

**OCCUPATIONAL HAZARDS AWARENESS AND SAFETY PRACTICES AMONG
PETROL SERVICE STATION WORKERS IN NAKURU COUNTY, KENYA**

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**A Thesis Submitted to the Graduate School in Partial Fulfilment of the Requirements
for the Master of Science Degree in Environmental and Occupational Health of Egerton
University**

EGERTON UNIVERSITY

NOVEMBER, 2020

DECLARATION AND RECOMMENDATION

Declaration

This thesis is my original work and has not been submitted to any other university for the award of a degree.

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DEDICATION

I dedicate this thesis to my family, my son, Jayden Mugambi, my daughter Jean Pendo and all my dear friends for their continuous encouragement, moral support and contributions while undertaking this research work. Without them I could have not been able to accomplish this work.

ACKNOWLEDGEMENTS

My foremost appreciation goes to God Almighty for the grace and guidance while undertaking this research project. I would like to thank the almighty God for his guidance and blessings that he rendered throughout my research work.

I am grateful to Kayiwa's family for their financial support and for enabling me undertake studies up to this far. Without their moral and financial support, I would not have made it to this end.

My appreciations go to Egerton University for allowing me to undertake my Master of Science degree in Environmental and Occupational Health and my supervisors, Prof. Wilkister Moturi and Dr. Stanley Makindi for their invaluable advice and guidance throughout this study. Their constructive criticisms and comments made this research work a success.

I would like to express my gratitude to Directorate of occupational Safety and Health Nakuru County, Mr. Joseph Kamau and Judith Muteitsi for their time and cooperation during data collection. Special thanks go to Betty Langat and Felista Kinyanjui for their assistance during fieldwork.

Finally, my sincerely gratitude goes to petrol stations management who allowed me to conduct my research in their workplace and all respondents who took time off their busy schedule to participate in the research survey. Without their contribution, this survey would not have been successful.

ABSTRACT

Globally, there has been tremendous increase in number of petrol service stations to refuel ever increasing automotive. In Kenya, oil and gas industry is rapidly emerging as a main source of employment especially in urban and peri-urban areas where it has attracted large workforce who work either at the petrol stations' dispensing area or at auto servicing sections. A Petrol station like any other petroleum industry generates and releases volatile organic compounds in all its operations. However, there is little or no documented information concerning hazard awareness and safety practices among petrol stations attendants in Nakuru County that can be used for health hazard control interventions. This research therefore highlights gaps in safety practices as well as factors that influence these practices in order to come up with appropriate information for health hazard control interventions. The research focused on one hundred and ninety-two (192) petrol station workers picked randomly from purposively selected 32 petrol stations in Njoro, Molo and Nakuru Municipality to give a desired sample size. The respondents were proportionately drawn from dispensing pump section, car servicing bay and front office section. A pilot test was conducted in Naivasha sub-county to test the validity and reliability of the research instruments. Data was analyzed using Statistical Package for the Social Sciences (SPSS Version 20). Findings of the study revealed that 60% of the respondents stated that employer provided PPE, out of which the commonest being Aprons/overall (99.1%) while the least being face mask (16.7%). However, from observations, only 12, (6.7%) of the respondents used PPE at the time of the study commonest being Aprons/overall (99.1). Safety sign "No smoking" was observed in all petrol stations as opposed to other safety signs, "turn off engine," "switch off phone" and "use of recommended container". About 48.3% had undergone safety training, 70% of the stations had emergency response plan while 90% of the accidents were caused by fuel splash to skin. From the findings of the study it can be concluded that there was low use of PPE among petrol station workers as operations were done without appropriate attire even by those who said had. Whereas the safety training among the staff and management is essential, supervisors should also enforce use of safety equipment and instigate disciplinary actions against non-compliance where necessary. The study recommends petrol stations to embrace Occupational Safety and Health Management System (OSHMS) which aims at reducing the operations mistakes, cost of correcting problems and level of risks while ensuring compliance with laws.

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LIST OF ABBREVIATIONS AND ACRONYMS

BTEX	Benzene, Toulene, Ethylbenzene and Xylene
DOSHS:	Directorate of Occupational Safety and Health Services
EAC	East Africa Community
EHS:	Environmental, Health and Safety
ERC:	Energy Regulatory Commission
GoK:	Government of Kenya
GSOG:	General Safety Orientation Guidelines
HSE:	Health Safety Executive
ILO:	International Labour Organisation
IPM:	Independent Petroleum Marketers
LPG:	Liquid Petroleum Gas
NACOSTI:	National Commission for Science, Technology and Innovation
NEMA:	National Environmental Management Authority
MoE	Ministry of Education
MoH	Ministry of Health
OSHA:	Occupational Safety and Health Act
OSHMS	Occupational Safety and Health Management Systems
PEF:	Peak Expiratory Flow
PEME	Pre-Employment Medical Examination
PPE:	Personal Protective Equipment
PSV:	Public Service Vehicle
PMS	Premier Motor Spirit
SHP	Safety and Health Practitioner
SME:	Small and Medium Enterprises
UST	Underground Storage Tanks
VoCs:	Volatile Organic Compounds
VRU:	Vapour Recovery Units
VCS:	Vapour Control System
WHO:	World Health Organisation
WHSQ:	Workplace Health and Safety Queensland
WIBA	Work Injuries Benefit Act

CHAPTER ONE

INTRODUCTION

1.1. Background Information

Petroleum industry has become one of the fastest growing sector due to ever increasing use of automotives and the population growth in urban and semi urban areas in the world. In Kenya, the number of petrol stations has increased tremendously in urban and along major roads. Petroleum products which include, diesel, petrol and kerosene move from the deployed underground tanks through a system of underground pipes to the respective dispenser pump machines. Petrol stations may have single or multiple dispenser pumps for each product with fuel tanks which vary in number and sizes depending on the local market demand (Chilcott, 2008). Consequently, petrol stations in developing world including Kenya have pumps attendants at the dispenser pump to refuel customers' automotives. However, developed countries in Europe, America and a number of Asian countries, for example, India, China and Malaysia have introduced self-service machines. Moreover, in some countries including India, the customers have an option of choosing a self-refueling petrol station, where they refuel their own vehicles or traditional fueling service where customers' vehicles are refueled by a pump attendant (Solanki *et al.*, 2015). Apart from refuelling services, these facilities also sell liquidified pressurised gas (LPG) cylinders and provide a 24-hour vehicle services like car wash, oil change and mechanical repairs to automobiles, food outlets and large parking areas to its customers; attracting massive employment of staff into petroleum industry.

Petrol stations generate and release Volatile Organic Compounds (VOCs) which consist of a mixture of benzene, toluene, ethylbenzene, and xylenes (BTEX). These chemical hazards (toxic vapours) are released during loading, storage, supply and refueling of automotives, oil spillage and exhaust fumes released from customers' automotives and finds its way into the work environment thus constitutes a high potential risk to the environment, station attendants' health and the general population. A study by Robert *et al.* (2014) on impact of petrol station on environment in Ghana states that 28% of surveyed stations do not have leak detection systems that alert attendants while 65% do not check leaks. Forty nine percent of petrol stations do not have vapour recovery system that prevents petroleum

vapours from escaping to the environment while 18% of the surveyed stations do not have adequate measures to prevent spillage. Moreover, a study done in Brazil by Sergio *et al.* (2012) on the impact of BTEX emissions from the petrol station into atmospheres, shows that there are high concentration of toxic gas around petrol stations and their concentration level were similar to those found in the tunnels.

In order to minimize the exposure to these chemical hazards, General Safety Orientation Guidelines (GSOG) for oil and Gas industry (Mitchelle *et al.*, 2012) and a guide for service station operators (Workplace Health and Safety Queensland, 2016) emphasizes on the need of employers to provide occupational safety and health orientation to their new, young and inexperienced workers upon their hire or transfer regardless of the jurisdiction in which they operate. The safety information should include but not limited to the specific hazards, conditions, equipment, procedures, policies, practices, rules and regulations where the work occurs and company responsibility. Workers are supposed to wear Personal Protective Equipments (PPEs) like gloves, overalls and practice high personal hygiene at all time at work place. The guidelines further recommend that inhalation of petrol vapour can be minimized when a workplace is provided with adequate ventilation, workers work in shifts and rotation of task. All containers used to store and transport petrol must be suitable, leak-proof, made of metal or other material of adequate strength and construction to prevent evaporation. Furthermore, petrol stations are required to install Vapour Control System (VCS) and activated at the time of discharge of petroleum products from petrol tankers to the Underground Storage Tanks (UST). Moreover, installation of Vapour Recovery Units (VRU) in the petrol bulk storages ensures that all petroleum vapours released from the USTs are recovered (Eisaei *et al.*, 2015). The Government of Kenya (GoK) through an Act of Parliament published the Occupational Safety and Health (OSH) Act in 2007 to replace Factories and Other Places of Work Act in order to reflect not only developments in technology and knowledge but also to address new areas of coverage including Small and Medium Enterprises (SME) and informal sectors other than factories/industries. Thus, the OSH Act (2007) aims at promoting workers' health, reporting of workplace injuries, near misses and diseases and to promote creation of safety culture at all workplace (Afubwa, 2004).

In Nakuru County, like any other place in Kenya, dispenser pump attendants serve each automotive that requires refueling rather than self-service making them to be at the greatest risk of exposure to potential VOCs through breathing the toxic vapour from the petrol spillage, fire explosion, contamination of attendants' clothe with petrol and automobile exhaust. These toxic gases have direct impact on human health because they are associated with allergic skin reactions, respiratory disorders, neurogenic, carcinogenic and mutagenic potential (Lin *et al.*, 2004). Sergio *et al.* (2012) present some findings done in Greece where the results indicate that people in the vicinity of a petrol station have an increased risk of cancer from 3 to 21%. In addition, a study by Mhina (2010) on respiratory health problems among petrol station pump attendants in Dar es salaam indicate that there is possibility of reduced lung function on petrol station workers. The results indicate that there was significant loss of 1.35 litres of Peak Expiratory Flow (PEF) among the workers who participated in the study thus implying that pump attendants had acute respiratory problems due to occupational exposure to VOCs. Further, a study done by Jo and Song (2001) indicates that exposure levels associated with gasoline vapour emissions in petrol service stations, car service bay and petroleum refineries were higher than those associated with motor vehicle emissions. However, the health effects of VOCs will depend on the nature of the volatile organic compound, the level of exposure, and the length of exposure (Kesavachandran *et al.*, 2006).

1.2.Statement of the Problem

Nakuru has experienced rapid increase in the number of petrol service stations over the past ten years. This is due to the fact that it serves as a major transport hub; passengers' vehicles and transit makes stop-over for refuelling, refreshment and sleep over before proceeding to western part of Kenya and other East and Central Africa countries. Apart from refueling, petrol service station also provides vehicle services like car wash, oil change and mechanical repairs to automotives, food outlets, large parking areas for its customers and booking offices for public service vehicles (PSV) thus attracting massive employment of staff and customers. However, these staff and customers are at a risk of hazards such as fire or explosions because petroleum products release toxic volatile and flammable gases that can easily give off even at low temperature. Moreover, dispenser pump attendants in Nakuru county like any other petrol station in Kenya play a major role in running all aspects of activities, serving each automotive that requires refueling rather than self-service making them to be at the greatest risk of exposure to occupational hazards. Repeated inhalation of

toxic vapours by pump attendants from petroleum products and automotive exhausts may not only result to acute respiratory disorders and allergic skin reactions but are also associated with carcinogenic and mutagenic health effects. There is little or no documented information concerning hazard awareness and safety practices among petrol stations attendants in Nakuru County that can be used for health hazard control interventions. This research therefore will highlight gaps in safety practices as well as factors that influence these practices in order to come up with appropriate information for health hazard control interventions.

1.3. Study Objectives

1.3.1. Broad Objective

To generate information on occupational hazard awareness and highlight gaps in occupational health and safety practices among petrol stations workers which could provide appropriate data that can be used to come up with appropriate occupational and health hazard control interventions.

1.3.2. Specific Objectives

The specific objectives of the study are:-

- i) To establish occupational health and safety practices evident in petrol stations.
- ii) To document factors that influence occupational health and safety practices in the selected petrol stations.
- iii) To assess the existing safety policies and regulations for petrol stations and determine the extent to which they address occupational hazards
- iv) To document health risk and safety management systems in place in the selected petrol stations and determine if they comply with existing safety regulations.

1.4. Research Questions

- i) What occupational health and safety practices are in place in petrol stations?
- ii) What factors influence occupational health and safety practices in the selected petrol stations?
- iii) What safety policies and regulations for petrol stations are in place to govern petrol stations in Nakuru County and do they address occupational hazards?

- iv) What health risk and safety management systems are in place in the selected petrol stations and do they comply with existing safety regulations?

1.5. Justification of the Study.

According to Mirza *et al.* (2012) safety and health management is one of the vital constituents of petroleum industry activities because most of the operational conditions, chemicals and end products associated with petroleum are well-known to pose serious safety and health threats to the workers. Workers are directly exposed to occupational hazards during refueling of the automobiles, bulk loading, moving of LPG cylinders, storage of petroleum products and cleaning fluid containers which may cause respiratory problems, dermatitis or chemical burns, back injury or even muscular strains.

The OSH Act (2007) points out the responsibility of employers and workers' role in ensuring safety at work place. Whereas the employers are to provide a safe and healthful workplace free of recognized hazards, comply with OSHA standards, provide training and required protective equipment; workers must follow the employer's safety and health rules that comply with OSHA standards and wear or use all required gear and equipment. World Health Organisation (WHO) and International Labour Organisation (ILO) estimates for the year 2000 was that there were 2 million work related deaths per year, 250 million non-fatal accidents and occupational disease caused absenteeism from work. The above alarming incident figures clearly highlighted the need for an effective occupational safety and health management system that integrates safety and health concerns into daily routines. There is little or inadequate data on occupational safety awareness among petrol station attendants in Kenya. This study highlighted the level of occupational hazard awareness, use of provided safety procedures among the petrol station attendants and the benefits of an effective Occupational Safety and Health Management System (OSHMS) for the petroleum industry. These findings will assist policy makers and petrol station owners in drafting appropriate legislations and policies regarding safety awareness, use of safety equipment provided and their challenges in implementing existing safety policies.

1.6. Scope of the Study

The study was confined to Nakuru County in the three sub-counties; Nakuru municipality, Molo and Njoro (Figure 3.1). The three sub-counties were a true representation of the County since Nakuru municipality represented the urban areas while Molo and Njoro

represented peri-urban and rural areas which too have petrol service stations. The study involved 32 petrol stations and the sampling areas included both the Multi-national companies service stations and the independent Petroleum Marketers in the above selected sub-counties. Data was collected from petrol station attendants, front office staff and Directorate of Occupational Safety and Health (DOSHS). Information on the knowledge, attitude and safety practices, factors that influence safety practices, existing safety polices and the health risks and safety management systems in the petrol stations was collected and analyzed.

1.7. Limitations and Assumptions of the Study

1.7.1. Limitations of the Study

The researcher encountered several challenges during data collection. One of the challenges was resistance from the owners or management of the petrol service stations. The researcher had to assure the management that information given was for the study purpose and would not be shared to a third party. Some petrol stations declined to be part of the survey. They were replaced by petrol stations that were willing to participate. Some employees were unwilling to volunteer information fearing victimisation by management. However, this was overcome by assurance in the consent form that information given would be treated confidential and not shared to the management.

1.7.2. Assumptions of the Study

- i) The types of activities undertaken in all selected petrol stations were similar.
- ii) The data collected during the study reflected the true representation of the situation at the time of the survey.

1.8. Operational Definitions of Key Terms

Adulteration: Is defined as the illegal or unauthorized introduction of foreign substances into motor fuels thereby altering and degrading the quality of the fuel.

Attendants: Refers to workers in the petrol station who do fuelling job and also do oil changes and mechanical repairs of the automotives.

Attitude: Refers to the feeling of people toward safety practices as well as any preconceived ideas that they may have towards it.

Automotives: These are means of transport that usually have wheels and an engine.

Bollard: A short thick concrete or metallic posts installed around the dispenser pump to prevent vehicles from striking gas pumps and damaging the pumps.

Education: The training or skill obtained by workers through a learning process at a school or institution prior to their employment in the petrol station.

Hazard: Refers to conditions or situations present in a petrol station that possess a level of threat to life, health and environment.

Health: Refers to a state of complete physical, mental and social well-being of petrol stations' attendants and not merely the absence of a disease (WHO, 1948).

Health and Safety Management Systems: It refers to a set of laid procedures and routing processes in place which aimed at minimising the incidences of injuries and illness at workplace.

