured questionnaires were researcher administered and they was used to assess compliance to occupational health and safety guidelines and its determinants among factory workers of factory phase III, roofing's rolling mills – Namanve. The questionnaires that were used had only close ended questions. The questions used gave choices of answers, some of which only required for example, a 'yes' or 'no', or an "Agree", "Disagree" response. Structured questions were used in order to allow for an easy comparison and quantification of the results. The structured interviewer-administered questionnaire consisted of five parts as shown below;

PART	Content
Part A	Socio demographic characteristics
Part B	Compliance to OHAS guidelines
Part C	Approaches to ensure a health promoting work place
Part D	Individual factors

Key informant interview guides

A key informant interview guide was designed with open ended questions to allow for discussion between the safety manager and the researcher on issues pertaining to occupational health and safety in the factory.

3.7 Data quality control

To ensure that the data generated is complete, reliable, accurate and above all reproducible using the same methods quality control was addressed through the following measures.

Training of research assistants

Four research assistants were recruited and trained for a day on issues pertaining to compliance occupational health and safety, participant handling skills such as interviewing skills, content and meaning of questions, correct recording of responses, and orientation to study objectives and procedures. The training also covered ethical considerations when handling participants, especially confidentiality of responses. These research assistants were recruited to help in the data collection process because being a work station based study, and given the time constraints, it was imperative that the researcher gets some more personnel to enable her cover more ground in the field in less time, so as to avoid significantly affecting production.

Pre-testing the data collection tools

The purpose of the pretest is to elicit flaws in the data collection tools, such as ambiguity and illogically sequenced questions and make revisions to strengthen the methodology (Basavanthappa, 2007). For this study, pre testing of the data collection tools was conducted on a sample of people which had similar characteristics as the actual study sample; this was at steel and tube industries on Jinja road. This helped to improve the data collection tools in terms of content and order of the questions in relation to the study objectives and necessary adjustments that needed to be made prior to data collection. The pretest was also used to determine the predictability of the data collection (Basavanthappa, 2007). It also helped the researcher to

determine the reactions of the respondents to the research procedure that the investigator watched for during the pre-test study.

Field editing of data

The researcher conducted preliminary field editing on the same day as the interviews were being done in order to; identify technical omissions such as a blank page on an interview form, check legibility of choices made as per the responses of the respondents; clarify responses that are logically or conceptually inconsistent. A daily field edit also allowed research assistants to identify respondents who could be re-contacted to fill in omissions in a timely fashion, ensuring a high questionnaire completion rate.

External validity

Burns and Grove (1999) describe external validity as "the extent to which the results can be generalized beyond the sample used in the study". This usually depends on the degree to which the sample represents the population. High external validity in this study implies that the results of a study can apply to not only roofing's factor phase III, but also other steel rolling factories in Uganda (Burns & Grove 1997; Neuman 1997). The external validity of this study was maintained by first of all targeting a representative sample of factory workers, selecting a random non-convenient sample of factory workers. There was guarantee that the factory workers sampled had dissimilar backgrounds and opinions as this sample were drawn randomly, implying that every factory worker in the research population had an equal chance of being included in the research sample.

To further ensure that the data generated was complete, reliable, accurate and above all reproducible using the same methods quality of data was addressed through the following measures.

- Effective supervision of research assistants was done to ensure work went on as planned. Any errors detected were discussed during the end of day meeting for solutions and best ways forward.

- Every day the data entry list was checked for completeness and accuracy so as to minimize possibilities of errors arising.

3.8 Measurement of variables

Compliance to OHAS guidelines

This was measured basing on the frequency of use of personal protective equipment among the respondents over a period of 7 days prior to the study. The period of 7 days was used for the reason that it could allow for easier recall of PPE use among the respondents, thus increasing accuracy of the responses. Each of the six questions used to assess compliance to safety guidelines had three response options score in the following order; Always = 3, Sometimes = 2, and rarely = 1. Therefore, the highest possible score for all the six questions was 18, and the minimum score was 6. A respondent was considered to be compliant is they scored at least 15 points.

Level of awareness

The level of awareness was measured using a 4 item scale, from which a cut off of 3/ 4 questions correctly responded to constituted high level of awareness and 2 or less questions correctly responded to, constituted low awareness.

3.9 Data analysis

3.91 Quantitative data

According to Yin (2003, p. 109) data analysis consists of "examining, categorizing, tabulating, testing, or otherwise recombining the quantitative evidence to address the initial propositions of a study." In this study, the primary step in analyzing the quantitative data was checking the questionnaire for consistency and errors. As most of the questions were close-ended, their responses were grouped into few discrete categories and tallied accordingly and analyzed through descriptive analysis method. The quantitative data collected were analyzed using SPSS version 21. First, all variables were analyzed at univariate level with an aim of first establishing the frequencies and valid percentages of each attribute therein.

At bivariate level, the data was analyzed using cross tabulations, and crude odds ratios to establish the relationship between the independent variables and the dependent variable (compliance to safety guidelines). At this level, alpha was set at 5%, implying that statistical significance was recognized if the p value was less than 0.05.

All variables that were significant at bivariate level were fitted into a logistic regression model to find out their independent prediction of compliance to occupational health and safety guidelines among factory workers at roofing's factory phase III. Backward step wise multivariable logistic

regression was done to determine independent predictors of compliance to OHAS guidelines among the factory workers. Variables not significantly associated (p value less than 0.05) were eliminated in stepwise followed by reentrance of the left variables until those significant variables were left in the final model. All tests were two-sided and $P < 0.05$ was considered statistically significant. Adjustment was made to control for the effect of confounders on the dependent variable, and the results have been thus reported using adjusted odds ratios.

3.92 Qualitative analysis

Textual data analysis of the transcripts of key informant interviews has been employed. The analysis began in the field, at the time when the key informant interviews were carried on. Information gathered from the interview notes, tape recordings, jottings or other records were read through to get what was being said, identifying key themes and issues in each text which finally were transformed into clusters of meaning, tying the transformation together to make a general description of the experience, including textural description, what was experienced and structural description, how it was experienced (Lester, 1999; Creswell, 1998).

Data was transcribed by typing text into the word processing document. All transcripts in Luganda were then translated to English language by the researcher. A research assistant was asked to re-translate three interviews selected randomly as a control of any researcher biased translation. Transcribed and translated data was read carefully, creating themes followed by assigning of a code or category name to signify the particular segment (Ryan & Bernard, 2003; Gorden, 1992)

3.10 Ethical considerations

The researcher observed a number of research ethics at all stages of the research process. The proposal was submitted to Uganda Martyrs University research committee for approval. Once the researcher had been given a go ahead to proceed with the data collection, permission to interview staff at Roofing's Rolling Mills Phase III was also sought.

Informed consent

Informed verbal consent of participants was sought. The objectives of the study were discussed with each participant. The participants were told that there was no incentive but the findings were to benefit the factory workers and that they have full right to discontinue the questionnaire at any time during the session. Privacy and confidentiality were maintained during and after the interview.

At the beginning and the end of filling of each questionnaire, data collectors thanked the study subjects for their willingness and giving their time to participate in the study. Also, the research report only portrays figures, statistics and discussions without giving any names.

The right to self-determination

The principle of self-determination means that prospective participants have the right to decide voluntarily whether to participate in a study, without risking any penalty or prejudicial treatment (Polit & Beck 2008). In this research, respondents were treated as 'autonomous agents' and they was informed of the study's objectives, requested to participate in the study, informed of their rights including the right to withdraw from the study without fear of any penalty and they were not coerced or deceived to participate. Their participation was totally voluntary.

Confidentiality

The data collectors informed the respondents that information that was to be collected from this research project would be kept confidential. They were told that all questionnaires were not going to have any of their names, but rather number codes to identify them.

Right to refuse or withdraw

Participants were told that they had the full right to withdraw from participating in the research (they were able to choose not to respond to some or all questions). It was further explained to the participants that if they do not wish to participate in the study they can withdraw.

