SAFETY OF WORKERS IN SLAUGHTERHOUSES AND MEAT PROCESSING PLANTS IN NAIROBI CITY COUNTY, KENYA

MAKORI CHARLES MOTARI (BVM)

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF PUBLIC HEALTH (OCCUPATIONAL HEALTH AND SAFETY) IN THE SCHOOL OF PUBLIC HEALTH OF KENYATTA UNIVERSITY

OCTOBER, 2018

DECLARATION

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

Signature …… Date……..….

Makori Charles Motari

Q139/CTY/PT/22740/2012

Supervisors: This thesis has been submitted for review with our approval as University Supervisors.

Signature …… Date……..….

Dr. Peterson N.Warutere

Department of Environment and Occupational Health

Signature …… Date……..….

Dr. Purity N. Nguhiu

Department of Animal Sciences

DEDICATION

To the one who has been encouraging, praying and giving me unconditional love despite the challenges faced in the period of study: to my beloved wife Jenipher.

ACKNOWLEDGEMENT

I am very much grateful to my supervisors, Dr. Peterson N. Warutere and Dr. Purity Nguhiu for their steady, unwavering determination, guidance and tremendous support rendered to me in the course of my study. I also take this opportunity to thank the study participants and the management of all the slaughterhouses and meat processing plants who allowed me to carry out the study in their facilities. The immense support given by the research assistants and Key Informants and all Focused Group Dicussion members was overwhelming and may God reward and remember them greatly. The recognition given by the Kenyatta University Graduate School and the Ethical Review Committee to the study proposal which enabled the consequent research authorization and issuance of Clearance Permit by the National Commission for Science, Technology and Innovation (NACOSTI) was very motivational.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

ACDP Advisory Committee on Dangerous Pathogens

AMI American Meat Institute

AMIEU Australian Meat Industry Employees Union

BLS Bureau of Labour Statistics

BMPA British Meat Processors Association

CBS Central Bureau of Statistics

CDC Centre for Disease Control

CDVS County Director of Veterinary Services

CIA Central Intelligence Agency

COHFE Centre of Human Factors and Ergonomics

COK Constitution of Kenya

CTDs Cumulative Trauma Disorders

DHH Department of Health and Human Services

DOSHS Directorate of Occupational Safety and Health Services

DVS Directorate of Veterinary Services

FSA Food Standards Agency

GDP Gross Domestic Product

HIV/AIDS Human Immunodeficiency Virus/Acquired Immunodeficiency syndrome

HSE Health and Safety Executive

HSW Health and Safety at Work

ILO International Labour Organization

IJCRLS International Journal of Current Research in Life Sciences

KNBS Kenya National Bureau of Statistics

KU-ERC Kenyatta University Ethical and Review Committee

MATFA Meat and Allied Trade Federation of Australia

MCA Meat Control Act

MSDs Musculo-Skeletal Disorders

MIA Meat Industry Association

MTC Meat Training Council

NACOSTI National Commission for Science, Technology and Innovation

NIOSH National Institute for Occupational Safety and Health

NZITO New Zealand Industry Training Organisation

OSH Occupational Safety and Health

OSHA Occupational Safety and Health Act

OSHO Occupational Safety and Health Offifer

PPEs Personal Protective Equipments

UK United Kingdom

USA United States of America

WHO World Health Organization

WIBA Worker Injury Benefits Act

DEFINITION OF OPERATIONAL TERMS

Abattoir A French term and has the same meaning as slaughterhouse

Animal Any mammal or bird declared by the Minister, by notice in the Gazette to be an animal to which this Act applies (Meat Control Act (MCA), Cap 356 of the Laws of Kenya).

Carcass The body of any slaughtered animal after bleeding and dressing (MCA, Cap 356)

Export slaughterhouse- A slaughterhouse that slaughters animals and produces carcasses/meat or processed meat products for export besides supplying the local market (MCA, Cap 356 of the Laws of Kenya).

Halal Arabic word meaning permissible**.** Rules of slaughter are based on Islamic law where animals have to be alive and health before slaughter and a muslim has to perform the slaughter in a ritual manner to ensure that all blood is drained from the carcass.

Hazard The disposition of a thing, a condition or situation with potential to produce an adverse health or environmental effect; or an event, sequence of events or combination of circumstances that could potentially have adverse consequences (adapted from "Advisory Council on Dangerous Pathogens" ACDP, 1996).

Health A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 1946)

Health and Safety policy- A written outline of an organization's general policy for health and safety, including the arrangement for carrying out the policy

Local slaughterhouse- Any place kept for the purpose of slaughter of animals for human consumption within the country (MCA, Cap 356 of the Laws of Kenya).

Meat Any portion of an animal which is intended for human consumption, either fresh or frozen or otherwise processed by any means whatsoever or included in any article of food for human consumption (MCA, Cap 356 of the Laws of Kenya).

Meat processing plant-A facility that receives meat or carcasses from slaughterhouses and processes them into meat and meat products either for local consumption or export.

Occupational Health (Joint ILO/WHO)- The promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst the departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his/her physiological and psychological capabilities; and to summarize: the adaptation of work to man and of each man to his job.

Occupational Safety and Health (OSH)- The science of anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and wellbeing of workers, taking into account the possible impact on the surrounding communities and general environment.

Risk The probability that, in a certain time frame, an adverse outcome will occur in a person or group of people. It can also mean the likelihood of harm.

Safety A condition of being safe/free from undergoing or causing, hurt, injury, harm or loss.

Slaughterhouse- Any place kept for the purpose of slaughter of animals for human consumption (MCA, Cap 356 of the Laws of Kenya).

ABSTRACT

Slaughterhouses and meat processing plants are known to potentially pose significant threats to worker's safety and health due to the hazardous conditions involving animals, tools and dangerous machines used in the meat industry.The main objective of this study was to investigate the safety of workers in slaughterhouses and meat processing plants in Nairobi City County. The specific objectives were to determine the level of compliance of various categories of slaughterhouses and processing plants to Occupational Safety and Health Act, 2007, establish the types of injuries experienced and the associated risk factors and the management of these injuries in these facilities. Descriptive cross sectional study design was used. Quantitative data was collected from the facilities using structured questionnaires while focused group discussions, key informant interviews and observational checklist were used to collect qualitative information. A total of 347 respondents were included in this study from 30 facilities. The data was analyzed using the Statistical Package for Social Scientists (SPSS) version 18 and relations between independent and dependent variables determined by use of Chi-Square. Frequency tables, percentages and charts were used to present the results. The study established that socio-demographic factors were statistically significant in influencing the safety of the workers where gender had the greatest impact in the safety of the workers where males received more injuries (92.1%) than the females (χ^2=27.72; p<0.05 and this was followed by age where the younger population received more injuries than the older workers (χ^2=25.59; p<0.05). Duration worked followed where experience had a positive impact in the safety of the workers (χ^2=22.12; p<0.05). The educational level of the workers was least of these demograhic factors in affecting the extent of injuries where workers with primary school education (92.5%) received more injuries than the ones with secondary school education (χ^2=21.39; p<0.05). OSHA parameters were also examined in various categories of facilities and established that the awarness level of OSHA, 2007 and WIBA, 2007 were highest in export facilities and processing plants and lowest in local facilities (χ^2=237.46; p<0.05) and followed by provision of Personal Protective Equipments (PPEs) in the same pattern (χ^2=62.43; p<0.05). Inspection of enterprises was higher in export oriented slaughterhouses than in local facilities (χ^2=15.97; p<0.05), training followed the same pattern (χ^2=28.5; p<0.05). Provision of safety and health policy was more pronounced in export and meat processing plants than local facilities (χ^2 = 38.41; p<0.05) and followed by training (χ^2 =28.5; p<0.05). The highest number of injuries were recorded in Category C facilities and lowest in export based facilities (χ^2=23.554; p<0.05) and this was significant. Safety and health committes followed (χ^2 =23.38; p<0.05).The least in impact was noted in inspection with (χ^2 =15.97; p<0.05). From this results, compliance levels were fairly high in export and processing plants than local facilities. In total, 85% of the workers in the meat industry in Nairobi received injuries and 15,261 working days (122,088 man-hours) were lost in the course of that year under study, 2015. The incidence rate of injury stood at 21.9 per 100-full time workers in 2015. In conclusion, the study recorded high incidence of injuries among the workers being commonly reported in young male workers who had been the service for short period of time. The injuries were commonly reported in Category C slaughter houses where the compliance levels to OSHA was very low. The study recommended that OSHA, 2007 be prudently implemented in all slaughter and processing facilities in Nairobi and nationally in order to prevent this high injury rate noted.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The meat industry falls under the agriculture sector and involves livestock production, processing, packing, preservation and marketing of meat and meat products. Slaughterhouses are places kept for purposes of slaughter of animals for human consumption as described in the Meat control Act, Cap 356 of the laws of Kenya (MCA, Cap 356). Some slaughterhouses do slaughter and convert the meat into other products and this is called meat processing. Meat processing plants are facilitis that receive fresh or frozen meat from slaughterhouses and process it into meat products. The slaughter process and the processing of meat into other meat products has a range of hazards. These hazards include animals, carcasses, equipments and all machinery used in the production of meat and meat products. The highest rates of occupational deaths occurred in agriculture, forestry, mining and construction and in the agriculture sector, meat packaging was identified as having high rates of work-related diseases including fatal occupational diseases (Alli, 2008).

Consequently, it is important to ensure the safety of the workforce in slaughterhouses and meat processing plants because it has direct benefits to the employees themselves and the business. There is a direct and positive relationship of safe work places with quality, productivity, cost, turnover and related measures of industry success (AMI, 2013). Furthermore, the meat industry contributes immensely to the economy of this country in terms of volumes of meat products sold internally and externally (CDVS Annual Reports, 2009-2015 in Nairobi City County). Therefore, it is important to assess the safety of these workers since they are exposed to physical, chemical, biological, ergonomical and psychological hazards in their workplaces (Abdullahi et al., 2016). This study assessed

the safety of these workers given the myriad of hazards they are exposed to. In this industry, accidents result from animals, machines, knives, hooks, falling carcasses, manual handling, lifting, slippery wet floors and many other hazards present in these facilities (BMPA, 2014). In the United Kingdom (UK), injury incidence rates per 100,000 employees as reported by the Health and Safety Executive (HSE) in 2011/2012 indicates that a total of 4,700 injuries were recorded and 17% of these were major and 83% minor in the meat industry (Nourish, 2012). Long hours of working and the performance of repetitive motion directly leads to increased risk of injury and predisposes workers to chronic pains in their hands, arms, shoulders and back pain (NIOSH, 2012). Data from the Bureau of Labor Statistics (BLS) in the USA (2003-2007) show that the rate of illnesses and injuries for workers in animal slaughtering and processing was more than twice as high as the national average, and the rate of illnesses alone was more than ten times the national average (Lo and Jacobson, 2011). Occupational health and safety remains a neglected "issue" in many developing and transitioning countries of the world mostly due to competing economic, social, and political needs and the concern is mainly provision of health care and treatment with less emphasis on preventive measures (Banjo et al., 2013).

A study in Nigeria among abattoir workers established that workers were predisposed to physical hazards (89% knife cuts) compared to blood borne infections (29.5%) and blood borne infections increased with years of exposure (Banjo et al., 2013). Predisposing factors for zoonoses in abattoir workers were found to be cuts, abrasions, wounds, unattended skin injuries, not providing Personal Protective Equipments (PPEs) to employees, lack of health education among others (Mahendra et al., 2014).

A study in slaughterhouses in Busia in Kenya established that workers with secondary level education were more aware of zoonoses and those workers with knowledge of zoonoses were more likely to wear Personal Protective Equipment (PPEs) (Cook, 2014). The study in Busia also revealed that slaughterhouse workers had a high risk of certain zoonoses due to the high injury rates recorded and these workers can act as reservoirs of zoonotic organisms.

In Kenya, the Veterinary Department regulates slaughterhouses and meat processing plants by enforcing food safety standards (Meat Control Act (MCA), Cap 356). The MCA is limited to food safety standards while silent on the safety of the workers. These enterprises are workplaces and should meet the requirements of a workplace as stipulated in OSHA, 2007. The meat industry is a key contributor to the Kenyan economy (CDVS reports 2009-2015), employs a large workforce and hence it is important to ensure the safety and wellbeing of persons working within this industry. In Kenya, there exists export, meat processing plants and local slaughterhouses and Nairobi City County has various categories (MCA, Cap 356 of the Laws of Kenya). Local slaughterhouses have been categorised into category A, B and C on the basis of the size of land occupied and throughput (MCA, Legal Notice 110 of 2010). Nairobi City County has 3 export slaughterhouses, 3 category A local slaughterhouses and 21 category C local slaughterhouses. It has a total of 4 processing plants. Category A is large slaughterhouse having an area of not less than 2.5 hectares and handles over 40 units of bovines/camels, 20 units of sheep/goats, 8 units of small pigs or 15 porkers per day while category B (Medium slaughterhouse) has land area not less than 1.5 hectares and a throughput of 6-39 bovines or camels, 16-24 units of sheep/goats, 1-7 units of small pigs and 2-14 units of

porkers per day. Category C (local slaughter slab) is the smallest of local slaughterhouses with land size of not less than 0.5 hectares and a throughput of 5 units of bovines or camels, 15 units of goats/sheep, 6 units of small pigs and 2 units of porkers per day (MCA,Cap 356, Legal Notice 110 of 2010). It is important to note that Nairobi City County does not have category B of the local slaughterhouses. The export slaughterhouses also process meat into other products for export and local markets besides slaughtering animals while processing plants do no slaughter but receive meat and process it further to meat products.

1.2 Statement of the Problem

Globally, a total of 2.3 million deaths were reported in the year 2012 and out of these, 318,000 were attributed to occupational injuries and 2,022,000 to work-related diseases (Hamalainen et al., 2014). In the USA, the illness and injury rate of workers was higher in slaughterhouses than in any other industry for "much of the last quarter of the twentieth century" (Broadway and Stull, 2008). The single largest factor contributing to worker injuries is the speed at which the animals are killed and processed (ILO, 2015). The poor recording systems of injuries/illnesses which have been identified in developing countries (Hamalainen et al., 2014), coupled with severe underreporting which has been identified in this industry, is a threat to worker safety.

These workers use sharp and dangerous tools and the incidence of accidents in this industry is one of the highest in the foods and drinks industry (ILO, 2011). In the year 2010, an employee in the slaughtering sector in Britain was three times more likely to be injured than the average person at work (BMPA, 2011). In Nigeria, workers in animal related occupation which includes abattoirs indicated that workers had an average

knowledge to adequate knowledge of zoonoses but poor knowledge of preventive measures and that employer responsibilities towards prevention and control of occupational hazards were inadequate (Awosile et al., 2013). In Kenya, a total of 1,364 accidents were reported in the Agriculture sector in the period 2010-2011 and of these, 14 were fatal (ILO, 2013). Workers in the slaughter process perform tasks at the speed of the conveyor and this subjects the workers to a lot of stress because they have to work at the speed of the machines (ILO, 2015).

Even in the absence of these fast moving machines, manual slaughter of animals takes place at a very high speed because of the quest to access the market before others. Kenya has no specific documentation on occupational injuries/accidents in slaughterhouses and meat processing plants and yet the likelihood of occurrence is very high due to the very high level of exposure to hazards. In view of the global perspective already outlined in the meat industry where injury rates are very high in the foods and drinks industry, this study has addressed this scenario in Nairobi, Kenya which has not been previously documented for Nairobi City County although the meat industry is important and vibrant in the study area.

1.3 Justification

The meat industry falls under the Agricultural sector which is a key contributor to the Kenyan economy with a GDP of 24% in 2008 (KNBS, 2013). The livestock sub-sector under which the meat industry falls accounts for 10% of the entire GDP and 42% of the Agricultural GDP and supplies the domestic requirements of meat and other livestock produts (National Livestock Policy, 2008). This policy has not addressed safety of workers in the meat industry but has mentioned HIV/AIDs as having a negative impact

on livestock production. The KenyaVeterinary Policy which is provided for in the fourth schedule of the constitution of Kenya (COK, 2010), appreciates the risks involved in the delivery of veterinary services. However, it has not made it clear how it it will address or implement safety measures to protect the workers in the animal resource industry (The Kenya Veterinary Policy, 2015).

It is therfore important that the issues of safety and wellbeing of workers in this industry are addressed in order to increase their productivity and reduce disease burdens resulting from injuries/illnesses in this industry.

The accelerated surge in human population, rise in incomes and urbanization have caused a demand for meat in Nairobi City County and hence the slaughter and processing of meat to meet not only the nutritional needs of this huge population which is currently estimated to be 3.1 million (KNBS, 2013), but also the external markets. Further, Article 46 of the Constitution of Kenya stipulates that every person has a right to the protection of their health, safety and economic interests and Article 42 further allows a person the right to a clean and healthy environment (the Constitution of Kenya, 2010). Hence, these workers have a constitutional right to their safety as they perform duty in the meat industry.

Workers in the meat industry use sharp and dangerous tools and the incidence of accidents in this industry is one of the highest in the foods and drinks industry (ILO, 2011). Consequently, this calls for high standards of occupational safety practices in this industry in order to minimize worker injury and illnesses.

The study will also show the extent of compliance of these enterprises to OSHA, 2007 since its enactment. Except for works on food safety and zoonoses, there is scanty

information on the safety of workers in the meat industry and no evaluation of their safety has been done in Nairobi City County despite the many slaughterhouses and the large workforce employed in this industry. This study generated baseline information which may be used by the management to improve the safety and productivity of these workers.

1.4 Research Questions

i) What are the safety practices and compliance levels of various categories of slaughterhouses and meat processing plants to OSHA, 2007 in Nairobi City County?

ii) What risk factors are associated with the injuries inflicted to workers in slaughterhouses and meat processing plants in Nairobi City County?

iii) How are injury outcomes managed within slaughterhouses and meat processing plants in Nairobi City County?

iv) 1.5 Study Hypothesis

Null Hypothesis: There is no relationship between safety measures in slaughterhouses and meat processing plants and the safety of workers in the study area.

1.6 Study Objectives

1.6.1 General Objective

The general objective of this study was to investigate the safety of workers in slaughterhouses and meat processing plants in Nairobi City County.

1.6.2 Specific Objectives

i) To determine the safety practices and the level of compliance of the various categories of slaughterhouses and meat processing plants to OSHA, 2007 in Nairobi City County.

ii) To establish the risk factors associated with the injuries inflicted to the workers in slaughterhouses and meat processing plants in Nairobi City County.

iii) To establish the management of injuries at the level of slaughterhouse and meat processing plants in Nairobi City County.

1.7 Limitations and Assumptions

It was assumed that all the respondents would be truthful in the handling of the questionnaires presented to them and give the correct information because some may fear the impact of the results of the study on their job security. It is also assumed that the management of all the slaughterhouses and meat processing plants would cooperate to enable collection of data.

1.8 Conceptual Framework

The conceptual framework as outlined in Figure 1.1 indicates the safety of workers as a dependent variable of the study and the independent variables are the factors, measures or indicators in place that determine the safety of these workers (dependent variable).

These independent variables included socio- demographic and economic characteristics of the workers, level of compliance of the facilities to Occupational Safety and Health Act (OSHA, 2007) and the Worker Injury Benefits Act (WIBA, 2007). Other determinants that affect the safety of the workers include the size (category) of the enterprise, type of hazards, the number of workers injured, sick, given offs and the

working days lost resulting from sickness. All the independent variables as outlined in the conceptual framework in Figure 1.1 have an impact on the safety of workers. The process component in this model includes activities or measures in place, how they are done and affect the safety of the workers (Handler et al., 2001).

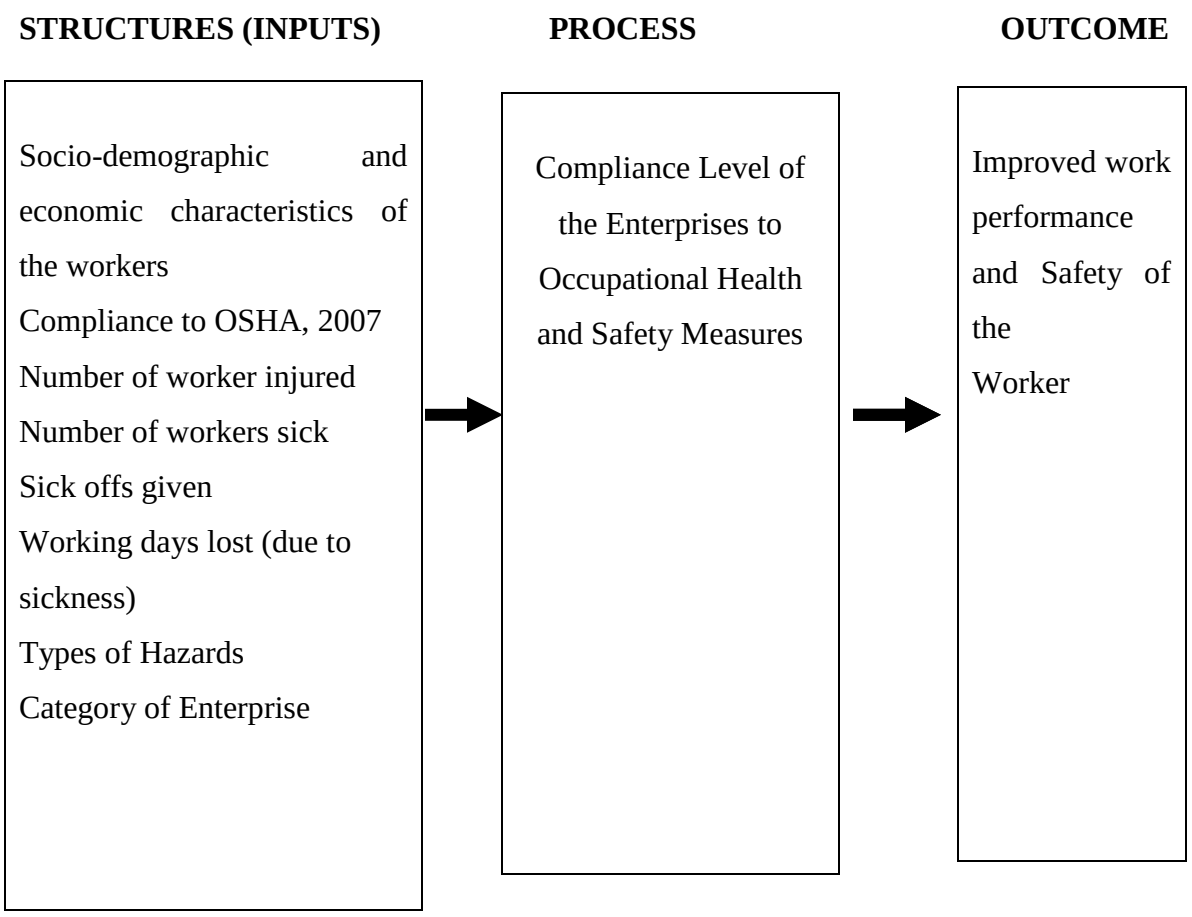


Figure 1.1: Conceptual Framework

Source: Adopted from Donabedian model of Quality improvement in Health Care (Handler et al., 2001)

1.9 Significance of the Study

Dessimination of the results of this study will positively contribute to continuous improvement on worker safety in slaughterhouses and processing plants by the employer and the relevant regulatory bodies charged with occupational health and safety. This continuous improvement leads to increased productivity of the workers, improved quality of the products, increased morale and decreased absenteeism of the workers and hence enhanced performance of the meat industry. The study generated baseline data on the extent of safety measures in place in these establishments which may be used by other researchers and scholars interested in doing research in the same field.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents literature which is relevant to the safety of workers in slaughterhouses and meat processing plants globally,regionally and Kenya with a specific focus in Nairobi City County in the following thematic headings namely: compliance of slaughterhouses and processing plants to OSHA, 2007, types of injuries the workers in these facilities are exposed to and the management of injuries sustained in these enterprises.