Illness: It refers to any abnormal health condition or disorder caused by exposure to occupational hazards found in petrol stations,

Independent Petrol Marketers: It refers to local oil companies that engage in the marketing or distribution of refined petroleum product and are not affiliated with, controlled by or under any common control with any refine.

Knowledge: Refers to the workers' understanding of any given topic on occupational hazards and safety practices in relation to petrol stations. In this study, knowledge level will be measured using likert scale

Multinational Companies: The term 'multinational companies' is used to operationally refer to oil and gas companies that competes across borders. Multinational Oil Company operates in more than one country

Neurotoxic effects: Refers to toxicity in the nervous system and it includes visual blurring, delirium, unconsciousness, coma and convulsions associated with petroleum products

Peak Expiratory Flow: Refers to how fast (ability) a person can exhale when exposed to toxic fumes associated with petroleum products. The PEF is reduced in proportion to the severity of the airway obstruction.

Perception: This is the way workers think about or understand on the use of provided safety equipment.

Petroleum products: These include gasoline, diesel fuel, residential fuel oil, kerosene and Liquid petroleum gas such as propane.

Petrol Service station: Any facility that has dispenser pumps for petrol, diesel and kerosene; customers can refuel their automobile, get services like carwash, oil change, mechanical repairs to automotive, parking area and food outlet.

Policies and regulations: These refers to rules that are made by the company to safeguard the health, safety and welfare of all workers and persons legally present at workplace

Risk: The possibility that harm (death, injury or illness) might occur when exposed to a hazard present in a petrol station.

Risk control: Means taking action to eliminate or minimise any health and safety risks associated with hazards found in a petrol station.

Safety: Refers to freedom from the occurrence or risk of injury, danger, or loss of property in and around the petrol station.

Self-service: A self service station is one where the customers have to serve themselves.

Servicing section: Part of petrol station where customers get car services like carwash, oil change, mechanical repairs to automotive and parking.

Tanker: a truck or a vehicle that transports petroleum products either liquid or gas form

Volatile Organic compounds: These are highly toxic chemicals that contain carbon, lead, nitrogen oxides, particulate matter, polycyclic aromatic hydrogen, sulphur, benzene and chlorine and are found in petroleum products and can easily change from liquid to vapour.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

Petrol service stations are particularly hazardous workplaces which require to be licenced and regulated by Local Authorities because their operations involve loading, storing and selling a highly flammable liquid. However, petrol stations have attracted massive number of workers since customers visit these premises not only to refuel their automotives but also to access other services like car wash and catering services. According to World Health Organization (WHO), workplace is considered as a priority setting for health promotion in the 21st century and therefore should have a positive impact on the health and well-being of workers, their families and society at large. This is achievable through adoption of labour codes where every organization has laws and regulations on occupational safety, health and working environment. On the contrary, one in three workers' compensation accidents involve new employees and this may be attributed to lack of right training on safety precautions or if they are, they do not practise safety procedures within their work place (Sousa, 2014). Whereas in Sub-Saharan African countries about 54 000 fatal occupational accidents happen annually and approximately, 42 million work-related accidents that took place resulted to at least 3 days absence from work (Clift, 2005). Moreover, the fatality rate as a result of work related incidences in Sub-Saharan African countries is 21/100000 workers and the accident rate per 100000 workers is 16000 (Hamalainen *et al.*, 2015). However, there is little or no documentation on the occupational injuries and fatalities in Kenya meaning that there is likelihood that such cases go unreported or overlooked thus they are not documented.

Before building of a petrol service station, operation, management and emergency procedures should be in place and arrangement for the initial staff training (Perry, 2003). This is because petrol stations which lack the minimum basic standard requirements in safety, health and risk control pose serious health threat to the station attendants, visiting clients and the residents who live next to the service station (Yirenkyi, 2017). Therefore, the regulatory body mandated with environmental protection should not only issue permits during set up but also periodically inspect and fine erring operators (Yirenkyi, 2017).

2.2. Hazard Awareness and Safety Practice among Workers.

2.2.1. Hazard and Safety Awareness

Every three-and-a-half minutes, somebody in the European Union (EU) dies from work-related causes (European Agency for Safety and Health at Work, 2004). This translates to almost 167,000 deaths a year as a result of work-related accidents and illnesses. This is despite the fact that employers are required by law to provide a reasonably practicable safe working environment. Where the hazard cannot be eliminated for instance in petrol stations where toxic fumes are generated and released during operations, the employer is required to provide information to the workers on the type of hazards in place and health and safety procedures available at petrol station including the persons or personnel to whom the worker may make an inquiry or launch a complain about their safety and health (Colborn *et al.*, 2011).

According to Shin (2007), employers and management should communicate the safety rules put in place and enforce them. The effective communication of these rules will help to reduce the risks of occupational diseases and illness associated with exposure to VOCs. This requires employers to inform, advice, assist and carry out trainings aiming at enlightening workers on hazards and risks at their workplace and how to keep the work environment safe. Workers especially those who are new to the workplace may not even see the risks that can cause ill-health. Workers who are new to the workplace are equally at risks of exposure to chemicals fumes and vapours which could affect their health at present and years after they have left the workplace. This is because they may lack experience, knowledge of hazards, and a full understanding of the consequences of being exposed to hazards. As a result, these workers cannot make the link between occupational exposures in petrol stations and health consequences. This underlines the importance of the role employers' play in making sure workers are protected from exposure hazards through testing and improving their understanding of the health risks present and safety as well (Sokas *et al.*, 2009).

Consultation is also important and should include a range of matters that directly affect the petrol station attendants. This should involve sharing information with attendants and giving them chances to air their views and concerns and subsequently taking these views into account. However, the communication methods vary from one organization to another

based on nature of risks and hazards in place, task, details of risks control used and the size of the company (Robson *et al.*, 2015).

Towers (2003) points out the importance of empowering and educating workers on safety issues so that they can exercise their rights to safeguard their health. Occupational Safety and Health Act (2007) states that the employer has a mandate to monitor and control hazards at workplace and disclose incidents and illness statistics and findings. Petrol station attendants should be informed of the dangers that are present at their work place and the findings should be posted in an area where all workers can see (HSE, 2006). However, it is unlikely to find a documentation or a report posted in workplace's notice board in developing countries particularly in Kenya highlighting major accidents, injuries and near misses that have been reported in that particular workplace that can serve as a reminder whenever workers visit the workplace every day.

2.2.2. Safety Practices and Workers Perception on Use of Safety Measures

According to Aswathappa (2005), employers are required to promote a safe working environment to minimize the possible health effect to the workers. The employee has a right to refuse or even complain to the relevant authorities should he/she find that the task compromises his health status. However, due to high job insecurity, low educational standards and poverty, petrol station staffs are exposed to exploitation by employers and high levels of occupational hazards (Shyam *et al.*, 2013).

Occupational safety and health measures and equipment may be present at the place of work but workers' negative attitude may hinder their implementation. Workers tend to ignore or misuse the personal protective equipment because they are oblivious of the risks and potential hazards they are exposed to (Cole, 2002). This is evident in most workplaces in developing countries and petrol station is no exception. Workers who are new to the work may know the hazards present but may not understand the risks or have different perception about how exposure affects their health. Workers may not report some illnesses or even seek medical attention but continue going to the workplace as if everything is normal. Some assumptions and misconception are that risks are part of work and that short time exposure may not be a problem, thus it is only the older people who have experienced long exposures to hazards should be worried (Koopman *et al.*, 2002).

2.3. Factors that Influence Occupational Health and Safety Practices

Safe work and workplace is necessary for increased production and higher productivity and hence promotion and protection of safe work and workplace is the complementary aspect of industrial development. According to Shyam *et al.* (2013) there are many factors that influence health and safety practices in a given workplace. These factors include and not limited to: design and location of Station, Knowledge levels and altitude, Level of education and years worked (Experience), Learning at work (training), institutions and legislation. These factors will also influence occupational health and safety practices in a given petrol station.

2.3.1. Availability of Safety Equipment

Safety is a priority concern in any workplace for both employees and employer. Safety equipment provides additional workplace protection to workers when all other safety measures are applied and they should be accessible and in good condition. Common safety equipment and supplies in a petrol station comprise of Firefighting equipment and Personal protective equipment (PPEs) like overall, gloves, safety helmets, glasses/goggles, safety boots, ear muff, and high-visibility clothing like reflector jackets. Moreover, workers should know how to use the equipment effectively, when to use it and what its limits are. Therefore, training on the use of PPEs is essential (Hall, 2012).

According to research finding by Mutua and Fedha (2012) petrol station have scored high (72%) when it comes to installation of fire fighting and presence of warning signs meaning that they take fire risks very seriously due to the fact that they harbour flammable petroleum products. However, the report further states that operations at the petrol station involved in the survey depended entirely on the management and their attitude towards safety and health.

2.3.2. Design and Location

The design and location of petrol station will affect the general set up of the petrol service station: the location of storage tanks, tanker delivery stands, filling and vents pipes, pump dispensers and front office block. The design and location of the service station should also take into account safe access to services provided, exit of customers' vehicles, hazardous processes and materials being stored and structures neighbouring the station. The site chosen

should be sufficiently spacious and designed not only for efficient delivery of service and exit of customers' vehicles but also to minimise risks from petrol to any person likely to be at or near the service station (Ahmed *et al.*, 2014). Moreover, spacious and well ventilated petrol station ensures that release toxic vapour are not concentrated around the petrol station atmosphere thus minimising workers exposure to VOCs through inhalation. However, more business premises including refreshment joints and supermarkets have come up within and around petrol stations targeting customers from public service vehicles and private vehicles who visit these areas for refuelling and car servicing. As a result there has been a congestion of both human and automotive traffic in areas not designated (Mutua & Fedha, 2012)

2.3.3. Knowledge Levels, Learning and Attitude

Knowledge levels and attitude of the workers is a crucial element in health and safety practices in a petrol station. Lack of attention and taking things for granted is a major cause of accidents in the work place. People involved in accidents assert that they did not know that they were acting in an unsafe manner (Habeldelhamid *et al.*, 2000).

According to Zin (2012), health and safety trainings significantly improve knowledge and behaviours related to workplace safety. Workers get to know the layout of the workplace and how to use the necessary equipment and how to safely wear/use any protective gear, such as gloves, safety footwear and goggles. This helps workers to develop safety awareness and take the correct ways to prevent unsafe practices when performing a task or several tasks, and create a conducive environment in which workers are neither injured nor made ill by the type of work they perform.

A study by Leveson (2015) shows that workers who are subjected to periodic training on safety handling practices displayed higher understanding of possible hazards in their workplace and safety practices to be taken to minimise the risks from petrol to any person likely to be at or near the petrol station. Thus, ought to put into practice the knowledge they gained.

2.3.4. Level of education and work experience

A study done by Shyam *et al.* (2013) on use of safety practices among welders states that workers with higher level of education are more likely to be aware of the occupational hazards and use of provided PPEs than those who are illiterate or with lower level of education. This is because they can read and get updates from different information sources

thus increasing their awareness of potential occupational hazards, how to avoid exposure and obtain additional information on hazards, safety incidence and near misses experienced by other workers in other similar organisation.

The duration of employment may also influence the awareness level and perception of the petrol station attendants on the safety practices. Workers who have worked in a particular workplace or performed a certain task over a long period of time tend to have higher level of awareness than young or new workers (Brandt-Rauf, 2001). Therefore, duration of employment in a petrol station may have an impact on the use of provided PPE since the employees have been there for long to experience injuries and near miss's incidents that have occurred in their workplace. However, awareness of hazard and PPEs may not necessarily result to utilisation of provided PPEs. In fact, experienced workers may be knowledgeable of health risks related to their job, but still they do not utilise the provided PPEs or even ignore procedural instruction therefore putting their lives and that of their workmate at risk (Shyam *et al.*, 2013).

2.3.5. Institutional and Legislative framework

Institutions and legislations in place give the guideline on the implementation of occupational safety and health issues at workplace. It illustrates the roles and duties of both the employers and employees in relation to safety of all workers and members of the public. These institutions work towards formulating, communicating and enforcing OSH laws that aims to minimise or eliminate risks at workplace (Health Safety Executive, 2006). In Kenya occupational health and safety systems is multi-sectoral in approach and is incorporated in various statutes such as Public Health Act Cap 242, Environmental Management and Coordination Act 1999 (Amended, 2015), the Petroleum Act Cap 116, Food, Drugs and chemical substances and Factories Act Cap 514 which is primary Occupational Safety and Health Act, 2007. Primarily, the implementation of the OSH rules and regulations is squarely on the employer. It is the responsibility of every employer to ensure safety, health and welfare of all employees and all persons lawfully present at his/her workplaces (OSHA, 2007). According to Energy Regulation Commission (ERC) website, Environmental Health and Safety (EHS) audit has been enlisted as services offered by ERC alongside technical audit, price surveillance and fuel quality monitoring. Interestingly, EHS audits focuses on the environmental aspect; where EHS best practices ensures that petrol stations minimizes the risk of pollution occurring to the surrounding environment to ensure compliance to the environmental legal framework. Therefore Directorate of Occupational Safety and Health

(DOSH) as the only agency that is tasked with enforcement of health and safety at workplaces should ensure that all workplaces including petrol stations comply to set safety regulations and those contravene to face the law.

2.4. Occupational Safety and Health Management Systems

An occupational health and safety management system (OSHMS) is a set of laid schedule and routine process by management leadership to minimize the incidences of injury and illness at workplace. This encompasses monitoring, assessment, identification and control of hazard, ongoing inspection and incident investigation, emergency preparation and response to safeguard health of the workers and the surrounding community. Efficient and effective operations gain at any workplace including petrol stations are realized by organizations that move from simply attaining legal compliance towards implementing the best practices of safety and Health (Health and Safety Executive, 2006).

World Health Organization (2002) states that effective health and safety measures in a workplace helps to safeguard workers' health through reducing exposure to hazard elements. He further says that OSH includes the social, mental and physical wellbeing of the worker. Ill health is costly to workers and their families and they can also hurt organization through providing cover for personnel absent, time consuming incident investigation and increased employer's liability insurance premium. An effective health and safety management system for a petrol station should have basic elements of policy, organising, implementing, measuring, reviewing and auditing. It emphasizes on inclusivity of workplace precaution and risks control systems that looks at risk at input stage, process stage and at output stage in an organisation (Robinson *et al.*, 2015).

Rowlinson *et al.* (2003) point out that training, education and efficacy on safety training needs to be carried out in three settings: at induction, on the job and in refresher courses. This should be supplemented by use of safety awareness campaigns and communication, and disciplinary action for those who contravene the safety rules and procedures outlined by the organization. Training of petrol station attendants aims at teaching about the rules and how to obey them; education teaches workers why the rules and what they are and finally efficacy is a proof that the training worked. Posters and safety signs placed at strategic areas within the petrol station give a specific message and information to those who may be exposed to hazards by signifying health hazards in place, indicate the location of safety equipment and guidance on how to escape in case of an emergency. However, if the

attendant is illiterate, he/she cannot interpret or not familiar with the symbols and terminologies used, then this posters and safety sign will not serve its objective. The safety symbols and terminology at the petrol station should therefore be simple, clear, brief and to the language understood by workers. This is achieved through translating into, explained in appropriate language and where practicable supported by a summary in a plain local language. Directorate of Occupational Health and Safety Services of the Ministry of Labour should be in a position to accredit the trained worker, by issuing a card or a certificate (Afubwa, 2004).

2.5. Safety Policy and Regulations

2.5.1. Occupational Safety and Health Act,2007 and Work Injury Benefit Act, 2007

The OSH Act, No. 15 of 2007 which repealed the Factory Act, provides for the safety, health and welfare of workers and all persons lawfully present at workplaces while WIBA of 2007 provides compensation to employees for work related injuries and illness contracted in the course of their employment. The two legislations are administered by Directorate of Occupational Safety and Health Services (DOSHS), one of the departments within ministry of Labour. Whereas Osh Act section 22 states that that all workplace injuries, their cause and action taken to prevent future occurrence shall be entered in the general register, WIB Act requires that notice of any accident that occurs during employment be submitted to employer and a copy sent to DOSHS in case of a fatal accident. From Therefore, DOSHS is tasked with enforcement of safety and health of workplace ensuring that all comply to set safety regulations and those contravene to face the law.

Work Injury Benefit Act of 2007 section 21 states that a written or verbal notice of any accident that occurs during employment shall be given by or on behalf of the employee to the employer and a copy of the notice sent to director of DOSHS within twenty four hours of its occurrence in the case of a fatal accident. Further, Occupational Safety and Health Act of 2007 section 22 states that all workplace injuries, their cause and action taken to prevent future occurrence shall be entered in the general register.

Further, OSH Act (2007) points out that employers and management must provide a clear objective and framework that will enhance workers to efficiently and effectively implement OSH practices in the workplace. This is through organisation commitment and providing leadership to empower workers and safety committees to manage workplace safety.