3.11 Dissemination of findings

With the help of the stakeholders particularly Uganda Martyrs University and the factory authorities, sessions will be organized for the presentation of findings, after which final copies of the report will be given to Roofing's Ltd

CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter presents results related to the determinants of compliance to occupational health and safety guidelines among mill plant workers of roofing's rolling mills – Namanve. The results are presented in both tables and figures according to the specific objectives of study

4.1 Primary Respondent bio data

Table 1: Socio demographic characteristic of the mill plant workers

Variable	Attribute	Frequency [n = 277]	Percent
Current age			
	18 - 28 years	42	15.2
	29 - 39 years	123	44.4
	40 - 50 years	80	28.9
	More than 50 years	32	11.6
Marital status			
	Single	53	19.1
	Married	110	39.7
	Cohabiting	100	36.1
	Separated	14	5.1
Religion			
	Catholic	122	44.0
	Anglican	78	28.2
	Muslim	35	12.6
	Born again	28	10.1
	SDA	14	5.1
Level of education			
	Secondary (O level)	43	15.5
	Secondary (A level)	139	50.2
	Post-secondary education	95	34.3
Duration of working in factory			
	1 - 5 years	108	39.0
	5 - 10 years	169	61.0

The results in the table above show the socio demographic profiles of the respondents; it is shown that almost half of the mill plant workers sampled had ages in the range of 29 - 39 years (n = 123, 44.4%) and subscribed to the catholic faith (n = 122, 44.0%). The biggest proportion of the respondents were married (n = 110, 39.7%). Half of the study population had been educated to Secondary (A level) (n = 139, 50.2%), whereas the majority of them had worked in the factory for a period ranging for 5 – 10 years (n = 169, 61.0%).These demographic characteristics could affect an individual worker's willingness to take on risky behavior, even at the work place including not adhering to safety guidelines. Education affects retention of messages, hence practice and adherence to safety guidelines.

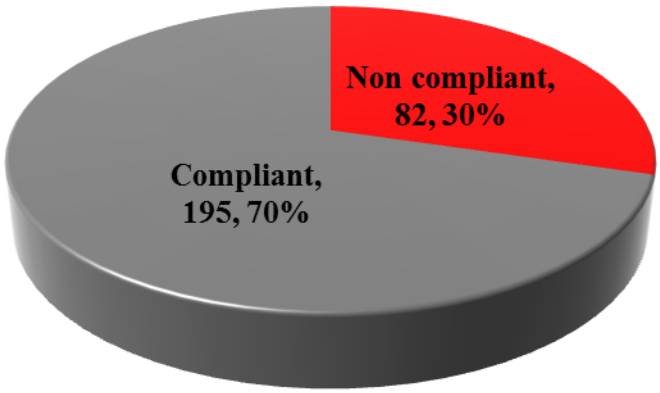
4.2 Individual mill plant worker practices towards compliance to OHAS

Table 2: Practices towards Compliance to OHAS guidelines among mill plant workers

Variable	Attribute	Frequency	Percent
Frequency of use of ear/hearing protection when in the factory			
	All the time	36*	13.0
	Sometimes	158	57.0
	Rarely	83	30.0
Frequency of use of eye protection when in the factory			
	All the time	51*	18.4
	Sometimes	91	32.9
	Rarely	135	48.7
Frequency of use of safety gloves while in the factory			
	All the time	184*	66.4
	Sometimes	83	30.0
	Rarely	10	3.6
Frequency of use of protective clothing while in the factory			
	All the time	235*	84.8
	Sometimes	30	10.8
	Rarely	12	4.3
Frequency of use of protective helmets while in the factory			
	All the time	241*	87.0
	Sometimes	31	11.2
	Rarely	5	1.8
Frequency of use of safety boots while in the factory			
	All the time	265*	95.7
	Sometimes	12	4.3

Compliance to OHAS guidelines was assessed based on the use of PPE among the respondents while in the mill plant over seven days prior to interview. More than half of the respondents reported that they sometimes used ear/hearing protection when in the factory (n = 158, 57%). Almost half of the respondents reported that they rarely used eye protection when in the factory (n = 135, 48.7%).Relatedly, majority of the respondents reported that they used safety gloves all the time while in the factory (n = 184, 66.4%). More than three quarters of the respondents reported that they used protective clothing all the time while in the factory (n = 235, 84.8%), and that they used protective helmets while in the factory (n = 241, 87%). Almost all the respondents reported that they used safety boots all the time while in the factory (n = 265, 95.7%). These findings indicate some disparity in the level of compliance to different PPE.

Figure 1: Level of compliance to OHAS guidelines among mill plant workers in factory phase 3 roofing's steel rolling mills



Basing on the measurement described in section 3.8, it was found that the majority of the factory workers at steel rolling mill – phase III factory were compliant to the OHAS guidelines (n = 195, 70%).

Predetermined theme	Emergent theme
Compliance to OHAS guidelines among mill plant workers in factory phase 3 roofing's steel rolling mills	• Proportion of factory workers who are compliant • PPE that is most complied to • PPE that is least complied to • Department with highest compliance to PPE in the factory

All key informants were of the view that compliance to occupational health and safety guidelines was high among the factory workers. All of them rated the level of compliances to be above 80%, with one of them opining that it is 100%.

"Our mill plant staff here are very compliant to occupational health and safety guidelines, if am to estimate, I would say that about 90% of them are compliant" KII 1

"You see, as roofing's we are very strict on worker safety because the factory can be a dangerous work environment if work safety is not observed, but they (workers) are human beings so some do not comply even when they are given PPE, thus I would say that compliances is about 80%" KII 2

"All our staff here use personal protective equipment, because we have it as a rule here that no one enters the factory without helmets, so they all comply" KII 3

Another added that;

"Compliance to *occupational health and safety guidelines is of course high among factory workers that is why there are very few reports of work related injuries in this factory, although*

there are some who get minor injuries, they are like 10%, so I would say 90% or more than 90% are fully compliant" KII 4

The key informants were asked to opine about the PPE that is most used consistently by the mill plant workers, and it was found that all of them has the same responses to that effect, reporting that safety boots, overalls, and helmets were the most complied to PPE.

"It is a policy for all mill plant workers here that they have to enter the factory with safety boots, overalls, and helmets on, so those are the most used" KII 2

"Hearing protection devices are used but they are not wide spread because there are some areas in the factory were noise production is normal, but for workers in departments with high noise production, hearing protection devices are always used by them" KII 4

4.3 Determinants of compliance at factory phase 3 roofing's steel rolling mills

4.3.1 Univariate analysis of institutional characteristics

Table 3: Institutional characteristics

Variable	Frequency (n)	Percent (%)
Established procedures for steel manufacture		
Agree	258	93.1
Disagree	19	6.9
PPE given when needed		
Agree	207	74.7
Disagree	70	25.3
Plant and equipment regularly checked and properly maintained		
Agree	185	66.8
Disagree	92	33.2
Factory has all PPE required for safety and it is enough for the workers		
Agree	187	67.5
Disagree	90	32.5
Reminder about the potential risks and hazards in workplace		
Agree	147	53.1
Disagree	130	46.9

Consults workers for suggestions about how to improve safety in		
Agree	144	52.0
Disagree	133	48.0
Reception of regular updates on technical aspects work		
Agree	181	65.3
Disagree	96	34.7
Pits and other floor openings are covered or cordoned off with clear warning signs when not in use		
Agree	148	53.4
Disagree	129	46.6
Incentives to encourage us adhere to occupational safety precautions		
Agree	117	42.2
Disagree	160	57.8
Supervision to see if workers are all following safety rules		
Agree	220	79.4
Disagree	57	20.6
Training on the effective use of hearing-protection devices		
Agree	217	78.3
Disagree	60	21.7
Training in the hazards of exposure to radiation and preventive measures		
Agree	143	51.6
Disagree	134	48.4
Warning danger signs on all dangerous equipment		
Agree	209	75.5
Disagree	68	24.5

The table above shows univariate (2nd and 3rd columns) analysis for the institutional approaches used to ensure a health promoting work place. The results of the study show that the majority of respondents agreed to the factory having established procedures for steel manufacture (n = 258, 93.1%), and also agreed that employers gave them PPE when they need it (n = 207, 74.7%). The majority of respondents agreed that the rolling plant and equipment were regularly checked and properly maintained (n =185, 66.8%), and that the factory had all PPE required for safety and it

is enough for the workers (n = 187, 67.5%). Slightly more than half of the respondents agreed that their supervisors/section manager often reminded workers of the potential risks and hazards in their workplace (n = 147, 53.1%), and that their supervisors / section manager consulted them for suggestions about how to improve safety in their respective units (n = 144, 52.0%). Similarly, more than half of the respondents agreed that the units they worked in received regular updates on technical aspects of their job that helps them to work safely (n = 181, 65.3%).

In the same vein, more than half of the respondent agreed that pits and other floor openings were covered or cordoned off with clear warning signs when not in use in the factory (n = 148, 53.4%). However, slightly more than half of the respondents disagreed to the statement that they are given incentives to encourage them adhere to occupational safety precautions (n = 160, 57.8%). More than three quarters of the respondents reported that their supervisors /section managers frequently checked to see if workers were all following safety rules (n = 220, 79.4%), and also agreed that management trains them on the effective use of personal -protection devices (n = 217, 78.3%).

