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Assessment of Occupational Safety and Health Status of Sawmilling Industries in Nakuru County, Kenya

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Abstract

The increasing demand for timber in Kenya has equally increased sawmilling activities and exposure to occupational and health hazards. This study assessed occupational safety and health status of sawmilling industry in Nakuru County. The study focused on safety and health hazards, knowledge, awareness and the control measures put in place in sawmills. Stratified random sampling technique was employed to select a sample of 386 participants from sawmilling industries in Njoro, Elburgon, Molo and Nakuru town. Semi-structured questionnaires were used to collect primary data which was analyzed both quantitatively and qualitatively using descriptive and inferential statistics. From the findings, 80.0% of the sawmill workers did not have any occupational safety and health training. 20% had short course professional trainings from the Forest Industrial Training Centre (FITC) in Nakuru. Workers were not adequately provided with protective face shields (16%), nose masks (46%), earplugs (21%) and helmets (44%). Further, majority (45.1%) encountered accidents at the sawmill workshops and production areas. The study recommends that saw mills should develop occupational safety and health policy, safe work methods, statements and comprehensive training programmes to create awareness on safety. The saw mills should invest in buying new machines, spare parts and training centers for technical skills.

Keywords: Occupation; Health; Hazard; Sawmill; Knowledge; Awareness; Training; Control; Measure.

1.0 Introduction

Kenya has a total of 633 pre-qualified saw millers spread all over the country. This includes 30 large sawmills, 65 medium sawmills and 538 small saw millers (KFS Conservancy Map Annual report 2010/2011, 19). The majority of sawmills are located in the western and central parts of the Country and the saw mills are mostly privately owned (MF&W & MFA 2008) in Nakuru County, majority of the saw mill industries are located in the wood producing Mau forest areas in the Rift valley where Nakuru County is found. The largest concentration of sawmills are in Njoro, Elbugon, Molo and Nakuru town. The guaranteed log supply is a major factor in the location of sawmilling industries in the mentioned areas. According to KFS (2008) prequalification inspection report, there were 276 registered sawmills. Out of this, 37 operational saw mills (large 8, medium 7 and 22 small saw mills) were located in Nakuru. Mbaabu et al., (2008) have explained the sawmill sizing and classification criteria in their prequalification inspection report of the Kenyan sawmills. They indicated that Kenyan sawmills have been categorized into three different size categories as follows:

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A large scale sawmill is one that has over 20m^3 of daily production, a medium scale sawmill has a daily production of between 10-20 m^3 per day and small scale sawmill is a saw mill with less than 10m^3 of daily production.

Sawmilling business is a thriving business in Nakuru County because of the availability of timber as well as the current high demand for the product in the local market. Many of the firms belong either to the small or informal sector. The informal small sawmills are characterized by one to five casual employees on a good day while the registered with bigger sawmills have five to ten employees. The bigger sawmill employers sometimes subcontract the informal ones. The most important wood products, produced, consumed and traded in the county are sawn-wood, plywood, wood panels printing and writing paper and paper boards (Kraft paper). In Nakuru County the tree species mostly used for timber and pole production include; C. lusitanica (Cypress), Eucalyptus grandis and Pinuspatula. Technology used in the industry varies from old and obsolete methods to the "state of the art" technology (for example as used in plywood manufacturing and sawmills). Majority of small-scale saw mills have old and inefficient machinery, where tractor engines, electric motors and saws are mostly used, and where labour intensive methods are used in logging and loading timber.

After loading, the timber is graded and seasoned before being sold. The nature of the work done by workers in these occupations and the types of equipment and materials they handle present many on-the-job hazards. These hazards and injuries resulting from such incidences include: being caught-in or struck by machinery, falling from a height, heavy lifting or repetitive movements, twisting or reaching and inhaling noxious or toxic chemicals. Besides the hazards inherent in this profession are the unfavourable weather conditions and noise pollution that is injurious to human health. (Judd et al, 2004). Human factors, which acts upon the working capacity and the daily production efficiency, include the individual characteristics such as sex, age, body-size, physical fitness, nutritional and state of health (Aiyelari et al, 1998, Jekayinfa, 2007). It has also been observed that psychological, cultural, economic, technological and organizational factors also act upon man's working capacity and production. There is need to have precise knowledge on the subject and the various exposure levels need to be measured and monitored. As noted by Comlan et al., (2007) in their study of wood processing enterprises in Gabon, lack of a prevention policy for the wood sector and occupational risks constitute an acute actual public health problem. They suggested that registration and research, being the main source of information on work accidents and occupational diseases should be improved.