This Occupational Health and Safety Policy should be communicated to all employees, reviewed periodically and the target be at all levels, outline timeframes, means and designate responsibilities. The provisions of occupational safety and health systems are better covered in large organisations; small and medium enterprises and informal sectors have little or no access to occupational health advice (HSE, 2006). The established legislation in Kenya obliges employers to provide safe workplace. Some organisations have left employees to form their own OSH committees that are not taken serious by the management (Towers, 2003).

2.5.2. Petroleum act. Cap 116 and Energy Act of 2006

Petroleum act is an act of parliament which makes the provisions for regulation of importation, transport and storage of petroleum products while Energy Act of 2006 (revised in 2012) led to establishment of Energy Regulation Commission whereby among its mandate include regulating; formulating, enforcing and reviewing environmental, health, safety and quality for the energy sector, in coordination with other statutory authorities among them NEMA and Directorate of Occupational Safety and Health Services (DOSHS). Both Petroleum and Energy Acts state that vehicle (tanker) on which petroleum is carried shall neither carry other goods of neither inflammable nature nor a passenger. The tanker shall exhibit in conspicuous characters the word “Petroleum” or other similar words indicating the nature of the contents and shall carry at least one fire extinguisher. The act further stipulates that no petroleum shall be loaded into or offloaded from any vehicle between the hours of sunset and sunrise or while the engine is running.

The regulation framework in Kenya concentrates on the quality of the petroleum products and control of retail prices as done by Energy Regulatory Commission (ERC). Therefore, the mandate of inspecting workplace and supervising the existing legislations on work place safety including petrol stations is given to Directorate of Occupational Health and Safety (DOSHS). Due to lack of funding and shortage of staff, workplaces are required to have self -regulation whereby central responsibility was placed on each employer and organisation management to identify, assess, monitor exposures and control all hazards. Consequently, OSH officers will only inspect a petrol stations and other workplace in response to public outcry or incident rather than procedural assessment and the information obtained by an OSH Officer is retained by DOSHS or stored in individual case file thus not available to the public (Driscoll, 2006).

A study by Dorman (2000) states that nature of work and operations are changing at a rapid rate due to technological revolution, therefore petroleum industry and specifically petrol stations should also review their safety policies periodically and use up to date safety standards. This existing OSH legislation in Kenya placed responsibility to employers to identify, assess, monitor exposures and control all hazards through the hierarchy or risk control. Contrary to the fact that use of administrative controls and personal protective equipment should be used as the last resort where there are no reasonably practicable control measures available, employers tend to focus on these measures ignoring level 1 and 2 control measures which are elimination and minimising of hazards, respectively. Lack of political will, funding, recruiting of staff as per established, professional training for OSH, provision of adequate tools and equipment, awareness and negative attitude among workers hinders development and implementation of the OSH services in developing countries (Amador-Rodezno, 2005).

2.6. Research gaps

Petrol stations are considered hazardous places because they generate and release toxic fumes in all its operations. In order to address the safety concern, literature shows that in developed countries, Petrol stations are located in open spaced isolated areas away from major towns where least number of people and traffic is expected. Isolation of petrol station ensures that there is adequate ventilation within petrol station thus prevent accumulation of vaporised fumes around the station. It also ensures that there is sufficient space for evacuation in case of emergency. Apart from location, Europe, America and number of Asian countries have adopted self-service machines with some countries including India, offerings its customers option of choosing a self-refueling petrol station where they refuel their own vehicles or traditional fueling service where customers' vehicles are refueled by a pump attendant. Safety awareness notices are posted conspicuously to inform workers and customers of the dangers that are present, past incidents and illness statistics. All these measures aim at reducing workers' risk of exposure to chemical fumes, and results to minimal loss of lives and proper in case of an incidence. On the contrary, the situation is different in Kenya; petrol service stations have pumps attendants at the dispenser pump to refuel customers' automotives and it is likely to find petrol stations located in major town within central business areas and/or with business malls built adjacent to these service stations causing congestion of both human and vehicles. However, it is unlikely to find a

documentation or a report posted in workplace's notice board highlighting major accidents, injuries and near misses that have been reported in that particular workplace that can serve as a reminder whenever workers visit the workplace every day. Subsequently, there is little or no documentation on use of self-service dispenser pumps in Kenya. Nevertheless, it is unclear what measures have been put in place in the facilities to protect the workers and the regular customers from risks of exposure to volatile organic compounds which could affect their health at present and even years after they have left the petrol station.

In addition, health and safety related studies on Kenyan petrol station shows that petrol stations have done well in installation of fire fighting equipment and warning signs thus taking fire risks very seriously by ensuring they comply to the legal framework. However, documentation of studies on safety practices, staff and customers' awareness to health and safety regulations in Kenya is scanty. It remains to be seen whether these safety equipments are operational, and if workers are trained on how to use them and personal protective equipment in general.

Furthermore, the WHO and ILO estimates for work related death and occupational diseases for sub-Saharan African countries is at alarming rate. However, there is little or no documentation on the case studies done in Kenya's Petrol station on occupational safety and health showing accidents, illness and fatal incidences meaning that there is likelihood that such cases go unreported or overlooked. Therefore, it remains unclear whether petrol stations in Kenya are in compliance with General Safety Orientation Guidelines for gas and Oil industry (2012) and if attendants are aware of the occupational hazards and safety procedures at their workplace. This study therefore aims at highlighting gaps in safety practices as well as factors that influence these practices in order to come up with appropriate data for health hazard control interventions.

2.7. Conceptual Framework

The conceptual framework illustrates how independent variables which are knowledge levels, altitude, factors influencing safety practices, policies and regulation that govern petrol stations and health and safety management systems are likely to influence dependent variable which is the relevant occupational health and safety practices. Intervening variables for this study will include physical location of the petrol station; and Management

and Organisational factors: - Independent Petrol Marketers & Multinational Companies (Figure 2.1).

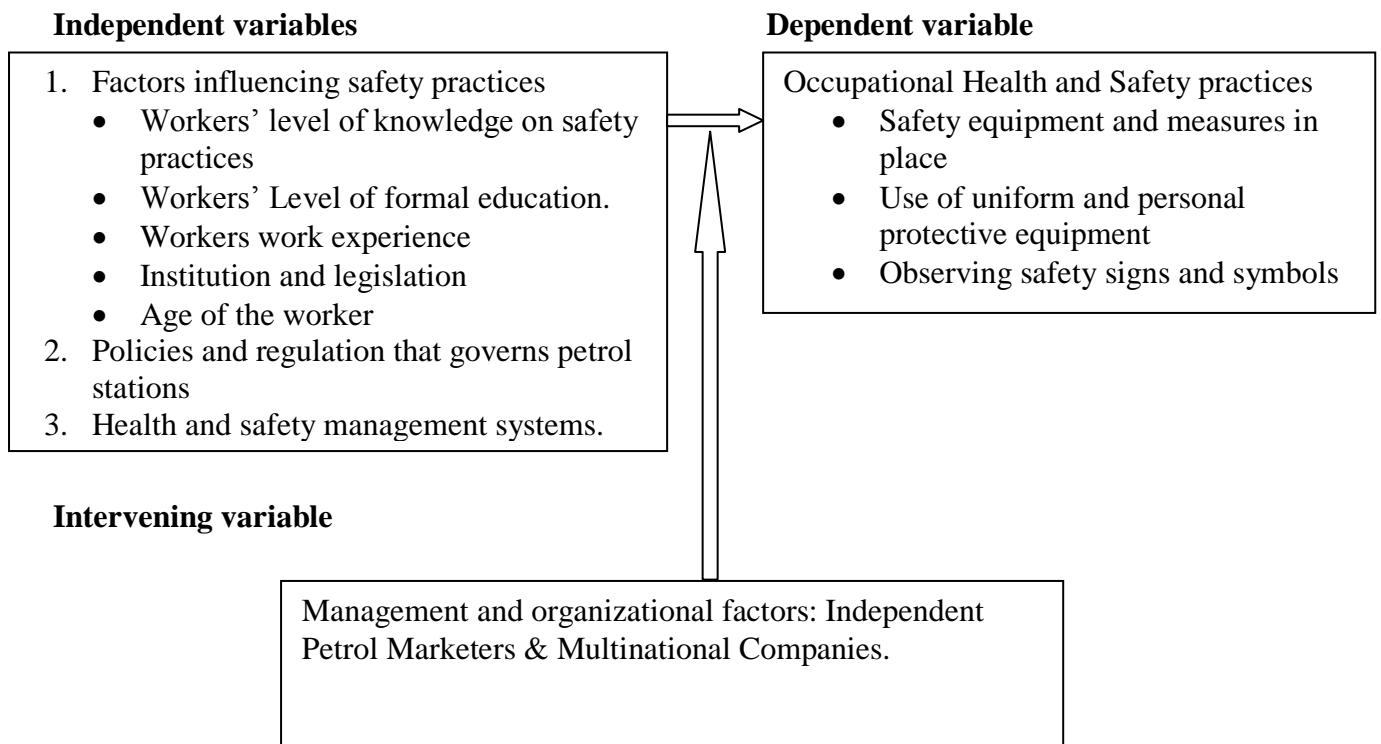


Figure 2.1: Conceptual Framework

The Level of knowledge and attitude on occupational health and safety practises will contribute to proper safety practises. Workers with better understanding of relevant occupational hazards present in their workplace tend to implement relevant safety procedures in place resulting to safe work environment. On the contrary, lack of knowledge and poor attitude towards safety procedures results to improper occupational health and safety practises thus putting the lives of fellow workers and customers at risk. In regard to level of formal education, workers with higher level of education are more likely to be aware of the occupational hazards and use of provided PPEs than those who are illiterate or with lower level of education. This is because they can read and get updates from different information sources thus increasing their awareness of potential occupational hazards, how to avoid exposure and obtain additional information on hazards, safety incidence and near misses experienced by other workers in other similar organisation. Duration of employment in a petrol station may have an impact on health and safety practices since the employees have been there for long to experience injuries and near miss's incidents that have occurred in their workplace. Age has an influence towards implementation of safety and health

practices in a workplace. Young and middle aged may lack experience and psychological maturity thus may not take seriously enough the safety precaution and measure in place to safeguard health and safety at workplace. However, due to their level of knowledge, young workers are likely to have a more positive attitude towards implementation of new health and safety practices

Institution and existing legislation will affect the overall performance of petrol station toward implementation of safety procedures in place. It illustrates the roles and duties of both the employers and employees in relation to safety of all workers and members of the public. Workplace Policies (internal safety laws and regulations) provide a clear framework that enables workers to efficiently and effectively implement safety practises in the workplace. Conversely, ineffective policies and lack of enforcement by relevant bodies is likely to result to poor housekeeping in these petrol stations. Moreover, Health and safety management systems which include set of laid schedule and routine process by particular petrol station leadership management ensure that safety procedures are strictly adhered to in all sections thus minimising the incidences of injury and illness at workplace.

Intervening variables which include physical location of the station and management and organisational factors may interfere with occupational safety and health practices in petrol stations. However, presence of strong Occupational Health and Safety Enforcement Agencies, efficient and effective health and safety management system in all petrol stations will yield positive outcome including proper safety practices and safe environment.

CHAPTER THREE

METHODOLOGY

3.1. Study Area

3.1.1. Physical Location and Size

Nakuru County lies within the Great Rift Valley and is located between Longitude 35° 28` and 35° 36` East and Latitude 0° 13 and 1° 10` South, 160km North west of Nairobi covering 2,325.8km². It borders seven other counties namely; Kericho to the west, Baringo and Laikipia to the north, Nyandarua to the east, Narok to the south-west and Kajiado to the south. The county is divided into nine administrative Sub-Counties namely; Naivasha, Gilgil, Nakuru, Rongai, Nakuru North, Subukia, Njoro, Molo, and Kuresoi. There are 11 constituencies and 55 Wards in the county (Figure 3.1).

3.1.2. Population and Social Economic Activities

Nakuru County has a population of 1,603,325 people comprising of 804,582 males and 798743 females (KNBS, 2010) making it fourth largest county in Kenya after Nairobi, Kakamega and Kiambu in that order in terms of population. The county population growth rate is estimated at 3.05 percent and has experienced growth of small urban centres due to the fact that peace is prevailing among different ethnic groups and availability of a wide range of economic activities. According to Nakuru CDIP (2013), the main economic activities are agri-based industries including vegetable and milk processing, large scale wheat and barley farming, manufacturing and assembling industries such as timber milling, canning, quarrying and assembling plant of motor vehicles. Nakuru County is also an important centre in agricultural research, trade, transportation hub, education and development. Tourism also plays an important role in the local economy as tourists can visit Lake Nakuru National Park, Menengai and Longonot craters and Lake Naivasha (Nakuru CIDP, 2013).

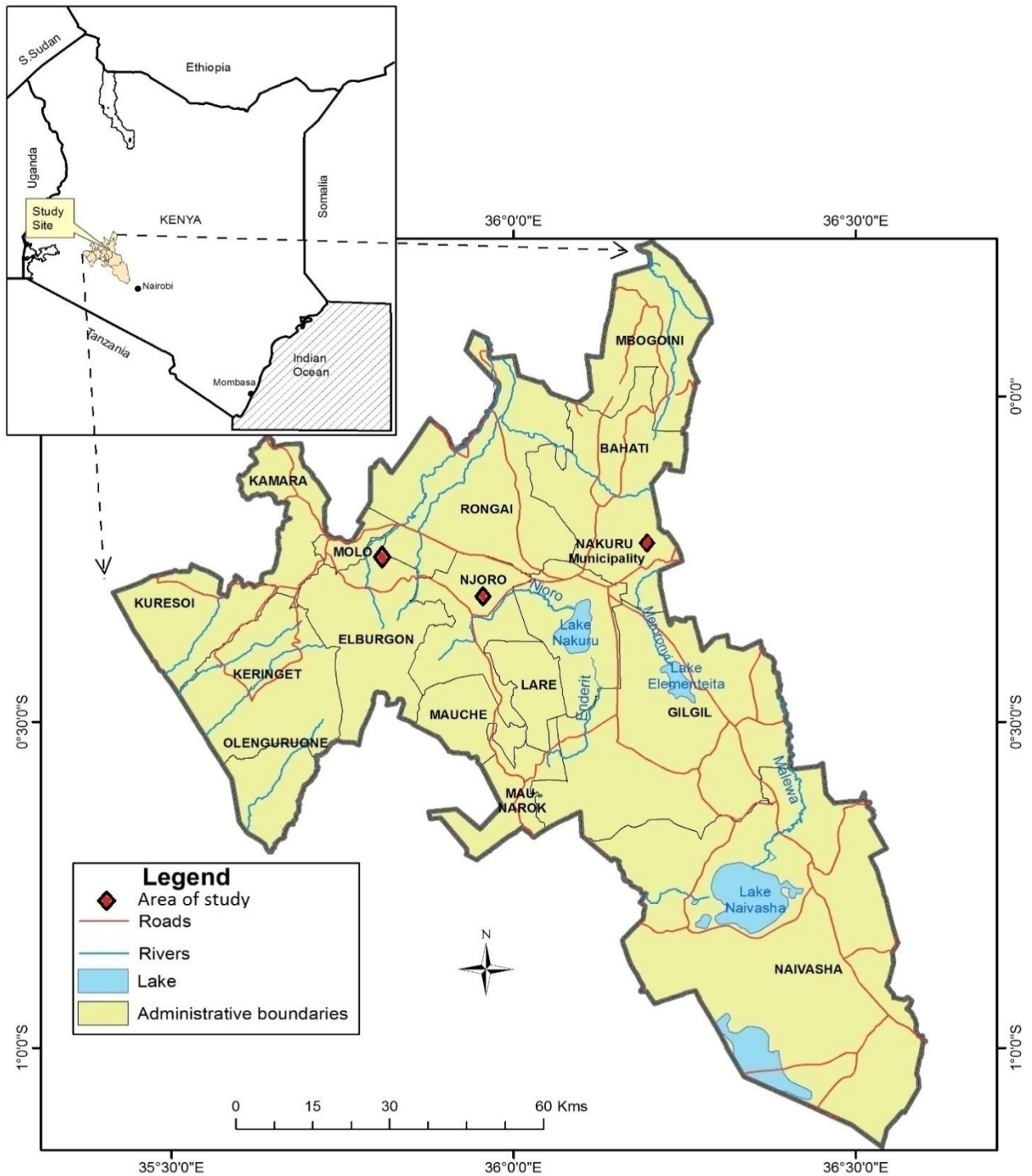


Figure 3.1: Map of Nakuru County showing area of study

Source: Nakuru CDIP (2013).