Slightly above half of the respondents agreed that management trained workers in the hazards of exposure to radiation and the measures to be taken if they encounter material they suspect to be radioactive (n = 143, 51.6%). Slightly above three quarters of the respondents agreed that their work place had warning danger signs on all dangerous equipment (n = 209, 75.5%). These findings, to a larger extent, reflect supportiveness of the factory management towards OHAS, which could contribute to perceived behavioral control and thus affect level of compliance.

4.3.2 Univariate analysis of Individual mill plant worker factors

In this section, I first present the assessment of safety awareness before presenting the other univariate individual mill plant factors analysis because it was a standalone variable that required independent measurement.

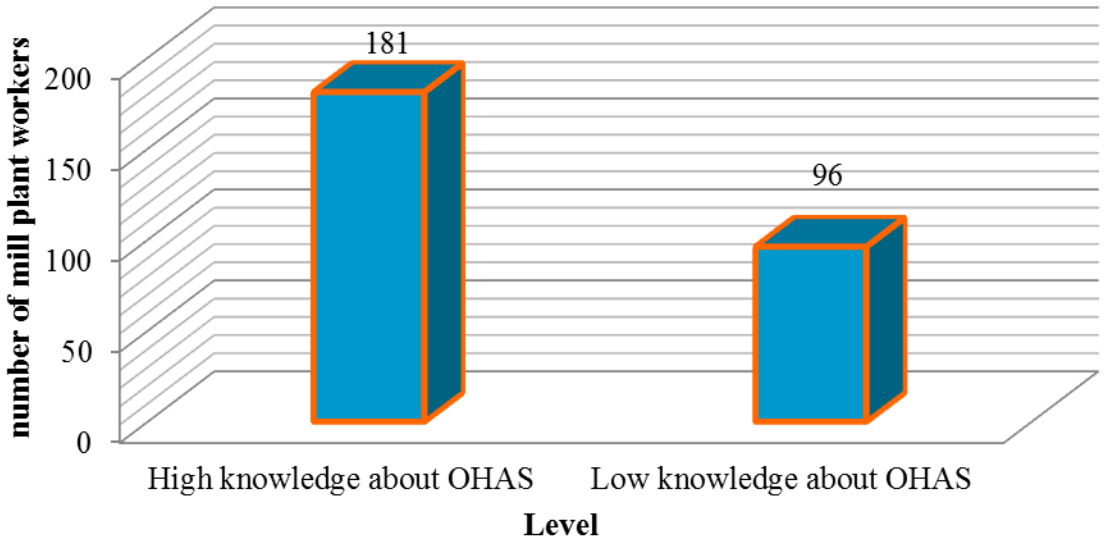
Table 4: Occupational safety awareness assessment among mill plant workers at factory phase III roofing's steel rolling mills

Variable/Attributes		Frequency (n =277)	%
Item not covered under occupational health and safety management systems implementation			
Planning for hazard identification		17	6.1
Structure and responsibility		67	24.2
Injury treatment and management		163	58.8
Training, awareness and competence		30	10.8
Units which create more than permissible noise levels (91.8 dB)			
	Nails and corrugation	203	73.3
	Cold rolling	37	13.4
	Color coating	19	6.9
	Batch annealing	18	6.5
Which of the following is necessary to eliminate struck-by, stuck-against and caught-between hazards to equipment operators, pedestrians and other vehicle operators			
	Use of helmets	25	9.0
	Use of safety boots and gloves	83	30.0
	Maintaining proper clearance for passage of large industrial equipment	169	61.0
Safety and health measure that can't be used in a cold rolling factory			
	Safety organization	17	6.1
	Training	22	7.9
	Personal protective equipment	18	6.5
	Ergonomics	30	10.8
	First aid	190	68.6

The results in the table above show that more than half of the respondents mentioned that the Item not covered under occupational health and safety management systems implementation is Injury treatment and management (n = 163, 58.8%). Almost three quarters of the respondents mentioned that the Units which create more than permissible noise levels (91.8 dB) in the cold rolling factory were the Nails and corrugation units (n = 203, 73.3%). The majority of the

respondents mentioned that the activity necessary to eliminate struck-by, struck-against and caught-between hazards to equipment operators, pedestrians and other vehicle operators was Maintaining proper clearance for passage of large industrial equipment (n = 169, 61%). The majority of the respondent's mentioned that the safety and health measure that can't be used in a cold rolling factory is First aid (n = 190, 68.6%)

Figure 2: Level of awareness about occupational health and safety among mill plant workers at factory phase III roofing's steel rolling mills



The results in the figure above show that the majority of the factory workers had high knowledge about OHAS (n = 181, 68.6%).

Table 5: Individual characteristics of mill plant workers

Variable	Frequency (n)	Percent (%)
Knowlegde about OHAS		
High knowledge	181	65.3
Low knowledge	96	34.7
View on who is Supposed to wear PPE		
Workers in dangerous areas	180	65.0
All workers	97	35.0
Ever received training in industrial safety		
Yes	149	53.8
No	128	46.2
Duration in steel manufacturing profession		
< 1 year	94	33.9
1 - 4 years	128	46.2
5 – 8 years	55	19.9
Job satisfaction as a mill plant worker		
Very satisfied	94	33.9
Satisfied	165	59.6
Dissatisfied	18	6.5
Daily work hours in mill		
1 - 5 hours	1	.4
6 – 10 hours	153	55.2
More than 10 years	123	44.4
Susceptibility to injury while at work in mill		
Yes	218	78.7
No	59	21.3
History of involvement in workplace accident		
Yes	142	50.9
No	137	49.1
History of suffering an occupational disease or suspected work related illness		
Yes	86	31.0
No	191	69.0
History of suffering an occupational disease or suspected work related illness		
Yes	191	69.0
No	86	31.0
Current age		
18 - 28 years	42	15.2
29 - 39 years	123	44.4
40 - 50 years	80	28.9
More than 50 years	32	11.6
Marital status		
Single	53	19.1
Married	110	39.7
Cohabiting	100	36.1
Separated	14	5.1
Level of education		
Secondary (O level)	43	15.5
Secondary (A level)	139	50.2
Post-secondary education	95	34.3
Duration of working in factory		
1 - 5 years	108	39.0
5 - 10 years	169	61.0

The table above shows univariate (2nd and 3rd columns) results for the individual characteristics. It is shown in that the majority of the respondents perceived that Workers in dangerous areas are the ones supposed to wear PPE (n = 180, 65%). Slightly more than half of the respondents reported that they had ever received training in industrial safety (n = 149, 53.5%). Almost half of the respondents had spent between 1 -4 years in the steel manufacturing profession (n = 128, 46.2%), while more than half of them reported that they were satisfied with their jobs as a mill plant workers (n = 165, 59.6%).

More than half of the respondents reported that they worked for about 6 – 10 hours daily in the mill (n = 153, 55.2%). More than three quarters of the respondents perceived that they could be easily injured while at work in mill (n = 218, 78.7%), and about half of them had been involved in a workplace accident in the past 1 year prior to the study (n = 142, 50.9%). However, the majority of the respondents had never suffered from an occupational disease or from a suspected work related illness before (n = 191, 69%). The majority of the respondents perceived that the factory management gave them enough work safety support (n = 191, 69%).

4.3.3 Institutional characteristics and compliance to Occupational Health and Safety Guidelines

Table 6: The relationship between Institutional characteristics and compliance at factory phase 3 roofing's steel rolling mills