1.2Statement of the Problem

Timber sawing is one of the occupations that provide raw materials to the building construction, furniture, paper and wood making industries. This very essential industry has offered employment opportunities to several people. It has also improved their economic status and projects the works of other sectors of the economy that depend on the timber raw materials. This industry is now being threatened by occupational hazards causing discomforts in the operations, tampering with efficiency and continuality in the business. Available evidence indicates that generally, the sawmilling sector in Kenya is underdeveloped and inefficient. It still uses very labor intensive working and production methods. There is inadequate knowledge and a lack of competences in plant design, selection of appropriate technologies, equipment and tools as well as in production engineering and plant operations (MF&W & MFA 2008). Also in maintenance and other services, that could be provided by service providers, the saw millers rely on their own work rather than outside service providers (MF&W & MFA 2008). Wamukoya and Ludeki (2007) found that majority of the saw mills in Kenya were privately owned. They further said, "The Small Micro Enterprises play an important role in the supply of sawn timber for the construction, fuel wood and associated secondary industry products. The closure of sawmills led to increased unemployment in the rural areas where forestry-related activities were the main economic mainstay of the people." However, the most important aspects in achieving higher recovery and improved sawing skills are in particular the training and competence development of sawyers as well as the application of appropriate technologies and equipment for the prevailing conditions (Muthike 2006). In absence of training on improved sawing and competence, there bound to be safety and health issues in saw mills. In light of these revelations, saw mills being privately owned commercial enterprises and therefore driven by profit-making and reduced costs of operations. Otala (2008) said that changes in the enterprise environment too often require a fast reaction by the management and employees, which requires also fast and effective competence development at the level of individuals. It is in view of the aforesaid issues in the saw milling industry that this study is embarked upon to assess the status of occupational safety and health in sawmilling industries in Nakuru County.

1.3 General Objective of the Study

The main objective of the study was to assess occupational safety and health status of saw milling industry.

1.3.1 Specific objectives

i. To identify safety and health hazards that employees are exposed to in saw milling work places.
ii. To assess the employers' and workers' knowledge and awareness in recognizing safety and health hazards and unsafe work practices.
iii. To appraise the control measures put in place in saw milling work places in managing safety and health hazards and workplace risks.

2.0 Theoretical Principles

Theories, as Silvermann (2000) underlines, provide the impetus for research. This study was guided by both Legislation and Enforcement of Health and Safety Regulations and enforcement Mechanisms of Safety and Health Regulations.

2.2.1 Legislation and Enforcement of Health and Safety Regulations

Cotton et al., (2005) noted that the institutional and legal governance frameworks on occupational health and safety in developing countries have little impact. The majority of organizations are small and medium Enterprises operating within their domestic markets where enforcement of health and safety standards and labour standards is very lax. Enforcement of health and safety regulations remains a problem due to lack of adequate resources available to government institutions responsible for occupational health and safety administration. Also, there remains an acute need for contract provisions to support the enforcement of labour laws in developing countries. According to the preamble to the ILO constitution of 2007, the protection of the worker against sickness, diseases, and injury arising out of his employment is a precondition to universal and lasting peace. As a result, millions of employees die, are injured and fall ill every year as a result of workplace hazards. It has been reported that 250 million work related accidents occur every year worldwide.

With these tragedies, the means of action used by ILO to promote occupational health and safety include International Labour Standards, Conventions, and Codes of practice, provision of technical advice and the dissemination of information (I.L.O. 2009). The ILO has adopted more than 40 standards and over 40 codes of practice specifically dealing with occupational safety and health. Occupational Health and Safety Convention 1981 (No. 155) and Occupational Health Services Convention 1985 (No 161) that covers the concept of occupational safety and health are the other conventions that are concerned with the protection of employees against risks and hazards as well as convection on safety and health in particular branches of economic activities. Others include the convection on 2006 Promotional Framework for Occupational Safety and Health (No 187), (Alphonse, 2008).

The protection of employees against hazards and risks at work remain a fundamental human right and as such the right to safety and health at work is enshrined in the United Nations Universal Declaration of Human Rights 1948, which states that, 'Everyone has the right to work, to free choice of employment, to just and favourable conditions of work.' The United Nations International Covenant on Economic, Social and Cultural Rights of 1976 reaffirms this right in the following terms, 'The state parties to the present covenant recognize the right of everyone to the engagement of just and favourable conditions of work which ensure in particular safe and health working condition' (NSSA 2008). The Seoul declaration, approved with a strong unanimous endorsement, was singed at the World Summit by a total of 46 leaders. The Seoul declaration state that a safe and health working environment should be considered as a fundamental human right and it encourages government to consider ratification of the ILO Promotional Framework for Safety and Health Convention, 2006 (no 187) as a priority, (Hope, 2009). Safety and health are basic human rights to be enjoyed by all employees throughout the world.

These can be enjoyed through formulation and implementation of national health and safety legislation and the adoption of international safety and health standards. Zimbabwe has adopted the following conventions: (C155) Occupational Health and Safety, (C161) Occupational Health Services, (C162) Safe use of asbestos and (C176) Safety in mines. National laws that cover occupational health and safety include NSSA Statutory instrument 68/90 accident prevention and workers compensation with particular emphasis on the duties of the employers and workers in accident prevention; the Pneumoconiosis Act which clearly stipulates the need for medical examination for all workers in dusty occupations and the Factory and Works Act with its supporting regulations and in particular regulation 263 on general safety and health issues. National laws basically provide for safe and health workplaces, safe work systems and workers compensation and rehabilitation.