2.2 Occupational Safety and Health Act, 2007 (OSHA, 2007 and other legal instruments

The first public slaughterhouse became operational in France at the beginning of the 19th century and the French word abattoir was introduced to refer to a specific place where animals are slaughtered for human consumption (Fitzgerald, 2010). Prior to that, slaughter used to take place in backyards of houses. In the 1990s, the United States of America (USA), Canada, Australia and New Zealand were the major meat producing countries and these countries are expected to have made great strides in the development of safety measures in abattoirs (Bulliet, 2005). By the 1880's, animal slaughtering had become the first mass production industry in the USA. Closely linked with this mass production, illness and injury rate of workers was higher in slaughterhouses than any other industry for much of the last quarter of the twentieth century (Fitzgerald, 2010).

In the USA, the Safety and Health Act was enacted in 1970. However, in 1991, twenty five workers died in a fire at the Imperial Poultry plant in Hamlet, North Carolina and the cause of this accident was due to employer locking the doors on suspicion that they

were taking chicken parts home from work (Compa, 2004). This disaster was attributed to laxity in the enforcement of the existing laws.

The rate of reported incidence of injuries/illnesses in the USA in 1999 was 26.7 per 100 full-time workers and this was three times the average for other industries (Fitzgerald, 2010). This incidence rate of injury has been reduced to an average of 7.2 per 100 full - time workers in the year 2012 (AMI, 2013). This means that there was increased compliance to the Safety and Health Act, 1970 resulting from its enforcement.

In Britain, the Health and Safety Act, 1974 provides for training, current health and safety policy, safety and health committees and these measures have helped to reduce injury rates in the meat industry (BMPA, 2014).

New Zealand has in place Health and Safety in Employment Act, 1992 and this has seen a recent trend of injury rates decreasing resulting from the enactment and implementation of this Act (MIA and NZITO, 2013).

In Australia, all the states have Occupational Health and Safety Acts since 1983 and in 1995, they developed National Guidelines for Health and Safety in the meat Industry (AMIEU; MATFA, 1995).

The control measures to minimize and reduce risks in the meat industry as already outlined in the legislations governing occupational health and safety need to be enforced in order to improve the safety of workers. These control measures include: risk identification, assessment and management, the hierarchy of control of hazards and these encompass elimination, substitution, engineering controls, administration controls and proper usage of PPEs. Training in all its forms plays a critical role in any workplace (BMPA, 2014). As already pointed out, predisposing factors for zoonotic diseases

include injuries and accidents (Mahendra et al., 2014) and the extent of injuries/accidents of workers in turn depends on the level of compliance to occupational health and safety practices of these enterprises. This study is aimed at addressing a knowledge gap that may exist between the employer and employees on prevention and control of occupational hazards which have been found to be inadequate in abattoirs in a study carried out in Nigeria (Awosile et al., 2013). This study is also intended to address the poor recording/reporting systems of injuries/illnesses which have been identified in developing countries (Hamalainen et al., 2006).

In Africa, few countries like South Africa (1993), Uganda (2006) and Tanzania (2003) have enacted legislations to deal with occupational health and safety. However, information on the development of National Guidelines on health and safety in the meat industry is not available like in developed countries (Zwi et al., 1988). These legislations cover occupational health and safety in all workplaces and ensure that employers and workers comply on the requirements stipulated so as to protect the workers from hazards in these workplaces.

The Kenya vision 2030 gives recognition of the fact that good health boosts the human capacity to be productive and the vision aims to shift its emphasis from curative to promotive and preventive health care (Kenya Vision, 2030). Except for the mention of Human Immunodefiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) and how it has impacted negatively on production at the farm level, the National Livestock Policy has no other information on the safety of workers in the livestock industry.

The Constitution of Kenya 2010 under section 41(2) part (b) of the labour relations stipulates that every citizen of this country is entitled to fair working conditions and

section 46(1) part (c) further lays emphasis on the protection of their health, safety and economic interests (COK, 2010). Prior to the Constitution of Kenya (2010), Kenya had already enacted two pieces of legislations specifically meant to ensure the health and safety of workers and their compensation in case of injury or disease. These are the Occupational Safety and Health Act, 2007 (OSHA, 2007) which provides for the safety, health and welfare of workers and all persons lawfully present at workplaces and WIBA, 2007 which provides for compensation to employees for work related injuries and diseases contracted in the course of their employment. If these legal instruments are successfully implemented and in particular in the meat industry, there will be a realization of increased safety, productivity and decreased absenteeism in this industry.

This study is aimed at investigating the compliance levels of various categories of slaughterhouses and processing plants to Occupational Safety and Health Act, 2007 (OSHA, 2007) and other legal instruments and these entities have been found to determine the safety of workers in this industry.

2.3 Types of injuries the workers are exposed to in the meat industry

Before one can indicate the types of injuries experienced in the meat industry, it is important to discuss the slaughter process, the hazards present in this industry and the risk factors in these facilities which predispose workers to injuries.

2.3.1 The slaughter process

After stunning and bleeding, the animal is hoisted with chains into the overhead conveyor system followed by the hide/skin removal. The carcass is split along the spinal column using hydraulic band saws or panga/axe (Berkowitz et al., 2011). Trained meat inspectors usually inspect the carcass while still hanging from the conveyor system. Chilling of the carcass takes 24 to 36 hours at 2^0C to slow bacterial growth and inhibit

spoilage (Berkowitz et al., 2011). Once chilled, the carcass is then prepared to meet the requirements of customers. In Nairobi City County, export slaughterhouses conduct further processing of the meat into meat products. Most meat in Nairobi City County is sold to butcheries and other outlets as hot/fresh carcasses (CDVS, 2009-2015). Processing plants obtain meat from slaughterhouses and process the same into meat products (CDVS, 2009-2015). These products include fresh processed meat products, cured meat pieces, raw cooked products, dried meat products among others. In meat processing, technologies used include:cutting/chopping, mixing/tumbling, salting/curing, utilization of spices/non meat additives, and filling into casings or containers, fermentation, drying and smoking. The main ingredients are muscle meat and fat besides occasional use of internal organs (Gunter et al., 2010).

2.3.2 Common hazards in slaughterhouses and meat processing plants

The process of slaughter exposes the worker to physical injuries and these include: being hit or kicked by animals in the lairage, risk of falling carcasses and products. Washing and cleaning of the surfaces using detergents and chemicals can cause skin irritation and respiratory problems (ILO, 2011).Chemical, biological, psychological, musculoskeletal and ergonomical hazards have also been reported in Malaysia (Abdullahi et al,. 2016).

The risk of zoonotic diseases among slaughterhouse workers exists due to the close contact with animals and animal products (Berkowitz et al., 2011).

The mechanical devices used, wet and slippery floors resulting from carcass grease, peritoneal fluid and stairs throughout the plant pose a serious hazard to the workers.

The hazard of electrocution to workers also exists given the elaborate electrical wiring in these systems and the possibility of fire outbreaks from electricity (ILO, 2011).

Repetitive lifting of meat, forceful nature of the work in processing plants, vibrations from equipment, dull knives usage, cutting of frozen meat and high pressure hoses in cleaning operations can cause muscular-skeletal disorders (MSDs), cumulative trauma disorders (CTDs) such as carpal tunnel syndrome, tendinitis and tenosynovitis (Tappin et al., 2006). In the USA, meatpacking operations cause higher rates of these disorders than in any other industry (Berkowitz et al., 2011).

Chemicals used during the cleaning operations include alkaline and acid cleaners. Chlorine in the water used to clean carcasses is also a potential hazard to the workers because it can cause eye, throat and skin irritation (ILO, 2011).

Ammonia (a refrigerant) and carbon dioxide (for packaging) used in this industry cause irritation to the eyes and skin leading to headache, nausea, vomiting and at high levels can lead to death (Berkowitz et al., 2011). Use of freezers may require temperature to go as low as -40^{o}C and hazards relating to these cold conditions include frostbite among others (Berkowitz et al., 2011).

In Kenya, there is scant information on hazards in slaughterhouses and meat processing plants despite the existence of these facilities in this country. However, a study carried out in Busia in Kenya revealed that 25% of the abattoir workers were physically injured at work at least once a month and 8% had a wound at the time of being interviewed (Cook et al., 2016). These wounds have been noted to be entry points of infections and especially thoses ones of zoonotic nature (Cook, 2014). Hence, prevention of injuries in these facilities will ultimately lead to prevention of infections to workers and this will in turn improve the health status of the workers in this industry. Improvement of the health

of workers will mean increased productivity of this workforce with increased profits in these enterprises.

2.3.3 Risk factors in slaughterhouses and meat processing plants

2.3.3.1 line speed and close quarter cutting

Line speed is the single largest factor contributing to worker injuries in the meat industry. Increased speed of slaughter is directly related to injuries since workers must move with speed pulling and cutting with sharp knives, hooks and other implements (Fitzgerald, 2010). Coupled with this high line speed, is close-quarter cutting which is complicated with the use of very sharp hooks and knives and workers who are shorter or taller must make an extra effort which brings extra risks to them and their co-workers (Compa, 2004).

2.3.3.2 Manual handling and prolonged workshifts

Despite automation, many jobs in the meat industry still have to be performed manually and this involves heavy lifting, shoving, turning of heavy animals and animal parts, saws and other equipment (Fitzgerald, 2010). Prolonged work shifts have also been identified to be less safe for workers than short ones. This prolonged work shifts increases the risk of accidents which increases at an accelerating rate and it is more than double at the end of a twelve-hour shift from what it would be at the end of an eight-hour shift (Folkard et al., 2006).

2.3.3.3 Sullied working conditions

Despite the usage of PPEs, sullied work conditions make workers come into contact with blood, grease, animal faeces, ingesta (from the animal's digestive system), and other secretions from animals slaughtered. These sullied work conditions present unsanitary

conditions in slaughterhouses which are dangerous to both the workers and consumers (Compa, 2004).

2.3.3.4 Inadequate training

Inadequate training and poor usage of equipment is very common in this industry**.** The OSHA, 2007 section 99 clearly stipulates that no person shall be employed at any machine or process being a machine or process liable to cause ill health or bodily injury unless he/she has sufficient training in work at the machine or in the process or is under the supervision of a person who is very conversant and experienced in the machine or the process (OSHA, 2007). The training should be undertaken at recruitment, transfer or change of job or introduction of a new machine or equipment.

The training must be done when risks change and should be repeated periodically and this is entirely the responsibility of the employer (OSHA, 2007). Deficiencies in training have been found to be not only on the workers, but also in the management and this has an adverse effect on all industry operations (Tappin et al., 2006).

2.3.3.5 Underreporting of injuries sustained

Independent researchers and OSHA administration in the USA have indicated that there is a common corporate practice of underreporting of injuries of all kinds and it has been estimated that there is an undercount of non-fatal occupational injuries across industrial sectors as high as 69 % (Marcin et al., 2004). In addition to the severe underreporting of injuries, the dangerous working conditions and physically demanding nature of the work creates a high turnover rate. This turnover rate results in inexperienced workers and this situation compromises worker safety and health (Fitzgerald, 2010). This study was designed to establish if similar and severe cases of underreporting of injuries and other

scenario which may have negative impact to measures aimed at improving of worker safety in slaughterhouses and meat processing plants in Nairobi City County exist.

2.3.3.6 The risk of contracting zoonotic diseases

Workers in abattoirs run the risk of contracting zoonotic diseases. These are diseases and infections which are naturally transmitted from animals to humans and they represent about 70% of the number of emerging infectious diseases in recent times (Mahendra et al., 2014*).* In the UK, anthrax was reported countrywide in 2009, 50 cases of leptospirosis and 150 of listeriosis are reported each year. Q fever outbreaks were very common in abattoir workers in UK in the same year. A total of 500,000 cases of salmonellosis were being reported each year in the UK (BMPA, 2011). In Uganda, it has been established that the risk of brucellosis was higher (23%) for individuals who do not use protective gear in abattoirs compared with those who used protective gear (9%) (Nabukenya et al., 2013*).*

In Western Kenya, the sero-prevalence of zoonoses in slaughterhouse workers was reported at 0.1% for brucellosis, 13.4% for leptospirosis, 4.5% for Q fever, 1.2% for Rift Valley Fever, 1.8% for taeniasis, and 2.6% for cysticercosis and that less than 32% of the workers wore PPEs (Cook, 2014). The same author reported that risk factors for these diseases included open wounds resulting from injuries, washing of the intestines and smoking at work.

2.3.3.7 Causes, types and body parts affected by the injuries

Out of 17 food and drink manufacturing industries in the UK, injury rates were highest in the processing of meat at 28 per 100 –full time workers (BMPA, 2014). In the same report, the main causes of injuries were identified as being struck by an object, handling

and lifting of heavy weights, slips on wet and greasily floors, machinery like band saws, dehiders, transport including lift trucks, vehicles and injury by animals.

In Nebraska in the USA, factors leading to high risk working conditions of meatpacking plants have been found to be usage of sharp tools, employees working with high speed machines, confined work places, long hours of working, slippery floors, and heavy lifting (Autumn, 2014). The same author found out that fingers, hands, wrists and forearms were the majority of body parts injured in the meatpacking industry. In the USA, it was established that fingers were the most common part of the body that were amputated as a result of injuries sustained in the meat packing industry (Lander et al., 2010*).* In New Zealand, the most common types of injuries reported included soft tissue (sprain and strain), lacerations or puncture wounds and chronic or slow onset conditions like muscular-skeletal disorders (MSDs) which result from use of repetitive force (MIA and NZITO, 2013). These guidelines also indicate that the parts of the body commonly affected by these injuries are shoulder, hand and wrist, back and the spine. A report from the Queensland employee injury database in meat processing indicated that hand and finger injuries accounted for 26%, back 13%, shoulder 11%, wrist 10%, forearm 6%, elbow 4% and eyes 3% (Queensland Government workplace Health and Safety, 2015). The hand and finger injuries are wounds/lacerations from knives, band saws and brisket cutters. The back, shoulder, wrist and elbow injuries are muscle and tendon injuries.

In Africa, there is scanty information on injuries encountered by workers because occupational health and safety remains a neglected issue in these countries due to competing economic, social and political needs (Banjo et al., 2013). Furthermore, the poor recording systems of injuries/illnesses which have been identified in developing

countries (Hamalainen et al., 2014), coupled with severe underreporting which has been noted, makes it impossible to access information regarding the types of injuries experienced in this industry.

In Kenya, studies carried out in slaughterhouses and processing plants are mainly on food safety with limited inclination to occupational health and safety. These studies point out that there exists a knowledge gap on workers' safety and health in the meat industry and this study is handy in bridging this gap.

2.4 The management of injuries sustained in the meat industry

Developed countries like Britain, USA, Australia, New Zealand and others realized that there was need to prevent the high incidence of injuries experienced resulting from the mass production of meat for commercial purposes (Fitzgerald, 2010). Consequently, these countries developed and put in place National Guidelines for Health and Safety in the meat industry in line with the legislations to enable reduction of injury rates which were found to be very prevalent in the meat industry. Despite the underreporting which is very common in this industry, these measures in place have helped in the reduction of injury rates in these countries (BMPA, 2014).

Good management of health and safety in any industry has positive results in the workforce and these include: increased productivity, income, alleviation of pain and suffering and increased morale of staff among others. A well-organized injury management system will help in the reduction of injuries that do occur and help prevent reoccurrence among those who have been injured. In the USA, OSHA has a medical and First Aid standard (1910.151) which requires that employers provide medical, first aid

personnel and supplies commensurate with the hazards of the workplace (Boyle, 2016). The same report indicates that early reporting of injuries and referral to a healthcare provider for diagnosis and definitive treatment of injuries can limit injury severity and minimize the likelihood of disability or permanent damage and reduce workers' compensation claims. In the US, an effective medical management program will use early identification and treatment methods to eliminate or reduce the risk of employees developing MSDs and a physician or Occupational nurse and training in the prevention of MSDs should supervise the program (AMI, 2013). Hindrances to effective management of injuries in the meat industry include underreporting of injuries, inaccuracies in recording of accidents, inadequate inspection of worksites like noted in OSHA in the USA which has 2,200 Inspectors against 8 million worksites and it was estimated that it would take 100 years to inspect every workplace (Biron, 2014).

It is important to identify the scope of accidents and the likely injuries that may be experienced so as to enable proper management of injuries. According to the Health and Safety (First Aid) Regulations in the UK, it is critical to properly assess the key accidents that are likely to occur in a work place so as to enable put in place the appropriate First – Aid arrangement (BMPA, 2014). These regulations state that the First Aid Box should not only contain a mandatory list but also have a minimum list of items which include: a leaflet giving guidance on first aid, 20 sterile plasters, 2 sterile eye pads, 4 triangle sterile bandages, 6 safety pins, 2 wrapped sterile un-medicated wound dressings, 6 medium sized wrapped sterile, un-medicated wound dressings and a pair of disposable gloves.In higher hazard workplaces or factories, First Aid rooms should be in place and conveniently placed with space for a medical couch, chair, additional equipment, well lit,

adequately ventilated and should be kept clean as outlined in the Health and Safety-First-Aid Regulations in UK (HSE, 2017). According to the National Guidelines for Health and Safety in the meat industry in Australia (1995), the number of First –Aiders in any workplace will depend on the size of the workplace, its location, the number of employees, nature of hazards, known occurrences of accidents and the distance from workplace to the nearest available and appropriate health and medical services including the nearest ambulance services (AMIEU; MATFA, 1995). First Aiders are trained at work and facilities can select an appropriate first aider trainer preferably external trainers like Voluntary Aid Societies (St.John's Ambulance, St.Andrew's or the British Red Cross) or a trainer who works within an accreditation scheme (HSE, 2014). This study aimed at addressing the management of injuries in the meat industry in Nairobi for purposes of continuous improvement in worker safety.

2.5 Summary of the Literature Review

The emergence of mass production of meat in the developed countries of the world in the early 1880's for commercial purposes led to increased rates of injuries in these countries (Fitzergerald, 2010). These countries included USA, UK, Australia, Canada and New Zealend. These countries realized that the only solution was to enact legislations of occupational health and safety to deal with the problem of injury rates which were very high at that time (as high as 26.7 per 100 Full-Time Workers in the USA (AMI, 2013). Britain enacted its OSHA law in 1974, USA, 1970, New Zealand, 1992 and Australia in 1983. Despite these legislations, there was a problem of underreporting of injuries in these countries and laxity in enforcement of these occupational health and safety laws. In Africa and other developing countries, the issue of occupational health and safety

remains neglected due to economic, social and political needs and the concern is mainly provision of health care and treatment (Banjo et al., 2014). South Africa enacted its OSHA in 1993, Uganda in 2006 and Tanzania in 2003 (Zwi et al.,1988). Kenya has two pieces of legislations namely the Occupational Health and Safety Act, 2007 (OSHA, 2007) which provides for safety, health and welfare of workers and all persons lawfully present at workplaces and Worker Injury Benefits Act,2007 (WIBA, 2007) which allows for compensation to employees for work related injuries and diseases contracted in the course of their employment. The Constitution of Kenya, 2010 (COK, 2010) also lays emphasis on fair working conditions, protection of the health and safety of workers and their economic interests while at work. The slaughter process exposures workers to hazards right from the entry of live animals into the slaughterhouse until meat and meat products are dispatched from these facilities. These hazards include: physical injuries from animals, falling carcasses, chemical injuries, risk of falling due to wet and slippery floors, electrocution among others. The risk facors which have been identified to causing injuries in the meat industry include: Line speed (the largest single factor) and close quarter cutting of carcasses heavy lifting, shoving, machines and other equipments (Compa, 2004). Prolonged work shifts, inadequate training, poor usage of equipments, underreporting of injuries, zoonoses, and poor recording of accidents/injuries have also been identified as risk factors in the meat industry. This study will focus on the issues of underreporting and poor recording systems which have been reported to be very common in the meat industry (Marcin et al., 2014).

In the USA, OSHA has adequate First Aid arrangement which ensures early reporting of injuries and referral to a health care provider and this limits severity of injuries and

minimizes the likelihood of disability (Boyle, 2016). In the UK, there is proper assessment of the key accidents/injuries that are likely to occur in a work place so as to enable put in place the appropriate First –Aid arrangements (BMPA, 2014). These countries have gone a notch higher in putting in place First Aid rooms within these facilities to properly and adequately handle injuries in these facilities. This study addressed the issue of injury management within theses facilities.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Location of the Study

The study was carried out in Nairobi City County which is located between Latitude of 1 17 0 S and the longitude of 36 49 0 E (Figure 3.1). The total size of Nairobi City County is 696 Km^2 with a total population of 3.1million (KNBS, 2009) and it has slaughterhouses and meat processing plants to meet the demand for meat by this population in Nairobi City County and external markets.

The reason this site (location) was chosen is that it has both export slaughterhouses, meat processing plants and local slaughterhouses which supply meat and meat products to the local and international markets. At the same time, Nairobi City County has meat processing plants which manufacture meat into other products and this feature is very unique to this County. These categories of slaughterhouses and meat processing plants allows for comparative studies/analysis to be done across these facilities as opposed to when there is only one category of a facility.