3.2. Research Design

Cross-sectional and descriptive study designs were used in this study. Data from each selected petrol station was collected at a time and examined. The cross sectional design was suitable to explain the relationship between knowledge and attitude of workers and health and safety practices among petrol station attendants in Nakuru County. The researcher used both qualitative and quantitative approaches in data collection. Qualitative data is that data that use non-numerical data like observations and interviews while quantitative data is presented in numerical values and from which statistical inferences may be drawn from the study subjects.

3.3. Sampling Design

3.3.1 Sampling Unit

The sampling unit of this study was petrol service stations workers. At the time of this survey only fifty three (53) petrol service stations had been registered as a work place according to Nakuru County Directorate of Occupational Safety and Health (DOSHS). The registered petrol stations were from seven (7) out of the nine (9) sub counties in the expansive Nakuru county while the remaining two sub-counties, Gilgil and Naivasha were under Naivasha DOSHS Office. However, the number of petrol stations could be more than the figures obtained from DOSHS since only handful workplaces are registered by the relevant body according to spot check done by researcher during pre -visit. Purposive sampling was used to select thirty two (32) petrol stations in Njoro, Molo and Nakuru Municipality with a special focus on petrol stations which have dispenser pumps for diesel, petrol and kerosene, car servicing bay and Front Office section. The petrol stations which met the above criteria were Four (4) in Njoro and Five (5) in Molo. All were included in the survey while systematic random sampling was used to select twenty three (23) petrol stations n Nakuru municipality where the study concentrated on petrol stations along Nairobi-Eldoret highway. The respondents were drawn from the mentioned sections and staff in the front office included and not limited to managers, owners and supervisor. The key informants were staff from Directorate of Occupational Safety and Health (DOSHS).

3.3.2. Sample Size

The study was done within three sub counties namely Nakuru municipality, Molo and Njoro due to their proximity to the Nairobi-Western highway. The sample size was determined using the formula below by Anderson *et al.* (2007) for an infinite population:

$$n = (Z^2pq)/e^2$$

Where n = sample size

Z= standard normal deviation, confidence interval at 95% that is (1.96)

p = proportion of target population with probability of occurrence of occupational exposures (0.5)

q = the proportion of population used as control sample (1-p)

e =acceptable sampling error 5% that is 0.05

The sample (n) is as follows $n=(1.96^2 \times 0.5 \times 0.5) / 0.05^2 = 384$.

Since the target sample was petrol station staff who were few under normal circumstances (less than 10000) and if 384 is the estimated total number of staff in selected stations, then sample size was calculated using Fischer *et al.* (1994) formula $nf=(nxN)/(n+(N-1))$.

Where - nf is the desired sample size when target population is less than 10,000

n is the desired sample size when population is greater than 10,000

N is the estimate of the population size

$$nf=(384 \times 384)/(384+(384-1)) = 192$$

The study used purposive sampling to select two (2) key informants from DOSH.

3.3.3 Sampling Procedure

Stratified and simple random techniques were used to obtain samples from selected petrol stations in Nakuru municipality, Njoro and Molo areas. Simple random sampling ensured that all workers from the selected petrol station had an equal opportunity of being selected while stratification ensured that cases from smaller strata of the population were included in sufficient numbers to allow comparison. The respondents from the randomly selected petrol stations were grouped according to their sections i.e. dispenser pump operators, car servicing and front office staff. A total of 32 petrol stations were used in this study and a number of respondents were picked randomly and proportionately drawn from each section in all petrol stations involved in the study to give a desired sample size of one

hundred and ninety two (192). A proportionate ratio was used to select respondents from dispenser pump section, car servicing section and front office section. Then, respondents within selected sections from all petrol station were sampled through simple random sampling and the samples be used for data collection.

3.4. Data Collection

Data was collected through questionnaires, interview guide and observation checklist. Open and closed-ended questionnaires (Appendix 1, Appendix 2 and Appendix 3) were used to collect data from the respondents on the social economic details, occupational hazards and safety awareness, factors that influence safety practices and safety management systems in place.

Observational checklist (Appendix 4) was used to observe safety practices, recording of the health risks and physical structures available to ensure that work condition complied with the set standards and regulations that govern a petrol station in order to safeguard the health of the workers in those petrol stations.

Key informant interviews (Appendix 5) from DOSH staff based in Nakuru was used to get information on factors and challenges experienced and existing safety policies and regulations in order to give in-depth information and an opportunity to clarify issues arising from the interview process. Secondary data was obtained from Energy regulation commission website, policy research working papers, published books and relevant journals.

3.5 Validity and Reliability

3.5.1. Validity

The validity of the instrument (questionnaire) was done to test clarity and relevance of the objectives and research questionnaires to the study (Gay, 1987). To ensure that the instrument was accurate and effective in measuring the variables of interest during the study, the content of the questionnaire was presented to experts from the department of Environmental Science and Faculty of Environment and Resource Development in Egerton University. After the assessment, comments from the experts were factored into the instruments to ensure that the questionnaire was relevant in terms of its content and effectiveness in obtaining the intended information on various aspects of the study objectives. To ensure consistency, the instrument was pre-tested using a random sample of workers in five petrol stations in Naivasha sub-county which was not part of the study, but with similar characteristics of the study area. After pre testing, the various inconsistencies in the

questionnaire were addressed to ensure that all the variables as far as the objectives of this study were incorporated. This was also justified by other literature related to this study.

3.5.2. Reliability

Reliability indicates the accuracy or precision of the measuring instrument (Radhakrishna, 2007). To test the reliability, pilot testing of the instrument was carried out among the petrol station workers in five petrol stations in a study area where workers had similar background with the study group, but which was not part of the study. Internal consistency technique was used to test reliability of the survey instruments. In this case, pilot testing data was subjected to Cronbach's alpha. An index of at least 0.70 was taken to mean instruments were reliable while instruments with scale less than 0.70 had some of their items either modified or discarded to increase the reliability of the scale (Fraenkel & Wallen, 2003). The questionnaires were found to have 0.96 reliable index and thus the researcher adopted the instruments on the basis as an appropriated tool to work with.

3.6. Ethical consideration

Permissions to conduct the research, research clearance permit (Appendix 11) were obtained from National Commission for Science, Technology and Innovation (NACOSTI). Consent was also sought from office of Nakuru County Commissioner, Ministry of Education (MoE) and proprietors/managers of the petrol stations where the study was carried out. The researcher clearly explained the purpose of the study to the respondents and their consent sought as indicated in the preamble of the questionnaire. Names of the respondents and place of work were not included in the questionnaire. The respondents were coded and the codes only known to the researcher (Appendix 1 and Appendix 2). Some photos taken as part of observational tool had either the petrol station name censored or faces of attendants blurred to protect anonymity and privacy of the respondents.

3.7. Data Analysis

The data collected from the field was coded, organised and analysed using Statistical Package for the Social Sciences (SPSS) version 20.0. The analysis of the data used descriptive statistics (Frequencies, mean, percentage and measures of central tendency) and qualitative statistics for non-numerical data and quantitative statistics for numerical values. Pearson Chi-square test analysis was also used to show the association between different

variables to achieve the objectives. The research findings were then presented using charts, graphs and tables that helped in understanding and interpretation of the information.

Table 3.1: Summary of data analysis

Research Questions	Variables	Analysis Methods
What occupational health and safety practices are in place in petrol stations	Safety equipment Use of PPE Observing Safety sign	Descriptive statistics (percentages, frequency distribution)
What factors influence occupational health and safety practices in the selected petrol stations	Non-availability of safety equipments Poor nature and state of Personal Protective equipment Poor Design and siting Failure by enforcing agencies	Descriptive statistics (Mean, Frequency, %) Chi-square
What safety policies and regulations for petrol stations are in place to govern petrol stations in Nakuru County?	Health safety and environmental policy Fire policy	Descriptive statistics (percentages, frequency distribution)
What health risk and safety management system are in place in the selected petrol station and determine if they comply with existing safety regulations?	Medical examination Work procedure emergency preparedness and response reporting accident safety statement	Descriptive statistics (percentages, frequency distribution)

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1.Introduction

The study had set out to collect data from one hundred and ninety two (192) respondents but only one hundred and eighty (180) respondents successfully filled the questionnaires which were analysed representing 93.8% response rate. The obtained response rate is high and acceptable in social research (Neuman, 2007). Twelve (12) of the respondents not included in the study after their stations declined to participate in the survey. The findings are presented qualitatively and quantitatively. Pearson Correlation coefficient was used at $P = 0.05$ to correlate the variables.

4.2.Socio-Economic Characteristics

This section provides findings on social economic characteristics of the respondents. The researcher sought to find the respondents' department, age, sex, level of education, and working hours per day and work experience in the current employment.

4.2.1. Sections/Departments Distribution

The study was on petrol station workers with respondents drawn from pump attendant section (50%), car servicing (33.3%) and front office section (16.7%) as shown in table4.1 below.

Table 4.1: Designation of the Respondents

Designation	Frequency (n=180)	Percent (%)
Pump attendant	90	50.0
Car servicing	60	33.3
Front office: Supervisor / manager	30	16.7

4.2.2. Age of Respondents

Results in figure4.1 shows that majority of the respondents were from the age bracket of 18-25 years 43.3% (n=78) followed by the 26-35 years 38.3% (n=69) and only 18.3% (n=33) were above 36 years. This generally implies that more than half of the workforce in petrol station is comprised of young staff less than 35 years and thus youth are more likely to be exposed to occupational hazards than workers who are above 35 years in petrol stations workplaces. This concurs with results of a study by Laurelize *et al.* (2012) on individuals exposed to benzene among gas station workers in Brazil which noted that most of the workers were young adults.

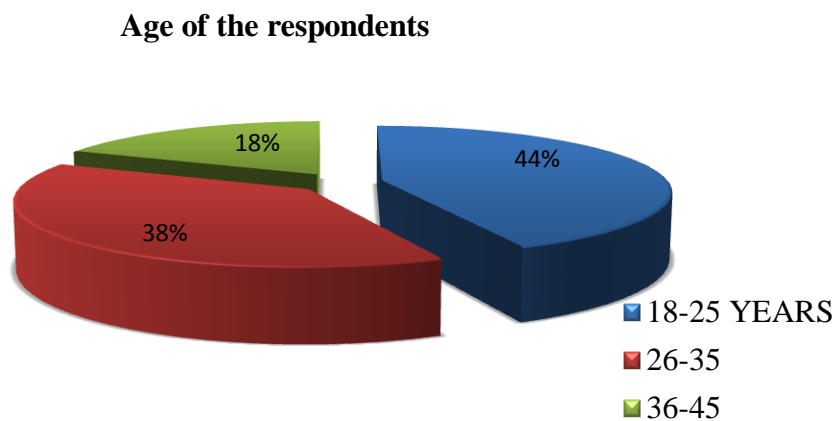


Figure 4.1: Age of the respondent

4.2.3. Gender of Respondents

The study had more male respondents (76.1%) than female (23.9%) as in the table 4 below. This compares to study findings from a study done by Gillula and Fullenbaum (2014) where women accounted for 19% of total employment in the combined oil and gas and petrochemical industries. Similarly, a study by Afolabi (2011) in Nigeria on assessment of safety practices in filling stations found that 72% of the respondents were also men. This implies that petrol stations are predominantly a male-dominated occupation. A possible reason for male dominating the workforce could be due to the fact that pump operations and

car servicing were considered strenuous and risky task since petrol stations operates till late night.

4.2.4. Education Level of the Respondent

Most respondents 46.7% (n=84) had attained secondary education followed by 41.1% (n=74) who had tertiary education. About 3.3% (n=6) of the respondents had university education while 8.9% (n=16) were of primary level. This shows that over 90% of the respondents had received post primary education thus knowledgeable to answer on the issues under study. Majority of the supervisors and front office staff had attained tertiary and university education while those who had attained primary education level were from car servicing section. This may be explained by the fact that supervisors and office staff mostly performs administrative and managerial responsibilities which requires a higher educated workers compared to workers at servicing sections who are responsible for servicing and repairing of automobiles

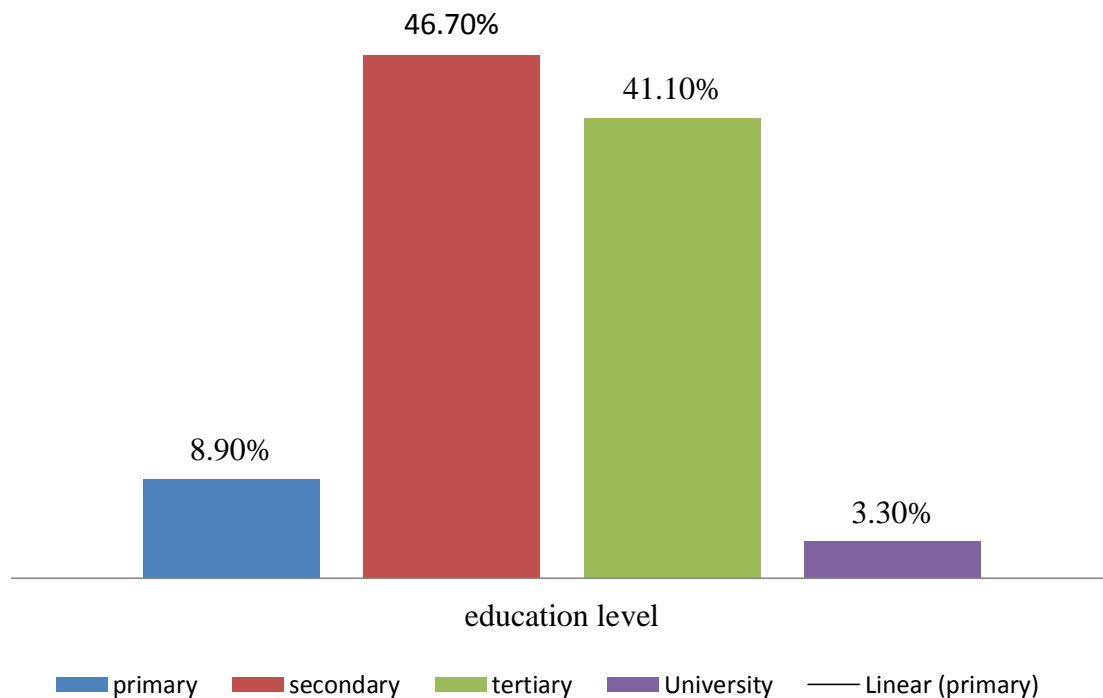


Figure 4.2: Educational Level of the Respondents

4.2.5. Hours worked per day

The study shows that 5.6% of the respondents worked below 8 hours a day while 86.7% worked 8-10 hours a day. Those who worked in the bracket of 10-12 hours a day were 5.6% and only 2.2% of the respondents worked 12 hours and above a day. Those who worked below 8 hours a day were from stations which had more staff who were split into shifts while those who worked overtime mostly from dispenser pump and car servicing sections were compensated with longer off days. The findings are consistent with similar studies done by Afolabi (2011) in Nigeria and Laurelize *et al.* (2012) in Brazil who observed that respondents who worked 8-10hrs a day were 85% and 90.2%, respectively. This implies that most staff worked 8 to 10 hours a day without a work break in between the shift. According to Marta *et al.* (2012), the greater the fuel exposure, the greater is the chances of fuel contact with skin and eyes of the workers. Though there are no safe levels of exposure, long working hours shows that the staffs are constantly exposed to PMS throughout the workday. Fewer working hours and break in between the shift for workers in high risk areas is necessary to minimise exposure to occupational hazards (Sergio *et al.*, 2012)

Table 4.2: Working Hours per Day

Working hours per day	Frequency (n=180)	Percent (%)
Below 8 hours	10	5.6
8-10 hours	156	86.7
11-12 hours	10	5.6
over 12 hours	4	2.2

4.2.6. Work Experience

With regard to working experience for the respondents in the current station, it was worth noting that 64% (n=115) of the respondents had worked below one (1) year. The finding concurs with a study done by Laurelize *et al.* (2012) in Brazil who noted that about half (50.7%) of the respondents had worked for a year. This could be due to the fact that the workforce was majorly young adult who may have just started working after completing post primary education. Another possible reason could be the fact that petrol station attendants don't stay on the job for long and that there is high turnover in petrol stations.

This should have an implication for training since the employers may not invest much in training if employees don't stay on for long.