Variable	Compliance to OHAS			
	Compliant (n = 195)	Non-compliant (n = 82)	COR[95%CI]	P value
Established procedures for steel manufacture				
Agree	183(70.9%)	75(29.1%)	1.55 [CI = 0.55 - 4.34]	
Disagree	12(63.2%)	7(36.8%)	1	0.41
PPE given when needed				
Agree	146(70.5%)	61(29.5%)	0.66 [CI = .21- 2.01]	0.46
Disagree	49(70.0%)	21(30.0%)	1	
Plant and equipment regularly checked and properly maintained				
Agree	135(73.0%)	50(27.0%)	1.43 [CI = 0.78 - 2.61]	0.25
Disagree	60(65.2%)	32(34.8%)	1	
Factory has all PPE required for safety and it is enough for the workers				
Agree	133(71.1%)	54(28.9%)	1.52 [CI = 0.54 - 4.27]	0.43
Disagree	62(68.9%)	28(31.1%)	1	
Reminder about the potential risks and hazards in workplace				
Agree	103(70.1%)	44(29.9%)	0.84 [CI = 0.48 - 1.48]	0.55
Disagree	92(70.8%)	38(29.2%)	1	
Consults workers for suggestions about how to improve safety in				
Agree	103(71.5%)	41(28.5%)	1.29[CI = 0.67 - 2.48]	0.44
Disagree	92(69.2%)	41(30.8%)	1	
Reception of regular updates on technical aspects work				
Agree	128(70.7%)	53(29.3%)	.93 [CI = .48 - 1.80]	0.82
Disagree	67(69.8%)	29(30.2%)	1	
Pits and other floor openings are covered or cordoned off with clear warning signs when not in use				
Agree	107(72.3%)	41(27.7%)	1.51 [CI = .84 - 2.71]	0.17
Disagree	88(68.2%)	41(31.8%)	1	
Incentives to encourage us adhere to occupational safety precautions				
Agree	78(66.7%	39(33.3%)	0.65 [CI = .36 -1.16]	0.15
Disagree	117(73.1%)	43(26.9%)	1	
Supervision to see if workers are all following safety rules				
Agree	161(73.2%)	59(26.8%)	1.78 [CI = 1.39 - 5.56]	0.04
Disagree	34(59.6%)	23(40.4%)	1	
Training on the effective use of hearing-protection devices				
Agree	162(74.7%)	55(25.3%)	2.60 [CI= 1.37 - 4.94]	0.00
Disagree	33(55.0%)	27(45.0%)	1	
Training in the hazards of exposure to radiation and preventive measures				
Agree	99(69.2%)	44(30.8%)	.77 [CI = 0.45 - 1.33]	0.36
Disagree	96(71.6%)	38(28.4%)	1	
Warning danger signs on all dangerous				

equipment				
Agree	142(67.9%)	67(32.1%)	.56 [CI = .29 - 1.10]	0.09
Disagree	53(77.9%)	15(22.1%)	1	

The table reveals that only two approaches used to ensure a health promoting work place in roofing's factory phase 3 had statistically significant relationships with compliance to OHAS among the factory workers. They are supervision to see if workers are all following safety rules (COR = 1.78, CI = 1.39 - 5.56, P = 0.04), and training of workers on the effective use of hearing-protection devices (COR = 2.60, CI= 1.37 - 4.94, P = 0.00). Disaggregated data (cross tabulations) show that of the workers who agreed that supervision was done to see if workers are all following safety rules, almost three quarters of them were compliant (73.6%) compared to a lesser proportion (59.6%). The higher level of compliance among the workers who agreed that supervision was done could have been contributed to by the perception of support from their supervisors. It is also shown that of the workers who agreed that they were trained on the effective use of hearing-protection devices, almost three quarters of them were compliant to OHAS (74.7%) compared to a lesser proportion (55.0%). This means training, a form of imparting specific knowledge, affects compliance of workers to OHAS.

4.3.4 Individual characteristics and compliance to OHAS guidelines.

Table 7: Relationship between individual characteristics and compliance to OHAS guidelines

Variable	Compliance to OHAS		COR(95%CI)	P value
	Compliant (n = 195)	Non-compliant (n = 82)		
Knowledge about OHAS				
High knowledge	136(75.1%)	45(24.9%)	1.90 [CI=1.11 - 3.23]	0.02
Low knowledge	59(61.5%)	37(38.5%)	1	
View on who is Supposed to wear PPE				
Workers in dangerous areas	127(70.6%)	53(29.4%)	1.28 [CI =0.68 - 2.39]	0.45
All workers	68(70.1%)	29(29.9%)	1	
Ever received training in industrial safety				
Yes	105(70.5%)	44(29.5%	0.88 [CI=0.48- 1.63]	0.68
No	90(70.3%)	38(29.7%)	1	
Duration in steel manufacturing profession				
< 1 year	83(88.3%)	11(11.7%)	2.08 [CI=1.33 -3.27]	0.00
1 - 4 years	78(60.9%)	50(39.1%)	1.42 [1.04- 4.004]	0.00
5 – 8 years	34(61.8%)	21(38.2%)	1	
Job satisfaction as a mill plant worker				
Very satisfied	53(56.4%)	41(43.6%)	0.42 [CI=0.24 -0.72]	0.00
Satisfied	126(76.4%)	39(23.6%)	1.48 (1.05 - 3.25)	0.01
Dissatisfied	16(88.9%)	2(11.1%)	1	
Daily work hours in mill				
1 - 5 hours	1(100.0%)	0(.0%)	1.84[CI=1.01 - 3.34]	0.05
6 – 10 hours	120(78.4%)	33(21.6%)	2.42 (1.25 - 5.70)	0.01
More than 10 years	74(60.2%)	49(39.8%)		
Susceptibility to injury while at work in mill				
Yes	151(69.3%)	67(30.7%)	0.72 [0.33 - 1.55]	0.40
No	44(74.6%)	15(25.4%)	1	
History of involvement in workplace accident				
Yes	97(69.3%)	43(30.7%)	0.88 [0.49 - 1.60]	0.68
No	98(71.5%)	39(28.5%)	1	
History of suffering an occupational disease or suspected work related illness				
Yes	62(72.1%)	24(27.9%)	1.16[0.61 - 2.22]	0.66
No	133(69.6%)	58(30.4%)	1	
Perception on whether factory management gives enough work safety support				
Yes	151(79.1%)	40(20.9%)	5.04 [2.68- 9.49]	0.00
No	44(51.2%)	42(48.8%)	1	
Current age				
18 - 28 years	34(81.0%)	8(19.0%)	1.20 [0.89 - 1.62]	0.23
29 - 39 years	86(69.9%)	37(30.1%)	0.35 (.100 - 1.228)	.099
40 - 50 years	53(66.2%)	27(33.8%)	0.95 (.408 - 2.15)	0.42
More than 50 years	22(68.8%)	10(31.2%)	1	
Marital status				
Single	42(79.2%)	11(20.8%)	0.52 [0.17 - 1.51]	0.23
Married	80(72.7%)	30(27.3%)	0.947 [.48 - 2.19]	0.89
Cohabiting	65(65.0%)	35(35.0%)	1.121 [.45 - 2.70]	0.79
Separated	8(57.1%)	6(42.9%)	1	
Level of education				
Secondary (O level)	20(46.5%)	23(53.5%)	1.98 [CI=1.31 - 2.99]	0.00
Secondary (A level)	98(70.5%)	41(29.5%)	.500 (0.16 - 1.56)	0.23
Post-secondary education	77(81.1%)	18(18.9%)	1	
Duration of working in factory				
1 - 5 years	72(66.7%)	36(33.3%)	0.73 [CI=0.42 -1.26]	0.26
5 - 10 years	123(72.8%)	46(27.2%)	1	

Of the individual characteristics among the mill plant workers, five had statistically significant relationships with compliance to OHAS. They include; knowledge about OHAS (COR = 1.90, CI = 1.11 - 3.23, P = 0.02), duration in steel manufacturing profession (COR = 2.08, CI = 1.33 - 3.27, P = 0.00), Satisfaction with job as a mill plant worker (COR = .42 (CI = 0.24 -0.72, P = 0.00), Daily work hours in the mill (COR = 1.84, CI = 1.01 - 3.34, P = 0.05), the perception that factory management gives enough work safety support (COR = 5.04, CI = 2.68- 9.49, P = 0.00), and the Level of education (COR = 1.98, CI = 1.31 - 2.99, P = 0.00)

Disaggregated data (cross tabulations) shows that of the workers who had worked for less than a year in the mill, a bigger proportion of them were compliant (88.3%) compared to those who had worked for a longer time in the mill plant. Mill plant workers who worked for less than 10 hours per day in the mill and complied with OHAS guidelines were more than those who worked for more than 10 hours per day. Of the workers who had post-secondary education, a bigger proportion of them complied to safety guidelines (81.1%), compared to those who had secondary education

4.35 Determinants of compliance to OHAS

Table 8: Multivariate Logistic regression analysis for the determinants of compliance to OHAS