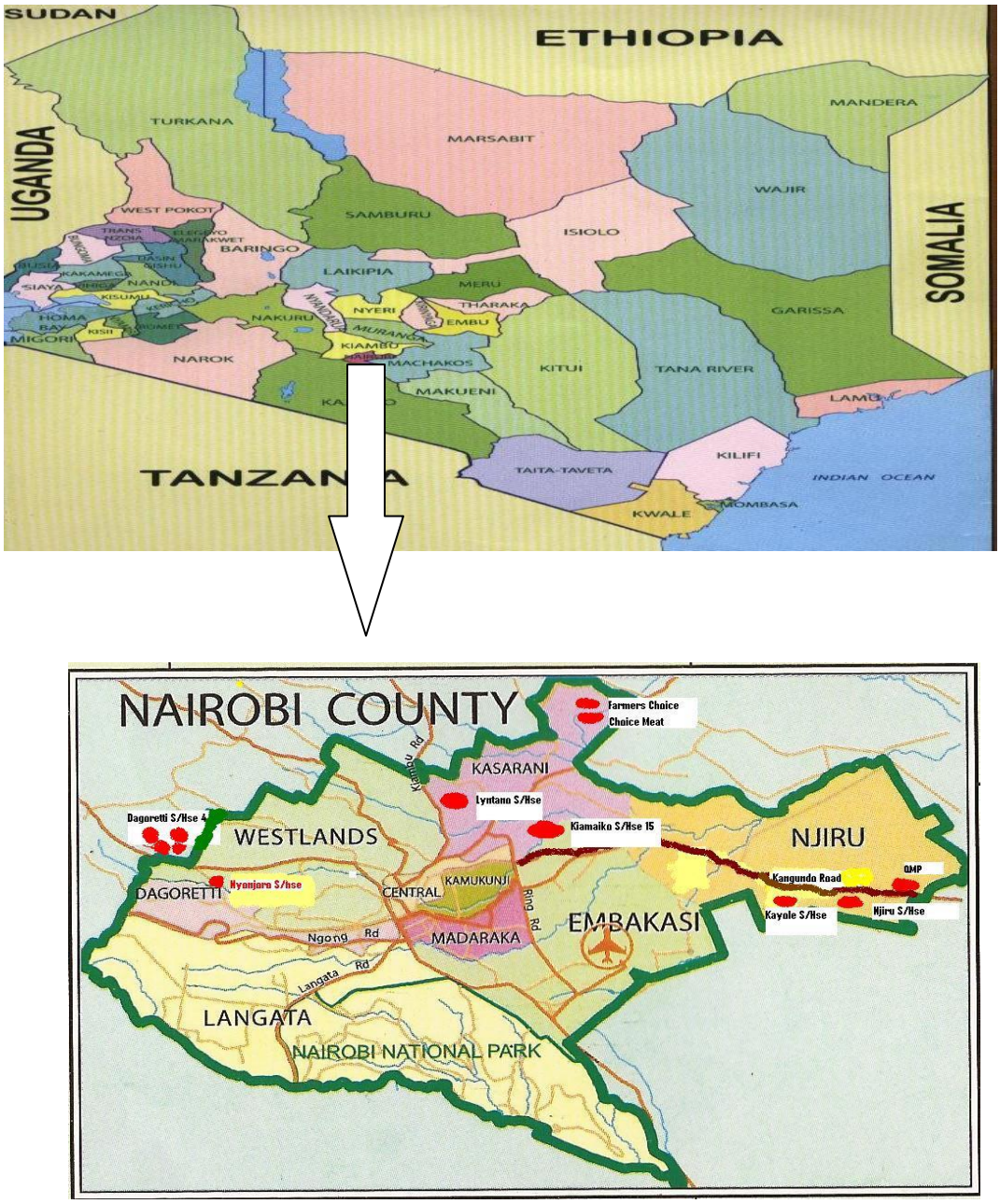


Figure 3.1: Map of Kenya showing the location of Nairobi City County

Key : The red dots indicate the slaughterhouses and meat processing plants

Source : Atlas Map of Kenya, 2011

3.2 Research Design

The research design adopted for this study was a descriptive cross sectional study. It was designed to answer the research questions and to bring out the relationship between the variables and included the methodologies to be used and in this case quantitative and qualitative approaches.

This type of study was relatively inexpensive to implement and allows for influence of factors which ultimately determine the safety of workers in these establishments. It is a kind of observational study where independent determinants are assessed for one outcome which in this case is the safety of workers in the meat industry.

It allows for the evaluation of associations between the independent variables like socio-demographic and economic characteristics of workers, the extent of compliance to OSHA, 2007, type of injuries inflicted and the level of their management to the safety of workers.

3.3 Study Variables

3.3.1 Dependent Variable

The dependent variable of the study was the safety of workers in slaughterhouses and meat processing plants in Nairobi City County.

3.3.2 Independent Variables

These were factors that determined the safety of workers in slaughterhouses and meat processing plants and included socio-demographic and economic characteristics of the workers, strict implementation of the legal instruments governing occupational health and safety and these included OSHA, 2007, WIBA, 2007.

Other factors that determine the safety of workers include; the type of hazards present, the types of injuries inflicted to the workers, the number of workers injured, the number of workers sick, the number of days off from duty and the level of management of injuries which also determine the safety of workers in these enterprises and this management differs across these facilities.

3.4 Study Population

A population refers to an entire group of individuals, events or objects having common observable characteristics and actually is the aggregate of all that conforms to a given specification (Mugenda and Mugenda, 1999).

The population under investigation in this study was a total of 2,206 workers who work in the meat industry in Nairobi City County. Out of these, 347 workers were recruited to participate in this study in these slaughterhouses and meat processing plants comprising 279 males and 68 females , aged between 18 and 60 years.

3.5 Sampling Techniques

Cluster sampling technique was employed to collect the information required from the slaughterhouses and meat processing plants. Slaughterhouses formed three clusters and processing plants one cluster as indicated in table 3.1 below. The cluster for slaughterhouses included export, category A and C of local slaughterhouses. Processing plants which receive meat from slaughterhouses for further processing into meat products formed another cluster. It is important to note that export facilities do slaughter and process the carcasses into meat products to supply both the local and external markets. There was even distribution of respondents in the slaughter process (Appendix III) in all the clusters and systematic random sampling was used to select these respondents. The

number of respondents in each cluster was calculated by multiplying the number of workers in that cluster and the sample size divided by the number of workers in the slaughterhouses and meat processing plants in Nairobi City County (target population).

Table 3.1: Clusters and the number of respondents interviewed in each category of slaughterhouse and meat processing plants

Cluster	**Number of slaughterhouses and processing plants**	**Type of Animals slaughtered and processed**	**Number of Workers**	**Number. of respondents**
Export	3	Pigs, Cattle, sheep and goats	1241	190
Local A	3	Cattle	154	24
Local C	21	Sheep and goats	535	90
Processing plants	4	Cattle, sheep, goat	276	43
TOTALS	**30**		**2206**	**347**

3.6 Sample Size and its Determination

For this study, Sample size was determined by adopting Fisher's formula (Fisher et al., 1983) formula where:

$n=z^2pq/d^2$

Where: n=desired sample size (if target population is greater than 10,000)

Z=standard normal deviation at required confidence level (1.96)

P=the proportion in the target population estimated to have the characteristics being measured (0.5)

q=1-p (0.5) d=the level of statistical significance (0.05)

n=1.96* 0.5*0.5/0.05*0.05=384

Since the target population of workers in these enterprises was less than 10,000, Cochran's (1977) correction formula was used: nf = n/ (1+n/N)

Where: nf=the desired sample size since the population was less than 10,000

n=the desired sample size derived using the first formula=384

N= the estimated sample size in all the slaughterhouses and meat processing plants in Nairobi.Therefore:

nf= 384/ (1+384/2206)=327

327 was the bare minimum sample size for statistical calculations for the study. However, to cater for non-response estimated at 6 %, an extra 20 participants were included making the actual number of repondents to be 347.

3.7 Data collection Instruments

Collection of primary data was done using a structured questionnaire (Appendix IV). Primary data is collected for the first time by the researcher and is original in character (Kothari, 2004). The questionnaire was used to gather quantitative data relating to occupational safety practices in these enterprises as contained in Appendix IV. Qualitative data was collected from four focused group discussions (FGDs) and key informant interviews (KII) were conducted at three slaughterhouses and one meat processing plant using a semi-structured questionnaire (Appendix V). The FGDs

members comprised of a few selected workers and management staff. The KII members comprised of meat inspectors, leather technology officers and veterinary officers working in these facilities together with the research assistants. The information sought here was to complement the quantitative information obtained using structured questionnaires. Further qualitative information was obtained using an observational checklist (Appendix VI) from at least one facility in each category. The information sought using the checklist was based on the general observation of hazards and any control measures available in these facilities.

3.8 Pre-Testing of the questionnaire

A pilot Study was carried out in one of the slaughterhouses (Dagoretti) in the adjacent Kiambu County which had both Category A and C slaughterhouses to ensure that the research instruments were clearly understood. In each category, 20 respondents participated in the pilot study. The purpose was to check for clarity, consistency and whether the questions were relevant to the study and that they elicit the kind of responses expected. The pretest results were used to correct any ambiguity noted. The reason for pretesting away from the study area is that we wanted to come with clean and ready to use research instruments in the study area without any interruptions arising from the research instruments. Clean and ready to use instruments cultivate or create confidence in the respondents as they participate in filling the questionnaire.

3.8.1 Validity

A keen review of the contents of the research collection instruments with veterinary officers, meat inspectors and leather technology officers in these facilities in relation to the study objectives ensured content validity. This was further enhanced by pretesting of

the tools and probability sampling. The ultimate aim was to ensure that the instruments were actually measuring what was intended.

3.8.2 Reliability

Reliability indicated that the results of the research were replicable or repeatable or remain consistent over a period of time and can be generalized to the target population. For the study, this was assured by thorough training of the research assistants, use of Kiwahili and local language where necessary in handling the questionnaires and ensuring that the questionnaires were checked for completeness and immediately corrected for any errors noted.

3.8.3 Inclusion Criteria

The participants of the study were recruited if they were willing to do so, had worked in the facility for more than a year and were in the enterprise at the time of administration of the questionnaires

3.8.4 Exclusion Criteria

Those workers who had not consented to participate in the study, had worked in the facility for less than one year, were sick and those employees in administration who had never stepped in the slaughter process were excluded from the study. Those employees of less than one year in the facilities are assumed to be still undergoing induction and acquinting themselves to the equipments and work processes under close supervision.

3.9 Data Collection Techniques

With the help of three trained research assistants, the questionnaires were administered at the various slaughterhouses and meat processing plants together with informed consent forms and the confidentiality of the respondents assured as declared in the opening

remarks of the questionnaire. Further qualitative information was obtained by conducting FGDs and KII where accurate data was captured through recording by a secretary (a reaserch assistant). Accuracy of information was assured by using Kiswahili or translation into local language where necessary. During each sitting, ranking of the hazardous/conditions was done and results recorded as indicated in Table 4.6 and 4.7.

3.10 Data Analysis

The data collected was cleaned, coded and entered into Statistical Packages for Social Scientists (SPSS) Version 18 for multivariate analysis (Rencher, 2003). The resultant statistics were used to summarise the data through percentages, proportions and scores for the variables in the questionnaire. The data was presented in figures, tables and plate. Chi-Square test was used to analyse relatioships between variables at a stastical significance level of 0.05 where a p value of less than 0.05 was statistically significant. In this study, socio-demographic factors, compliance to Occupational Health and Safety Act, 2007 (OSHA, 2007) and distribution of injuries in various facilities were analysed.

3.11 Logistical and Ethical Considerations

Approval to carry out the study was given by Kenyatta University Graduate School (REF:Q139/CTY/PT/22740/12 of 4th May, 2016 in Appendix VII) and Ethical clearance was sought and obtained from Kenyatta University Ethics and Review Committee (Ref:KU/R/COMM/51/820 in Appendix VIII). Research Authorization and Permit to do the research was obtained from the National Commission for Science, Technology and Innovation (NACOSTI) through the Principal Secretary in the Ministry of Education (Ref: NACOSTI/P/16/65830/14951 in Appendix IX and X). Authority to carry out the study was sought from the Director of Veterinary Services (DVS) and the County Director of Veterinary Services (CDVS) in Nairobi City County.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Socio-demographic characteristics of the respondents

A total of 347 respondents participated in the study. Seven socio-demographic variables were investigated and these included: gender, age, marital status, religion, duration of time worked in the facility, educational level and position held in the facility. Except for religion, all these other demographic variables had an impact in the safety of the workers in slaughterhouses and meat processing plants as will be shown later. The results of socio- demographic information of the respondents are shown in Table 4.1.

Table 4.1: Socio-demographic characteristics of the respondents in the facilities

Socio-Demographic variables (N=347)		**N**	**%**
Gender	Male	279	80.4%
	Female	68	19.6%
Age	16-18 Years	13	3.7%
	19-30 Years	93	26.8%
	30-40 Years	132	38%
	40-50 Years	82	23.6%
	Over 50 Years	27	7.9%
Marital status	Single	80	23%
	Married	257	74%
	Divorced	10	3%
Religion	Christianity	281	81%
	Islam	66	19%
Duration worked	< 5 Years	105	30.3%
	5-10 Years	94	27.1%
	10-15 Years	52	15%
	15-20 Years	42	12.1%
	20-25 Years	54	15.5%
Educational level	Primary Education	121	34.9%
	Secondary Education	198	57.3%
	Diploma Education	28	7.8%
Position held in the facility	Manager	14	4%
	Supervisor	28	8%
	Workers	305	88%

The socio- demographic data of the respondents in the focused group discussions (FGDs) and key informant interviews (KIIs) wa as shown in Table 4.2.

Table 4.2: Demographics of FGD and KII Members in the clusters

Cluster	**Number**	**Christian**	**Muslim**	**Males**	**Females**	**Age in years**
Export	15	12	3	11	4	35-60
Processing plant	8	7	1	5	3	30-50
Category A	11	9	2	8	3	30-60
Category C	10	7	3	6	4	30-50
Totals	**44**	**35**	**9**	**30**	**14**	

4.2 Distribution of the Injuries

The study participant reported a high incidence of injury occurrence. The injuries were reported among the old and young, male and female,and those who had worked for various times and in all categories of slaughterhouses and meat processing plants. The distribution in various categories is herein described and discussed.

4.2.1 Gender distribution of the respondents and its impact on safety

Results of gender distribution of the respondents are presented in Table 4.1, where majority (80.4%) of the respondents were males, while the rest were females. This implies that majority of the workers in slaughterhouses and meat processing plants in Nairobi are males. This compares well with the results of FGD and KII (Table 4.2) where

the percentage of men was higher (68.42%) than that of women (31.81%). Similar results have been obtained in a study carried out in slaughterhouses in Western Kenya where 97% of workers were found to be men (Cook *et al*., 2016).

Gender had a statistical significance (with a χ_2 =27.72; p<0.05) on the level of injuries experienced by the workers (Table 4.3). The percentage of injuries noted in the females was very small (1.9%) as compared to males (92.2%). Although more male workers worked in these facilities than females, the injury rates for male workers was higher than females and gender was a factor in the safety of these employees.

Table 4.3: Distribution of injury by gender of the workers

		Distribution of injury by gender		Total
		Yes	No	
Gender	Male	92.1% (319)	4.6% (16)	96.7% (335)
	Female	1.9% (7)	1.4% (5)	3.3% (12)
Total		**326**	**21**	**347**

χ_2 =27.72; p<0.05 (Exact p value=0.001421)

4.2.2 Age distribution of the respondents and its influence on safety

As indicated in table 4.1 the study found out that most of the workers (88.4%) in these facilities were more than 19 years of age and the rest were between 16 and 18 years (11.6%). These observations were noted during the FGDs and KII (Table 4.2) where most participants were adults of middle age and above. The Employment Act Cap 226 prohibits the employment of a child below the age of 13 years and allows children of 13-16 years to be employed in some light work and that from 16-18 years are employable. In this study, children of age bracket 16-18 years were thirteen.

There was a significant relationship between age and injury rates with a χ_2=25.59; p<0.05 (Table 4.4). The percentage of workers between 18-19 years was very insignificant (1.7%) while those ones between 19-30 years were 65.5%. The study established that age was a factor in the safety of workers in these establishments with young and inexperienced workers receiving more injuries than the older workers. The older workers are more conversant with the equipments and work processes than the younger ones whose exposure is less than the elderly employees. These findings are similar to a report by the U.S. Department of Labor done by the occupational safety and health administration in 1988 which found out that more than 30% of all injuries occured to workers who were less than 25 years and that younger and newly employed workers were at the highest occupational risk and suffer a significant proportion of injuries (AMI, 2013). The distribution of injury by age was as shown in Table 4.4.

Table 4.4: Distribution of injury among the respondents by age

Age group of respondendent		**Distribution of injury by Age**		**Total**
		Yes	**No**	
Age	16-18 years	1.7% (6)	1.7% (6)	3.4% (12)
	19-30 years	52.5% (182)	11.5 % (40)	64.0% (222)
	30-40 years”	23.9% (83)	1.7% (6)	25.7% (89)
	40-50 years	5.2% (18)	0.0	5.2% (18)
	Above 50 years	1.7% (6)	0.0	1.7% (6)
Total		**85.0% (295)**	**15% (52)**	**100.0%(347)**

χ_2=25.59; p<0.05 (Exact p value=0.00289)

4.2.3 Marital Status of the respondents

The study reported that 74% of the workers in the meat industry in Nairobi City County were married people with 23% being single and only 3% being divorcees (Table 4.1). This was noted during the FGDs where most of the participants pointed out that their safety was important to enable continuity of work in order to provide for their families. Married people in most cases are very careful and committed to work because doing so helps them to meet family obligations. This obligation makes them stay longer in employment and hence able to gain in experience as far as work processes are concerned and this in turn increases their safety. Hence, marriage prolongs the duration of time worked by the employees. A study on abattoir workers in Abuja in Nigeria had similar findings where 75% of the workers were married people (Mabel *et al.,* 2013).

4.2.4 Religion of the respondents

This study reported that the majority (81%) of the workers were christians while the rest (19%) were from the Islamic faith (Table 4.1). This result concurred with the responses from the FGDs and KII where most of the participants were christians (Table 4.2). It was emphasised that the muslim workers were mostly concerned with the halal slaughter in these facilities where they ensure that animals are slaughtered in accordance to their faith.

4.2.5 Duration workers had worked in the facility and its influence on safety

The study sought to establish the duration the respondents had worked in the slaughterhouses and meat processing plants and its influence on the safety of workers. As presented in Table 4.1, it was noted that 69.7% of the workers in the slaughterhouses and meat processing plants had worked for more than 5 years while 30.3 % had worked for

less than 5 years. Working in a place for longer periods means that there is job satisfaction or there is no other option for alternative employment (Fitzergerald, 2010).

It is also important to note that high turn over rates attract newly employed workers who are likely to receive more injuries than the ones who have stayed longer in employment. In this study, workers of less than one year in employement were excluded from the study and assumed to be undergoing induction under supervision.

This study found out that the longer a worker stays in employment the less the likelihood of experiencing injuries and hence the safer that worker is than the rest. Table 4.5 shows the analysis of these results where the duration workers had worked was significant (with a χ_2=22.12; p<0.05) and determines the injuries experienced by the workers.

This in turn has a relationship with turnover rates of workers across the facilities because a high turnover rate results in inexperienced workers who in turn have higher injury rates. This result compares very well with the findings of Fitzgerald (2010) where inexperience and high turnover rates increased rates of injuries. High turn over rates means more employees leaving work resulting in newly employed workers who have no experience in the machines and work processes being employed and this results in higher injury rates in these facilities.

Table 4.5: Distribution of injuries by the duration worked in the facilities

		Distribution of injury by Duration worked in the facilities		Total
		Yes	No	
Duration worked in the facilities	Less than 5 years	52.2% (181)	13.3% (46)	65.4% (227)
	5-10 years	24.2% (84)	1.7% (6)	25.9% (90)
	10-15 years"	5.2% (18)	0.0% (0)	5.2% (18)
	15-20 years	1.7% (6)	0.0% (0)	1.7% (6)
	20-25 years	1.7% (6)	0.0% (0)	1.7% (6)
Total		**85% (295)**	**15.0% (52)**	**100.0% (347)**

χ_2=22.12; p<0.05 (Exact p value=0.003359)

4.2.6 Educational level of the workers and its impact on safety

The education level of the study population was fairly high with 65.1% of the workforce in these facilities having attained secondary education level and above while the rest had primary education level (Table 4.1). This was noted during the FGDs where most of the participants spoke in English and Kiswahili very fluently. The information given by the management indicated that those respondents who had post secondary level education were mostly deployed in supervision and management positions and hence exposure level to hazards was minimal. Workers with high literacy level are expected to understand and apply written instructions and policies pertaining to occupational health and safety and hence there safety level is higher than those with lower literacy level.

As shown in Table 4.6, the education level of the workers had a statistical significancy in the safety of the workers where those employees who had not attained secondary education received more injuries than those who had attained it.

The same was observed by a study carried out in Busia where those workers with higher education level were more careful in the usage of Personal Protective equipments (PPEs) and hence well protected from infections of zoonoses (Cook *et al.,* 2014). This was also noted in Nigeria where abattoir workers with lower education levels were more seropositive to brucellosis (Mabel *et al*., 2013).

As presented in the Table 4.6, the respondents with the highest injuries (92.5%) had attained primary school level of education and 4.2% had secondary school level of education while 3.3% had diploma level of education. This means that education level determines the safety of workers in the meat industry and this was found to be stastically significant (with a $\chi 2$ =21.39; $p<0.05$).

Those workers educated up to Diploma level received minimal injuries as compared to those who had attained primary and secondary level education. These workers with high education level tend to have supervisory roles and are not directly in contact with machines and equipments and hence less injuries experienced. These results were consistent with those of Cook et al. (2014) where those workers with higher education level were more knowledgeable in the usage of PPEs and of course more protected from hazards than those with lower education. It is also important to note that supervisors normally give feedback to the operational managers who are normally in the offices and hence these managers are not always in contact with the machines and work processes despite their knowledge in the operation of these machines and the processes involved.

Table 4.6: Distribution of Injury by Education level of the respondents

		Distribution of injury by Educational Level		Total
		Yes	No	
Education	Primary education	87.9% (305)	4.6% (16)	92.5% (321)
	Secondary Education	2.5% (9)	1.4% (5)	4.2% (15)
	Diploma Level	1.9% (7)	1.4% (5)	3.3% (11)
Total		**92.6% (321)**	**7.4% (26)**	**100% (347)**

χ^2 =21.39; p<0.05 (Exact value of p=0.00248)

4.2.7 Position held by the respondents in the facilities

Results of the position held by the respondents are as shown in Table 4.1, where 88% of the respondents held the position of workers while 8% were supervisors and 4% were managers. These findings are expected because slaughterhouses and meat processing plants have many workers with very few workers in management positions. Local slaughterhouses were found to have one manager manning all the operations while export and processing plants were having managers operating various sections. Managers must understand all work processes, machines and equipments in these facilties to be able to manage safety of workers in these enterprises. The same applies to supervisors who are always in direct contact with the workers and who directly receive reports from them for purposes of remedial measures in case of a situation which may present imminent danger to the safety of workers. Workers who are not in management and supervisory positions (88%) are the majority in these facilities and are the ones who are always in contact with

the machines, equipments and work processes. These workers, when well coordinated and motivated by the management, determine the success of the meat industry in terms of profitability, productivity and quality of products from these enterprises.

4.3 Compliance to legal instruments governing safety

4.3.1 Awareness level of Occupational Health and Safety Act (OSHA), 2007 and Work Injury Benefits Act (WIBA), 2007

On level of awareness of the legal instruments, 226 (65%) of the respondents indicated that they had not heard of the Occupational Health and Safety Act (OSHA), 2007 and Work Injury Benefits Act (WIBA), 2007 while only 121 (35%) were aware. From the FGDs and KII, it emerged that only export facilities, processing plants and slaughterhouses in category A were fairly compliant to OSHA, 2007 while workers in Category C slaughterhouse were not aware of OSHA, 2007 and WIBA, 2007. The impact of careful implementation of OSHA, 2007 is very great especially when management collaborates with the Government agency (DOHS) responsible for its enforcement. Category C slaughterhouse workers were not aware of this legal instrument which may explain why the workers received the greatest injury rates as reported in this study. Work Injury Benefits Act, 2007 (WIBA) is very favourable to the workers and in this industry where injury rates have been found to be very high, it defeats logic when only 35% of them are conversant with it.

The distribution of workers who had heard of OSHA, 2007 and WIBA, was done and results indicated in Table 4.7 where the number of respondents who had heard of OSHA, 2007 and WIBA, 2007, 86.8% were from export slaughterhouses, 10.2% from processing plants and 1.9% from Category “A” while 1.1% were from Category “C”

slaughterhouses. This result is statistically significant (with a χ_2 =237.46; p<0.05) and the category of a facility determines its compliance to OSHA, 2007 and WIBA, 2007. The enactment of these two legislations was meant to enhance the safety of the workers since the constitution of Kenya stipulates that every worker has a right to a safe work environment.These two instruments are vital indicators that determine the safety of workers in any organisation .