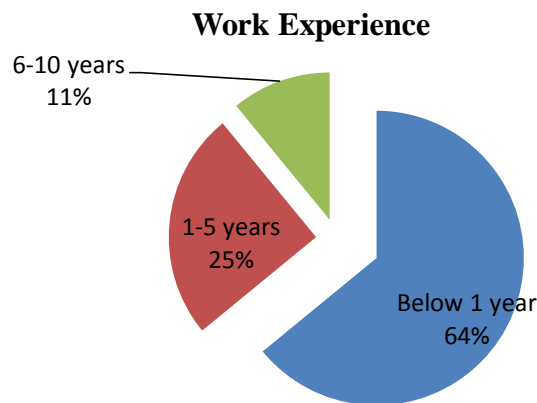


Figure 4.3: Working Experience

4.2.7. Previous Employment

The findings of the study show that 60% of the respondents had worked in another petrol station while 40% of the respondent had not worked elsewhere. This shows that majority of workers had been working elsewhere before they joined the current station meaning that they can also move to work elsewhere. A possible reason could be the fact that most staff are young and may quit their job frequently in search of greener pasture. This may be attributed by poor management, overworking and the absence of staff growth opportunities at the current job. This should have an implication on the overall performance due to loss of productivity from the departure, the cost of finding a replacement and the reduced productivity while the new employee gets up to speed on issues related to safety and general procedures.

4.3. Occupational Health and Safety Practices

4.3.1. Safety Equipment and Measures in Place

The findings of the study show that fifty percent of the workstations had a first aid kit placed either at the front office or in the changing room while 86.6% had fire extinguishers sand bucket and fire alarms which were clearly labeled and warning signs (91.7%) placed adjacent to dispenser pumps as illustrated in plate 4.1 and 4.2 respectively. About 65% of the petrol stations had warning signs as text or symbol displayed while 33.9%

had no “IN” and “OUT” signs to guide the traffic. The findings concur with a similar study done in Nigeria by Afolabi *et al.* (2011) who noted that 55.6% of the petrol stations had no “IN” and “OUT” signs. The results are also consistent with a study by Mutua and Fedha (2012) who noted that most petrol stations (72%) along Thika highway had fire extinguishers, alarms, fire detectors and warning signs placed conspicuously enough to draw attention of even the public. This implies that petrol stations take fire risks very seriously due to the fact that they store and sell flammable petroleum products thus provision of firefighting equipment at such workplaces is a necessity.



Plate 4.1:

First Aid Kit

Plate 4.2: Fire extinguisher at the forecourt

4.3.2. Use of Uniform and Personal Protective Equipment

According to OSHA (2007), employers are required to provide adequate, effective and suitable PPEs such as suitable gloves, safety boots, goggles and head covering gears where employees are employed in any process involving exposure to offensive substance or wet. In addition, safety vests (reflector jackets) and respiratory protectors such as nose and mouth are essential health-servicing equipment for petrol station attendants (Ansah & Mintah, 2012; Fabiano *et al.*, 2004; Olaotse, 2010). In regard to the self-reported use of PPE, about 86.1% of the respondents reported that uniforms are available for use and were required to put on while on duty while 13.9% reported that they wore their own cloth while at work as illustrated in plate 3 and 4. Majority of the respondents 60% (n=108) stated that employer provided PPE, out of which the commonest being Aprons/overall (99.1%) while the least

being face mask(16.7%).However, the findings of the study from the observations showed that only6.7% (n=12) of the respondents used PPE at the time of the study commonest being Aprons/overall (99.1) and the least used being gloves and face mask8.3% each as illustrated in the table 4.3 below. With regard to an association between age and use of PPEs, there is no enough evidence to suggest an association between age and use of PPE as illustrated in table 4.6. In addition, some stations pump attendants could be seen refuelling customers' vehicle while in open shoes and offloading was done without proper attire as shown in plate 4.4 and 4.5. It was worth noting that refuelling in all stations was done without gloves even by those who said had them. This study concurs with Olaotse (2010) who noted that essential health servicing equipment such as respiratory protectors, safety glasses, gloves and safety vests usage was minimal butinconsistent withthe same study by Laurelize *et al.* (2012), whom in a study noted that boots were the most frequent PPE (91.4%) used by petrol station workers.

Table 4.3: Provision, Usage and Non-Usage of PPE while at Work

Provision of PPE	Frequency n=180	Percentage (%)
Yes	108	60
No	72	40
*Type of PPE provided	n=108	
Aprons /overall	107	99.1
Reflector jacket	40	37
Gloves	39	36.1
Safety boots	22	22.1
Face mask	18	16.7
Use of PPE	n=180	
Yes	12	6.7
No	168	93.3
*Type of PPE used while at work	n=12	
Aprons/overall	10	83.3
Reflector jacket	5	41.6
gloves	1	8.3
Safety boots	7	58.3

Face mask	1	8.3
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Reasons for non-use of PPE	n=180	
Not available	95	52.8
Not necessary in my section	36	20.0
Not directly involved in loading and offloading	40	22.2
Uncomfortable	9	5

***Multiple responses**

When respondents were asked why staff were not using PPE at work, 52.8% stated that PPE were not available, 20% were in the view that PPE were not necessary in their section while 22.2% stated they were not directly involved in loading and offloading thus no need to use them and 5% stated that some PPEs provided were either oversize or undersize thus unattractive and uncomfortable when using them as illustrated in table 4.3 above. The findings of the study showed that non-availability of the PPE was the main reason given for non-usage of PPE at work. This concurs with a study done by Okafoagu *et al.* (2016) in Nigeria but inconsistent with a study done by Langkulsen *et al.* (2011) in Thailand where respondent mention the feeling of discomfort while using PPE as the main reason for non-usage of PPE. This indicates that there is low use of PPE among petrol station workers in Nakuru, Kenya since operations were done without appropriate attire even by those who said had.



Plate 4.3: Attendants in uniform



Plate 4.4: Attendant fueling without uniform



Plate 4.5: Staff Offloading Petroleum Product from the Tanker

4.3.3. Observing Safety Signs and Symbols

According to Talab *et al.* (2008), safety signs/symbols are important safety communicating tools that help to indicate various hazards and risks that are present at the workplace. From observation checklist, majority of the petrol stations (91.7%) had safety signs placed conspicuously in areas of danger like forecourt and offloading area. The safety signs included “No Smoking”, “Switch Your Phone Off”, “Switch Your Engine Off” and “Use Recommended Fuel Container”. However, use of mobile phones at the forecourt was a common practice in all the petrol stations and this was manifested by presence of paybill number poster placed on the dispenser pump in most of the petrol stations (98%) where customers would pay for the service using their mobile phone. About 60.6% of the petrol station did actually refuelling of the customers’ vehicles while engine was running. However, it was note taking that staff and clients in all the stations involved in the research complied with “No smoking” as opposed to other warning signs, “turn off engine,” “switch off phone” and “use of recommended container”. This is because fire outbreak was considered as a dangerous scenario due to presence of flammable materials and this was evident by presence of fire extinguishers and sand buckets. These results concur with a study done by Mirza *et al.* (2012) whom in a study sought to find out hazard contributing factors classification for petrol stations observed that inadequate use of safety signs and instructions, missing safety signs at desirable location and use of mobile phone in tank zone was common practice in petrol stations. This clears implies that warning sign “switch off phone” was not observed at all while refuelling of customers’ vehicles while engine is running was a common practice in most stations despite the presence of prohibiting signs.

4.4.Challenges and Factors Related to Safety Practices

The following are the challenges and factors affecting the implementation of health and safety culture in the petrol stations as illustrated in figure 4.4 below.

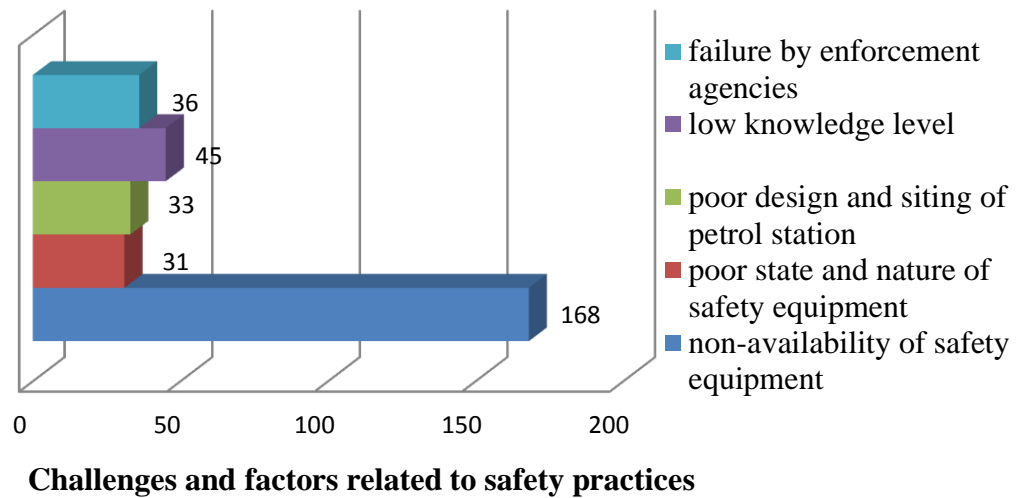


Figure 4.4: Challenges and Factors Related to Safety Practices

The findings of the study show that respondents mentioned more than one factor that affected the implementation of health and safety. About 93.3% (n=168) of the respondents stated that inadequate and non-availability of safety equipment was a major challenge to implementation of safety culture. About 17.2% (n=31) the respondents stated that the state and nature of safety equipment available as challenge. Though most of the petrol stations had safety equipment like fire extinguishers, sand bucket and first aid kit placed strategically, only 62.2% (n=112) were in good state. Some fire extinguishers had not been serviced in the last two years while First aid kits were not stocked. This implies that in case of an incident, there is likelihood that the station will not be able to handle the emergency. Those who mentioned poor siting were 18% (n=33) citing lack of emergency exit, location of fuel storage tanks within the forecourt, refreshment joints and shops neighbouring the station, and storage of LPG cylinder in the front office. This implies that the said stations were not well ventilated and were likely to be congested with human and vehicles' traffic thus limiting emergency services in case of accident. According to Ahmed *et al.* (2014), petrol stations should be sufficiently spacious and designed to allow safe access to services, exit of customers' vehicles and minimize risks from petrol to both staff and customers while, 45

(25%) of the respondents mentioned Knowledge level and attitude of the staff toward safety rules at work.

About 20% of the respondents stated that institutions and the legislation framework are to blame for safety non-compliance in petrol stations. This point is further supported by officers from DOSHS who stated that they faced a number of challenges when inspecting and enforcing safety compliance at workplaces including inadequate staff, funds and lack of cooperation by owners and management of petrol stations. At the time of survey, there were only two OSH officers who were responsible to carry out safety inspection in all workplaces in Nakuru County. This means that the agency had inadequate personnel to carry out meaningful inspections of workplaces throughout the county. There is also inadequate funding from the government. DOSHS is a department under Ministry of East Africa Community (EAC), Labour and Social Protection thus receives a fraction of the funds allocated to the mother ministry. Therefore, the agency may not have enough funds to carry out thorough inspections to all workplaces due to constrained resources. As a result, more attention is paid to workplaces like factories and flower farms which have large number of employees thus considered to be at high risk compared to petrol stations which have few workers. Lastly, lack of co-operation by owners and management of petrol stations was a major challenge. The DOSHS officers further stated that most of the petrol stations had not registered as a workplace with DOSHS. Hence it was difficult to keep the track of all the petrol station in relation to safety and health of workplaces within the county.

4.4.1. Hazard Awareness and Knowledge on Safety Measures, Effects and Health Risks

The findings indicate that all the respondents (100%) were aware of occupational hazards present at their workplace where respondents could mention more than one risk. When asked to outline them, all respondents (100%) could easily identify fire as an occupational hazard. This is due to that fact that most of the stations had a fire extinguisher or warning signs. Other risks mentioned were oil spill (83.9%), Inhalation of PMS (85.6%), explosives (63.3%), noise (35%), fuel contact with body (93.9%), cold weather (26.1%) and risk of being run over by customer vehicles (65%). These results contradict with similar studies done in Nigeria by Okafogun *et al.* (2016) and in Thailand by Langkulsen *et al.* (2011) in Thailand who noted that only about 41% and 34.1% of the respondents,

respectively, had good knowledge of occupational hazards present in the workplace. This implies that respondents were aware of occupational hazards present at their workplace.

The study further sought to determine the respondents' knowledge levels towards safety measures, effects of ignoring safety procedures and health risks associated with the hazards at their workplace. A score was used where marks obtained by respondents were ranked (no knowledge = 0, very low = 1 low = 2, moderate = 3 and advanced = 4) base corrected answers scored by the respondents. The results are summarized in the figure 4.5 below.

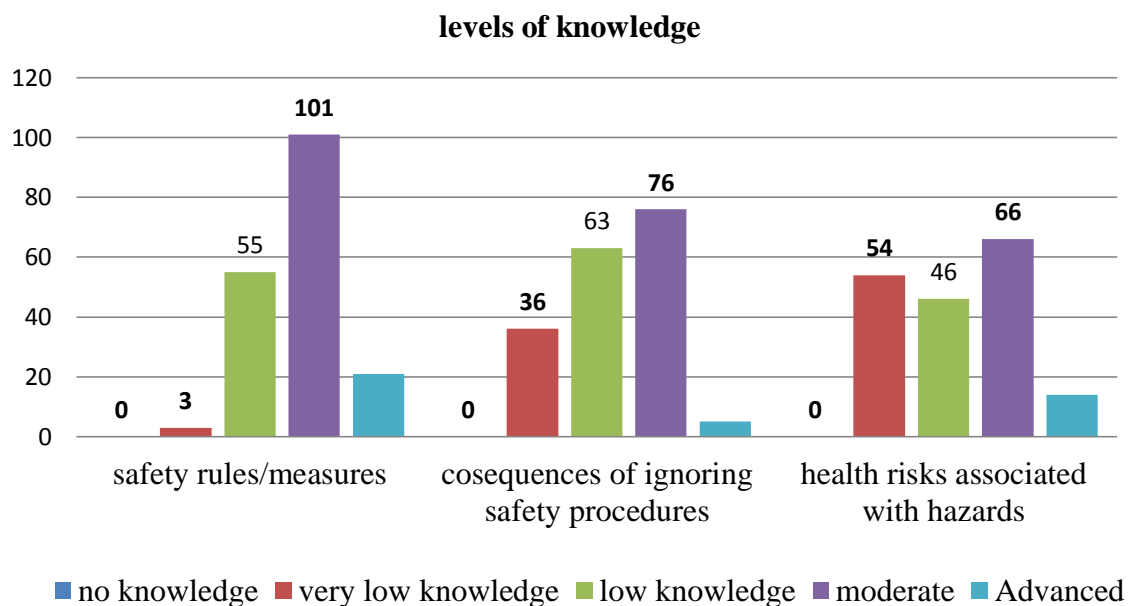


Figure 4.5: Levels of Knowledge

Majority of the respondents 88.3% (n=159) had low knowledge to moderate knowledge on safety rules and measures at their workplace while 11.7% (n=21) of the respondents had advance knowledge on them. Among the safety rules mentioned were; avoid sitting on bollards, keep Exit clear, avoid fuel spillage during fueling, put on protective attire like closed shoes and observing warning signs, “No Smoking”, “Turn off engine” and “switch off mobile phones”. This concurs with similar studies in Thailand by Langkulsen *et al.* (2011) and in Nigeria by Okafoagu *et al.* (2016) who observed that knowledge levels of the respondents on health and safety at work was 50% and 55.2%, respectively. This implies that majority of the respondents had knowledge on safety handling practices at their place of work.

The study shows that majority of the respondents 97.2% (n=175) had low to moderate knowledge on the consequences of ignoring safety procedures while 2.8% (n=5) of the respondents had advance knowledge on the consequences of ignoring safety procedures. Respondents mentioned fire as the most dangerous situation since it may lead to loss of life and property if the safety rules are not followed. Other consequences mentioned included injuries and health impact, near misses and waste of fuel. Respondents stated that though it is important to follow safety rules, sometimes, safety rules were overlooked while performing their work activities and this was attributed by inadequate pump attendants and unresponsive clients who seem to be in hurry. Some of the shortcut mentioned included fueling a running engine, use of mobile phone at forecourt, fueling and offloading without appropriate attire. Respondents stated that though it is important to follow safety rules they faced challenges ranging from working conditions to unresponsive clients. These results are consistence with Cheng *et al.* (2004) who noted that, major cause of accidents at a workplace is lack of attention and taking things for granted. There is need for safety training and periodic refresher courses which will significantly improve the knowledge and behaviours related to workplace safety (Demirkesen & Arditi, 2015).

The study noted that the knowledge level of the respondents on health effects associated with petroleum products varied. More than half of the respondents had low 25.6% (n=46) to moderate knowledge 36.6% (n=66) on health effects, about (30%) n=54) of the respondents had no knowledge while 14, 7.8% had advance knowledge on health risks associated with petroleum products. The findings are consistence with Okafuagu *et al.* (2016) who noted that a good proportion of the respondents (72.4%) were aware of harmful effects of VOCs on health.

4.4.2. Association between socio-economic factors and safety practices

The analysis in table 4.4, table 4.5 and table 4.6 below show the calculated Chi-square value and the associated p-values between socio-economic factors and safety practices.