	Compliance to OHAS					
Variable	**Compliant (n = 195)**	**Non-compliant (n = 82)**	**COR (95%CI)**	**P value**	**AOR (CI 95%)**	**P value**
Supervision to see if workers are all following safety rules						
Agree	161(73.2%)	59(26.8%)	1.78 (1.39 - 5.56)	0.04	3.10 (1.58 - 4.10)	0.046
Disagree	34(59.6%)	23(40.4%)			1	
Training on the effective use of hearing-protection devices						
Agree	162(74.7%)	55(25.3%)	2.60 (1.37 - 4.94)	0.00	4.42 (2.3 - 5.75	0.00
Disagree	33(55.0%)	27(45.0%)			1	
Knowledge about OHAS						
High knowledge	136(75.1%)	45(24.9%)	1.90 (1.11 - 3.23)	0.02	2.53 (1.31- 5.90)	0.018
Low knowledge	59(61.5%)	37(38.5%)	1		1	
Duration in steel manufacturing profession						
< 1 year	83(88.3%)	11(11.7%)	2.08 (1.33 -3.27)	0.00	4.22 (2.00 -7.49)	0.00
1 - 4 years	78(60.9%)	50(39.1%)	1.42 [1.04- 4.004]	0.00	1.04 (0.84 -1.99)	0.01
5 – 8 years	34(61.8%)	21(38.2%)	1		1	
Job satisfaction as a mill plant worker						
Very satisfied	53(56.4%)	41(43.6%)	0.42 (0.24 -0.72)	0.00	6.19 (0.35 - 28.45)	0.05
Satisfied	126(76.4%)	39(23.6%)	1.42 [1.04- 4.004]	0.00*	2.48 (.55 - 11.25)	0.24
Dissatisfied	16(88.9%)	2(11.1%)	1		1	
Daily work hours in mill						
1 - 5 hours	1(100.0%)	0(.0%)	1.84(1.01 - 3.34)	0.05	1.10 (.88 - 2.10)	1.00
6 – 10 hours	120(78.4%)	33(21.6%)	2.42 (1.25 - 5.70)	0.01*	4.42 (1.25 - 6.70)	0.00
More than 10 years	74(60.2%)	49(39.8%)	1		1	
Factory management gives enough work safety support						
Yes	151(79.1%)	40(20.9%)	5.04 (2.68- 9.49)	0.00	7.28 (2.16 - 11.48)	0.00
No	44(51.2%)	42(48.8%)	1		1	
Level of education						
Secondary (O level)	20(46.5%)	23(53.5%)	1.98 (1.308 - 2.99)	0.00	.43 (.10 - .61)	0.00
Secondary (A level)	98(70.5%)	41(29.5%)	.500 (0.16 - 1.56)	0.23*	.72 (.50 - 1.01)	0.02
Post-secondary education	77(81.1%)	18(18.9%)	1		1	

The two significant institutional approaches at bivariate level were fitted into a logistic regression model and the two still remained significant. It was found that the odds of workers who agreed that supervision was done to see if workers are all following safety rules, complying to OHAS guidelines were three times higher than the odds of their counterparts who disagreed.

OHAS (AOR = 3.10, CI = 1.58 - 4.10). The odds of compliance to using earmuffs among factory workers who were trained on effective use of hearing protection devices were 4 times greater than the odds of compliance among those who were not trained (AOR = 4.42, CI = 2.23 – 5.75). These findings mean that supervision and training both improve perceived benefit and attitude towards compliance to OHAS, thus relevant interventions in the two fields could improve current levels of compliance.

The six significant individual characteristics at bivariate level were fitted into a logistic regression model and only four remained significant after adjusting for confounders. These were; duration in steel manufacturing profession, Daily work hours in mill, perception on whether factory management gives enough works safety support and the Level of education. Factory workers who had high knowledge about OHAS had two times higher odds of being compliant to safety guidelines (AOR = 2.53, CI = 1.31 – 5.90) compared to their counter parts.

Mill plant workers who had worked for less than a year in the mill, had 4 times higher odds of being compliant to safety guidelines (AOR = 4.22, CI = 2.00 - 7.49) compared to those that had worked for longer. This could be due to the fact that familiarity with a particular work environment over time breeds a false consciousness of safety, hence neglect of precautions. Mill plant workers who worked for 6 - 10 hours per day had 4 times higher odds of being compliant to safety guidelines (AOR = 4.42, CI = 1.25 – 6.70) compared to those who worked for more than 10 hours per day. This could be because the less hours of work mean less time to bear the perceived discomfort associated with PPE use.

Factory workers who perceived that the factory management gave enough work safety support, had 7 times higher odds of being compliant to safety guidelines (AOR = 7.28, CI = 2.16 - 11.48),

compared to those who perceived otherwise. This finding means that the former develop a positive attitude to compliance due to the perceived support of management, as the later develop a negative attitude towards the same, due to perceived nonsupport of management. Mill plant workers who had attained secondary education (O level), had less odds of being compliant to safety guidelines (AOR = .43, CI = .10- .61). This could be due to lower knowledge levels about safety at the work place.

The informants were also probed about the different approaches used to ensure a health promoting work place and how they affect compliance to OHAS in the mill in factory phase 3 roofing's steel rolling mills. It was reported that the factory had a number of approaches in place to that effect, and all the informants were of the view that whatever approaches where in place upheld compliance.

Predetermined theme	Emergent theme
Different approaches used to ensure a health promoting work place and how they affect compliance to OHAS in the mill in factory phase 3 roofing's steel rolling mills	Effect of • Adequacy of PPE • Employee engagement and training • Maintenance of workplaces, plant, equipment, and tools and machinery • PPE provision by employers • Risk assessment in plant by management • Training in welding safety • Work supervision

"We have a whole department of safety, and the management always ensures that there is enough personal protective equipment for each factory worker, we actually even have excess, so that is not a problem here". KII3

Another one also opined that*; " The factory has all the necessary equipment in stock to cater for all factory workers and even anyone who wants to access the factory, PPE inadequacy has never been a problem here"* KII 2

"Before we recruit any mill plant worker, we first take them through training and orientation, and even when they became part of our staff, we still offer training when need arises" KII 1

"Of course as management, training our staff in OHAS is one of the things we focus on because without it, injuries can increase" KII 4

"This factory obviously has work supervision policies, every department has a head, who is charged with overseeing safety therein, then we also have a factory supervisor who is supposed to make sure that safety guidelines are observed by each worker" KII 1

When asked whether they thought any of the approaches used to ensure a health promoting work place affected compliance to OHAS in the mill in factory phase 3, all the key informants were quick to respond that these approaches definitely supported compliance to occupational health and safety practices

"The approaches we have to promote OHAS in this factory definitely have a positive determining effect on compliance to OHS among the mill plant workers" KII3

"I think most of the approaches we have in place here affect OHAS, but I also think that there are also some approaches which negatively affect OHAS, for example training because some mill plant workers miss training" KII

Predetermined theme	Emergent theme
Individual factors which determine compliance to safety guidelines among mill workers in factory phase 3 roofing's steel rolling mills	Effect of; • Employee demographic characteristics • Awareness about safety guidelines • Experience steel industry work • Gender • Job satisfaction • Perceived susceptibility to industry injury • Perceived work safety support • Possession of welding instruction manual • Work load

The key informants also opined that between the approaches and individual determinants, it is the individual determinants which possibly had more impact on OHAS compliance among the factory worker. All key informants ruled out the effect of experience in steel industry work, Gender, and Job satisfaction on OHAS compliance.

*"Those individual characteristics like experience in steel industry work, Gender, and Job satisfaction on OHAS compliance, do not significantly affect OHAS in my opinion, may be characteristics like work duration in this factory could be having an effect"*KII4

CHAPTER FIVE

DISCUSSION

5.0 Introduction

This chapter presents a discussion of only the key findings of the study, done for each of the study objectives

5.1 The level of compliance to OHAS guidelines among mill plant employees.

The results of the current study showed that the majority of the workers knew and were actually practicing according to the required OHAS guidelines. Consistent practice of OHAS guidelines breeds compliance, which is a health promotive behavior. It results in less morbidity, hence more working time for the employee, which not only directs benefits the employee and his family, but also benefits the factory management in the sense of more productivity, and less injury related costs, hence maximizing profit. However this 7 out of every 10 workers only represents a fair level as compared to the recommended 80% universal standard. This means that there are still gaps in compliance which could perhaps have originated from supervision, training in use of hearing devices duration in factory work, and perception of safety support, as shown by results in tables 4 and 7. This finding is contrary to the reports by all key informants who reported that the rate of compliance to OHAS guidelines among the factory workers was above 80%.

The higher reports by them could be related to the need to paint a better picture of the factory's safety culture, however it should be noted that the study used a stringent measurement procedure of compliance were only consistent use over the previous 7 days was considered. Therefore, it is possible that the key informants based their estimate on mere single or intermittent use of PPE

Lower rates of compliance to occupational health and safety guidelines were reported in studies from Asia (12.0 – 49.4 %) (Jaiswal, 2012; Parimalam, 2007) and also Africa (16.7–75.3%) (Akintayo, 2013; Ahmad, 2012; Kamal, 2007). This could be because of the differences in study settings in that the current study was conducted in a still rolling industry which is perceived as being more hazardous while the other studies were conducted in tea factories and cement factories, in which the workers possibly perceived lower safety risks and hence were less compliant. Nonetheless, studies by Tadesse (2016) and Motbainor (2007) reported higher levels of compliance to occupation health and safety guidelines. This could be due to methodological variations between studies; this study assessed compliance based on consistent use (Always) of each PPE in the factory while the other studies assessed compliance basing on plain use of PPE and observation of certain rules in the factories, that made them report higher rates of compliance.