Table 4.7: Distribution of workers who had heard of OSHA, 2007 and WIBA, 2007

		Workers who have heard of OSHA, 2007 and WIBA, 2007		**Total**
		Yes	No	
Workers who had heard of OSHA, 2007 and WIBA, 2007	Export Slaughterhouses	86.8% (165)	4.6% (25)	190
	Processing Plants	10.2% (4)	1.4% (39)	43
	Category "A" Slaughterhouses	1.9% (1)	1.4% (23)	24
	Category "C" Slaughterhouses	1.1% (1)	0.1% (89)	90
Total		**171**	**176**	**347**

χ_2 =237.46; p<0.05 (Exact p value=0.00027)

4.3.2 Registration of the facilities under OSHA, 2007

As indicated in Table 4.8, the study found out that 42% of the respondents were not aware whether the facility was registered under OSHA, 2007 and 27% said that the

facility was not registered under OSHA, 2007. However, 31% of the respondents indicated that the facility was registered under OSHA, 2007.

From the management of these facilities, it was noted that all export, category A slaughterhouses and processing plants were registered under OSHA, 2007. Category C slaughterhouses were not registered with OSHA, 2007. Of the 42% respondents, it is possible that some of their facilities are registered and they were not aware. Registration of a facility by the competent authority (Directorate of Occupational Health and Safety (DOHS)) means that it is in their data base and is subject to inspection for compliance to enable increased improvement in worker safety. Consequently, registration of a facility is in the best interest of the worker in terms of her/his safety and health and this is stipulated in OSHA, 2007 in section 43 that any workplace has to be registered and the register kept by the Director of Occupational Health and Safety (DOHS).

Table 4.8: Registration of facilities under OSHA, 2007

Level of Registration	**Percent**	**Frequency**
Not Aware	42%	146
Not Registered	27%	93
Registered	31%	108
	100%	147

4.3.3 General Health and Safety Policy in the facility and a copy of the document

OSHA, 2007 stipulates that every workplace should have a written safety and health policy which must be documented and distributed to all workers in a language which they understand. The study found out that 30.8% of the respondents were not aware whether there was a general Health and Safety policy in their facility and 23.6% indicated that there was no general Health and Safety policy (Figure 4.1). Further, 26.2% of the workers pointed out that there was a general Health and Safety policy in their facilities although they did not have a copy of the document while 19.3% of the respondents indicated that there was a general Health and Safety policy in their facility and that they had a copy of it. From the management of these facilities, it was confirmed that only export and processing plants had a safety and health policy. One of the key basic principles of occupational health and safety is that an occupational Health and Safety Policy should be established at the national and enterprise levels (Alli, 2008). At the enterprise level, it should be documented in a language all the workers can understand and then distributed as stipulated in OSHA, 2007. This document is critical as it spells the safety precautions a worker is supposed to adhere to as he or she performs work activities in an enterprise.

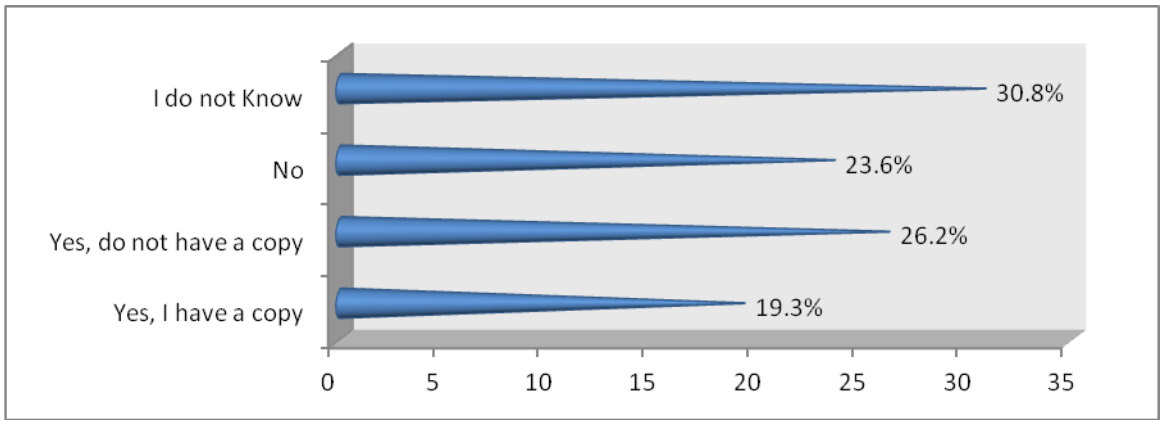


Figure 4.1: Awareness of general Health and Safety policy in the facility and a copy of the document

As presented in Table 4.9, analysis of the distribution of Health and Safety policy was done across the facilities where 39.1% of the export slaughterhouses had the highest distribution of health and safety policy, 14.4% were category "C" and 4.6% were processing plants while 2.5% were category "A" slaughterhouses with the least distribution of health and safety policy. This is statistically significant indicating that variation in the distribution of health and safety policy is determined by the category of a facility. The study established that health and safety policy was better known in export facilities than local slaughterhouses. OSHA, 2007 in section 7(1) stipulates that every employer has a duty to prepare a safety and health policy with respect to the safety and health at work of his/her employees and that this policy statement should be brought to the attention of all workers. This policy represents the foundation from which occupational safety and health goals, objectives, performance measures and other system components are developed and should be concise, easily understood by all employees in the organization (Alli, 2008). Consequently, a safety and health policy has a bearing on the safety of workers in any organization and hence determines the injury rates in these facilities.

Table 4.9: Distribution of health and safety policy in the facilities

Slaughterhouses		**Distribution of health and safety policy**		**Total**
		Yes	No	
Distribution of health and safety policy	Export	39.1% (74)	60.9% (116)	100% (190)
	Processing Plants	4.6% (2)	95.4% (41)	100% (43)
	Category "A"	2.5% (1)	97.5% (23)	100% (24)
	Category "C"	14.4% (13)	85.6% (77)	100% (90)
Total		**(90)**	**257**	**347**

χ_2 =38.41; p<0.05 (Exact p value=0.001672)

4.3.4 Reporting situations that present imminent danger to the safety of workers

As shown in Table 4.10, the study found that 72.9% of the respondents reported to their supervisors in case of a situation that presented imminent danger to their safety and 23.3% reported to the managers. Those who reported to the Occupational Health and Safety Officer (OHSO) were 3.7%. This findings concurred with one of the FGDs in an export facility where reporting to the supervisors was given the priority. The OSHA, 2007 document states in section 13(1) e states that every employee shall report to the supervisor any situation which he/she has reason to believe would present a hazard and which he/she cannot correct. Reporting to the supervisor is very appropriate because it would trigger prompt action in terms of remedial measures. However, 23.3% reporting to the managers mean that the imminent danger would not be attended to quickly since managers are usually not close to work processes. The Occupational Safety and Health Officers were not found in the enterprise and only came occasionally for inspection in the facility.

Table 4.10: Whom to report to in case of imminent danger in the facilities

	Frequency	**Percent**
My Supervisor	253	72.9
The Manager	81	23.3
The Occupational Health and safety Officer	13	3.7
Total	**347**	**100.0**

4.3.5 Trainings carried out on issues of safety and health

Results of the study showed that 54% of the respondents agreed that there were trainings carried out on issues of safety and health in their facilities. Those who denied of any such trainings were 30% while 16% of the respondents were not aware of whether there were trainings carried out on issues of safety and health in their facilities (Table 4.11).

During the FGD and KII, it was noted that in export facilities, processing plants and category A slaughterhouses, trainings were carried out and this was usually done once every year. In one of the processing plants, it was noted that training was done twice a year. In category C, there were no trainings done on safety and health at all but trainings on food safety and leather technology were annually carried out (FGD and KII).

To maintain a healthy and safe workplace, training is very essential and should be incorporated in the daily work procedures. One of the most important tasks carried out by employers is training of all the workers on how to do their jobs, protect themselves and their co-workers while working. Within an enterprise, managers and supervisors are responsible for ensuring that workers are adequately trained (Alli, 2008). OSHA, 2007 in section 99 stipulates that no person shall operate machines in a workplace unless he/she has received sufficient training in work at the machine or in the process; or is under adequate supervision by a person who has a thorough knowledge and experience of the machine or process.

Training of workers on all issues of health and safety is very critical and hence all workers must know of its existence since it has a direct bearing on their safety. When 16 % deny/or are not aware of any trainings on health and safety, then the safety of these workers is a great concern.

Table 4.11: Trainings carried out on issues of health and safety

	Frequency	**Percent**
Trainings done	187	54%
No trainings done	104	30%
Not Aware of trainings	56	16%
Totals	**347**	**100%**

Trainings in various categories of slaughterhouses and processing plants was anaylsed and table 4.12 shows the results of the same. Of the categories of the slaughterhouses, 38.7% of the workers pointed out that training was carried out in export slaughterhouses, 26.8% in category "C" and 7.0% in processing plants while 3.2% in category "A" slaughterhouses. Training is an essential component in occupational health and safety practices and should involve all workers from top management to all players. As seen in the Chi-square statistic in Table 4.14 ($\chi 2$=28.5; p<0.05) the result is statistically significant and this indicates that the type of facility influences the extent of training carried out with the export facilities at least taking the lead. In category C, it was clarified that the trainings reffered to were mainly on food safety and leather technology and were not at all related to safety issues (FGD and KII). If people are to be taught on how to earn their living, they should also be taught on how to protect their lives (Alli, 2008). This study brings a similar sentiment that if people are trained on how to enhance food safety in the meat industry they can also be trained on how to protect themselves from hazards as they work. OSHA, 2007 in section 99 stipulates that no person shall be employed at any machine or any process, being a machine or process liable to cause ill health or

bodily injury unless he /she has received sufficient training in work at the machine or process and the training should be done at recruitment, transfer or change of job, the introduction of new work equipment and introduction of new technology.

Table 4.12: Training for compliance to OSHA, 2007 in various facilities

Slaughterhouses		**Compliance with OSHA, 2007- training**		**Total**
		Yes	No	
Training	Export S.H	38.7% (74)	61.3% (116)	100% (190)
	Processing S.H	7.0% (3)	97% (40)	100% (43)
	Category "A"	3.2% (1)	96.8% (23)	100% (24)
	Category "C"	26.8% (24)	73.2% (66)	100% (90)
Total		**102**	**245**	**347**

χ^2=28.5; p<0.05 (Exact p value=0.002252)

4.3.6 Persons trained on safety and health

As indicated in Figure 4.2, 38.3% of the respondents said that employees were the ones trained on issues of safety and health and 30.3% indicated that employees, supervisors and managers were the ones trained on the same. Respondents who said that supervisors were the ones trained were 11.2%. On the other hand, 20.2% of the respondents in these facilities pointed out that no training was carried out for all mentioned on issues of worker safety.

In section 99 of OSHA, 2007, training for performance of work safely is emphasized and according to ILO, managers, supervisors and all workers need to be trained (Alli, 2008). During one of the FGDs in an export facility, it emerged that Occupational Health and

Safety committees played a major role in carrying out trainings in these facilities and on job training was a major feature.

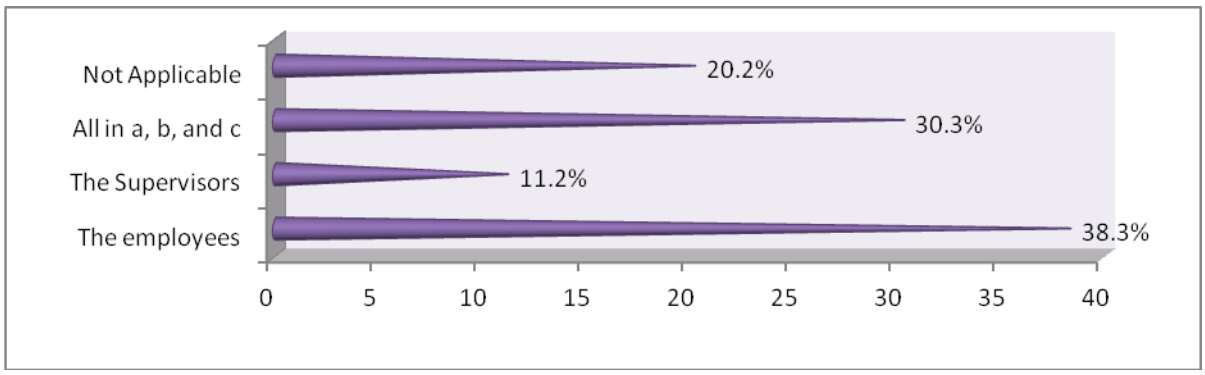


Figure 4.2: Persons trained on safety and health

Key: (a), (b) and (c) represent the three categories of employees, supervisors and managers respectively

4.3.7 When to train on health and safety in the organization

The OSHA, 2007 in section 99 (2) indicates that training should be carried out on recruitment, transfer or change of job, introduction of new technology and introduction of new work equipment. Results of this study show that 41.8% of the respondents said that training was carried out during recruitment, transfer or change of job, introduction of new technology and on introduction of new work equipment while 22.8% said that training was done on recruitment (Table 4.13). This section of OSHA, 2007 further stipulates that training shall be undertaken or adapted to take into account new changed risks and repeated periodically. These trainings shall be done at the expense of the employer and shall take place during working hours.

Employers are supposed to instigate training and information programmes on the prevention and control of hazards and protection against risks and such training should include information on the safety and health aspects of the work (Alli, 2008).

Table 4.13: When to train the workers in slaughterhouses and meat processing plants on health and safety

	Frequency	Percent
(a) On recruitment	79	22.8
(b) On transfer or change of job	13	3.7
(c) On introduction of new technology	27	7.8
(d) On introduction of new work equipment	41	11.8
(e) All in a, b, c and d	145	41.8
Not Applicable	42	12.1
Total	**347**	**100.0**

4.3.8 Employees provision with Personal Protective Equipment (PPEs)

The study observed that 68% of the respondents were provided with Personal Protective Equipment (PPEs) by the management while 32% were not (Table 4.14). From the FGD and KII , the workers in category A and C slaughterhouses purchase PPEs for themselves while in export slaughterhouses and processing plants, they are provided by the management. This was further confirmed by the management of these facilities. The participants further listed the PPEs and how they were protected by the same during the execution of their work: dust coat protects from contamination, cap and helmet the head, boots the feet, gloves the fingers and hand, plastic aprons the belly, cold room jackets from coldness, mouth/nose masks from inhalation of fumes and goggles for the eyes from pieces of bones. Provision of cold room jackets was very notable in export and processing plants. Where management does not provide PPEs as noted in this study, the

quality of these equipments was compromised. In this study, high injury rates noted in local slaughterhouses attests to this situation where employees are left to purchase their own PPEs as opposed to export facilities and processing plants where provision of these equipments are centralized to management.

Table 4.14:Employee provision with Personal Protective Equipments

	Frequency	**Percent**
Provided with PPEs	236	68%
Not provided with PPEs	111	32%
Totals	**347**	**100%**

Analysis of the provision of personal protective equipments (PPEs) in the facilities was done as indicated in Table 4.15 where 39.1% of the respondents were from export slaughterhouses. Category "C" were 14.4% and 4.6% from processing plants and 2.5% from category A. In export facilities and processing plants, there was provision of protective equipment to all the workers by the management.

This study found out that export facilities and processing plant workers were provided with personal protective equipment (PPEs). This was supported by the qualitative information given by the FDGs and KII. From the same qualitative information, it was established that workers in category A and C slaughterhouses are never provided with protective clothing and this leaves workers exposed to cuts, wounds, cuts and abbrasions as reported by other researchers (Mahendra *et al*., 2013).

In export and processing plants, PPEs were highly specialized to protect workers from various worksite hazards.

Section 101.(1) of OSHA, 2007 stipulates that every employer shall provide and maintain for use employees in any workplace where employees are employed in any process involving exposure to wet or to any injurious or offensive substance, adequate, effective and suitable protective clothing and appliances, including, where necessary, suitable gloves, foot wear, goggles and head coverings. Local facilities are not compliant to OSHA, 2007 in the provision of PPEs.

Table 4.15: Distribution of provision of Personal Protective Equipment (PPEs) in the facilities

Slaughterhouses		**Compliance with OSHA, 2007- personal protective equipment (PPES)**		**Total**
		Yes	No	
Personal Protective Equipment (PPES)	Export S.H	39.1% (74)	60.9% (116)	100% (190)
	Processing S.H	4.6% (2)	95.4% (41)	100% (43)
	Category "A"	2.5% (1)	97.5% (23)	100% (24)
	Category "C"	14.4% (3)	85.6% (87)	100% (90)
Total		**80**	**267**	**347**

χ_2 =62.43; p<0.05 (Exact p value=0.001028)

4.3.9 Health and Safety committee in the organization

According to OSHA, 2007 (Section 9), every workplace shall establish a safety and health committee to promote the safety and health of workers. Overall, 34.6% of the respondents pointed out that their slaughterhouse/meat processing plant did not have a health and safety committee, 27.1% were not aware whether they had a health and safety committee and 19.6% indicated that there was a health and safety committee and they were members of the committee while 18.7% were not members of the committee as

tabulated in Table 4.16. From the FGDs and KII, it emerged that there were active health and safety committees in export facilities and processing plants while in category A, they existed but were not active. In category C, these committees do not even exist. The functions of the health and safety committee in an organization include: developing and carrying out measures designed to ensure the workers' health and safety in collaboration with management, assist in developing standards, rules or procedures relating to health and safety to improve and ensure workers health and safety and to comply with functions prescribed by regulations. These committee must meet at least every three months and at any reasonable time when need arises. The absence of this committee in any industry means that the safety of workers is not assured and injury rates are very likely to be very high.

Table 4.16: Health and Safety committee in the organization

	Frequency	**Percent**
Yes, a member	68	19.6
Yes, not a member	65	18.7
No	120	34.6
I do not Know	94	27.1
Total	**347**	**100.0**

The absence of this committee at the enterprise level makes implementation of safety measures very difficult and the safety of workers is not assured. That alone explains the highest injury rates noted in category C slaughterhouses as compared to export facilities and processing plants with lower injury rates (Table 4.17).

Further analysis of safety and health committees was done and it was established that 78 (41.2%) existed in export slaughterhouses, 15 (35.2%) in processing plants, 4 (15.8%) were from category A and 7 (7.7%) in Category C slaughterhouses. This result was significant (with a χ_2 =23.381; p<0.05) and the category of a facility influences the existence of a safety and health committee.

A study carried out in Massachusetts in the USA in 127 manufacturing firms found out that objective attributes of these committees may be less important to its success than the commitment of the management and labour to solving the safety problems of workers (Boden *et al*., 1984*).* No specific documented study has been carried out on Health and safety committees in the meat industry and this study has addressed this knowledge gap. The existence of health and safety committees play a significant role in the reduction of injuries and particularly where management has fully supported them in their operations especially in the provision of resources.

Table 4.17: Distribution of safety and health committees in the facilities

Slaughterhouses and processing plants		**Distribution of safety and health committees**		**Total**
		Yes	No	
	Export S.H	41.2% (78)	58.8% (112)	190
	Processing S.H	35.2% (15)	64.8% (28)	43
	Category "A"	15.8% (4)	84.2% (20)	24
	Category "C"	7.7% (7)	92.3% (83)	90
Total		**104**	**243**	**347**

χ_2 =23.381; p<0.05 (Exact p value=0.00275)

4.3.10 Inspection of the facility to ensure safety to the workers

The safety and health committees comprise of workers and employers' representatives and meet regularly and should periodically inspect the workplace and help to promote workers' active involvement in safety and health at work (Alli, 2008). The study observed that safety and health committee (45.8%) was responsible for the inspection of the facility to ensure of its safety to workers and 30.8% were not aware of the person responsible while 23.4% indicated that the employers were responsible for the inspection of the facility to ensure of its safety to workers (Table 4.18). The 23.4% saying that employers were responsible are right to some extent because it is the sole commitment of the management to ensure that their workplaces are regularly inspected for compliance. Besides the inspection which takes place internally by the safety and health committees, occupational health and safety officers may come for inspection at their own discretion to ensure compliance to OSHA, 2007.

In Kenya, a total of 140,000 workplaces are known to exist with only 71 officers to do inspection of all these places and this means most of the places are not inspected (ILO, 2013). In the USA, a total of 8 million worksites are known to exist with only 2,200 inspectors and it is estimated that it would take 100 years to visit and inspect them (Biron, 2014).

As presented in Table 4.19, the study found out that inspection of these enterprises for compliance to OSHA, 2007 was higher in export (41.2%) and processing plants (15.8%) than the local slaughterhouses. In category C slaughterhouses (35.2%), workers did not differentiate between the inspection which is normally carried out annually for food safety and the one for OSHA, 2007.

This result was stastically significant with a χ_2 =15.97; p<0.05. From the qualitative information given by the FGDs and KII , it emerged that there is no inspection carried out on issues of occupational health and safety in these local slaughterhouses.

Table 4.18: Inspection of facilities for compliance to OSHA, 2007

	Percent	**Frequency**
Safety and health committee	**45.8%**	**159**
Not aware	**30.8%**	**107**
Employers	**23.4%**	**81**
	100%	**347**

Table 4.19: Distribution of inspection of facilities for compliance to OSHA, 2007

Slaughterhouses		**Compliance with OSHA, 2007- Inspection**		**Total**
		Yes	No	
Inspection	Export Slaughterhouses	41.2% (78)	58% (112)	190
	Processing Plants	15.8% (7)	84.2% (36)	43
	Category "A"	7.7% (2)	92.3% (22)	24
	Category "C"	35.2% (32)	64.8% (58)	90
Total		**119**	**228**	**347**

χ_2 =15.97; p<0.05 (Exact p value=0.00402)

4.3.11 Number of times that inspection took place in the facilities.

From the findings of the study and as presented in Figure 4.3, 26.5% of the respondents indicated that inspection in the facility was carried out once a year and 19.3% indicated

that it was carried out thrice per year and four times per year while 15.6% said that it was carried out two times per year. The health and safety committee is to do inspection of a facility on regular basis at their own discretion depending on hazard level and when new risks are anticipated in a facility. Three times and four times a year would suffice but can be done even monthly depending on the needs that may arise. The 26.5% of the workers who said once a year would be referring to the safety and health audit which takes place once in every twelve months by a safety and health advisor (OSHA, 2007 section 11(1)). Inspection is important because it informs management on new hazards, risks and any changes that may affect the safety and health of workers in any enterprise to enable appropriate control measures to be taken.

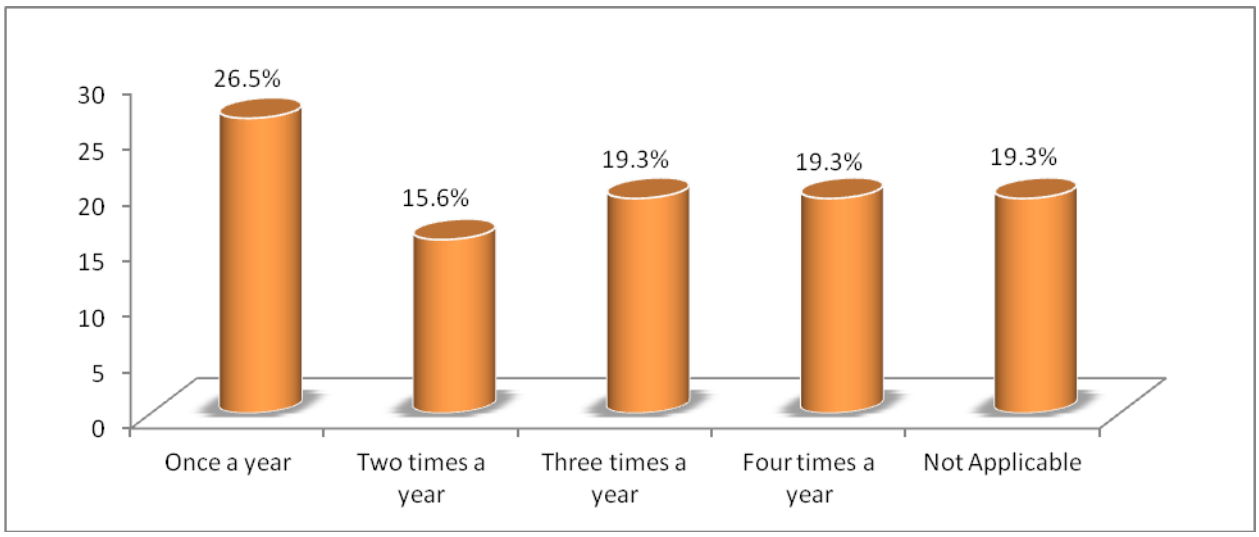


Figure 4.3: Number of times that inspection took place in the facilities

4.3.12 Trained team on emergencies

Results of the study as shown in Figure 4.4 indicated that the majority of the respondents (53%) had trained team to handle emergencies like fire in their facilities. Respondents who did not know of the existence of the team were 27% while 20% said that their facilities did not have a trained team in case of emergencies like fire.