Table 4.4: Chi-Square Tests for Level of Education and Challenges Related to Safety Practices

Challenges	Chi-Square Value	Df (degree of freedom)	Asymp. Sig. (P-value)
Non availability of equipments	2.490	3	0.477
Poor equipment	5.949	3	0.114
Poor design & siting of petrol station	12.608	3	0.006
Low knowledge level	1.718	3	0.633
Failures by enforcement agencies	1.780	3	0.010

The results in table 4.4 above showed that the calculated associated values for the challenges: non-availability of equipments, poor equipment and Low knowledge level, stated by respondents is more than 0.05 (5% level of significance). This implies that there is no association between the workers' level of education and the challenges they mentioned, non-availability of equipments, poor equipment and Low knowledge level. However, the results in table 4.4 also showed that the calculated values for the mentioned challenges, Poor design and siting of petrol station and Failures by enforcement agencies is less than 0.05 (5% level of significance). This implies that there is significance association between the workers' level of education and the challenges they mentioned, Poor design and siting of petrol station and Failures by enforcement agencies. This could be attributed to the fact that workers with higher level of education are more likely to be aware of the role of enforcement agencies than those with lower level of education level. Similarly, workers with higher level of education are more likely to be aware of importance of design and siting of petrol station in relation to implementation safety practices at their workplace than those with lower level of education level.

Table 4.5: Chi-Square Tests for Work Experience and Challenges Related to Safety Practices

Challenges	Chi-Square Value	Df (degree of freedom)	Asymp. Sig. (P-value)
Non availability of equipments	5.450	2	0.066
Poor equipment	4.027	2	0.133
Poor design & siting of petrol station	2.570	2	0.277
Low knowledge	1.433	2	0.489
Failures by enforcement agencies	1.780	2	0.411

The analysis in table 4.5 above showed that the calculated associated values for each of the stated challenges related to safety practices is more than 0.05 (5% level of significance). This indicates that there is no association between workers' work experience and the mentioned challenges related to safety practices. Therefore, duration of employment in petrol station may not necessarily have an impact on the workers' knowledge on the challenges related to safety practices at their work place. These findings are inconsistent with the study done by Brandt-Reuf (2001) who established that workers who have worked in a particular workplace or performed a certain task over a long period of time tend to have higher level of knowledge on the challenges related to safety practices than young or new workers.

Table 4.6: Chi-Square Tests for Socio-Economic Factors and Use of PPEs

Variable	Chi-Square Value	Df (degree of freedom)	Asymp. Sig. (P-value)
Designation	6.071	2	0.048
Age	1.453	2	0.484
Level of formal education	38.584	3	.000
Work experience	1.677	2	0.432

The results showed that at 5% level of significance ($p=0.05$), there was no association found between age and use of PPE. This implies that there is not enough evidence to suggest an association between age and use of PPE. The results also showed that at 5% level of significance, there was no association between work experience and use of PPE. This indicates that work experience has no influence on use of PPE. However, the analysis above showed that at 5% level of significance, there was a significant association between designation of the worker and use of PPE. The findings imply that designation of the worker affects the use of PPE among petrol station workers. Further, the results showed that at 5% level of significance, there was a significant association between level of formal education and use of PPE. This indicates that level of formal education influenced the use of PPE among the workers. These findings are contrary to those of Brandt-Rauf (2001) who noted that duration of employment in a petrol station may have an impact on the use of provided PPE but consistent with those of Shyam *et al.* (2013) whose study noted that workers with higher formal education are more likely to use the provided PPE than those who are illiterate or with lower level of education. This could be attributed to the fact that workers with higher education can read and obtain additional information from different information sources on safety incidence and near misses experienced by other workers in other similar organisation. Based on the results on table 4.6 above, the findings imply that use of PPEs are influenced by workers' level of education and designation while workers' age and work experience may not necessarily result to utilization of provided PPEs.

4.5.Reviewing Existing Safety Policies and Regulations for Petrol Stations

There are several regulations and subsidiary laws that deal with Occupational Safety and Health (OSH) issues. The principal legislations related to safety at petrol station and Petroleum sector in general are Petroleum Act (repealed by Energy Act, No 12 of 2006), Occupational Safety and Health Act (OSHA) of 2007 and Work Injuries Benefit Act (WIBA) of 2007.

4.5.1. Health Safety and Environmental Policy

Majority of the petrol stations (57.8%) did not have written Health, Safety and Environmental (HSE) policy statement for their company, while those who had, only 20% had them displayed at the front office as illustrated in plate 4.6. This is contrary to provisions of OSH Act of 2007 which states that an employer should prepare a safety and health policy statement, display, revise it when deemed appropriate, and bring the statement and any

revision of it to the notice of the employees. The HSE policy displayed by petrol stations indicated commitment of the management in ensuring compliance with applicable HSE legislation.



Plate 4.6: Policy Statement of the Hashi Energy

About 45% of the petrol station had their forecourt in poor condition ranging from wet floor to potholes and large cracks with service water accumulation, oil leaks and drip spot were left unattended to as illustrated in plate 4.7, while 60% fall short of recommended storage and handling of LP Gas ranging from LP Gas cage not labeled “Flammable gas”, cage located either next to a building opening or near fuel dispenser. According to Workplace Health and Safety Queensland, WHSQ (2016), LP Gas cage should have a red class diamond label and warning notice displayed on the front of the cage, reading “FLAMMABLE GAS- NO SMOKING”. It should also be located outdoors away from building opening and trafficable areas notable 1 metre from the building opening and 1.5 metre from fuel dispenser to minimize risks of impacts and damage. Moreover, most respondents (58%) mentioned that

offloading of petroleum product was sometimes done between the hours of sunset and sunrise contrary to what the petroleum act stipulates and this happens when the tanker arrives past 1800hrs. This implies that petrol stations are partially compliant to petroleum act provisions



Plate 4.7: Water and Oil Spills at Forecourt Floors of Typical Petrol Stations in Nakuru County

4.5.2. Fire Safety Policy

About a half (56.5%) of the petrol stations had fire policy either displayed at the forecourt or in the front office. Fire was recognised as a major threat to the normal business activities in all fire safety policy. Further, fire policy highlighted the fire safety arrangements and roles to be played by the petrol station and all stakeholders in case of fire; staff fire safety training; fire safety provisions including fire risk assessment and emergency procedures; and fire safety management listing fire equipment in place. The findings of the study show that 48.3% of the respondents had attended fire safety training, though few petrol stations (36%) had copies of certificate as a proof of training. All petrol stations had “NO SMOKING” sign as text or symbol displayed while 36% of the stations had FIRE ACTION NOTICES” and “FIRE EXIT” displayed at prominent locations. About 70% of the petrol station had fire extinguishers mounted and sand buckets placed adjacent to dispensing pumps, but only a half of them had serviced their fire extinguishers at the time of study. However, the stations did

not have a particular person in charge of fire safety. The results are consistent with a study by Mutua and Fedha (2012) who noted that most petrol stations (72%) along Thika highway had firefighting equipment and warning signs at their workplace. Similarly, the study also concurs with a study done by Afolabi *et al.* (2011) on assessment of safety practices in filling stations in ile-lfe, south western Nigeria where 63% of the petrol stations did not maintained the fire extinguisher in the last six months preceding that study.

4.5.3. Risk Assessment and Audit

On risk assessment and audit, the findings of the study show that most petrol stations (58%) had risk assessments done either annually (40%) or after six (6) months (18%) with documentation available. However, the audit reports were kept in company files and only accessible to relevant authority on demand thus not accessible to staff as require by law. According to Section 6 (3) of OSHA of 2007 provides that every occupier/employer must ensure the safety, health and welfare of all persons in his workplace and shall carry out a safety and health audit at least once in every period of 12 months by a safety and health auditor. The auditor records the relevant information on audit form as per section 11 (1) of OSHA 2007 and The Factories and Other Places of Work Act (Safety and Health Committee), Legal Notice no. 31 of 2004. Further, the findings of the risks assessment and audit shall address the likelihood of risk occurrence and the seriousness of impact, recommendation on the appropriate steps to either eliminate the risk or minimize the impact if any and periodic monitoring of safety procedures in place.

4.6. Health Risk and Safety Management Systems and their Compliance

The study was interested to find out whether the petrol stations had a set of laid procedures and routing processes in place which aimed at minimising the incidences of injuries and illness at workplace.

4.6.1. Work Procedures.

According to work health and safety Work procedures 2011, work procedure is a form of administrative control that meant to minimise the risk to people, equipment, materials, environment and processes. Most of the respondents 91.7% (n=165) stated that they had specified work assignment where staff had defined job descriptions outlining how to perform their duties. However, from observation, multitasking was evident in most stations 76.7%

(n=23) where pump attendant would refuel more than one vehicle at a go, wash windscreen and charge for the services. Similarly, staff from front office and car servicing section could also be seen refuelling customers' vehicles. The finding concurs with another study in Brazil by Racho *et al.* (2014) who observed that more than half of the pump attendants could be seen refuelling more than one vehicle at a go while charging for the services. This implies that workers at the petrol stations may work in any of the designations when called upon thus supposed to familiarise themselves with work procedures in front office, car servicing, and pump dispensing unit.

4.6.2. Emergency Preparedness and Response Plan

Majority of the respondents 70% (n=126) stated that they had guidelines for emergency action plan though 40% (n=72) did not show any document to support it. The emergency preparedness and response plan displayed by petrol stations included emergency reporting procedures, emergency escape route, evacuation procedures and procedures for getting an accurate head count after evacuation. However, the list of trained personnel onsite to be contacted during emergency was not displayed even by those who had their staff trained. This may be attributed to the fact that safety related issues had not reached all petrol stations.



Plate 4.8: Emergency Procedures Notice in Nation Oil Petrol Station

4.6.3. Medical Examination of the Workers

In terms of medical examination, only 18.9% (n=34) reported undergoing either pre-employment medical examination or periodic examination. Of those who had been subjected to medical examination, the most commonly medical test done was chest examination 94.1% (n=32), eye sight 29.4% (n=10), and blood sample 5.9% (n=2) while 82.4% (n=28) and 17.6% (n=6) of the respondents said it was done after 6 months and annually, respectively, as illustrated in the table 4.7. Moreover, most of the respondents 97.9% (n=143) who had not been subjected to medical examination stated that medical examination had not been done because it was not necessary contrary to the fact that petrol station attendants are likely to be exposed to occupational hazards (Harrisson *et al.*, 2002). Different studies have documented chronic cough, breathlessness, nausea vomiting, redness of the eyes, fatigue, dizziness and migraine headache as common symptoms reported by petrol station attendants (Ansah & Mintah, 2016; Monney *et al.*, 2015; Rocha *et al.*, 2014). These results are consistent with a study in Nigeria by Johnson and Umoren (2018) which states that only 4.2% reported undergoing medical examination before or after commencement of work as petrol station attendants. The low practice of medical examination of the workers may be due to the fact that general population has less knowledge of the benefits of Periodic Medical Examination (Akande & Salaudeen, 2004).

Table 4.7: Medical Examination for the Workers

Variable	Frequency (n)	Percentage (%)
Medical examination done	n=180	
Yes	34	18.9
No	146	81.1
*Type of medical examination tests done	n=34	
Eye sight	10	29.4
Chest examination	32	94.1
Blood sample	2	5.9

How often Periodic medical examination is done	n=34	
After 6 months	28	82.4
Annually	6	17.6
<hr/>		
*Reasons medical examination not done	n=146	
Fit and well	9	6.7
Lack of awareness	15	10.3
It was not necessary	143	97.9
Supervisor/management are well known to me	13	8.9
<hr/>		
*Multiple responses		

4.6.4. Reporting Accidents and Incidences

Majority of the respondents 80% (n=144) indicated that they had laid procedures in reporting incidences. The reporting procedures include verbal notice to immediate supervisor and filling of incident report form. However only 23.3% (n=7) of the stations had a general register or incident notification report form where the details of accident and actions taken to prevent occurrence of similar incident are recorded.

The most common accident occurrences stated were fuel splash on the skin 90% (n=162) others included slip and fall, fingers pinched/laceration by faulty pump handle and fire. However, the respondents stated that only near misses, injuries and fires were reported. Majority of the respondents 82.8% (n=149) stated that carelessness and ignorance were the main contributing factors while 17.2% (n=31) attributed that accident happens by chance. This finding is consistent with Janjua *et al.* (2006) which states that though incident rate remained 0.669% for the year 2006-2007, the root cause for the 130 incidences reported was identified as carelessness. However, there was no documentation to show that reported incidents were recorded among the sampled station, despite the fact that reporting and recording are legal requirements.

4.6.5. Provision for Clean Water and Changing Room

From the observational checklist (Appendix 4), 90% of the petrol stations had bollards installed as pump shields and a tap of water at forecourt while 45% had provisions for storage and changing of clothing. This contradicts with a study done by Mirza *et al.* (2012) on petrol fuel station safety and risk assessment framework, noted that there was no provision for storage and changing of clothing. Studies by Colman and Coleman (2006) and Marta *et al.* (2012) have suggested that changing clothes for each shift and applying hygiene measures, such as hand washing after handling petrochemical products as among the protective measures that might minimize the risk exposure since as it is difficult to avoid occupational exposure to chemicals in petrol stations.

4.6.6. Training of Workers on Safety

All respondent stated that they were trained on use of work tool and equipment at their workplace upon their employment. The training aimed at ensuring that staff fuel customer's vehicles with the right fuel, avoiding fuel waste during fueling and on customer care services. About 27.2% (n=49) of the respondents agreed that they have undertaken refresher courses in their place of work while 72.8% (n=131) disagreed. In regard to safety training, about 48.3% (n=87) of the respondents stated that they had attended safety training. Of those who attended safety training, 98.9% (n=86) had attended fire safety training while 48.3% (n=42) had first aid training as illustrated in table 4.8 below. However, only few stations 33.3% (n=10) had copies of certificate as a proof of training. These results are consistent with Cheronno (2011) whom in a study on occupational accidents in Hotels within Eldoret town, Kenya noted that 55% of the respondents had attended safety training. This implies that majority of the respondents had attended a safety training thus understands the health hazards in place, safety equipment to be used in case of an incident and how to escape in case of an emergency. According to Grimaldi and Simonds (2003), training, education and efficacy on safety training needs to be carried out in three settings: at induction, on the job and in refresher courses. This should be supplemented by use of safety awareness campaigns and communication, and disciplinary action for those who contravene the safety rules and procedures outlined by the organization.

Table 4.8: Safety Training

Attended safety training	Frequency	Percentage
	n=180	
Yes	87	48.3
No	93	51.7
*Type of safety training	n=87	
First Aid	42	48.3
Fire	86	98.9
* Multiple responses		

Generally, multinational companies performed better in safety practices, compliance and enforcement of institutional safety policy and health management systems in place than the independent petrol marketers. This concurs with similar studies which state that multinational companies are more likely to comply with international health and safety regulations by which they conduct their business than local companies who only operate within a specific country (Ansah & Mintah, 2012; Garcia *et al.*, 2004; Olaotse, 2010). The independent petrol marketer in the other hand have worse or less developed safety and health programmes (Olaotse, 2010) for their workers which were responsible for high prevalence of injuries in such companies (Fabiano *et al.*, 2004). This is also consistence with a study done in Kenya by Mutua and Fedha (2012) who noted that multinational oil companies and National Oil Company of Kenya performed better as far as safety at work was concerned compared to other independent operators.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the key study findings, conclusions and recommendations. It also shows the extent to which objectives were addressed; and suggests recommendations on the way forward and implications for further research.

5.1. Conclusions

The following conclusions were made based on the findings of the study:

The study findings have shown that safety practices in place at petrol stations in Nakuru County Kenya included presence of first aid kit and fire fighting equipments, use of uniform and PPEs and observing warning sign and symbols. However, there was low use of PPE among petrol station workers as only 6.7% of the respondents used PPE at the time of the study commonest being Aprons/overall (99.1) and the least used being gloves and face mask at 8.3% each. In addition, the study observed that “No smoking” safety sign was strictly observed by all Staff and clients while “switch off phone” safety sign was hardly observed as use of mobile phones at the forecourt was a common practice nearly to all (98%) the petrol stations.

Many factors that influence implementation of safety culture at petrol station have also been established. The most significant factor was inadequate and non-availability of safety equipment 93.3% (n=168). Other challenges mentioned included poor state and nature of the safety equipment 17.2% (n=31), poor design and siting of the petrol station 18% (n=33), low knowledge level 45 (25%) and failure by enforcement agencies. Majority of the respondents had low knowledge to moderate on safety rules and measures at their workplace as represented by 88% while 12% of the respondents had advance knowledge on them. More than half of the respondents had low to moderate knowledge on health effects as represented by 25.4% and 35.6%, respectively, about 30% of the respondents had no knowledge while 8.1% had advance knowledge on health risks associated with petroleum products. Moreover, majority of the respondents (90.2%) were of the perception that some of the safety rules including warning sign “No mobile phones”, “Turn off engine while refueling” and “use of recommended containers” were hard to practice.