The fairly high rate of compliance to OHAS guidelines, figure 1, observed among factory workers at roofing's phase III was contributed to by the high levels of consistent use of safety boots all the time while in the factory, consistent use of protective clothing all the time while in the factory and consistent use of protective helmets while in the factory as shown in table 2. The use of these PPEs was rather expected to be high use by the factory workers because it is factory policy that all people accessing the factory use are required to have their safety helmet's on, while for specifically factory workers, their safety boots and overall should be worn at all times. This finding is comparable to the findings of studies by (Zungu, 2011; Parimalam, 2007), most probably because in all study settings, the safety rule of having safety wear on at all times held.

However, the level of compliance to occupational health and safety guidelines among the factory workers at roofing rolling mills phase 3 was hampered by the non-consistent use of ear/hearing

protection when in the factory as shown in Table 4. This was consistently used by less than half of the factory workers who were sampled, as shown in table 3, which finding was collaborated by key informant opinion. This could be because of the ground rule of the factory safety department that it is only workers in certain departments like pickling that should use ear protection at all times due to the damage that can be caused to the unprotected ears while in such departments. It is therefore plausible to postulate that some of the factory workers did not embrace ear protection on the perception that the department they working in had minimal amounts of noise production. A substantial proportion of the respondents also reported rarely using eye protection when in the factory, Table 3, which also affected the overall level of compliance to OHAS guidelines. This non consistent use of eye protection could be because majority of the factory workers perceived low susceptibility to eye injury given that the majority of the factory workers who were sampled were in departments where welding was less done.

5.2 The institutional determinants of compliance to safety guidelines among mill workers in factory phase 3 roofing's steel rolling mills

It was found that workers who agreed that supervision was done to see if workers are all following safety rules, were three times as likely to be compliant to OHAS (AOR = 3.098, CI = 1.576 - 4.095) as shown in Table 4. This finding falls in the realm of perceived behavioral control by significant others, and as such can determine health behavior. Constant supervision especially by a person also practicing the desired health behavior, creates a positive attitude of employees towards the health promoting behavior. They are thus more predisposed to practicing consistently, hence developing the behavior. On the other hand a non practicing supervisor , or a less informed supervisor, especially where practicing a practice that is deemed a bit uncomfortable is concerned, is seen by his/her supervisees as imposing and inflicting discomfort,

hence may not contribute to positive attitude towards the practice and development of desired behavior. As workforces have become leaner over the past several years, the supervisor's role continues to be one of the critical elements in an organization's ability to carry out the mission of the organization (Dawson, 2006). Supervisors are the direct link between the workforce and upper-level management (Callor, 2011). The supervisor's role has evolved drastically from solely focusing on production pressures to a front-line leader in safety coaching, mentoring and training to his or her employees (Robbins, 2004). The supervisor position is a multidimensional role that can fulfill both management's and employees' expectations. These expectations include managing safety. Even if supervisors do not have a formal background in occupational safety, they can influence a successful safety culture, in a way that their continuous presence in a work environment makes factory workers to not only perceive safety support from management but also presence of a gate keeper who is meant to oversee all their operations. This makes them not to hesitate utilizing any form of safety measures available to them, hence the compliance.

Factory workers who agreed that they were trained on the effective use of hearing-protection devices, were 4 times more likely to be compliant (AOR = 4.415, CI = 2.229 – 5.751) as seen in Table 4. This is consistent with the study by Robson (2010). OHAS training often consists of instruction in hazard recognition and control, safe work practices, proper use of personal protective equipment, and emergency procedures and preventive actions. Training can also guide workers on how to find additional information about potential hazards. It can empower workers to become more active in implementing hazard control programs or effecting organizational changes that enhance worksite protection. Safety training fosters a positive attitude towards compliance to safety measures and hence increases conformity. Training in the use of hearing protection devices could have also increased compliance because as mentioned earlier, use of ear

PPE contributed to low compliance rates among the factory workers and so the training could have increased use of the ear PPE, and hence higher scores of compliance.

5.3 The individual determinants of compliance to safety guidelines among mill workers in factory phase 3 roofing's steel rolling mills

Factory workers who had worked for less than a year in the factory, were 4 times more likely to be compliant to safety guidelines (AOR = 4.215, CI = 2.003 - 7.493), as seen in Table 8, compared to those who had worked in the factory for more than a year in the factory. This finding is consistent with the findings by Tadesse (2016). The possible explanation for this may be that those who served for longer period could have developed a false perception of safety that often comes with familiarization with a particular work environment. The false perception of safety may drive them to non-compliance with safety precautions including proper use of PPE. Therefore, prioritizing the particular segment of workers for safety practices may contribute to safety improvement.

The results of this study showed that factory workers who worked for 6 - 10 hours per day as seen in Table 7 were 4 times more likely to be compliant to safety guidelines (AOR = 4.415, CI = 1.245 – 6.704) compared to those who worked for more than 10 hours per day. The majority of the key informants had a divergent view from this, reporting that it is those who worked for longer hours that complied more with OHAS. However, this finding of the current study could be related to shift work whereby factory workers who reported working in shifts of less than 10 hours had higher compliance. This is because working in shifts reduces the discomfort brought about by long time use of some PPE like helmets, safety boots and safety gloves. This in a way could be giving shift workers assurance of PPE use for only a few hours, hence making them use them consistently. This is less likely among factory workers who work for long hours and

probably experience some discomfort from use of some PPE, they are more likely to be intermittently putting on PPE between various work sessions, hence leading to low compliances. The other reason behind the finding could be that shift work encourages workers to adhere to PPE utilization because it gives the workers time to think about their safety and act accordingly when their shift comes on. This implies that there is need for reviewing work schedule to promote use of PPE in the factory.

Factory workers who perceived that the factory management gave enough work safety supports shown by Table 7, were 7 times more likely to be compliant to safety guidelines (AOR = 7.278, CI = 2.160 - 11.480), compared to those who perceived otherwise, similar to findings by Zungu (2011). This finding relates to the effect perceptions have on health behavior, as stipulated by the Theory of planned Behavior. Perceived support from management is multifaceted, it can in perspective of support in the provision of PPE, support in form of information provision, support in provision of safety infrastructure within the factory and /or support supervision within the factory. Positive perceptions of the above mentioned items most likely perpetuates behavior change among factory workers who do so, since they will have the mindset that they have been provided with all the necessary items to uphold a good safety culture, hence realizing no reason to be non-compliant.

The findings of this also showed that factory workers who had high knowledge about OHAS were twice as likely to be compliant to safety guidelines (AOR = 2.528, CI = 1.310 – 5.898) , as seen in Table 7. This is consistent with findings by Hatting (2013) and Troung, Siriwong & Robson (2009). The finding is premised on the fact that by and large, for one to effectively use PPE, they have to first appreciate the types of PPE, the importance of each specific PPE and when to use particular types of PPE for which occasion. For example consistent use of ear

protection requires one to know the importance of doing so and which areas of the factory need one to be having ear muffs on, short of which they might not use the PPE. Secondly, if a factory worker for instance knows how to avoid certain hazards for example struck-by, struck-against and caught-between hazards and other safety and health measure that can be used in a cold rolling factory, it increases their proactiveness while in the factory, which proactiveness calls for maximum compliance to safety measures in place. This also in part explains the study findings that chances of being compliant to OHAS guidelines increased with increasing education level of the factory workers. It is the workers with post-secondary education that that had relatively higher odds of being compliant to occupational safety guidelines, most probably because they had higher levels of knowledge about OHAS guidelines. On the contrary one study showed that high educational level was related with noncompliance to OHAS guidelines and thus high injury occurrence (Kiflea, 2014).

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

This chapter presents the study conclusions premised on the key findings obtained per study objective. The chapter also includes a set of recommendations as to how to augment compliance to occupational safety guidelines among factory workers

6.1 Conclusion

The majority of the factory workers at roofings steel rolling mill – phase III factory are compliant to the OHAS safety guidelines. It is concluded that compliance to occupational health and safety guidelines among factory workers at the steel rolling mills factory phase III is fairly high but not satisfactory since only 7 out of every 10 factory workers are compliant to the safety guidelines.