From one of the KII in an export facility, it was clear that emergency teams were present in export slaughterhouses and processing plants and none at all in category A and C slaughterhouses. Emergencies in a facility include fire outbreaks, gas and boiler explosions and electricity related shocks, burns and fires (HSE, 2014). Export facilities and processing plants have a high risk of having fire outbreaks and gas explosions because they are actually factories and hence need to have a trained team to handle these emergencies in case they occur. Besides these teams, it is important that all employees be trained on what to do in case of fire,explosion or other emergencies.

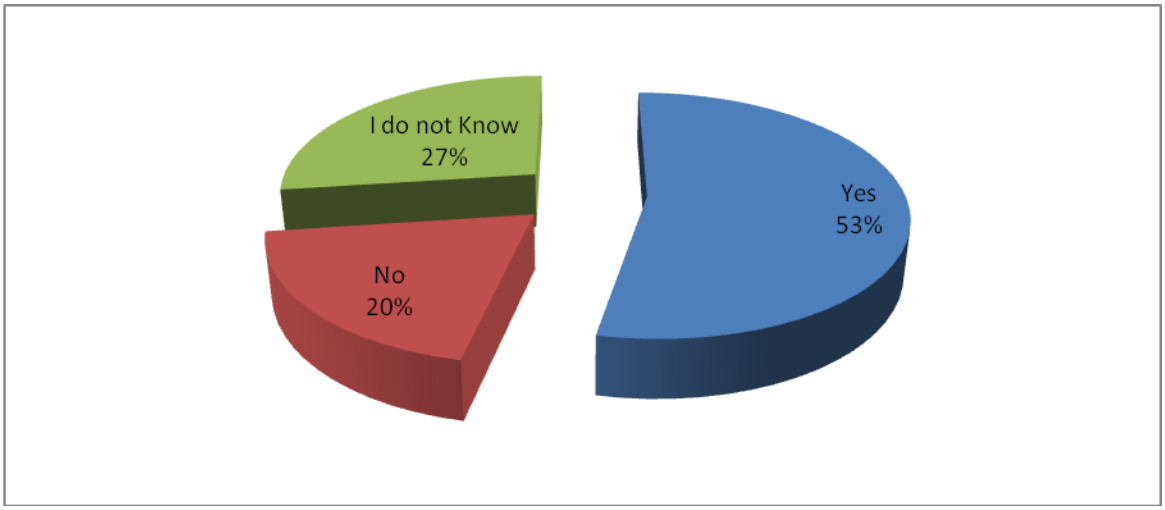


Figure 4.4: Trained team on emergencies

4.3.13 Records of injuries, accidents and incidents in the facility

The study found out that 118 (34%) of the respondents said that records of injuries, accidents and incidents were kept and 80 (23%) did not, while 149 (43%) were not aware of whether records were existing in their facilities. From the management of these facilities, it came out clear that records of injuries were only kept by export slaughterhouses and processing plants while Category A and C had no records at all. Records of injuries, accidents and incidents inform management on how to take

precautions and hence prevent future occurrences. Section 21 of OSHA, 2007 stipulates that an employer is to notify the area occupational health and safety officer in case of an accident, dangerous occurrence or poisoning which has occurred at the workplace and further in 21(5) enter all workplace injuries in a register.

4.3.14 Hazard identification in slaughterhouses and meat processing plants

As indicated in Table 4.20, the study observed that hazard identification was carried out by health and safety committees in the facility (30.5%) and a similar percentage was of a contrary opinion while (38.9%) of the respondents were not aware if hazard identification was carried out in their facility. From FGDs and KII, it was observed that use of knives, pangas, spreaders, slippery floors, animals, falling from flat forms, pieces of bones injuring the eyes, splitting of carcasses, carcasses falling, falling objects, violence from fellow workers, vehicles, hot/frost bite, naked electrical wires, gases like ammonia, zoonotic diseases, working in confined places and captive bolt stunner posed hazardous conditions to the workers in these facilities.

Table 4.20: Hazard identification in slaughterhouses and meat processing plants

	Frequency	**Percent**
Yes	106	30.5
No	106	30.5
I do not Know	135	38.9
Total	**347**	**100.0**

Ranking of the hazardous conditions and situations was done by FGDs and KII in all the facilities as indicated in Table 4.21 and further analysis done as shown in Table 4.22. Ranking was done by scoring of the hazardous conditions from 1 to 14. A score of 1

means that the hazard has the greatest danger to the safety of the workers and that of 14 has the least threat to worker safety. From the results of this ranking, it was found that the knife presents the greatest threat to worker safety in export, category A and C slaughterhouses. Further analysis of ranking (Table 4.22) showed that the highest score was in category C with mean score of 10.363 and this means that it had the least of the hazardous conditions compared with the processing plants with mean score of 5.632 in the ranking and had the highest exposure to hazardous conditions. This was followed by export slaughterhouses which also process meat into other products (with mean score of 6.894). The export facilities and processing plants have specialized equipments and machines to enable slaughter and processing of meat into meat products and hence high hazard levels noted as opposed to the local slaughterhouses which only slaughter animals. The study found out that higher injury rates were experienced in local slaughterhouses despite the lower level of hazardous conditions/situations noted during the ranking exercise. The export and processing plants registered higher levels of hazardous conditions/situations but experienced lower injury rates compared to local facilities. The simple reason is that the committment of management in the export and processing plants was fairly higher in the implementation of OSHA, 2007 than in the local slaughterhouses where the implementation level was very minimal and in category C facilities, it was totally absent. The local slaughterhouses lack the elements of OSHA, 2007 and these include: Training, health and safety committees, health and safety policy, registration of facility by health and safety officers, health and safety audits, regular inspections and risk assessment to enable control of hazards in this industry.

Table 4.21: Ranking of hazardous conditions by FGDs and KII in the facilities

Hazard/Hazardous Situations	Export Facilities	Processing Plants	Category A	Category C
Use of Knives	1	2	1	1
Use of Pangas	N/A	N/A	2	2
Use of Spreaders	N/A	N/A	3	14
Equipments/Machines	2	2	NA	14
Slippery Floors	3	1	4	5
Animals	4	NA	5	14
Falling from plat forms	13	11	7	14
Pieces of bones injuring eyes	10	6	8	14
Splitting of carcasses	11	N/A	9	14
Carcasses falling	5	4	10	13
Falling Objects	5	3	7	14
Violence from fellow workers	6	13	4	2
Moving Vehicles	7	7	11	10
Hot water/frost bite	8	5	12	14
Naked electrical wires	9	8	12	13
Exposure to Ammonia leaks	10	9	13	14
Zoonotic Diseases	11	10	12	10
Working in confined places	12	12	13	14
Captive bolt stunner	14	14	14 *	14

Hazard ranking: (1) high priority and (14) low priority

Table 4.22: Analysis of the hazardous conditions by groups of KII and FGDs in the Clusters

CLUSTER	TOTAL SCORE (X)	$\overline{X}$	$(\overline{X}-X)^2$
Export	131	6.894	315.0625
Processing plants	107	5.632	1743.0625
Category A	160	8.421	126.5625
Category C	197	10.363	2328.0625
Totals	595	7.827	4512.75

Key: **X**- Total Score of hazardous conditions

$\overline{X}$- Mean Score of the Hazardous conditions

Mean for all the Clusters= 7.827

$(\overline{X}-X)^2$ - Variance

Total Variance = 4512.75/4

Standard deviation (σ)=33.588

4.3.15 Risk assessment for the safety of workers in the facilities

The study observed that 161 (46.4%) of the respondents were not aware whether risk assessment for their safety was carried out in the facility. Those respondents aware and knew that risk assessment was carried out were 106 (30.5%) and 80 (23.1%) said that there was no risk assessment carried out (see Table 4.23). From the FGDs and KII (table 4.26), it was noted that export and processing plants had risk assessment carried out in their facilities to ascertain the kind of hazards existing in these facilities to enable control.

This assessment has to be carried out regularly by the management in order to identify new risks and plan to control them so as to improve the safety of all workers at work and those who might be affected by them.

Table 4.23: Risk assessment for the safety of workers in the facilities

	Frequency	**Percent**
Yes	106	30.5
No	80	23.1
I do not Know	161	46.4
Total	**347**	**100.0**

4.3.16 Mechanism of communication and information to employees

Overall, 212 (61%) of the workers pointed out that there was a clear mechanism of communication and availing of information to employees on plant equipment, hazardous substances and work processes while 135 (39%) were of contrary opinion (Table 4.24). Communication in a language the employees understand in an organization is very important especially when it comes to operations of machines new hazards, risks and operating procedures. A clear mechanism of communication has safety implications to the workers.

Table 4.24: Mechanism of communication and information to employees

	Frequency	**Percent**
Clear mechanism of communication	212	61%
No mechanism of communication	135	39%
Totals	347	100%

4.3.17 Language used to avail the relevant information

As presented in Figure 4.5, 173 (49.9%) of the respondents pointed out that Swahili was the language that was used to avail the relevant information in the facilities, 133 (38.3%) indicated both English and Swahili while 28 (8.1%) indicated that local vernacular was the language that was used to avail the relevant information in the facilities. From the FGDs and KII most of the respondents spoke very well using Swahili and others used both Swahili and English and this concurs with these findings.

Instructions on work processes and procedures must be given in a language which is well understood by the workers so as to enable protect themselves and others in the place of work. In case of danger communicating to others is critical to safety and language used means life or death.

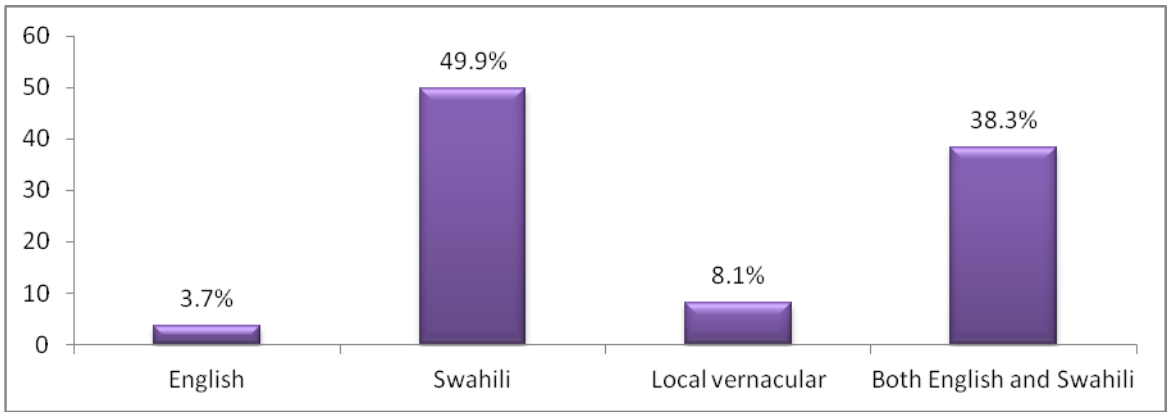


Figure 4.5: Language used to avail the relevant information

4.3.18 Visitation of the facilities by Occupational Safety and Health Officer

As presented in Table 4.25, 201 (57.9%) of the respondents indicated that they were not aware whether an occupational safety and health officer had visited the facility while 119 (34.3%) were aware and 27 (7.8%) were not aware whether an occupational safety and health officer had visited the facility. In one of the FGDs and KII (Table 4.25), export

and processing plants had an occupational safety health officer visit the facility for licensing and ensuring compliance with OSHA, 2007 requirements. Occupational safety and health officers from the DOHSS are supposed to regularly visit these facilities to ensure compliance to instruments governing occupational health and safety.

Table 4.25: Visitation of the facilities by Occupational Safety and Health Officer

	Frequency	Percent
Yes	119	34.3
No	27	7.8
I do not Know	201	57.9
Total	**347**	**100.0**

4.3.19 The last visit made by an Occupational Safety and Health Officer

As presented in Figure 4.6, 146 (42.1%) of the respondents indicated that they were not aware of the last time that an occupational safety and health officer had visited the facility.Those who said that he/she had visited the facility in the last month were 79 (22.8%) and 55 (15.9%) and 54 (15.6%) indicated three months ago and one year ago respectively while 13 (3.7%) indicated that an occupational safety and health officer had visited the facility two months ago.

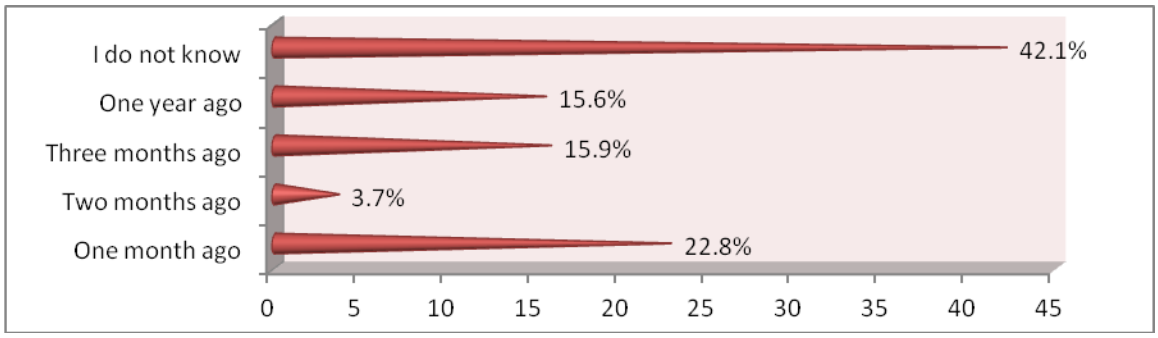


Figure 4.6: The last visit made by an Occupational Safety and Health Officer

The results on the views of FGDs and KIIs on visitation, language used and risk assessment of the facilities was as shown in Table 4.26. It was reported that in the export slaughterhouses and processing plants visitation and risk assessments were done while none was carried out in category A and C.

Table 4.26: FGDs and KII view on visitation, language used and risk assessment in the facilities

Cluster	**Visitation by occupational health and safety Officer**	**Language used**	**Risk assessment**
Export slaughterhouse	Yes	Swahili English	Yes
Processing Plants	Yes	Swahili English	Yes
Category A	No	Swahili English	No
Category C	No	Swahili	No

4.4 Types of injuries reported

4.4.1 Injuries while working

The study observed that the majority 295 (85%) of the respondents had been injured while at work while 52 (15%) had not. This is a significant number of workers injured in the course of the previous year and this has a negative impact in the profitability of the enterprises and productivity of the workers.

From the FGDs and KII, the determinants of rates of injuries in these enterprises included: speed of slaughter and processing, overcrowding, poor and inadequate training, poor handling of tools, lack of continuous cleaning of floors, inadequate management, workplace violence, improper handling of animals, prolonged hours of working and new and inexperienced workers.

4.4.2 Distribution of injuries in various facilities

The result in Table 4:27 shows that the highest rates of injuries were recorded in Category C (97.2%) followed by Category A (96.4%) and processing plants (71.1%). The lowest rates of injuries were recorded in export slaughterhouses which experienced a rate of (79.1%). With a χ_2 =23.554 and $p<0.05$ (Exact p value of 0.00225), this result is statistically significant and hence, the category of a facility has an impact on the rates of injuries experienced. The study established that the injury rate in the meat industry in Nairobi City County is very high an indication that the safety of the workers is not assured. The injury rate of 21.9 per 100 full-time workers in the Nairobi City County compares very well with the one of USA in 2001 which was 20.4 per 100 full-time workers and declined to 7.2 per 100 full- time workers in the year 2012 (AMI, 2013). In total, 295 (85.01%) workers were injured in these facilities in Nairobi out of 347 respondents in the year 2015.

The highest injury rates were recorded in local slaughterhouses as compared to export and processing plants. The existence for instance of occupational health and safety committee in an enterprise obviously must have an impact in the injury rates. These committees were not present in local slaughterhouses and hence the higher injury rates in these establishments than export and processing facilities. A work place safety and

health committee is responsible for the implementation of Occupational Health and Safety Act, 2007(OSHA, 2007) in collaboration with the management.

Table 4.27: Distribution of injuries in categories of slaughterhouses and meat processing plants

Facility	**Yes**	**No**	**Totals**
Export	150 (79.1%)	40 (20.9%)	190
Processing Plants	33 (76.7%)	10 (23.3%)	43
Category A	23 (96.4%)	1 (3.6%)	24
Category C	89 (97.2%)	1 (1.1%)	90
Totals	**295**	**52**	**347**

χ_2 =23.554; p<0.05 (Exact p value of 0.00225)

4.4.3 Results of observational checklist in relation to injuries experienced in the facilities

Table 4.28 shows the results of obsevational checklist where measures in place to minimize exposure to hazards was 100% in export abattoirs, 96.4% in processing plants, 85.7% in category A and 78.6% in category C. This is expected when considering the practices and implementation level of OSHA, 2007 in these facilities.

Table 4.28: Results of observational checklist in relation to injuries in the facilities

S/NO	Facility	Score	Percentage score (Measures in place for injury prevention)
1.	Export	28	100 %
2.	Processing Plants	27	96.4 %
3.	Category A	24	85.7 %
4.	Category C	22	78.6 %

4.4.4 Part of the body that was affected

The majority of the respondents 267 (76.9%) indicated that they had been injured at the fingers, arms and wrist and 13 (3.7%) and 14 (4%) had been injured at the back, shoulder and neck respectively. Further, 15.3% indicated that it was not applicable to them and this means that they were either not injured in parts outlined or never injured at all. As shown in Plate 1, some of the respondents in category C slaughterhouses volunteered to show us the injuries sustained by knives during their work. Some fingers (the first three) were unable to stretch due to chronic injuries affecting nerves and this is a clear case of Carpal Tunnel syndrome. In fact one of them asked if the government would come to their plight in terms of establishing a small hospital to handle injuries in their slaughterhouse. This findings compare very well with a study carried out in Nebraska where fingers, hands, wrists and forearms were the majority of body parts affected in the meatpacking industry in the USA (Autumn, 2014). These injuries were mostly inflicted by knives and open wounds would be noticed and some fingers would not stretch because of fibrotic tissue and nerve interference resulting from repetitive motion. This is a clear

case of Carpal Tunnel Syndrome (CTS) which results from repetitive motion. It is important to appreciate that these wounds predispose these workers to zoonotic infections given the sullied working conditions. This study compares well with a report from the Queensland employee injury database in meat processing (2000-01 and 2008-09) where hand and finger injuries accounted for 26%, back 13%, shoulder 11%, wrist 10% ,forearm 6%, elbow 4% and eyes 3% (Queensland Government workplace Health and Safety, 2015). The hand and finger injuries are wounds/lacerations from knives, band saws and brisket cutters. The back, shoulder, wrist and elbow injuries are muscle and tendon sprains and strains. From one of the FGDs and KII, it was revealed that eye injuries result from pieces of bones (bone dust) and this has also been reported in the Queensland Government workplace Health and Safety, 2015 report as already indicated.

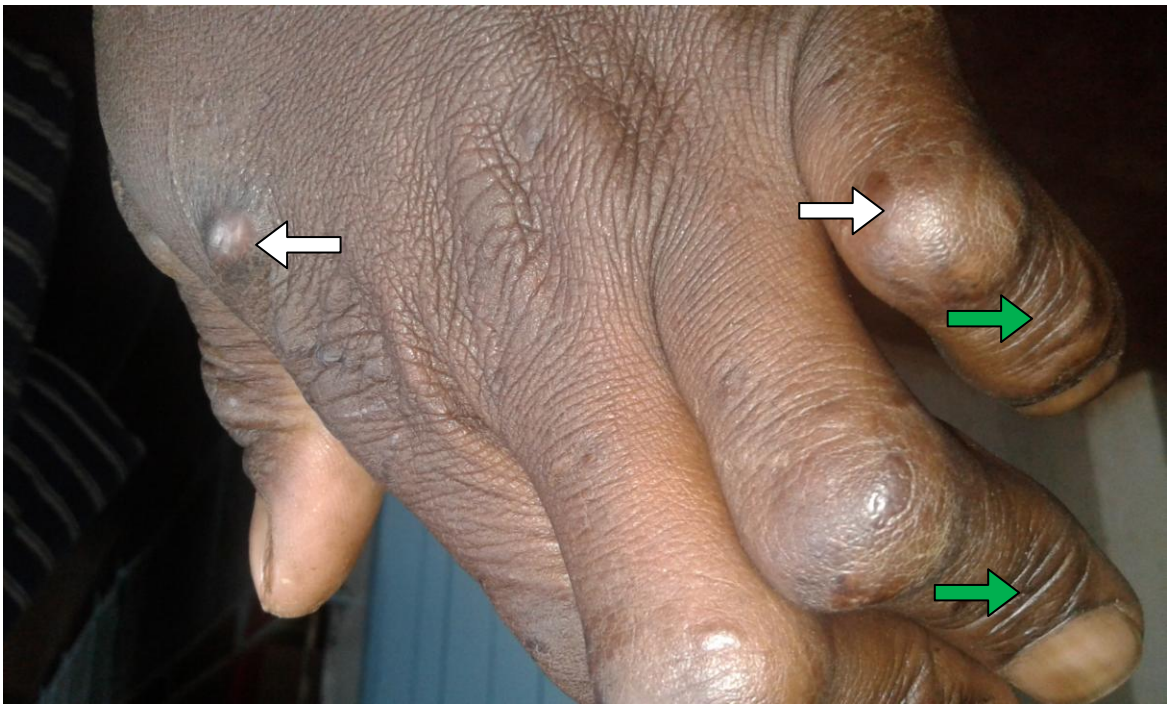


Plate 1: Chronic injuries sustained in the arms and fingers of the respondents and fingers unable to stretch (Carpal Tunnel Syndrome)

Key: ⇨ **The two upper arrows in the plate shows chronic injuries sustained**

➡ **The green arrows indicate fingers unable to stretch**

4.4.5 Causes of the injuries experienced by workers in the meat idustry

The study observed that most of the respondents 119 (34.3%) were injured by an object which struck them and 81 (23.3%) were injured by slips and falls while the same number by handling and lifting. Only 13 (3.7%) were injured by animals (Figure 4.7). From the FGDs and KII, it emerged that knives, pangas, spreaders, machines, falls/slips, animals, pieces of bones, falling carcasses/objects, violence, vehicles, hot water/frost bite, electrocution, suffocation, captive bolt stunner and working in confined places in that order were the most common cause of injuries.