Though majority of the petrol stations had formulated Health Safety and Environment (HSE) and Fire Safety Policies as internal health and safety workplace laws, the findings show that few petrol stations had posted policy statements at strategic areas where workers could read them. The follow up to ensure that contents of policies were implemented in all work stations of the workplace was hardly done by the management. Presence of poor forecourt conditions ranging from wet floor to potholes and large cracks with service water accumulation, oil leaks and drip spot were left unattended was a common observation in most workplaces while majority fall short of recommended storage and handling of LP Gas. This study has therefore re-affirmed that petrol stations were partially compliant to safety policies despite their existence in the workplace.

The study has deduced that despite the majority of petrol station workers being aware of health risk and safety management systems in place, some of them had not adopted such measures. Multitasking was evident in most stations 76.7% (n=23) where pump attendant would refuel more than one vehicle at a go, wash windscreen and changing engine oil. Similarly, staff from front office and car servicing section could also be seen refuelling customers' vehicles. In regard to safety training, about 48.3% (n=87) of the respondents stated that they had attended safety training. Of those who attended safety training, 98.9% (n=86) had attended fire safety training while 48.3% (n=42) had first aid training. Though, nearly 30 % of the petrol stations had displayed emergency procedures and evacuation plan, none of the petrol stations displayed list of trained personnel onsite to be contacted during emergency even by those who had their staff trained. About 90% of the petrol stations had bollards installed as pump shields and while 45% had provisions for storage and changing of clothing. In addition, there was low practice of medical examination of the petrol station workers as only 18.9% (n=34) reported undergoing either pre-employment medical examination or periodic examination. Furthermore, only 23.3% (n=7) of the stations had a general register or incident notification report form where the details of accident and actions taken to prevent occurrence of similar incident are recorded. The most common accident occurrences stated was fuel splash on the skin 90% (n=162). However, about 82.8% (n=149) of the respondents stated that carelessness and ignorance were the main contributing factors while 17.8% (n=32) attributed that accident happens by chance.

5.2. Recommendations

This study makes the following recommendations in view of the findings and the conclusion drawn above:

Safety equipment like fire extinguishers and first aid box should not only be available and accessible to workers but also serviced regularly to ensure that they are functional in case of emergency. Moreover, staff should be trained on the use of first aid kit and fire appliances present since majority of the staff did not know how to use them while essential personal protective equipment such as respiratory protectors, safety glasses, safety vests and boots should be provided to workers to be used at all time at workplace.

In order to address challenges that affect implementation of safety culture, the following measure need to be observed: Management should ensure that adequate and suitable PPEs are provided to workers and trained on how to use them; that widespread Safety awareness campaign has been done to enlighten workers with knowledge on the occupational hazards, health effects associated with the hazards, the importance of observing warning signs and more so the role of employers and workers regarding PPE. Whereas the training on provision and the use of safety equipment among the staff is essential, supervisors should also enforce their use and instigate disciplinary actions where necessary. Enforcement government agencies including DOSHS and Energy Regulation Commission should ensure that Petrol stations comply with government guidelines and regulations during setting up and normal operation activities.

All petrol stations need to formulate Health and Safety, and Fire safety policies. The safety policies are workplace specific and should be established after workplace occupational health and safety, risk assessment and fire safety audit has been carried out by approved personnel as stipulated under sections 6&11 of OSHA, 2007 and the Fire Risk Reduction Rules Legal Notice 59, 2007. The contents of the policies should be communicated to all workers through posting of the policies in strategic points in wall work stations where workers can read them. Furthermore, these policies should be written in a language that is easily understood by all workers, preferably English and Swahili.

The study also recommends petrol station to embrace on Occupational Safety and Health Management System (OSHMS) which aims at reducing the operations mistakes, cost of correcting problems and level of risks, and ensuring that petrol stations comply with laws.

These HSMS include and not limited to pre-employment medical examinations and periodic examination of workers' health status, work procedures, restructured safety training to include chemical safety, incidence reporting procedures and emergency preparedness and response plan.

5.3.Suggestions for Further Studies

This study suggests the following for further research:

- i. Health problems among petrol station workers
- ii. The role of customers in implementing health and safety at petrol stations.

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APPENDICES

Appendix 1: Questionnaire for Petrol Station Staff

My name is Joshua Kyalo Mutungi. I am a student at Egerton University pursuing a Master of Science Degree in Environmental and Occupational Health. The aim of administering this questionnaire is to assess occupational hazards awareness and safety practices among petrol service stations workers within Nakuru County. The findings will benefit government agencies and Organisation you work in with information relating to occupational exposure to hazards and control intervention. Any information provided by you either by filling in the questionnaire or giving an in-depth interview to the researcher will be treated as confidential and will not be used against you in any way. Your participation is voluntary and you have a right to withdraw from the study any time you wish to do so.

Your assistance will be highly appreciated

CONSENT

If you agree with the above statements, Kindly sign below as evidence for your willingness to participate in this study

Sign..... Date

Instructions to participants

1. Do not write your name or indicate any personal details on the questionnaires.
2. Tick/fill in the blank spaces provided to answer the questions

County: _____ Sub-county: _____

Station No: _____ Date _____

Category of station: Independent Petroleum Marketers

Multinational Companies

SECTION A: PERSONAL AND SOCIO ECONOMIC DETAILS

1. Respondent No. _____

2. Section/Designation: _____

3. What is your Gender?

Male Female

4. What is your Age?

Under 18

18 – 25

26 – 35

36 – 45

45 and Above

5. What is your educational level?

Primary

Secondary

Tertiary

University

6. What is your working experience in years in current employment?

Below 1

1 – 5

6 – 10

11 years and above

7. Have you worked in another petrol station before joining this station?

YES NO

8. How many hours do you work per day?

Below 8

8 – 10

11 – 12

Over 12 hrs

SECTION B. AWARENESS

1. Are there any occupational hazards in your work areas that you are aware of ?

YES NO

If yes, state them _____

2. Is there any written safety procedures in place to minimize occupational exposure to volatile organic Compounds?

YES NO

3. Do you know any other safety measures to be put in place at your work place?

YES NO

If yes, outline them _____

4. Who is responsible for the implementation of safety practices at your workplace?

Top management

Supervisor

Self

All of the above

None of the above

5. Are there issues of occupational health and safety that concerns you?

YES NO

If yes how should they be dealt with in the company?

SECTION C: SAFETY PRACTICES AND THEIR PERCEPTION

1. State any safety equipment/gears available in your workplace

2. Which of the following are in place at your workplace?

Training on use of work tools and equipment

Provision of personal protective Equipments

Warning signs in areas of danger.

Work in shifts with rest in between shifts

Refresher courses

Availability of medical services

3. In your own opinion what are major challenges faced while implementing safety and safety practises? Tick as appropriate

Challenges	YES	NO
Inadequate and non availability of safety equipments		
Poor state and nature of safety equipment		
Poor design & siting of petrol station		
Low knowledge level of workers		
Failures by enforcement agencies		

Others, name them _____

4. How do you rate your workplace in terms of safety?

Good

Average

Poor

5. How do you rate the implementation of health and safety practises in your workplace

Very successful

Fairly successful

Success

Unsuccessful

6. State any safety shortcuts which are sometimes undertaken to get work done faster and on time

7. How will you rate the health risk associated with the above stated safety shortcut?

Not bad

Bad

Worse

SECTION D: SAFETY POLICY

1. Is there a safety policy statement in your workplace?

YES NO

2. Do you know any other laws governing health and safety at your workplace?

YES NO

If yes, outline them _____

3. Does your supervisor talk about safety with you?

YES NO

4. Is there a procedure for reporting accident or occupational illness?

YES NO

If yes, state them _____

5. Have there been any accidents or incidences reported to occur in your workplace?

YES NO

If yes state it _____

6. Have you had the mandatory training on the type of work before being employed?

YES NO

If yes, how has it helped you _____

7. Have you attended any of the safety training listed below?(Tick appropriate)

	YES	NO
Fire safety		
First Aid		
Health and safety		

8. Does the management undertake medical examination for its staff?

YES NO

If yes, how often_____

9. In your own opinion does safety policies and regulations contribute to productivity.(Tick appropriate)

	YES	NO
Employee efficiency and Effectiveness		
Improve the morale of the workers		
Improves time management		
Attracts and retains skilled workers		

Appendix 2: Likert Scale Showing Knowledge Levels on Safety Measures, Effects and Health Risks Associated with the Occupational Hazards

State four (4) safety practices in place

The marks obtained by the respondents were ranked (no knowledge = 1, low = 2, moderate = 3 and advanced = 4) base corrected answers scored by the respondents.

State four (4) effects of poor safety practices

The marks obtained by the respondents were ranked (no knowledge = 1, low = 2, moderate = 3 and advanced = 4) base corrected answers scored by the respondents.

State four (4) health risks associated with the occupational hazards

The marks obtained by respondents were ranked (no knowledge = 1, low = 2, moderate = 3 and advanced = 4) base corrected answers scored by the respondents.

Thank you for your cooperation and assistance

Appendix 3: Interview Schedule for Petrol Station Manager/Supervisor

County: _____ Sub-county: _____

Station No: _____ Date _____

Category of station: Independent Petroleum Marketers

Multinational Companies

1. What is your position within this petrol station? _____

2. For how long has this petrol station been operational

Below 2 year

2 – 5 years

Above 5 years

3. What is your working experience in your current position?

Below 6 months

6months - 1 year

1 – 3 years

4 – 6 years

Over 6 years

4. Do you have any safety measures or policies that govern this petrol station?

YES

NO

If yes outline them _____

5. State any problems you encounter in enforcing them _____

6. Are you aware of occupational volatile organic compounds at petrol station?

YES

NO

If yes State them _____

7. What preventive measures do you have in place to minimize possible occupational exposure to volatile organic compounds?

8. Any future plans or further preventive procedures you intend to put in place.

9. In your current position, how would you ensure safety of staff at work?

10. Does the petrol station have safety committee/personnel in charge of safety?

YES

NO

If yes, which criteria did you use to come up with its members.

11. Do you offer training on specific task or on general operations upon hiring?

12. (a) Do you offer safety training to all workers or to specific work group and Why?

(b) How often?

After 6months Yearly When need arise

13. Is there a system of reporting risks, hazards and occupational injuries/illness?

YES

NO

If yes, what are the laid procedures? _____

14. Any suggestion you wish to make concerning safety in your workplace?

Thank you for your cooperation and assistance.

Appendix 4: Observational Checklist

County: _____ Division: _____

Station No: _____ Date _____

Category of station: Independent Petroleum Marketers

Multinational Companies

DESCRIPTION	YES	NO
General facility		
Is house-keeping ok?		
No slippery flooring,		
No rubbish,		
grass cut,		
no blocks to entry and exit.		
No loose fittings at fill & dip points of underground storage tanks		
Are leaks and drips spot cleaned routinely in reference to their maintenance schedule		
FORECOURT& dispensing areas		
Safety signage in place?		
No smoking,		
no mobile phone,		
switch off engine on or near dispenser.		
Minimum of two powder-type fire Extinguishers available		
Fire extinguishers routinely serviced at least 6 months		
Each Extinguisher location is marked by a “ FIRE EXTINGUISHER’ sign mounted at least 2 m above ground		
Are forecourt services in good condition?(No trip hazards due to potholes & large cracks, no service water accumulation		
Are fuel dispensing areas maintained using-:		
dry cleanups methods such as sweeping for removal of litters,		
use of rags and absorbents for leaks and spills		
never washed down unless the wash water is collected and disposed of properly		

Are signs posted at fuel dispenser or fuel island warning vehicles operators against topping off of vehicle fuel tanks?		
Impact protection is installed(e.g. bollards) or dispenser is located so potential damage(e.g. from vehicle) is minimised		
Hoses are free of cracks, fractures, or movement between hose and fittings		
LP GAS & UNDERGROUND TANK REQUIREMENTS		
Cylinder cages are outdoors		
The front of each cage has a dangerous goods class label 'Flammable gases'		
Cages are separated by at least 1.5 from any pit basement, public place or fuel dispenser.		
Cages are separated by at least 1 m from any building opening		
Cage are separated by at least 5 m from any LP Gas tank		
The vent outlet of the underground fuel tank is 4 m or more above the ground level i.e. petrol at least 4 m laterally from any opening into a building and 2 m for diesel		
AUTO SERVICING AND CARWASH		
The type of floor at oil changing station & Car wash Porous floor		
Non-porous floor		
Used oil is collected/stored, disposal monitored & recorded,		
Used oil collected by authorised used-oil collector		
Are vehicle fluids changed, whenever possible, indoors and only on floors constructed of non-porous materials?		
Are damaged vehicles inspected for leaks when they are received, and are drip pans used if necessary?		
Are spills prevented from reaching the street or storm drain by working over an absorbent mat, use of drip pans or covering nearby drains?		
Drain fluids from leaking or wrecked vehicles as soon as possible, to avoid leaks and spills		
Are specific areas or service bays designated for engines, or radiator cleaning? (Note Parts should not be washed or rinsed outdoors)		
If soap is used in washing, is the wash water collected and discharged to the sanitary sewer and not discharged to a storm drain?		

OPERATIONAL PROCEDURES		
Vehicles engines must be switched off while refuelling		
Spillage and overfilling must be prevented during the filling of the storage tanks		
Containers must be on the ground while being filled at a fuel dispenser (ie must not be in or on a vehicle or trailer)		
Children under the age of 15 years are not permitted to operate fuel dispenser		
SAFETY MANAGEMENT AND TRAINING OF STAFF		
Safety Training manuals & records available		
Emergency procedures and call numbers available (posted conspicuously)		
Safety meetings conducted at least monthly with all staff in attendance. (Presence of minutes)		
Availability of Material Safety Data Sheets (MSDS) for all products i.e. fuels and lubes.		
Staff in appropriate working attire(wearing closed shoes, gloves)		
Are all employees trained upon hiring and annually thereafter on personal safety, chemical management and proper methods for handling and disposing of waste?		
Are instructional/informational signs posted around the station for customers and employees?		
Are signs place on hose bibs reminding employees and customers not to use water to clean up spills?		

Sources: (NTworksafe 2010, Resources safety, 2011)

Appendix 5: Interview Guide for Key Informants

1. How many petrol stations have been registered as a workplace by your agency?
2. How often does the agency do spot check/crackdown on petrol stations which operates illegal and/or a non-compliance to health and safety regulations?
3. When was the last time the agency visited a petrol station to check on health and safety compliance?
4. What are the contributing factors to poor safety procedures in petrol stations?
5. What challenges do you face while enforcing the safety and health compliance?
6. Which other Enforcement agency do you work with to ensure that petrol stations are compliance to health and safety regulations?
7. What legal actions are taken to stations which are non-compliance?
8. How many petrol stations in your area of jurisdiction have been closed non-compliance in the last 10 years?

Thank you for your cooperation and assistance

Appendix 6: Registration of Work Place Form

MLSSS/DOSH 21A (Revised 2014)
 (fill in duplicate)
 OFFICIAL USE ONLY
 Reg. Fee/ Levy: KSh.....
 MR No.....
 Signature.....
 Date.....20.....



OFFICIAL USE ONLY
 Recommended for Registration on/20...
 Name of County OSH Officer
 Signature

THE OCCUPATIONAL SAFETY AND HEALTH ACT, 2007

Section 44 of the Occupational Safety and Health Act, 2007 requires that before any person occupies or uses any premises as a workplace he shall apply for the registration of such premises by sending to the Director of Occupational Safety and Health Services a written notice containing the particulars set out in the Fourth Schedule of the Act. When completed, it should be sent to the Director of Occupational Safety and Health Services, Ministry of Labour, Social Security and Services.

APPLICATION FOR REGISTRATION OF A WORKPLACE

I HEREBY APPLY for the registration of the premises of which particulars are given below, which premises I intend to occupy as a workplace.