It is concluded that two institutional (factory related) characteristics determine compliance to occupational health and safety guidelines among factory workers at roofing's still rolling mills phase III. These are; supervision to see if workers are all following safety rules, and training about the effective use of hearing-protection devices.

The individual characteristic's which determine compliance to safety guidelines among mill workers in factory phase 3 roofing's steel rolling mills are; knowledge about OHAS, duration of being an employee at the factory, perceived factory management work safety support and education level of the factory workers

6.1 Recommendations

Factory workers themselves are urged to take personal initiatives to learn more about OHAS as a way of increasing their knowledge base about it. An increment in knowledge about OHAS, as evidenced by this study, will increase compliance to it, hence fostering work health promotion in the long run. This they can do through personal reading, participation in routine OHAS education sessions at the factory, as well as subscription to and participation in trade union activities. Trade unions are key in advocating for worker safety because they present the views workers who often are unable to voice their concerns as individuals for fear of safety of their jobs. Roofing's limited has a website. Workers through their leaders can advocate for a safety page where information about safety can be accessed. A weekly newsletter on safety, reviewing the weeks safety challenges, how they were addressed and recommendations can also be included. Given that all workers interviewed had at least O-level education, and in the era of smart mobile phones with reducing costs of data bundles, this will encourage personal reading.

Factory workers who have been employees of the factory for more than a year should remember or be reminded that despite the seemingly lengthy duration of work in a steel rolling work environment, they are still prone to injury and other occupational hazards for as long as they work in the factory, and as such need to be compliant to all safety rules.

The Factory safety department could as well occasionally consider specialized extra sensitization sessions, tailor made for employees who have worked in the factory for longer, with an aim of perpetuating behavior change among them.

Health promotion that is sustainable will be achieved at the factory if all factory staffs perceive that factory management always provides them with work safety support. However, there is a

section of workers at the factory who do not perceived so. It is therefore recommended that the department mandated to promote workers safety at the factory ups its material and information support activities to the employees so they feel empowered to comply with all safety rules.

On the other hand, one of the ways through which the management at roofing's rolling mills is going to improve conformity to work place safety guidelines is by enhancing the component of factory staff supervision especially when it comes to ensuring that PPE are being utilized at all times when in the factory. Management should either recruit more staff supervisors or utilize those already available by making them carry out their supervisory roles more frequently.

Roofing's rolling mills already provides training to its staff before and after recruitment, nonetheless, it is recommended that during that training, personal protective equipment, what they are, their importance and when to use each of them, are emphasized and or expounded on more per session of training. That will make all staff to appreciate the importance of PPE, which will ultimately increase their compliance to it, hence fostering work health promotion in the long run,

Management should consider holding regular occupational health and safety education sessions, in the form of continuing professional development, for factory staff so that general knowledge about the same is continuously boosted among the factory workers at roofing's phase III. The trainings and regular OHAS education sessions will contribute to further enabling workers to continuously plan for and practice their own safety at the work place, as well as build a positive attitude towards practice of OHAS which is key for individuals to be able to practice any health promoting behaviors.

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APPENDIX E: LETTERS

Nakatumba Anne Ruth

Uganda Martyrs University

Faculty of Health Sciences

P.O. Box. 5498 Kampala

Tel: 0702 295 626 / 0772 832 830

ROOFINGS LIMITED
PHASE III, NAMANVE
HUMAN RESOURCE DEPT.
14 SEP 2017
Received
Plot 406, Industrial Park Namanve
P.O Box 3506, Kampala

To the

Human Resource Manager

Roofings Rolling Mills - Namanve

RE: Request to conduct research at the factory

I hereby request for permission to carry out an academic study among factory workers at Roofings Rolling Mills - Namanve. This study is titled **"Determinants of compliance to occupational health and safety guidelines among mill plant workers of roofing's rolling mills – Namanve.** In addition to it being a requirement for the award of a masters of public health, it will be of great of significance to the factory as well. For instance it will provide valuable information to the Roofing's industry administration, regarding how much their staffs comply with occupational safety thus helping them to make appropriate safety interventions on how to improve or uphold the compliance levels that will be found. This will in turn help increase safety guideline adherence and hence reduce injuries and fatalities that could occur due to non compliance as well as associated costs.

The study will be done with the highest regard of research ethics; consent, confidentiality and privacy will be upheld during data collection process, and as such participation in the study by the factory employees will carry no risk whatsoever.

It is my humble appeal that my request is considered.

Yours

Nakatumba Anne Ruth

3. 08. 2017.

Uganda Martyrs University

making a difference

Faculty of Health Science
Email: health@umu.ac.ug
lwnantume@yahoo.com

31st July, 2017

ROOFINGS LIMITED
PHASE III, NAMANVE
HUMAN RESOURCE DEPT.
14 SEP 2017
Received, Work Permit Issued
Plot 406,Industrial Park, Namanve
P.O Box 3506, Kampala

To: The Officer Responsible

Dear Sir/Madam

Re: Introducing Nakatumba ANNE Ruth A.K Reg. No: **2015-M282-20027**

This is to introduce to you Nakatumba ANNE Ruth A.K a *bona fide* student of Uganda Martyrs University. She is pursuing a course leading to the award of a Master of Public Health, specializing in Health Promotion.

Nakatumba is currently undertaking a research for her academic dissertation. The research topic is: **Determinants of Compliance to Occupational Health and Safety Guidelines among Mill Plant Workers in Roofings Steel Rolling Mills Factory, Phase III, Namanve**

The topic and protocols have been approved by the relevant University authorities. Any assistance rendered to her in this respect will be much appreciated by the University.

Yours Sincerely,

.....

Mrs. Lilian Nantume Wampande

Supervisor and Lecturer

For Faculty Approvals Committee

APPENDIX B: CONSENT FORM

Title: Determinants of compliance to occupational health and safety guidelines and its determinants among factory workers of roofing's rolling mills – Namanve

Introduction: You are being asked to be in a research study of compliance to occupational health and safety guidelines and its determinants among factory workers of roofing's rolling mills – Namanve. You were selected as a possible participant because you happen to meet the criteria for inclusion into this study. We ask that you read this form and ask any questions that you may have before agreeing to be in the study.

Purpose and benefits of the Study: The purpose of this study is to study compliance to occupational health and safety guidelines and its determinants among factory workers of roofing's rolling mills – Namanve. We hope this study will serve to identify the factors that facilitate or hinder the compliance to occupational health and safety practices and will inform health and safety policy development and implementation in Uganda to reduce the incidence and socioeconomic costs of work related injury and empower laborers to embrace OHS procedures for their improved health. You will be given 1 questionnaire that will ask how you practice occupational safety. The questions take about 20 minutes to complete. There are no right or wrong answers.

Potential Risks: There are no foreseen risks that may result from your participation in the study

Description of the Study Procedures: If you agree to be in this study, you will be asked to do the following things: a questionnaire will be given to you measure the level of depression and another questionnaire will be given to you to assess your demographic characteristics,

compliance to OHS guidelines, work environment characteristics and individual characteristics. This process will only take you 30 minutes and no invasive procedures will be used.

Confidentiality: Confidentiality is assured; researchers will only have a number to identify you. The findings of the study will exist only as grouped completely anonymous data and kept on your chart. The findings will be shared with the program and may be used in a student thesis, presented at conferences, and published in journals. The completed questionnaires will be kept securely until the study is over. All electronic information will be coded and secured using a password protected file, it will only be accessed by the researcher, and will be used for educational purposes only. We will not include any information in any report we may publish that would make it possible to identify you. Your identity will be disclosed in the material that is published. However, you will be given the opportunity to review and approve any material that is published about you

Right to Ask Questions and Report Concerns: You have the right to ask questions about this research study and to have those questions answered by me before, during or after the research. If you have any further questions about the study, at any time feel free to contact the PI on Tel: 0702 131 212 or at email annenak@gmail.com. If you like, a summary of the results of the study will be sent to you.

Right to Withdraw: You may withdraw from the study or refuse to answer individual questions for any reason, at any time, without any sort of penalty. Participation is voluntary and refusal to participate in the study will not result in any change in service or care provided. If you withdraw from the study, any data about you will be destroyed.

Consent to Participate:

Your signature below indicates that you have decided to volunteer as a research participant for this study, and that you have read and understood the information provided above. You will be given a signed and dated copy of this form to keep, along with any other printed materials deemed necessary by the study investigators.