The study found out that the injuries inflicted by the workers were caused by objects which struck them and this was mainly the knife (34.3%). This result was fairly consistent with the findings in Malasyia of 20% (Abdullahi et al., 2013*)* and by slips and falls resulting from slippery floors. Other injuries were caused by handling and lifting of carcasses, meat and meat products in these facilities.

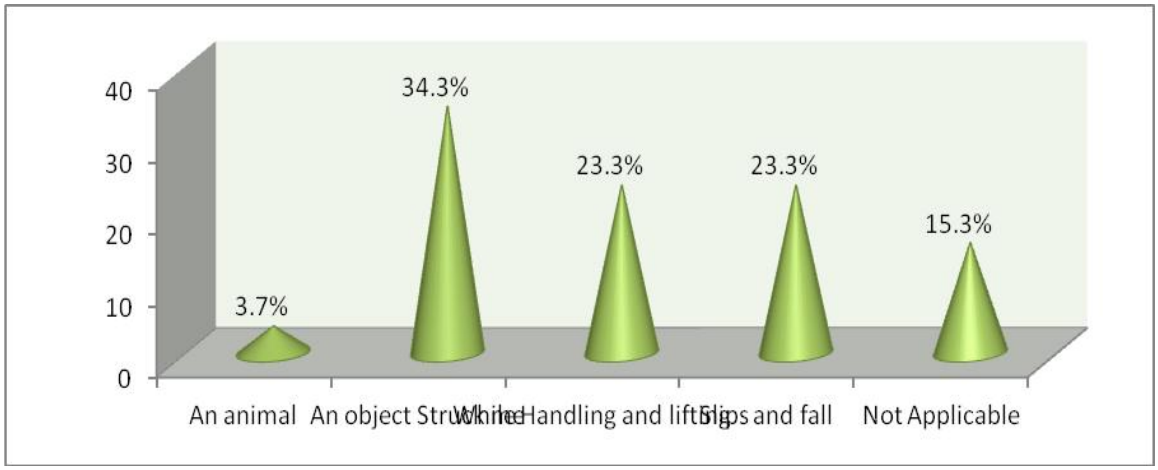


Figure 4.7: Causes of the injury

4.4.6 Types of Injuries inflicted to the workers and the associated risk factors

As reported in Table 4.29, the study found out that 199 (57.3%) of the respondents were suffering from wound or superficial injury, 26 (7.5%) from bone fracture, 13 (3.7%) from dislocation, sprain or strain, concussion and internal injury and 14 (4%) were suffering from burn, scald or frost bite and 14 (4%) poisoning infection and suffocation respectively. Other types of injuries 28 (15.1%) affected some workers while 53 (15.3%) said that it was not applicable. From our observation and as indicated in Plate 1, some of the wounds were chronic and yet others were fresh oozing blood which easily contaminates the meat. This means that the meat through the fresh blood from these wounds could serve as a source of infection from blood borne diseases among the workers. Outbreaks of wound infections in UK in 1981 with streptococcus organisms that occurred in an abattoir and pork-processing plant resulted from wounds inflicted to the workers (Barnham *et al.,* 1981). This result compares well with a report in the USA where common injuries were cuts, strains, and cumulative trauma injuries sustained from falls (AMI, 2013).

Risk factors which this study identified included poor protocol of reporting of injuries. In case of injury, a worker is supposed to report to the supervisor for prompt action and not to the manager or an occupational health and safety officer whose office is outside the enterprise. Another critical risk factor identified was underreporting. In this study, it was found that some workers got injured and continued to work and this kind of situation would easily lead to other complications like exsposure to infections. The lack of or poor implementation of OSHA, 2007 especially as noted in category A and C slaughterhouses predisposed workers to injuries. This is comparable to export and meat processing plants where injury rates were less than the local slaughterhouses. Other risk factors which were identified by FGDs and KII included: poor usage of knives and pangas, slippery floors, kicks from animals destined for slaughter, falling carcasses, falling objects, violence from fellow workers, gases like ammonia, pieces of bones injuring eyes, falling from flatforms, vehicles, naked electrical wires, overcrowding, frost bites working in confined places and the risk of contracting zoonotics diseases.

These were not simple injuries sustained because most of the workers were allowed off duty as a result of the injuries inflicted. In fact, 46.1% of the workers were allowed off duty between 4-13 days and 40 workers were off duty for over 6 months because of injuries inflicted in their workplaces. These are many man- hours lost due to injury an indication that there is a problem in the meat industry and we cannot say that workers are safe in these enterprises. The wounds and superficial injuries have been reported to expose workers to zoonotic infections resulting from the close contact with animals and animal fluids (Mahendra *et al*., 2014).

Table 4.29: Types of Injuries sustained by workers in the facilities

	Frequency	Percent
Wound or superficial injury	199	57.3
Bone fracture	26	7.5
Dislocation, sprain or strain	13	3.7
Concussion, Internal Injury, Burn, scald or frost bite	14	4.0
Poisoning, Infection Suffocation (asphyxiation)	14	4.0
Other types	28	8.1
Not Applicable	53	15.3
Total	**347**	**100.0**

4.4.7 Off days given to workers resulting from injury during the year 2015

The study found out that 185 (53.3%) of the respondents had been injured and given off days in the year 2015 while 162 (46.7%) had not (Table 4.30). The off days given would be related to injury or to sickness relating to injury.

Table 4.30: Off days given to workers resulting from injury during the year 2015

	Frequency	Percent
Yes	185	53.3
No	162	46.7
Total	**347**	**100.0**

4.4.8 Number of off days given to workers as a result of injury

As presented in Table 4.31, the study found out that 23.3% respondents had been off duty as a result of injury for between 4-6 days, 22.8% for between 7-13 days, 7.8% for between 14-20 days and 15.9% and 15% had been off duty as a result of the injury for between 21-30 days and 15.9% between one month and three months respectively. Further, 11.5% and 3.7% had been off duty as a result of the injury for between three and six months and above six months, respectively as a result of injuries sustained.

This translates to a total loss of approximately 15,340 working days and this is equivalent to 122,720 hours resulting from injuries sustained by workers in the meat industry in Nairobi, Kenya in the year 2015. During one of the FGDs, it was noted that two workers were in hospital as a result of injuries sustained in the course of their duty.

It is importanat to note that those workers who were off between three and six months and above six months must have received major injuries.

Table 4.31: Number of off days given to workers in these facilitie as a result of injury

	Frequency	**Percent**
4-6 days	81	23.3
7-13 days	79	22.8
14-20 days	27	7.8
21- 30 days	52	15.0
1 month-3 months	55	15.9
3 months- 6months	13	3.7
6 months and over	40	11.5
Total	**347**	**100.0**

4.4.9 Injury rates in the Meat Industry in Nairobi City County compared with USA

The study found out that 85% of the workers in slaughterhouses and meat processing plants had been injured while at work and 15% had not been injured at all.In the same period, 54% of the workers were sick in the course of last year (2015). From this information, we can calculate the incident rates of injury as follows:N/EHx200, 000, where N-Number of injuries and illnesses (482) EH-Total hours worked by all employees during the calendar year (2015) 200,000 – Base for 100 equivalent full-time workers and work hours 40 per week for 50 weeks per year. For this study, the total population of the workers was estimated to be 2206.Therefore, the incidence rate of injury is calculated as: 482x200, 000/2206x40x50=21.9 for 100 full-time workers. According to a report done by the AMI in 2013, the combined rate of injury and illness cases per 100 full-time workers in the USA in 2012 was at 8.7 while in 2001 it was at 20.4 per 100 full-time workers and this compares very well with Nairobi City County in Kenya in 2015 at 21.9 per 100 full-time workers. This decline in injury rates in the USA was attributed to the strict implementation of the Occupational Health and Safety Act in that country (AMI, 2013).

4.5 Management of injury outcomes

4.5.1 Injury reporting by the workers

As presented in Figure 4.8, the study established that 53.6% of the respondents reported to their supervisors in case they were injured in the course of their duty, 31.1% reported to the managers while 3.7% reported to their fellow workers. However, 11.5% of the respondents never reported at all. Reporting of injuries by the workers is very important because the management cannot manage them if not reported. Those workers who

followed the proper protocol of reporting of incidents of injuries and reported to the supervisors were 186 (53.6%). Supervisors know all their workers and what each of them does, the tools or machines being operated and the processes being undertaken. They also know the injuries their workers are likely to sustain and the course of action in terms of managing these accidents/injuries. Managers are not near the work processes compared to supervisors and may not promptly handle emergencies and 108 (31.1%) of workers doing this will cause delay in remedial measures. Reporting to fellow workers who can also alert the supervisors can also work. The worst scenario is where workers get injured and do not report at all. In this study, 40 (11.6%) workers got injured and never reported to anybody and the safety of these workers was not assured. At the same time, proper control measures cannot be put in place when injuries sustained are not reported and records kept. Employee participation in safety and health at work has been identified as a key precondition of successful OSH management and major contributing factor in the reduction of occupational diseases and injuries (Alli, 2008). This situation concurs very closely with the findings of Banjo et al. (2013) who indicated that in developing and transitioning countries of the world, the concern is mainly provision of health care and treatment with less emphasis on preventive measures.

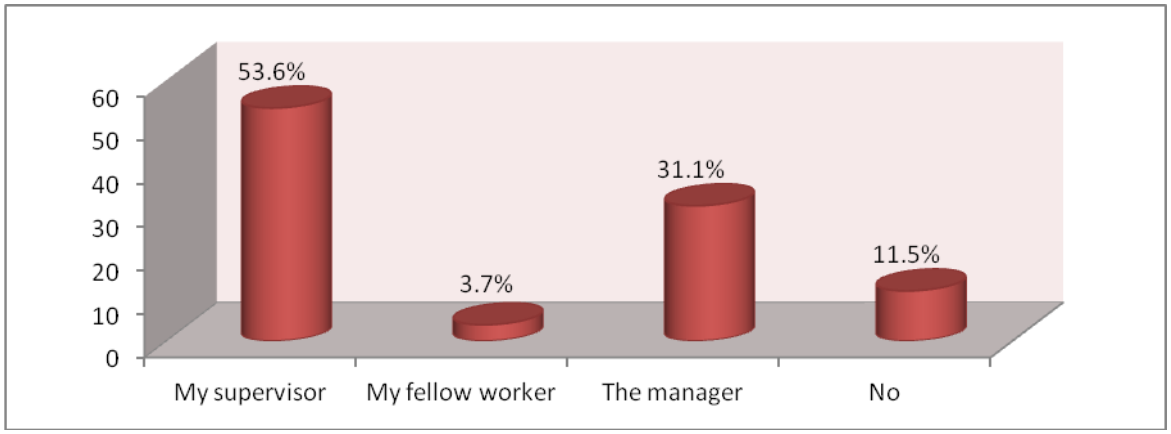


Figure 4.8: Injury reporting behavior of employees

4.5.2 Treatment of workers after the accident/injury

As presented in Table 4.32, the study observed that 255 (73.5%) of the respondents who had been injured received First Aid Treatment, 52 (15%) were taken to hospital as outpatient by the management and 27 (7.8%) continued to work and never reported while 13 (3.7%) were taken to hospital by management and admitted. During one the FGDs in one local slaughterhouse, two workers were in hospital admitted as a result of injuries sustained. There was a total of 307 workers who got injured and were either given First Aid treatment, or taken to hospital treated and discharged/admitted. Those workers taken to hospital by management and given admission were 13(3.7%). Interestingly, 27 (7.8%) of the workers sustained injuries and never reported at all but continued to work.

This is a clear case of employees not participating in efforts aimed at enhancing their safety. From this interrogation alone, it was evident that a total of 347 workers sustained injuries out of a total of 347 respondents investigated in slaughterhouses and processing plants in Nairobi City County. This is a clear case of underreporting.

Table 4.32: Treatment of workers after the accident/injury

	Frequency	Percent
Received First Aid Treatment	255	73.5
Taken to hospital as outpatient.	52	15.0
Taken to Hospital and admitted	13	3.7
Continued to work and never reported	27	7.8
Total	**347**	**100.0**

4.5.3 Accident investigation to determine the exact cause of the accident

As presented in Figure 4.9, the study established that 189 (54.5%) of the respondents had nobody to carry out accident investigation to determine the exact cause of the accident while 12 (30.5%) indicated that somebody carried out accident investigation to determine the exact cause of the accident. However, 52 (15%) were not aware whether accident investigation to determine the exact cause of the accident was carried out. From the FGDs and KII conducted , it was found that there was no accident investigation carried out in category A and C slaughterhouses. On the contrary, export and processing plants had accident investigation carried out in case an accident occurred.

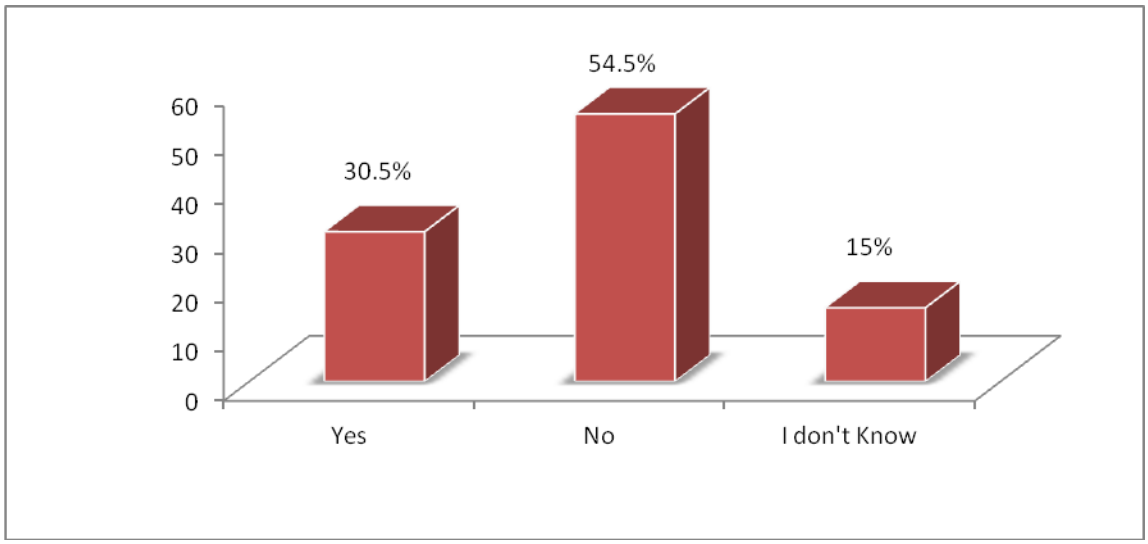


Figure 4.9: Investigation to determine the exact cause of the accident

4.5.4 Trained first aiders in the facility

As presented in Table 4.33, 239 (68.9%) of the respondents indicated that the facility had trained first aiders while 94 (27.1%) said there were no trained first aiders. However, 14 (4%) were not aware whether the facility had trained first aiders. During one of the FGD and KII in an export facility, it was noted that they had 10 trained first aid workers with first aid rooms. In another export facility, it was reported they had a total of 45 first aiders who were trained externally by St. Johns Ambulance and that refresher causes are done annually for these aiders. Simple injuries were managed in the facility by these first aid workers while complicated cases are taken to hospital by the management. In category A, there was one trained worker in the facility handling simple injuries and there was only one first aid box which contained pain killers, hydrogen peroxide, iodine, cotton wool, bandages, strapping's, gloves and crib bandages. At the time of the interviews, the management indicated that 2 workers were in hospital being sick from work-related

illnesses. It was also indicated that the management could take responsibility in clearing hospital bills of these workers.

Table 4.33: Awareness on presence of trained first aiders in the facility

	Frequency	Percent
Yes	239	68.9
No	94	27.1
I do not Know	14	4.0
Total	**347**	**100.0**

4.5.5 First aid rooms in the facility

The study established that 253 (73%) of the respondents pointed out that the facility had first aid rooms while 80 (23%) said no such rooms were present (Figure 4.10). However, 14 (4%) were not aware whether the facility had first aid rooms. From the FGDs, KII and observational checklist, it was noted that export facilities and processing plants had first aid rooms while category A and C slaughterhouses did not have.The first aid rooms in theses export facilities were fully equipped with the requisite infrastructure which include stretchers, couches/beds and modulated lighting to enable smooth carrying out of first aid procedures. The OSHA, 2007 in section 95 stipulates that every occupier shall provide and maintain so as to be readily accessible, a first-aid box or cupboard to be used in case of injuries sustained in that workplace.

First-aid means the immediate measures taken at the site of an accident by a person who may not be a physician but trained to ensure that professional medical care will follow his or her intervention. In Nairobi City County, export facilities have gone a notch higher by

providing first-aid rooms to facilitate quick intervention by availing rooms for this service.

Furthermore, from the FGDs and KII, a total of 55 first aiders who get external training by St. John's Ambulance are known to exist and offer these services in these facilities indicating that the problem of injury of workers is a reality.

These facilities spend a lot more on treatment rather than putting in place preventive measures to stop these injuries/accidents and these findings concur with Banjo et al. (2013) in a study carried out in Abeokuta in Nigeria.

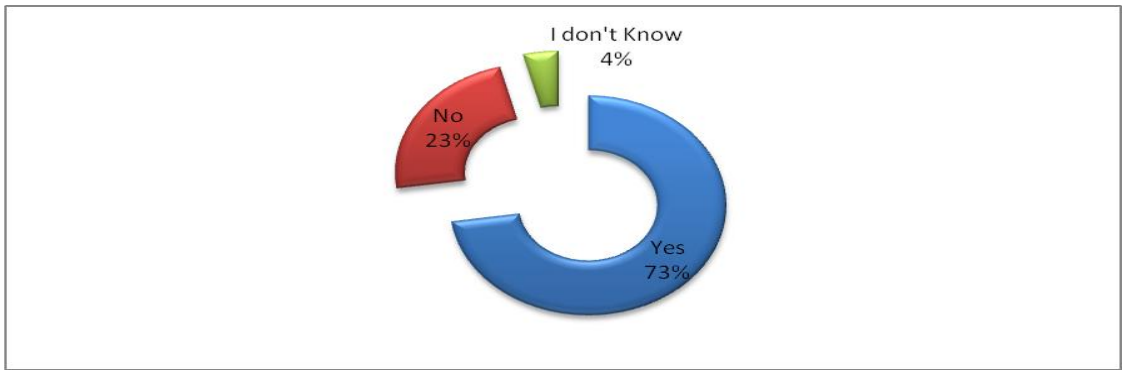


Figure 4.10: First aid rooms in the Facility

4.5.6 Employees insurance

As presented in Table 4.34 below, the majority of the workers were not insured (57.9%) while 26.5% stood insured and yet 15.6% did not know whether they were insured or not. From the FGDs and KII, it was noted that the management of export facilities and processing plants had an arrangement of insuring their workers as opposed to category A and C slaughterhouses. Given the high exposure to risks in the meat industry and the very high injury rates in the meat industry noted in this study, it is vital that all employers have an arrangement with insurance companies for their workers and this will obviously

increase the morale of the workers. With an injury rate of 21.9 per 100 full- time workers in the year 2015, it is prudent that employees get a medical insurance cover.

Table 4.34:Employees Insurance

	Frequency	**Percent**
No	201	57.9%
Yes	92	26.5%
I do not know	54	15.6%
Totals	347	100%

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of the study

5.1.1 Socio-demographic characteristics of the study population

Socio-demographic characteristic of the study population were statistically significant in influencing the safety of the workers in the meat industry in Nairobi, Kenya. Young and inexeperienced workers were not safe. Injury rates for male workers were higher than females and gender was a factor in the safety of the employees. Highest rates of injuries incurred by workers who had worked for less than 5 years as opposed to those who had worked for many years. This result compares well with findings of Fitzgerald (2010) where inexperience and high turnover rates resulted in increase of injuries.

The educational level of the participants had a significant impact on the safety of the workers where workers with higher educational level received minimal injuries compared with those with lower education and this result is consistent with Cook at el, (2013) where those workers with higher educational level were more knowledgeable in the usage of PPEs and of course more protected from hazards than those with lower education.

5.1.2 Compliance to legal instruments governing safety

5.1.2.1 Awareness level of OSHA, 2007 and WIBA, 2007 by the employees

The study established that the awareness level of OSHA, 2007 and WIBA, 2007 was very high in export and processing facilities as compared to the local slaughterhouses and these results were statistically significant. In export slaughterhouses, 86.8% of the workers were conversant with these instruments governing occupational health and safety while the percentage of awareness in local slaughterhouses combined was only 3%.

5.1.2.2 Health and safety committees

This study established that export and processing plants had health and safety committees while category A slaughterhouses were only existing in name and not active. However, in category C slaughterhouses, these committees did not exist at all. In the absence of this committee at the enterprise level, implementation of safety measures becomes very difficult and the safety of workers is not assured. That alone explains the highest injury rates noted in category C slaughterhouses as compared to export facilities and processing plants with lower injury rates. This study has established that the existence of health and safety committees play a significant role in the reduction of injuries particularly where management has fully supported them in their operations especially in the provision of resources.

5.1.2.3 Inspection of slaughterhouses and processing plants by Occupational Health and Safety Officer

The study found out that inspection of these enterprises for compliance to OSHA, 2007 was higher in export and processing plants than the local slaughterhouses. In category C slaughterhouses, workers did not differentiate between the inspection which is normally carried out annually for food safety and the one for OSHA, 2007. From the qualitative information given by the FGDs and KII, it emerged that there is no inspection carried out on issues of occupational health and safety in these local slaughterhouses

5.1.2.4 Health and safety policy in these enterprises

The study established that health and safety policy was more pronounced in export and processing facilities than local slaughterhouses. The existence of a health and safety policy document in an enterprise indicates management commitment and concern in

improving the safety of all its employees. The absence of this policy statement in an interprise obviously shows that management is not keen on the safety of its employees.

5.1.2.5 Provision of Personal Protective Equipments (PPEs) in the facilities

In this study, export facilities and processing plant workers were provided with personal protective equipment (PPEs) and this was supported by the qualitative information generated during the FDGs and KII. Local facilities were not compliant to OSHA, 2007 in the provision of PPEs and hence these employees have higher exposure to hazards than their counterparts in export and processing plants.

5.1.2.6 Trainings on matters of occupational health and safety

The study established that the training level of the employees was higher in export slaughterhouses than processing plants and local slaughterhouses. OSHA, 2007 in section 99 stipulates that no person shall be employed at any machine or any process, being a machine or process liable to cause ill health or bodily injury unless he /she has received sufficient training in work at the machine or process and the training should be done at recruitment, transfer or change of job, the introduction of new work equipment and introduction of new technology. This training should take into account new changed risks and be repeated periodically.

5.1.3.1 Body parts of the workers that were affected by the injuries

The study established that fingers, wrist and arms injuries were the highest accounting for 76.9% of the body parts affected and the shoulders and neck received 4% of the injuries while 15.1% of the workers either were affected in other body parts not mentioned in the study or were not injured at all. From Plate 1, which was taken in one of the local slaughterhouses, it was obvious that most complaints of injuries were limited to fingers,

arms and wrists. These injuries were mostly inflicted by knives and from Plate 1, open chronic wounds would be noticed and some fingers would not stretch because of fibrotic tissue and nerve interference resulting from repetitive motion.

5.1.3.2 Types of injuries experienced by the workers and the associated risk facors.

The study found out that the majority of the workers were suffering from wound or superficial injury, borne fracture, dislocation, sprain or strain, concussion and internal injuries. The associated risk factors for the injuries inflicted were found to be poor protocol of reporting, underreporting and poor or lack of implementation of OSHA, 2007 and this included training.