1. Name of the workplace County
2. (a) Situation: Plot No. Street Town District
- (b) P.O. Box Code Town
- (c) Tel. Mobile Email.....
- (d) Registered office (if any)
3. Name of intending occupier
(In case of a firm, names of each director/partner should be entered. If more than two attach a separate piece of paper with the required details) (Please state FULL names)
4. Name of owner of the premises or building. *(If different from 3 above)*
 Name..... Address.....
5. Nature of the work to be carried on.....
6. Name of manager
7. Are chemical substances to be used? Yes No. *If yes, attach a list of chemical, trade name and chemical safety data sheets for each chemical.*
8. Are machines/equipment to be used? Yes No.
If yes, state the source of energy to be used (e.g. electric, steam, gas or oil)

9. Are power presses to be used? Yes No.

If yes, attach separate piece of paper giving the particulars of each power press in the format given below:-

Type of Power Press	Description	Distinctive number	Country of manufacture	Year of manufacture

10. Are passenger or goods lifts to be used? Yes No.

If yes, attach a separate piece of paper giving the particulars in respect of each such lift in the format given below:-

Type	Description	Distinctive Number	Country and year of manufacture	Date of the last thorough examination	Name of Approved Person by whom the examination was made	*M.P.W. L

11. Are steam boilers to be used? Yes No.

If yes, attach a separate piece of paper giving the particulars in respect of each such boiler in the format given below:-

Type	Description	Distinctive Number	Country and year of manufacture	Date of the last thorough examination	Name of Approved Person by whom the examination was made	*M.P.W.P in psi or Kg/cm ²

12. (a) Number of persons to be employed in the workplace. Male Female..... Total

(b) Are persons to be employed in shifts? Yes No.

If yes, state the maximum number to be employed at any one shift.

13. Have the premises previously been used as a workplace? Yes No.

If yes, state name of the workplace

14. Name of Director/Partner/Proprietor

Date20.....

.....
Signature of Director/Partner/Proprietor

.....
Full Name

Note:-

1. This form should be accompanied with DOSH 23, (Self-Assessment Form) together with OSH Levy and registration fee payment (KShs. 5000) banking slip in the name of workplace.

2. It is an offence for any person to occupy or use any premises as a workplace without first having been issued with a certificate of registration. Where the Director of Occupational Health and Safety Services refuses to issue a certificate of registration, he must, if so required by the applicant, state in writing the grounds of such refusal. Appeal against the Director of Occupational Health and Safety Services' refusal to register is provided for under section 44(6) of the Act.

* M.P.W.P: Maximum Permissible Working Pressure,

* M.P.W. L: Maximum Permissible Working Load.

Appendix 7: Workplace Self-Assessment Report Form

MLSSS/DOSH 23
(Revised 2014)
Fill in duplicate

THE OCCUPATIONAL SAFETY AND HEALTH ACT, 2007
WORKPLACE SELF-ASSESSMENT REPORT

1. NAME OF WORKPLACE.....

2. PERSONNEL

	<i>Permanent</i>		<i>Casuals</i>		<i>Sub - Total</i>
	<i>Male</i>	<i>Female</i>	<i>Male</i>	<i>Female</i>	
Management/Supervisors					
General workers					
Sub - Total					
<i>Grand Total</i>					

3. PREMISES

- a) Type of Building
- b) Description of work place(s).....

4. NUMBER OF SANITARY AND WASHING FACILITIES

<i>MALE</i>					<i>FEMALES</i>			
<i>Floor</i>	<i>Toilets</i>	<i>Urinals</i>	<i>Showers/ bathrooms</i>	<i>Hand Washing</i>	<i>Floor</i>	<i>Toilets</i>	<i>Showers/ bathrooms</i>	<i>Hand Washing</i>

5. RAW MATERIALS IN USE

6. PRODUCTS

7. GIVE A BRIEF SUMMARY OF NATURE OF WORK BEING DONE IN THE WORKPLACE

8. LIST THE HAZARDS IN YOUR WORKPLACE

9. WHAT PRECAUTIONS HAVE YOU TAKEN TO CONTROL THE HAZARDS?

10. LIST THE PROTECTIVE APPLIANCES AND CLOTHING PROVIDED TO WORKERS (if any)

11. VENTILLATION

- a) Mechanical (e.g. Type)
- b) Local exhaust ventilation (if any):

12. FIRE PRECAUTION

- a) Appliances (Indicate types, number and distribution of fire extinguishers):
- b) Means of escape from workplace in case of fire: (specify).....
- c) Has a fire risk audit been carried out?

13. WELFARE FACILITIES

- a) First Aid Box/First aid rooms
- b) Drinking Water

14. OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT SYSTEMS.

- a) Is there a documented Occupational Safety & Health Policy in place? YES/NO
- b) Is there a functional Occupational Safety and Health committee? YES/NO
- c) Has the committee received the prescribed basic training in OSH? YES/NO
- d) Date of last Safety Audit..... Name of Safety and Health Adviser

15. HAVE MEDICAL EXAMINATIONS AND TESTS ON WORKERS BEEN DONE AND WHEN

i.e. give dates and names of DHP

.....

16. DECLARATION.

I declare that the information given herein is true to the best of my knowledge and belief.

Name of Person filling Assessment Report: **Signature:**

Designation **Assessment Report Date**

Appendix 8: Incident Notification Form



Near Miss / Incident Notification Report Form (EHS-F-001)

Issue/Revision 1/1

Reported By:.....

Date of the Incident:

Time of the Incident.....

Location:

Time Reported.....

What Happened? (Brief Description)

Why did it happen?

What should be done to ensure it does not happen again?

Appendix 9: Abstract Page of Published Paper



Current Journal of Applied Science and Technology

37(2): 1-8, 2019; Article no.CJAST.50961

ISSN: 2457-1024

*(Past name: British Journal of Applied Science & Technology, Past ISSN: 2231-0843,
NLM ID: 101664541)*

Occupational Safety and Health Management Systems and Their Compliance among Petrol Stations in Kenya: A Case Study in Nakuru County

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¹*Department of Environmental Science, Egerton University, Njoro, P.O.Box 536 Egerton, Kenya.*

Authors' contributions

This work was carried out in collaboration among all authors. Author JKM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors WM and Author SM managed the analyses of the study and refined the manuscript. Author JKM managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2019/371230275

Editor(s):

(1) Dr. David Coman, Professor, Medical Director of Paediatrics, The Wesley Hospital, Brisbane, Australia And The Lady Cilento Children's Hospital, Brisbane, Australia.

Reviewers:

(1) Emmanuel Etim, Lagos State University, Nigeria.

(2) Abi Drochioiu, Alexandru Ioan Cuza University, Romania.

Complete Peer review History: <http://www.sdiarticle3.com/review-history/50961>

Original Research Article

Received 02 June 2019

Accepted 13 August 2019

Published 22 August 2019

ABSTRACT

Companies have a legal and social responsibility to ensure the safety of its workers, all persons lawfully present at the workplace and the surrounding community. This requires laid down procedures and routing process which aims at identifying, eliminating, minimizing and control the work-related hazards and decrease the risks. To be effective, the Occupational Safety and Health Management Systems (OSHMS) need to be integrated within the organization's safety policy and objectives. Therefore, this explains why OSHMS has continued to play a pivotal role in the decision making process in most companies. This study aimed at assessing occupational health and safety management systems in place and their compliance. The sampling unit was petrol stations and the study employed use descriptive study design. The purposive sampling was employed to select thirty two (32) petrol stations in Njoro Molo and Nakuru Municipalities of Nakuru County with a special focus on petrol stations which have dispenser pumps, car servicing bay and Front Office section. Data was collected using purposive sampling, stratified and simple random where interviews, observations and questionnaire survey. Descriptive statistics which involved frequency tables and

*Corresponding author. E-mail: mutungijoshua@gmail.com;

percentages was used to analyze the data. The findings of this study shows that more than half of the petrol stations lacked defined Occupational Safety and Management systems. There is need of Occupational Safety and Health Management System to be integrated within petrol stations policy in order to reduce the operations mistakes, costs of reducing problems and level of risks while ensuring that they comply with laws and regulations.

Keywords: BTEX; compliance; occupational safety and health management systems; premium motor spirit.

1. INTRODUCTION

The number of petrol station has increased tremendously in the recent years in Kenya. These petrol stations are located in major routes and highways with passing traffic [1], towns and busy shopping centers serving as a vehicle fueling and servicing point, food outlets and parking areas [2]. Petrol stations have attracted large number of people both as staff and customers [3]; whereby some serves as a designated booking place where Public service Vehicles (PSV) starts or ends its scheduled route. This is despite the fact that petrol stations stores flammable materials, generates and releases toxic substances which consist of a mixture of benzene, toluene, ethylbenzene, and xylenes (BTEX) in all its operations [4]. The atmosphere around the petrol stations contains high concentration level of BTEX due to emission of toxic fumes during loading, storage, refueling, oil spill, exhaust fumes and leakages from Liquefied Pressurized Gas (LPG) Cylinders; pose a high potential risk to the environment, staff and general population [5]. Further, a study done by Jo and Song [6] indicates that exposure levels associated with gasoline vapour emissions in petrol service stations, car service bay and petroleum refineries were higher than those associated with motor vehicle emissions.

Apart from hazardous substances and fumes generated and release by petroleum products, other health and safety risks found in and around petrol station include fire and explosion, lone working, vehicle movements, lifting and carrying, slips, trips and falls [7]. Efficient and effective operations gains at any workplace including petrol stations are realized by organizations that move from simply attaining legal compliance towards implementing of the best practices of safety and Health [8]. The good occupational health and safety practices should be in balance with socio-economic needs of the workplace. A sound occupational health and safety management systems must link workplace operations in order to effectively manage the

business. The OSHMS aims at eliminating where possible or minimizing the likelihood of work related accidents, diseases and fatality cause by occupational hazards. Therefore, OSHMS encompasses monitoring, assessment, identification and control of hazard, ongoing inspection and incident investigation, emergency preparation and response to safeguard health of the workers and the public. It addresses the anticipated safety concerns and gives a room for continual improvement of the laid procedures and routing processes. The success of OSHMS depends on the commitment of all stakeholders including and not limited to top management, workers and customers. Petrol stations are required to establish a safety and health management systems which entails safety policy and periodic risk assessment to its hazardous nature [9] Fire incidences and explosions have been reported in petrol stations around the world. Notable incidences include petrol stations fire incidences in Ghana in year 2015 and 2017 where a total of 150 people and 3 people lost their lives respectively and dozens injured [10]. In Kenya, tankers explosions have been report along our major roads and highways killing dozens of people. Recently, a shell petrol station in Nairobi, Kenya, busted into flames. According to statement issued by Energy Regulatory Authority, the fire started after the motorist sped off while the pump was inside the vehicle's fuel tank; the friction between the ground and the pump produced sparks which ignited a fire. Although no injuries were reported on the 14th April 2018 incidence, however the station was extensively damaged. This has led to scrutiny on the level of emergency preparedness and responds plan, work procedures, safety culture and training which are part of issues addressed by OSHMS. There have been studies related to health and safety in both petroleum industry and other sectors in Kenya. For instance, Operational risks management in petroleum filling station [11] and Health and safety assessment in Kenyan petrol stations [12]. However these studies focused on examination and evaluation of operational risks management practices, safety

Appendix 10: Data Analysis Summary Table

Frequency Table

Safety equipment and measures in place: First Aid Kits

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	First aid Kits	15	50.0	100.0	100.0
Missing	System	15	50.0		
	Total	30	100.0		

Safety equipment and measures in place: Fire extinguishers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Fire extinguishers	26	86.7	100.0	100.0
Missing	System	4	13.3		
	Total	30	100.0		

Presence of safety signs and symbols

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	27	90.0	90.0	90.0
	No	3	10.0	10.0	100.0
	Total	30	100.0	100.0	

Documented health safety environmental policy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	13	43.3	43.3	43.3
	No	17	56.7	56.7	100.0
	Total	30	100.0	100.0	

Documented fire safety policy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	17	56.7	56.7	56.7
	No	13	43.3	43.3	100.0
	Total	30	100.0	100.0	

Risk assessment done

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	17	56.7	56.7	56.7
	No	13	43.3	43.3	100.0
	Total	30	100.0	100.0	

Descriptive

Descriptive Statistics

	N	Mean	Std. Deviation
Safety equipment and measures in place: First Aid Kits	15	1.0000	.00000
Safety equipment and measures in place: Fire extinguishers	26	2.0000	.00000
Presence of safety signs and symbols	30	1.1000	.30513
Documented health safety environmental policy	30	1.5667	.50401
Documented fire safety policy	30	1.4333	.50401
Risk assessment done	30	1.4333	.50401
Valid N (listwise)	15		

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Use of PPE * Age	180	100.0%	0	0.0%	180	100.0%

Use of PPE * Age Cross tabulation

			Age			Total
			18-25 YEARS	26-35	36-45	
Use of PPE	Yes	Count	4	4	4	12
		% within Use of PPE	33.3%	33.3%	33.3%	100.0%
	No	Count	78	69	21	168
		% within Use of PPE	46.4%	41.1%	12.5%	100.0%
Total		Count	78	69	33	180
		% within Use of PPE	43.3%	38.3%	18.3%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.453 ^a	2	.484
Likelihood Ratio	44.913	2	.000
Linear-by-Linear Association	36.050	1	.000
N of Valid Cases	180		

Frequency Table

Medical examination done

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	34	18.9	18.9	18.9
	No	146	81.1	81.1	100.0
	Total	180	100.0	100.0	

How often medical examination is done

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	After 6 months	28	15.6	82.4	82.4
	Annually	6	3.3	17.6	100.0
	Total	34	18.9	100.0	
Missing	System	146	81.1		
	Total	180	100.0		

Appendix 11: Research Clearance Forms from Nacosti



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: da@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/T/17/48717/17094**

Date: **13th June, 2017**

Joshua Kyalo Mutungi
Egerton University
P.O. Box 536-20115
EGERTON.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“An assessment of occupational hazards awareness and safety practices among petrol service stations in Nakuru County, Kenya,”* I am pleased to inform you that you have been authorized to undertake research in **Nakuru County** for the period ending **13th June, 2018.**

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

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

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Nakuru County.

The County Director of Education
Nakuru County.

MINISTRY OF EDUCATION
State Department of Basic Education

Telegrams: "EDUCATION",
Telephone: 051-2216917
Fax: 051-2217308
Email: cdenakurucounty@yahoo.com
When replying please quote
Ref. NO.
CDE/NKU/GEN/4/1/21/VOL.V/95



COUNTY DIRECTOR OF EDUCATION
NAKURU COUNTY
P. O. BOX 259,
NAKURU.

3rd July, 2017

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION – JOSHUA KYALO MUTUNGI
PERMIT NO. NACOSTI/P/17/48717/17094

Reference is made to letter NACOSTI/P/17/48717/17094
dated 13th June, 2017.

Authority is hereby granted to the above named to carry out
research on "**An assessment of occupational hazards awareness
and safety practices among petrol service stations in Nakuru County,
Kenya**" for a period ending 13th June, 2018.

Kindly accord him the necessary assistance.

A handwritten signature in black ink, appearing to read 'Akoko Okayo'.

AKOKO OKAYO
FOR: COUNTY DIRECTOR OF EDUCATION
NAKURU COUNTY

Copy to:

Egerton University
P. O. Box 536-20115
EGERTON



THE PRESIDENCY
MINISTRY OF INTERIOR AND
CO-ORDINATION OF NATIONAL GOVERNMENT

Telegrams: "DISTRICTER", Nakuru
Telephone: Nakuru 051-2212515
When replying please quote

COUNTY COMMISSIONER
NAKURU COUNTY
P.O. BOX 81
NAKURU

Ref. No. **CC.JR.EDU 12/1/2 VOL.II/214**

3rd July, 2017

TO WHOM IT MAY CONCERN

RE: RESEARCH AUTHORIZATION – JOSHUA KYALO MUTUNGI

The above named student has been given permission to carry out research on ***"An assessment of occupational hazards awareness and safety practices among petrol service stations"*** in Nakuru County for the period ending **13th June, 2018**.

Please accord him all the necessary support to facilitate the success of his research.

VICTOR M. GITONGA
FOR: COUNTY COMMISSIONER
NAKURU COUNTY


THIS IS TO CERTIFY THAT:
MR. JOSHUA KYALO MUTUNGI
of EGERTON UNIVERSITY, 188-20115
EGERTON, has been permitted to
conduct research in Nakuru County


Permit No : NACOSTI/P/17/48717/17094
Date Of Issue : 13th June,2017
Fee Received :Ksh 1000

on the topic: AN ASSESSMENT OF
OCCUPATIONAL HAZARDS AWARENESS
AND SAFETY PRACTICES AMONG PETROL
SERVICE STATIONS IN NAKURU COUNTY,
KENYA



for the period ending:
13th June,2018


.....
Applicant's
Signature


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

CONDITIONS

1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.
2. Government Officer will not be interviewed without prior appointment.
3. No questionnaire will be used unless it has been approved.
4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.
5. You are required to submit at least two(2) hard copies and one (1) soft copy of your final report.
6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice



REPUBLIC OF KENYA



National Commission for Science,
Technology and Innovation

RESEACH CLEARANCE
PERMIT

Serial No. A14343

CONDITIONS: see back page