Subject's Name (print):

Subject's Signature: _____ Date:

Investigator's Signature: _____ Date: _____

APPENDIX C: QUESTIONNAIRE

Part A: Socio demographic characteristics

S.NO	Statement	Choice
1	**What is your current age (in years)**	....
2	**What is your current marital status**	1. Single 2. Married (traditional, civil, religious) 3. Cohabiting 4. Separated
3	**Religion**	1. Catholic 2. Anglican 3. Muslim 4. Born again 5. Other (specify).....
4	**What is your current level of education?**	1. Secondary (O level) 2. Secondary (A level) 3. Diploma 4. Degree 5. Other (Specify).....
5	**For how long have you worked in this factory**	....

Part B: Compliance to OHAS guidelines

S.NO	Statement	Choice
	PPE for eye protection	
6	How often do you use eye protection when in the factory	1. All the time 2. Sometimes 3. Rarely
	PPE for Hearing	
7	How often do you use ear protection when in the mill?	1. All the time 2. Sometimes 3. Rarely
	PPE for Feet and Hands	
8	How often do you use safety boots while in the when in the factory?	1. All the time 2. Sometimes 3. Rarely
	PPE for Hand protection	
	How often do you use safety gloves while in the factory?	1. All the time 2. Sometimes 3. Rarely
	PPE for the body trunk	
9	How often do you use protective clothing while in the factory	1. All the time 2. Sometimes 3. Rarely
10	How often do you use protective helmets?	1. All the time 2. Sometimes 3. Rarely
	Fall protection	
11	Do you use fall protection while working at heights in this factory?	1. Yes **2.** No

PART C; Approaches to ensure a health promoting work place

S.No	Statement	Agree	Disagree
12	There are established procedures for steel manufacture in this factory		
13	Your employers give you PPE when you need it		
14	Steel rolling plant and equipment regularly checked and properly maintained		
15	The factory has all PPE required for safety and it is enough for the workers		
16	My supervisor/section manager often reminds workers of the potential risks and hazards in our workplace		
17	My supervisor/ section manager consults us for suggestions about how to improve safety in this unit		
19	Reporting a safety problem in this unit will not result in negative repercussions for the person reporting it		
20	Pits and other floor openings are covered or cordoned off with clear warning signs when not in use		
21	We are given incentives to encourage us adhere to occupational safety precautions		
22	My supervisor /section manager frequently checks to see if workers are all following safety rules		
23	Management trains you on the effective use of PPE		
24	Management trains workers in the hazards of exposure to radiation and the measures to be taken if they encounter material they suspect to be radioactive		
25	Our work place has warning danger signs on all dangerous equipment		

PART D; Individual factors

Awareness of occupational health safety guidelines

26. Which of the following is not covered under occupational health and safety management systems implementation?

1. Planning for hazard identification, risk assessment and risk control
2. Structure and responsibility
3. Injury treatment and management
4. Training, awareness and competence

26. In this factory, which of the following units create more than permissible noise levels (91.8 dB)?

1. Nails and corrugation
2. Cold rolling
3. Color coating
4. Batch annealing

27. Which of the following is necessary to eliminate struck-by, struck-against and caught-between hazards to equipment operators, pedestrians and other vehicle operators?

1. Use of helmet's
2. Use of safety boots and gloves
3. Maintaining proper clearance for passage of large industrial equipment

28. Which of the following is not a safety and health measure that can be used in a cold rolling factory such as this one?

1. Safety organization
2. *Training*
3. *Personal protective equipment*
4. *Ergonomics*
5. First aid

S.NO	Statement	Choice
29	Who is supposed to wear PPE?	1- Workers in dangerous areas 2- All workers 3- Supervisors 4- Managers
30	Have you ever received training in metal fabrication safety?	1- Yes 2- No
31	For how long have you been in the steel manufacturing profession?	1. < 1 year 2. 1 - 4 years 3. 5 – 8 years 4. More than 8 years
32	To what extent are you satisfied with your job as a mill plant worker in this place?	1. Very satisfied 2. Satisfied 3. Dissatisfied
33	For how many hours do you work in this mill per day?	1. 1 - 5 hours 2. 6 – 10 hours 3. More than 10 years
34	Do you think you can be easily injured (are likely) to be injured while at work in this mill plant?	1. Yes 2. No
35	In the last one year have you been involved in a workplace accident?	1. Yes 2. No
36	Have you suffered an occupational disease or from a suspected work related illness before?	1. Yes 2. No
37	Do you think factory management is giving you enough work safety support?	1. Yes 2. No

END

APPENDIX D: IN DEPTH INTERVIEW GUIDE

1. What is your description of the level of compliance to occupational health and safety guidelines among factory workers in this plant? Please explain
2. What do you suggest are the most non complied to OHAS guidelines among the mill workers in this plant?
3. What approaches do you have in this factory to ensure that OHS is complied to by the factory workers?
4. Do you think any of those approaches affects compliance to OHS guidelines, please explain
5. What do you think is the effect of individual characteristics on compliance to OHS guidelines among factory workers here?
6. Of the answers in 4 and 5, above, and the answers to 6, which of the two do you think influences compliance to occupational health and safety guidelines among mill workers in this plant to a larger extent? Please support your answer.

APPENDIX E: SELF REFLECTION

This study was done in roofings rolling mill phase three, Namanve. However pre-testing of questionnaires was done at steel and tube industries, on Jinja road. The questionnaire pretesting took quite some time given that to get permission I had to go through the same procedure I went through with the actual data collection site. I believe next time it would be better to set time to pretest the questionnaires independent from time of actual data collection for better time management.

Being that it was looking at occupational health and safety, management was at first hesitant to let me carry out the study. However, I shared with them my proposal and made it clear to them that this research is purely academic, with no ill intentions what so ever intended. I also highlighted how useful this research could be to the company in helping the address any gaps beforehand.

Contrary to the study population's initial expectation, I was not going to give any rewards to study participants. This I feared would affect willingness to be involved in the study. However I think that explaining to them that I would not want to influence their responses in any way, that they had a right to opt out of the study at any time they felt they could not continue, and that am a mere student living on transferred incomes, changed their initial expectation. I finally got the desired sample and none opted out even without rewards.

As we interviewed the participants, they had to leave their duty stations for the interview that was being carried out in the factory compound. This was somewhat an inconvenience to the participants. I feel that given a similar study population later, I would consider carrying out interviews during work breaks or at the end of work shifts.

Conclusively, this was a very successful study, albeit the occurrence of minor limitations.

APPENDIX F: WORK PLAN

OBJECTIVE	ACTIVITIES	RESPONSIBLE PEOPLE	TIME FRAME	OUTCOME
Write a research Proposal	• Literature review • Topic refining • setting objectives and research questions • deciding on methodology of data collection • designing data collection tools	Researcher, under guidance of supervisor	April - July 2017	Research proposal
Obtain permission to collect data	• Write an introductory letter of the researcher to the study area management, to render necessary assistance in data collection. • submission of introductory letter of researcher along with copy of proposal and request to collect data to factory management	Supervisor Researcher	August 2017 August 2017	Introductory letter of researcher to study area management. Consent to collect data in the factory
Pre –test data collection tools and refine Tools according to outcomes of	• pre- testing data collection tools at steel and tube industries.	Researcher	August 2017	Data collection tools refined.

pre-testing.				
Collect data	• Recruiting and training research assistants • sensitization of study population about the study • sample selection • administering questionnaires • conducting key informant interviews • checking for completeness and accuracy of completed questionnaires.	Researcher and research assistants.	September -October 2017	Data collected
Analyze Quantitative Data	• Data editing • Data cleaning • Data coding • Data entry into SPSS • Univariate analysis • Bivariate analysis • Chi square test • Multivariate analysis	Researcher and research assistants with guidance from supervisor	October-November 2017	• Analysis tables • chi squares
Analyze Qualitative data	• ordering and summarizing of transcriptions • sorting and derivation of themes from transcriptions		October – November 2017	• Transcripts • Themes derived from key informant interviews

	• Coding of themes			
Develop a discussion and write a draft final report		Researcher with guidance from supervisor	December 2017-April 2018	Draft final report submitted to supervisor
Submit final report to faculty of health sciences Uganda Martyrs University	• Addressing comments of supervisor in draft final report • submission of final report	Researcher	May 2018	Final report submitted to faculty of health sciences Uganda Martyrs University.

APPENDIX G: BUDGET

ITEM	NUMBER	UNIT COST	FREQUENCY	TOTAL COST
UMU Research fee	1	500000	1	500000
Training Research Assistants	4	40000	1	160000
Research assistant remuneration	4	40000	15	600000
Purchase of SPSS	1	250000	1	250000
Purchase of safety boot, goggles and body suit	1	200000		200000
Printing and photocopying				200000
Book Binding	4	20000	1	80000
Grand total				1990000