5.1.4 Management of injury outcomes

5.1.4.1 Reporting of injuries by workers in the facilities

The study found out that 186 (53.6%) followed the proper protocol of reporting of incidents of injuries by reporting to the supervisors. Supervisors know all their workers and what each of them does, the tools or machines being operated and the processes being undertaken. They also know the injuries their workers are likely to sustain and the course of action in terms of managing these accidents/injuries. Reporting to fellow workers who can also alert the supervisors can also work. The worst scenario is where workers get injured and do not report at all.

In this study, 27 workers got injured and never reported to anybody and the safety of these workers was not assured. Reporting of accidents/injuries enables recording of these incidents and this in turn informs proper and appropriate preventive measures to be put in place.

5.1.4.2 Treatment of workers after injury

In this study, 27 (7.8%) of the workers sustained injuries and never reported at all but continued to work. This is a clear case of underreporting by the employees. The interrogation of workers on treatment after injury produced different result from the one enquiring if a worker got injured in the year 2015. This interrogation alone indicated that a total of 347 workers sustained injuries in respect of treatment after injury compared with results of injured workers (295) and this means that the injury rate in the meat industry in Nairobi City County was even higher than the reported 21.9 per 100-Full time workers in year 2015.

5.1.4.3 First aid rooms in the facilities

The study established that export and processing plant facilities had First Aid rooms where the injured are taken to receive first aid treatment and a smaller percentage of workers was not aware of the existence of these rooms in their facility. These means that these export facilities have gone a notch higher by providing this facility to facilitate quick intervention by availing rooms for this service as opposed to OSHA, 2007 which only allows first-aid treatment using a first aid box. This advancement alone indicates that injuries are a reality in these facilities and resources are being spent on treatment. A long term solution to the safety of workers in these facilities is to allocate a greater budget to preventive measures in order to reduce the high injuries rates noted in this study.

5.1.4.4 Insurance of the workers

The study established that only 26.5% of the workers were insured as they work in these facilities and the rest either were not insured or did not know their status of health/safety insurance. With an injury rate of 21.9 per 100 full- time workers and this rate is even

higher from the intorregation of treatment after injury in the course of the year of study (2015) and the fact that more than 85% of the workers sustained injuries, it is prudent that employees get a medical insurance cover.

5.2 Conclusions

The study concludes that:

The implementation level of the legal instruments governing occupational health and safety was relatively higher in export and processing plants as compared to local slaughterhouses where it was very low and in most cases absent. This was very notable in the awareness level of OSHA, 2007 and its indicators used in this study and in particular the trainings done, presence of occupational health and safety committees, policy statement on health and safety, inspection by the Occupational Health and Safety Officers and provision of PPEs. Prudent implementation of OSHA, 2007 will have far reaching effects in enhancing the safety of employees in the meat industry in this county and the country at large. Socio-demographic characteristics of the study population had a high statistical significance on the safety of workers in all the facilities. The types of injuries noted in the meat industry in Nairobi City County are mainly wound or superficial injuries, bone fracture, dislocation, sprain or strain, concussion or internal injuries and were mainly limited to fingers, arms, wrist, hands, shoulders, neck and back and all were related to similar common hazards in this industry. Consequently, these findings can be used to institute control measures in these facilities so as to enhance worker safety in this industry.The types of injuries to the workers were various, included wounds, burns, fractures and dislocations. The superficial wounds were the most prevalent. Most of the injuries occurred in Category C slaughter house workers.

The incidence of injury rate in the meat industry in Nairobi City County is very high (21.9 per 100 full-time workers in 2015) and would even be higher with the underreporting noted and this rate compares very well with the USA in 2001 which at that time stood at 20.4 per 100 full-time workers. This country reduced this rate to 8.7 per 100 full-time workers in the year 2012 (AMI, 2013). This rate in Nairobi is very much supported by the high number of workers injured and treated in medical facilities in the course of the year of study (2015) and a total loss of 15,261 working days the equivalent of 122,088 man-hours lost resulting from off days given due to injuries. Those 40 workers who received off days of more than 6 months must have had major injuries.

The management of injury outcomes was noted to be high by the management in export and processing plants because of the prompt employment of first aid measures at the enterprise level and those cases not handled at this level being taken to hospitals for specialized treatment. Some facilities already had first-aid rooms to use in the institution of this treatment before further action is taken. This alone points out that the injury rates are very high hence these measures in place.

5.3 Recommendations

5.3.1 Recommendations of the study to implementing agencies

The study recommended that:

1. Implementation of OSHA, 2007 should be intensified in all the slaughterhouses and meat processing plants so as to reduce the high injury rates recorded. The Directorate of Occupational Health and Safety should employ more Officers to carry out inspections and enforce OSHA, 2007 and other relevant legislations so as to prevent injuries in these enterprises. More resources should be allocated to preventive measures in order to nib the

problem at the bud. All workers, supervisors and managers should undergo training in order to enhance worker safety. The most affected body parts interms of injuries incurred were fingers, arms and wrists and hence management should provide specialized protective devices to reduce injuries to these body parts.

2. Every slaughterhouse and processing plant in Nairobi City County should be registered by the Directorate of Occupational Health and Safety (DOHS) and ensure that occupational health and safety committees are in place to address the high injury rates noted in this industry. Occupational Health and safety committees should be reactivated where they exist and formed where they are not so as to reduce the incidence of injuries.

3. Records of incidences of injuries/accidents should be kept in slaughterhouses and meat processing plants to enable remedial measures to be undertaken in these facilities.

It is important to note that control measures will be more focused when the underlying causes of injuries and incidents are recorded and with these records in place, it is easy to tell whether control measures are working or not.

4. Workers should be given adequate training and education in the usage of equipments and machines. Workers and their supervisors must receive trainings, education and should understand all work processes to be able to prevent the occurrences of injuries and accidents as they work. It is imperative that senior managers and managers of all work processes should adequately be trained so as to provide continuous improvement in all matters of occupational health and safety. From this study, newly employed workers and the younger workers received more injuries than the older population and hence more focus on training and education should be directed to them.

5. Given the high exsposure to risks in the meat industry and the very high injury rates noted in this study, it is vital that all employees have an arrangement with insurance companies for their workers and this will obviously increase the morale of workers.

6. The Veterinary Department and the Directorate of Occupational Health and Safety should collaborate especially on matters of inspection for food safety and the safety workers in these facilities. From the study findings, it was noted that the injuries inflicted are possible entries of animal pathogens to humans and at the same time the oozing of blood from these injuries contaminate food and can lead to cross infection among the workers and this is a public health concern to not only the workers themselves but also the consumers of meat and meat products.

5.3.2 Recommendations for further research

1. The study recommends an in depth study on the usage of equipments and machines in slaughterhouses and processing plants.
2. The study recommends a study on the safety of workers in the various stages of the slaughter process.
3. The study recommends an in depth investigation of the relationship of injuries inflicted to workers and the zoonotic diseases in the meat industry.

6.0: REFERENCES

Abdullahi Auwalu, Azmi Hassan, Norizhar Kadarman, Yakubu Muhammad Junaidu,Olanike Kudrat Adeyemo, and Pei Lin Lua (2016). Occupational hazards

among abattoir workers associated with non-compliance to the meat processing and waste disposal laws in Malaysia. Risk Manag. Health Policy. 9:157-63. doi: 10.2147/RMHP.S98271. Collection 2016.

ACDP (1996). Advisory Committee on Dangerous Pathogens. Microbiological Risk Assessment: an interim report. HMSO, London.

Alvin C.Rencher (2003). Methods of Multivariate Analsis.Vol.492 Wiley Series in Probability and statistics.ISBN-0471461726,9780471461723

Alli, B.O. (2008). Fundamental Principles of Occupational health and safety (Second Edition). International Labour Organization: Geneva, pages 3-117

AMI (2013). At (202) 587-4200 or visit www.meatmicom.2013), Accessed on 17th of July, 2014.

AMIEU and MATFA (1995). Australian National Guidelines on Safety and Health in the Meat Industry, Page 1-133

Atlas map of Kenya (2011). United States Central Intelligence Agency - CIA World Factbookhttps://www.cia.gov/library/publications/the-world-factbook/geos/ke.html Image: https://www.cia.gov/library/publications/the-world-factbook/graphics/maps/large/ke-map.gif

Autumn (2014). University of Nebraska-Lincoln. Hand, Wrist, Forearm and finger

occupational injuries in pork processing; comparison by worksite and source of injury: USA Occup Environ Med. 67 (10): 686-92. Doi: 10.1136/oem.2009.048611. PubMed.

Awosile B, Osen, Omoshaba E, (2013). Hazards Exposures of workers of Animal Related occupations in Abeokuta South Western Nigeria, Journal of Veterinary Advances, 3; 9-19.

Banjo T.A, A.A. Onilude, A.O.J. Amoo, A. Busari, O.A. Ogundahunsi, W.E. Olooto , O.B. Familoni, A.A.Amballi, A.A.A. Oyelekan and O.A. Abiodun (2013).

Occupational Health Hazards among Abattoir Workers in Abeokuta (Nigeria)**.** Academ Arena 2013; 5(10):29-36] (ISSN 1553-992X).http://www.sciencepub.net/academia. 5

Barnham M., Kerby J (1981). Skin sepsis of meat handlers: observations on the causes of injury with special reference to bone (UK). Journal of Hygiene 78; (283-296).

Berkowitz, Deborah E, Fagel, Michael J (2011). Meatpacking/processing. In Cyclopedia of occupational Health and Safety, J. M Stellman, Geneva (ILO, 2011), Pages 1-5

Biron, (2014). Meatpacking workers Flight "Unacceptable and Inhumane" conditions. Accessed on 29.05.17at www.minpress news.com/187409

BMPA, HSE, MTC, FSA, AHDS (2011). Health and Safety Guidelines in the Meat Industry in Britain.

BMPA, HSE, MTC, FSA, AHDS (2014). Health and Safety Guidelines in the Meat Industry in Britain.

Boden LI, Hall JA, Lewenstein C, Punnet L (1984). The impact of health and safety committees. A study based on survey, interview, and Occupational Safety and Health Administration data. J Occup Med. 26 (11): 829-34.

BohrnstedG.W. and Knoke D (1994). Statistics for Social Data Analysis.3rd Edition.

Boyle Elizabeth (2016). Worker Safety in the Meatpacking plant in the USA. 1997-2016 American Meat Science Association. 1 E Main St Ste 200 | Champaign, IL USA 61820 | 1 800 517 AMSA • 1 217 356 5370

Broadway, Michael and Donald D. Stull (2005). "Meat processing and Garden City, KS: Boom and bust." Journal of Rural Studies.

Bulliet, Richard (2005). Hunters, Herders and Hamburgers:The Past and Future of Human-Animal Relationships.New York: Columbia University

Bureau of Labor Statistics, Census of Fatal Occupational Injuries (2006). athttps://www.bls.gov/iif/oshwc/cfoi/cfoi_revised06.pdf

CDVS, Nairobi (2009-2015). Meat Inspectorate Reports in Nairobi City County (2009-2015). Annual Reports from the CDVS in Nairobi City County.

Cochran, W.G. (1977). Sampling technique (3rd edition). John Wiley and sons New York:

COK (2010). Government printer, Nairobi, www.Kenyalaw.org.National Council for Law Reporting with the Authority of the Attorney-General.

Compa, Lance (2004). Blood, Sweat and Fear: Workers' Rights in U.S Meat and Poultry Plants."http://www.hrw.org/reports/2005/usa0105/ (6/2/10), accessed on 20th June, 2015 ISBN: 1-56432-330-7 Page 27

Cook, EA (2014). Epidemiology of zoonoses in slaughterhouse workers in Western Kenya. 10 (3):387-48

Cook EA, William Anson de Glanville (2017). Working conditions and public health risks in slaughterhouses in western Kenya BMC Public HealthBMC series – open, inclusive and trusted2017**17**:14

Employment Act Chapter 226 (2012). Revised Edition 2012(2007) Published by the National Council for Law Reporting with the Authority of the Attorney General www.Kenyalaw.org

Fisher, Laing, Stockeckel (1983). Self-designing clinical trials.Stat.Med 17:1551-156

Fitzgerald Amy J. (2010). A Social History of the Slaughterhouse: From inception to contemporary implications. Human Ecology Review, 17(1): 1-20

Folkard S, Lombardi DA (2006). Modeling the impact of the components of long work hours on injuries and "accidents" American Journal of Industrial Medicine. 2006;49:953–963 [PubMed].

Gunter Heinz,Peter Hautzinger (2010). Meat processing Technology.ISBN:978-974-7946-99-4

Hamalainen, P.; Takala, J.; Saarela, K. L. (2006)."Global estimates of occupational accidents".*1*http://onlinelibrary.wiley.com/doi/10.1002/ajim.20411/full*37*-American Journal of Industrial Medicine *50* (1): 28-41.accessed 24.05.17

Handler Arden, Michele Issel, Bernad Turnock (2001). A conceptual framework to measure performance of Public Health System (USA).American Journal of Public Health.2001;91:1235-1239

HSE (2014). The Health and Safety (First-Aid) Regulations 1981. Guidance on Regulation. Date of publication:2013 ISBN: 9780717665600, Series code: L74(Third Edition)

HSE (2017). Basic advice on First Aid at work. ISBN:9780717666683

Series code:INDG-347

ILO (2011). Meatpacking/processing.Encyclopedia of Occupational Health and Safety. ILO (2011).

ILO (1996-2015). Safety and Health of Meat, Poultry and Fish processing workers-Sectoral Working papers, 104 (Food and beverage industries, Occupational Safety and Health).

ILO (2013). National Profile on Occupational Safety and Health, Kenya (2013). A publication of the International Labour Office, Geneva Republic of Kenya-Ministry of Labour (Pages 1-56)..

Lo and Jacobson (2011). Human Rights from Field to Fork, Improving Labour conditions for food sector workers by organizing across boundaries (pages 2-6).

Kenya National Bureau of Statistics (KNBS, 2013). Kenya – 2009**,** Kenya Population and Housing Census (10 Per Cent sample, every 10th household), Population and Housing Census.

Kenya VISION 2030 (2008). First Medium Term Plan, 2008-2012 Government of the Republic of Kenya 2008.Website: www.planning.go.ke

Kothari C.R. (2004). Research Methodology: New Age International P Ltd. (13):978-81.ISBN-224-2488-1.

Lander L. Sorock G.S., Stentz T.L., Eisen E.A., Mittleman M., Hauser R., Perry M.J. (2010). A case study of occupational laceration injuries in pork processing:Methods and preliminary findings (USA). 67(10) :686-92. Doi: 10.1136/oem.2009.048611. PubMed.

Mabel Kamweli Aworh, Emmanuel Okolocha, Jacob Kwaga, Folorunso Fasina,

David Lazarus IdrisSuleman, Gabrielle Poggensee, Patrick Nguku, Peter Nsubuga (2013). Human brucellosis: sero-prevalence and associated exposure factors among abattoir workers in Abuja, Nigeria. Pan Afri Med J. 16:1-3

Mahendra Pal, SihinTestaye, Pratibha (2014). Zoonoses occupationally acquired by abattoir workers. *Environ occupScie*.2(3):155-162. ISSN: 2146-2180

Marcin J.P.,Leigh J.P., Miller T.R. (2004). An estimate of the U.S. Government's undercount of nonfatal occupational injuries. *Occup Environ Med*. 46(1):10-8.

Meat Control Act (2012). (Local Slaughterhouse), Regulations, 2010 (Section3,LN.110/2010) Government Printer,Nairobi.Laws of Kenya

MIA; NZITO (2013). Meat Industry health and Safety guidelines of Newzealand.Page 1-184)

Mugenda, O. M. and Mugenda, A. G. (1999). Research Methods: Quantitative and Qualitative Approaches. Nairobi: Acts Press.

Nabukenya Immaculate, Deogratius Kaddu-Mulindwa and George William Nasinyama (2013). Survey of Brucellosis infection and malaria among Abattoir workers in Kampala and Mbarara Districts, Uganda. BMC Public Health, 2013, D01:1186/1471-1471-2458-13-901

National Livestock Policy (2008). Republic of Kenya. Ministry of Livestock Development, Sessional Paper Number 2 of 2008 on Livestock Policy. Government Printer, Nairobi.

NIOSH (2012). Health hazard evaluation report: evaluation of eye and respiratory symptoms at a poultry processing plant – Oklahoma. By Chen L, Eisenberg J, Durgam S, Mueller C. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, NIOSH HETA No. 2007-0284 & 2007-0317-3155.

NIOSH (1981). Occupational Hazard assessment, Criteria for controlling hazards in Animal rendering process. U.S Department of Health and Human Services, Public Health Service, CDC, No.81-133.

Nourish (2012). A Recipe for Safety, Occupational Health and Safety in Food and Drink manufacture, Health and Safety Executive, ISBN 9780717661152 (Pages 9-44)

OSHA (2007). Occupational Safety and Health Act, 2007 Government Printer, Nairobi,

Kenya Gazette. Supplement No 111(Acts No.15) Acts, 2007, Nairobi, 26th October, 2007. Page 100.

Queensland Government Workplace Health and Safety (2015). Queensland employee Injury database-200-01and 2008-09.www.worksafeqld.gov.au

Tappin D., Moore, Ashyyby L. Riley D., Bentley T. and Trevelyan (2006). Musculoskeletal Disorders in meat processing: A review of literature for the New Zealand meat processing industry., 7(1): 45-89., COHFE REPORT ISSN 1174-1234.

The Kenya Veterinary Policy (Kenya Markets trust) (2015). Kenya-veterinary – policy-January-2015-draft.pdf-Adobe acrobat document from:hhp:www.kenyamarkets:org.

Version 1. (2013). Meat Industry Health and Safety Guidelines in New Zealand.

WHO (1946). Preamble to the constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946-Official records of WHO, No.2.

WIBA (2007). Work Injury Benefits Act, 2007 Government Printer, Nairobi,

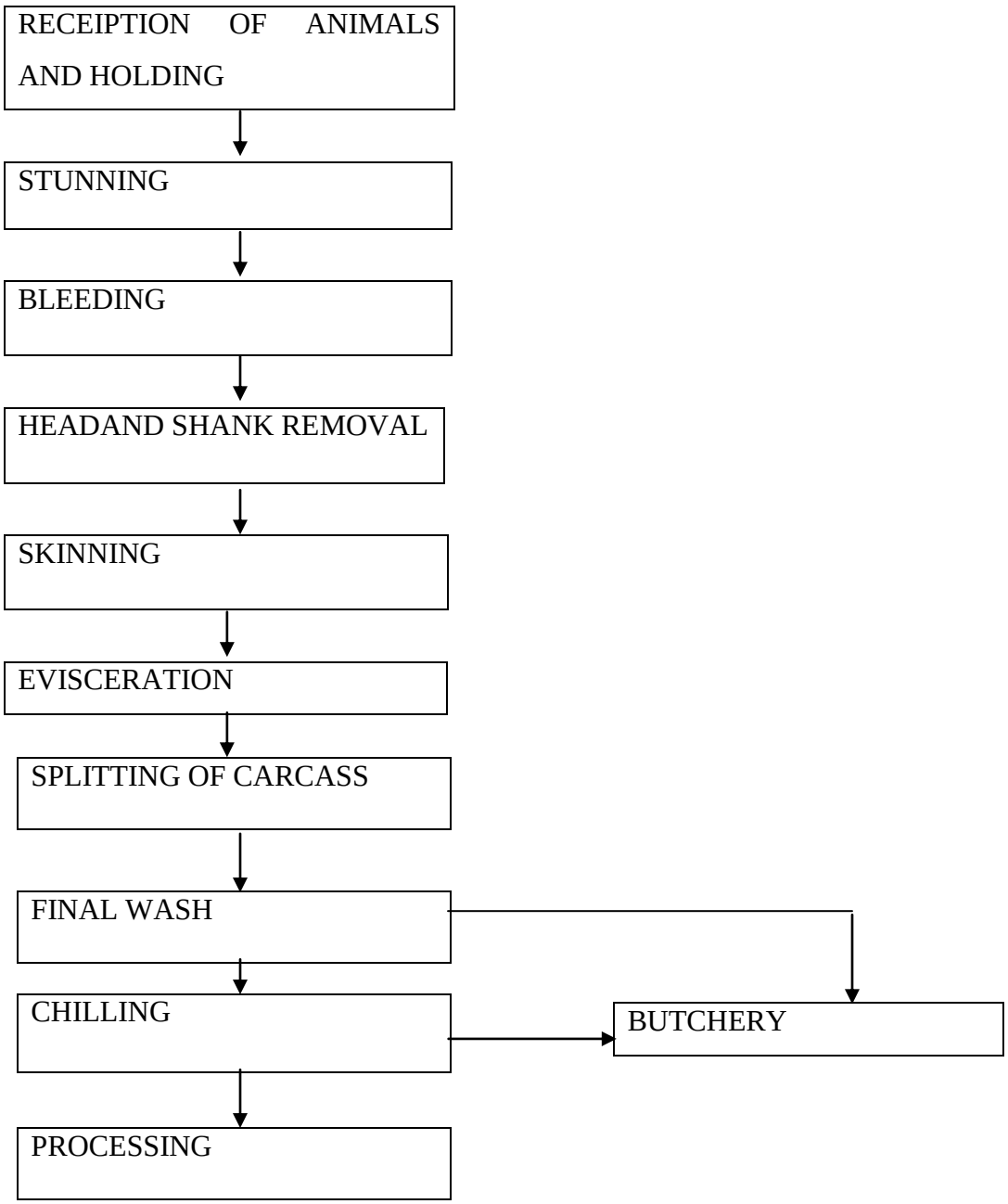
Kenya Gazette. Supplement No 111(Acts No.15) Acts, 2007, Nairobi, 26th October, 2007.Page 100.

Zwi A., Finn S., Steinberg M. (1988). Occupational health and safety in South

Africa:the persective of capital, state and unions.Soc SciMed. 1988;27(7):691-702.

7.0 APPENDICES

Appendix I: The slaughter process



(Source: ILO, 2011)

Appendix II: Nairobi City County Annual Slaughter and Exported Meat Products (2009-2015)

Annual slaughter figures

Year	Bovines	Caprines	Ovines	Pigs	Poultry
2009	33,172	73,038	47,584	96,817	165,234
2010	39,500	105,037	54,195	83,413	173,838
2011	33,600	121,203	60,480	81,563	173,535
2012	28,878	157,207	76,700	98,771	217,214
2013	33,775	212,684	73,512	113,424	221,977
2014	43,286	256,878	99,788	111,981	273,547
2015	70,902	294,804	96,243	124684	79,141
Totals	**283,113**	**10,636,644**	**508,502**	**710,653**	**1,304,486**

Exported Animal Products in Kilograms

Year	Beef products Kgs	Lamb products Kgs	Goat products Kgs	Pork and pork products kgs	Poultry and poultry products kgs	Total Exported animal products
2009	754,345.02	76,675.05	238,678	1,785,367.03	15,567.30	2,870,632.13
2010	853,271.01	68,848.06	220,423	1,871,839.62	18,242.10	3,032,623.17
2011	338,655.52	159,885	423,485.10	2,429,464.95	16,455.14	3,367,945.71
2012	1,020,162.90	361,075	374,380.68	5,306,976.50	13,529.15	7,076,124.23
2013	1,248,299.75	168,033.04	298,523.7	4,058,434.42	64,315.98	5,837,606.89
2014	993,866.05	161,389.01	1,203,547.59	2,775,390.30	49,223.64	5,183,416.5
2015	915,209.17	63901.78	1,281,353.97	1,964,595.2	26,113.55	4,251,173.67
Totals	**6,123,809.42**	**1,059,806.94**	**4,040,392.04**	**20,192,068.02**	**203,456.86**	**31,619,533.28**

Source: County Director of Veterinary Services (Annual Reports 2009-2015 Nairobi City County)

Appendix III: Number of Respondents in each activity in the Slaughter process

Cluster	**Activity in the slaughter process**	**No. of respondents**	**Total respondents Per cluster**
Export	Reception of Animals	6	
	Stunning	5	
	Bleeding	22	
	Skinning(Flaying)	24	
	Evisceration	22	
	Splitting of Carcass	22	
	Final Wash	22	
	Cleaners	22	
	Chilling	22	
	processing	22	**190**
Local A	Reception of Animals	2	
	Stunning	2	
	Bleeding	2	
	Skinning(Flaying)	6	
	Evisceration	3	
	Splitting of Carcass	2	
	Final Wash	2	
	Cleaners	2	
	Chilling	3	**24**
Local C	Reception of Animals	12	
	Stunning	5	
	Bleeding	12	
	Skinning(Flaying)	24	
	Evisceration	20	
	Final Wash of Carcass	7	
	Cleaning	10	**90**
Processing Plants	Reception of Carcass	6	
	Freezer and cold storage	6	
	Deboning Section	7	
	Cutting and Sorting meat	7	
	Smoking Section	4	
	Curing meat and sausage manufacturing	7	
	Fresh meat packaging	3	
	Cooked ready to eat packaging	3	**43**
Totals		**347**	**347**

Appendix IV: Questionnaire

QUESTIONNAIRE FOR DATA COLLECTION FROM SLAUGHTERHOUSES AND MEAT PROCESSING PLANTS IN NAIROBI, KENYA

Questionnaire on the safety of workers in slaughterhouses and meat processing plants in Nairobi, Kenya

The study being undertaken is solely an academic work for a university postgraduate degree. The information to be obtained will be kept very confidential and you are consequently requested to be cooperating and contribute to knowledge generation for the improvement of the safety and welfare of a worker.

Thanks and be blessed.

Instruction: Please tick or fill where appropriate

Name of Slaughterhouse/Processing

Plant……

Name of respondent (optional)…… ……

Position held in the Organization…….

SECTION A: SOCIO-DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS OF THE WORKERS

1. Sex information

   Male [ ] b) Female [ ]

2. What is your age?

   a) 9-18 Years [ ] b) 19-30 Years [ ] c) 30-40 Years [ ] d) 40-50 Years [ ]

   e) Over 50 Years [ ]

3. What is your marital status?

   a) Married [ ] b) Single [ ] c) Divorced [ ]

4. Which religion do you belong to?

   a) Christianity [ ] b) Islam [ ] c) Hindu [ ] d) Others [ ]

5. How long have you Duration worked in this facility?

   a) Less than 5 Years [ ] b) 5-10 Years [ ] c) 10-15 Years [ ]

   d) 15-20 Years [ ] e) 20-25 Years [ ] f) Over 25 Years [ ]

6. What is the level of your education?

   a) Primary Education Level [ ] b) Secondary Education Level [ ]

   c) Diploma Level [ ] d) University Level [ ]

7. What position do you hold in this facility?

   a) Manager [ ] b) Supervisor [ ] c) Employee [ ] d) Any other [ ]

SECTION B: COMPLIANCE TO LEGAL INSTRUMENTS GOVERNING SAFETY

8. Have you heard of the Occupational health and safety Act (OSHA), 2007 and Work Injury Benefits Act (WIBA), 2007?a) No [ ] (b) Yes [ ]

9. Is this Facility Registered under the Occupational Health and Safety Act, 2007?

   a) Yes [ ] b) No [ ] c) I do not Know [ ]

10. Is there a general Health and Safety policy in this facility and do you have a copy of the same?

    a) Yes, I have a copy [ ] b) Yes, do not have a copy [ ] c) No [ ]

    d) I do not know [ ]

11. In case of a situation that presents imminent danger to the safety of your life, whom do you report to? a) My Supervisor [ ] b) The Manager [ ] c) The Occupational Health and safety Officer

12. In this Facility, is there any training carried out touching on issues of your safety and health?

    a) No [ ] b) Yes [ ] c) I do not Know [ ]

13. If the answer to question 12 is yes, who gets trained?

    a) The employees [ ] b) The managers [ ] c) The Supervisors [ ]

    d) All in a, b, and c [ ]

14. When is training on health and safety carried out in this organization?

    a) On recruitment [ ]

    b) On transfer or change of job [ ]

    c) On introduction of new technology [ ]

    d) On introduction of new work equipment [ ]

    e) All in a, b, c and d [ ]

15. Are employees in this organization provided with Personal Protective Equipment (PPES)?

    a) Yes [ ] b) No [ ]

16. In this facility, is there a Health and Safety committee and are you a member?

    a) Yes, a member [ ] b) Yes, not a member [ ] c) No [ ]

    d) I do not know [ ]

17. Who does inspection of this facility to ensure of its safety to you and others?

    a) The employer [ ] b) The safety and health Committee [ ]

    c) The employee [ ] d) I do not Know [ ]

18. How many times have you seen inspection carried out here for your safety and health?

a) Once a year [ ] b) Two times a year [ ] c) Three times a year [ ] d) Four times a year [ ]

19. In case of emergencies like fire, is there a trained team on emergency?

a) Yes [ ] b) No [ ] d) I do not Know [ ]

20. Do we have records of any injuries, accidents and incidents in this facility?

a) Yes [ ] b) No [ ] c) I do not know [ ]

21. Has hazard identification been carried out in this facility?

a) Yes [ ] b) No [ ] c) I do not Know [ ]

22. Has risk assessment for your safety been carried out in this facility?

a) Yes [ ] b) No [ ] c) I do not Know [ ]

23. Is there a clear mechanism of communication and availing of information to employees on plant equipment, hazardous substance and work processes?

Yes [ ] b) No [ ]

24. If the answer to question 23 is yes, what language is used to avail the relevant information?

a) English [ ] b) Swahili [ ] c) Local vernacular [ ]

d) Both English and Swahili [ ]

25.) Has an Occupational Safety and Health Officer visited this facility? a) Yes [ ] b) No [ ] c) I do not Know [ ]

26.) If the answer to Question 25 is yes, when was the last visit made?

a) One month ago [ ]

b) Two months ago [ ]

c) Three months ago [ ]

d) Six months ago [ ]

e) One year ago [ ]

f) I do not know [ ]

SECTION C: INJURIES

27.) Have you been injured while working?

a) No [ ] b) Yes [ ]

28.) If the answer to question 27 is yes, which part of your body was affected?

a) Fingers, arms and wrist [ ] b) Shoulders and neck [ ] c) Back [ ] d) Legs [ ]

e) Ankle [ ]

29.) What caused your injury?

a) An animal [ ] b) An object Struck me [ ] c) While Handling and lifting [ ]

d) Slips and fall [ ] e) Machinery [ ] f) Transport [ ] f) Electrical problem [ ]

g) Fire [ ] h) Aggression, fright, shock and Violence [ ]

30.) Which types of Injuries have affected you?

a) Wound or superficial injury [ ]

b) Bone fracture [ ]

c) Dislocation, sprain or strain [ ]

d) Concussion, Internal Injury, Burn, scald or frost bite [ ]

e) Poisoning, Infection ,suffocation(asphyxiation [ ]

f) Other types [ ]

g) None at all [ ]

31.) In the course of last year, have you been injured and given off?

a) Yes [ ] b) No [ ]

32.) If yes, how many days were you off from duty as a result of the injury?

a) 4-6 days [ ]

b) 7-13 days [ ]

c) 14-20 days [ ]

d) 21- 30 days [ ]

e) 1 month-3 months [ ]

f) 3 months- 6months [ ]

g) 6 months and over [ ]

33.) Have you been sick in the course of last year (2015)?

a) No [ ] b) Yes [ ]

34.) If the answer to 33 is yes, was the sickness related to

a) Bone, Joint or muscle problem [ ]

b) Breathing or lung problem [ ]

c) Hearing problem, headache [ ]

d) Stress, depression anxiety [ ]

e) Skin problem [ ]

f) Not Applicable [ ]

35.) What specific Risks are associated with this facility? Rank the risk (1-12)

a) Manual handling [ ]

b) Noise [ ]

c) Knives' safety [ ]

d) Hazardous substances [ ]

e) Mechanical Hazards [ ]

f) Electrical Hazards [ ]

g) Temperature extremes [ ]

h) Confined Spaces [ ]

i) Zoonotic diseases [ ]

j) Slips and falls [ ]

k) Being knocked by an animal [ ]

l) Vehicle Accident [ ]

SECTION D: MANAGEMENT OF INJURY OUTCOMES

36.) If you have been injured in the course of your duty, whom did you report to?

a) My supervisor [ ] b) My fellow worker [ ] c) The manager [ ]

37.) How were you treated after the accident/injury?

a) Received First Aid Treatment [ ]

b) Taken to hospital as outpatient by the management [ ]

c) Taken to Hospital and admitted by the management [ ]

d) Continued to work and never reported [ ]

38.) Did anybody carry out the accident investigation to determine the exact cause of the accident?

a) Yes [ ] b) No [ ] c) I do not Know [ ]

39.) Do we have trained first Aiders in this facility?

a) Yes [ ] b) No [ ] c) I do not Know [ ]

40.) Do we have First Aid Rooms in this Facility?

a) Yes [ ] b) No [ ] c) I do not Know [ ]

41.) As an employee in this organization, are you insured as you work here?

a) Yes [ ] b) No [ ] c) I do not Know [ ]

END OF SURVEY: THANK THE RESPONDENTS

Appendix V: Checklist for Focused Group Discussions and Key Informant Interviews

Interviewer Initials		**Date**	
FGD/KII Code No			

Nature of Participant: (Tick Appropriately)

FGD		**No**	**KII**		**No**
Men			Meat Inspector		
Women			Veterinary Officer		
			Public Health Officer		
			Leather Technology Officer		
			Manager		
Others(Specify)			Others (Specify)		

Questions

SECTION A: COMPLIANCE TO OSHA, 2007

1. Why is the safety of workers in this facility very important?

2.) Do we have any hazards in this facility that may negatively impact on the safety of the workers?

-List the Hazards in the order in which they have affected the safety of the workers

3. Occupational Health and Safety Act (OSHA, 2007) was enacted to address the safety and health of the workers in all organization and lays emphasis on:

-Training-Is training carried out and when?

-Registration of all premises-Is this facility registered under this Act?

-Health and safety Committees-Does this Facility have this Committee and what is the work of this committee?

4. Who provides Personal Protective Equipment (PPEs) in this facility?

-List them and say how they protect the worker

5. Have you heard of the Directorate of Occupational Health and Safety?

If yes, do Officers from this Directorate visit this Facility?

SECTION B-INJURIES

6. Is it possible in a slaughterhouse or meat Processing plant to have workers injured?

-Can you list the possible causes of injuries in these facilities?

7. How are injury outcomes handled in these facilities?

8. What are the determinants of rates of injuries in these enterprises?

-What can be done to reduce the injury rates of workers in such facilities?

Appendix VI: Observational checklist in slaughterhouses and processing plants, Nairobi City County

Date----------

Name of facility……

S/NO	ITEM	YES	NO	REMARKS
1.	Perimeter Containment for animals			
2.	Offloading point for the animals			
3.	Lairage in the facility			
4.	Is stunning done? Indicate type in the remarks			
5.	Are workers working in heights?			
6.	Are floors slippery?			
7.	Is cleaning of the floor continuous?			
8.	Do we have First Aid Boxes?			
9.	If yes, any items in the Box?			
10.	Are fire Extinguishers Available?			
11.	Are fire exit signs available?			
12.	Do we have hazardous materials in this facility?			
13.	If yes, are Pictograms clearly indicated?			
14.	If yes in 13, is Material Safety data Sheet available?			
15.	Are workers in PPE in this facility?			
16.	Is there enough light in the killing/processing area?			
17.	In processing, Chopping of the meat is done by Knife, Cleaver Chop-slicing machine, Tick			
18.	In processing, are high speed machines guarded to protect the workers from rotating blades?			
19.	Can you see machines used in Mincing and grinding of meat?			
20.	Are machines used in this facility electrically operated?			
21.	Are electrical wires concealed?			
22.	Are emergency exits accessible?			
23.	Is suitable clothing available for workers who need extra protection against cold?			
24.	Is Ventilation of the room adequate?			
25	Is there adequate space for the workers in every job?			
26	Is hand drying facilities provided?			
27	Is the task performed in confined space?			
28	Are floors slippery or uneven or unsafe?			

Appendix VII: Informed Consent Form

My name is Charles Makori Motari. Iam a Masters student from Kenyatta University. Iam conducting a study on "Safety of Workers in Slaughterhouses and Meat processing Plants in Nairobi, Kenya" The information will be used by the Department of Veterinary services and the Directorate of Occupational Health and Safety to improve on your safety and the safety of others who may be affected directly or indirectly by your work. The information generated will also be used by these facilities for continuous improvement on the safety of workers and hence increase quality of the products and profitability of the enterprises.

Procedure to be followed

Participation in this study will require you to answer questions as outlined in the questionnaire and some questions may be asked outside the questionnaire and will be recorded.

You have the right to refuse participation in this study and we respect your decision. Please remember the participation in this study is voluntary and you are free to ask questions relating to this study at any time.

In this study, you may refuse to answer to any questions in the questionnaire or during any interview and you may stop an interview at any time. You can also stop being in the study at any time without any consequences from the management

Discomforts and Risks

Some of the questions you will be asked on the performance of your work may be embarrassing or may make you uncomfortable. If this happens, you may refuse to answer these questions if you so choose. You may also stop or withdraw from the interview at

any time. The answering of questions in the questionnaire may take approximately twenty five minutes and the interview will take twenty minutes.

Benefits

If you participate in this study, you will help us to learn on how to improve your work environment and improve on your safety and welfare and this will reduce the risk of you being injured as you perform your duty in this facility.

Reward

If you agree to participate in this study, lunch will be provided and transport expenses will be reimbursed.

Confidentiality

You will be given the questionnaires within the enterprise and fill it alone. Your name will not be recorded on the questionnaires. The questionnaires will be locked in a locked cabinet for save keeping at Kenyatta University. Everything will be kept private.

Contact Information

If you have any questions you may contact Dr. Peterson Njogu Warutere Supervisor 1. On mobile number 0721993833 or Dr. Purity Nguhiu on mobile number 0722737711 or the Kenyatta University Ethical Review Committee Secretariat on chaiman.kuerc@ku.ac.ke,secretary.kuerc@ku.ac.ke,ercku2008@gmail.com

Participant's Statement

The above information regarding my participation in the study is clear to me. I have been given a chance to ask questions and my questions have been answered to my satisfaction. My participation in this study is entirely voluntary. I understand that my records will be kept private and that I can leave the study at any time. I understand that my decision to

withdraw from the study or refuse to answer some question will be respected by both the management and the investigator.

Name of Participant……

…… ……..

Signature or Thumbprint Date

Investigators statement

I, the undersigned, have explained to the volunteer in a language she/he understands the procedures to be followed in the study and the risks and benefits involved.

Name of Interviewer/ Questionnaire administrator……

…… ……..

Signature or Thumbprint Date

Appendix VIII: Kenyatta University Ethics Review Committee approval

KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Fax: 8711242/8711575
Email: kuerc.chairman@ku.ac.ke
kuerc.secretary@ku.ac.ke
Website: www.ku.ac.ke

P. O. Box 43844,
Nairobi, 00100
Tel: 8710901/12

Our Ref: KU/R/COMM/51/820

Date: 1st November, 2016

Makori Charles Motari
Kenyatta University
P.O. Box 43844 – 00100
NAIROBI

Dear Makori

APPLICATION NUMBER **PKU/567/I656** – "SAFETY OF WORKERS IN SLAUGHTERHOUSES AND MEAT PROCESSING PLANTS IN NAIROBI, KENYA" – VERSION 2

---

1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic **"Safety of Workers in Slaughterhouses and Meat Processing Plants in Nairobi, Kenya" Version 2** received on 25th October, 2016 and discussed on 27th October, 2016.

2. APPLICANT
Makori Charles Motari

3. SITE
Nairobi County, Kenya

4. DECISION

The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines **AND APPROVED that the research may proceed for a period of ONE year from 1st November, 2016.**

5. ADVICE/CONDITIONS

i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
ii. Serious and unexpected adverse events related to the conduct of the study are reported to this board immediately they occur.
iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
iv. Submit an electronic copy of the protocol to KUERC.

When replying, kindly quote the application number above.
If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

KENYATTA UNIVERSITY OFFICE OF THE CHAIRMAN 03 NOV 2016 ETHICS REVIEW COMMITTEE P.O. BOX 43844 - 00100 NAIROBI

DR. TITUS KAHIGA
CHAIRMAN ETHICS REVIEW COMMITTEE

I, MAKORI CHARLES accept the advice given and will fulfill the conditions therein.

Signature..... Dated this day of 3rd NOVEMBER, 2016.

cc. Vice-Chancellor
DVC-Research Innovation and Outreach

Appendix IX: National Commission for Science, Technology and Innovation Research Authorization

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email:dg@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/16/65833/14951**

Date: **14th December, 2016**

Charles Makori Motari
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Safety of workers in slaughterhouses and processing plants in Nairobi,Kenya''*** I am pleased to inform you that you have been authorized to undertake research in **Nairobi County** for a period ending **6th December, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Nairobi County** before embarking on the research project.

On completion of the research, you are required to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

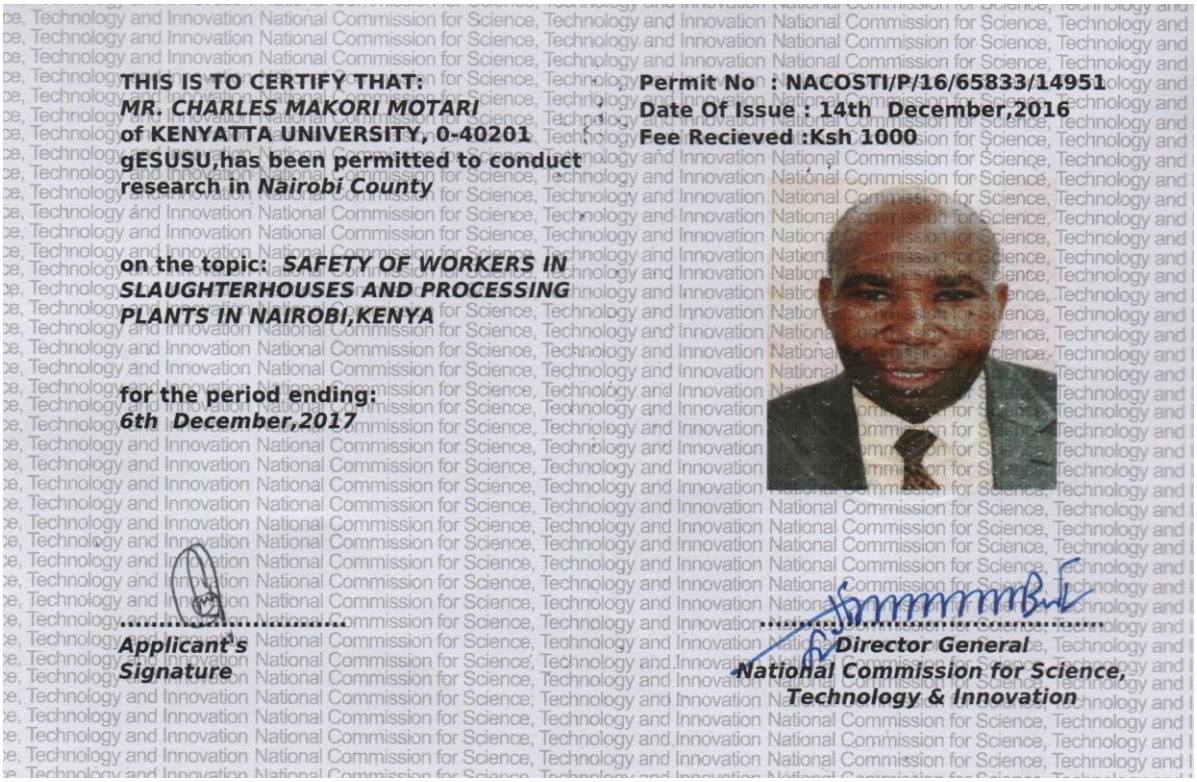
The County Commissioner
Nairobi County.

The County Director of Education
Nairobi County.

COUNTY COMMISSIONER
NAIROBI COUNTY
P. O. Box 30124-00100, NBI
TEL: 341666

COUNTY DIRECTOR OF EDUCATION
NAIROBI
15 DEC 2016
MINISTRY OF EDUCATION
P. O. Box 74629, NAIROBI

Appendix X: National Commission for Science, Technology and Innovation Research Clearance Permit



THIS IS TO CERTIFY THAT:
MR. CHARLES MAKORI MOTARI
of KENYATTA UNIVERSITY, 0-40201 gESUSU,has been permitted to conduct research in *Nairobi County*

on the topic: *SAFETY OF WORKERS IN SLAUGHTERHOUSES AND PROCESSING PLANTS IN NAIROBI,KENYA*

for the period ending:
6th December,2017

Permit No : NACOSTI/P/16/65833/14951
Date Of Issue : 14th December,2016
Fee Recieved :Ksh 1000

.....
Applicant's Signature

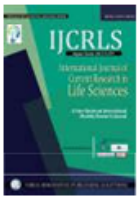
.....
Director General
National Commission for Science, Technology & Innovation

Appendix XI: Published Research Article.

ISSN: 2319-9490

Available online at http://www.ijcrls.com

International Journal of Current Research in Life Sciences
Vol. 07, No. 05, pp.2020-2023, May, 2018



RESEARCH ARTICLE

FACTORS ASSOCIATED WITH THE INJURIES INFLICTED TO WORKERS IN SLAUGHTERHOUSES AND MEAT PROCESSING PLANTS IN NAIROBI, KENYA

***Makori, C.M., Warutere, P.N. and Nguhiu, P.N.**

Department of Environment and Occupational Health, Kenyatta University, Kenya

Received 17thMarch, 2018; Accepted 26th April, 2018; Published 18th May, 2018

ABSTRACT

Background: Slaughterhouse facilities and meat processing plants are known to pose significant threats to worker's safety and health due to the hazardous conditions involving animals, tools and dangerous machines used in the meat industry.

Objective: To investigate the types of injuries and associated factors experienced by workers in slaughterhouses and meat processing plants in the study area since the extent of this has an impact on the safety of the employees.

Methodology: A total of 347 respondents were included in this study out of an estimated population of 2206 workers in slaughterhouses and meat processing

plants in the study area. Information was obtained using structured questionnaires, Key informant Interviews and focused group discussions.

Result: The types of injuries inflicted to these workers included wounds/superficial injuries (57.3%), bone fracture(7.5%), concussion, internal injury, burn, scald or frost bite(4.0%), poisoning, infection and suffocation (4.0%) and other types (8. 0%).

Demographic factors had a significant influence on injury rates and so was the category of a slaughterhouse and processing plant. The level of implementation of Occupational Health and Safety Act (OSHA, 2007) determined the injury rates in these facilities.

Overall, workers in Nairobi experienced very high injury rates (21.9 per 100 full-time workers).

Conclusion: Demographic factors had an influence on incidence of injuries and the category of slaughterhouses and processing

plants which again was closely linked with the level of compliance to OSHA, 2007.

Key words: Injuries, slaughterhouses, workers.