In short, Maruta (2005) asserted that through ILO standards and national OHS laws decent work for all workers can be achieved through building and maintenance of a preventative health and safety culture. The Standards Association of Zimbabwe (SAZ) plays a very important role in reducing impact of environmental hazards through periodically auditing implementation of ISO 14001/2004 Environmental Management Systems as well as OSHAS 18001.

Such audits are made not only for certification of industry but also as an assessment tool for measuring performance with special regard to reducing Environmental and health disasters. The situation has been improving gradually and Zimbabwe has been commended for developments in management of Occupational Health and Safety. WHO (2005) noted that the number of diseases and deaths have declined in the past decade in Zimbabwe. Critics were, however, quick to say that such a decline is attributed not to developments in management of OHS but to the fact that the industry is and for the past decade has been operating far beyond capacity. In case of the timber industry, the metamorphosis from manual system of sawing to the use of electrically driven rotary tools technically introduced around 1930s, grinding and polishing, followed by chainsaws in the 1950s for felling, disbranch and sawing of timbers have caused disturbance to the health of the users (Gardner, 1982). Chainsaw used by timber workers have the potential to cause terrible injuries. One of the biggest hazards is kickback, which happens when the chainsaw carries into contact with objects such as logs or branches. Tyner and Lee (1985) reported that vibration of the range of 40 - 1.25Hz associated with the use of vibrating tools, lead to white "fingers" or dead hand" which constitute 56% of problems among forestry and wood sawyers in Brazil. In another report, occupational Health and Safety in Europe's forestry Industry (2012) maintained that carrying out heavy physical work and being exposed to noise, vibration, biological and chemical hazards put forestry workers at risk of harm.

Furthermore, European Agency for Safety and Health at work (2007) added that wood working tools may expose workers to vibration that could result in hand-arm and vibration induced "white finger" syndrome. Noise or unwanted sound, is one of the most pervasive occupational health problems. It is a by-product of many industrial processes. European Agency for Safety and Health at work (2012) asserted that "high noise level can cause permanent hearing loss". Common source of noise in the wood industry include all-terrain vehicles, stump grinders, wood chippers, chainsaw and free drilling machines. National Institution of Safety and Health (NIOSH) 2012) reported that approximately 22 million U.S. workers are exposed to hazardous noise level at work. Similarly, HSE (2007) asserts that people, who are exposed to high noise levels even for a short time, may experience temporary hearing loss. This loss is gradual and sufferers do not realize that their hearing is being damaged (Jain & Rao, 2008).

According to European Agency for Safety and Health at work (2012), dangerous substances that affect the health of forestry workers include fertilizers, colorants for making trees and timber and exhaust gasses from chainsaws. Discussing health risk of machine fumes, Occupational Safety and Health Administration (OSHA, 2012) asserts that the main components of chainsaw exhaust emission are hydrocarbons, and that breathing in these diesel fumes can cause adverse health effects. These hazards have short and long term effects as follows. Short term effects are; Irritation of eyes, nose and throat, dizziness (light headedness), nausea wheezing, headache and drowsiness (feeling sleepy). Long-terms effects are increased susceptibility to bacteria or viral respiratory infection, Asthma persistent cough, lack of coordination and Blood disorder. In Zimbabwe wood and wood products are ranked among the major accident, injuries and diseases industries, and in Manicaland Province they are at the forefront. The Timber Producers Federation of Zimbabwe is using various methods to reduce occupational hazards in the wood sector, but with limited success (NSSA 2007).

Parastatals such as NSSA are assisting in the management of occupational hazards in the wood industry. NSSA is assisting with inspections, laws and regulations. In Zimbabwe, laws have been developed to supplement international standards and these laws cover hazards in the mining, industrial and agricultural sectors. According to the World Health Organisation (WHO), a substantial part of the general morbidity of the population is related to work (WHO, 2006). Indeed, people spend a significant portion of their lives at work with their jobs often bringing meaning and structure to their lives (Jahoda, 1982). Because work is a central part of many people's lives. Workers should have a safe and healthy working environment (Warr, 1987). According to the WHO Health for All principles and ILO Conventions on Occupational Safety and Health (No. 155) and on Occupational Health Services (No. 161), every worker has the right of access to occupational health and safety services, irrespective of the sector of the economy, size of the company, or type of assignment and occupation. The Rio Declaration on environment and development (1992) states that "human beings are at the Centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature".

In Kenya Occupational Safety and Health Act (OSHA) which was enacted in 2007 provide for the safety, health and welfare of workers and all persons lawfully present at workplaces. The purpose of this Act is to secure the safety, health and welfare of persons at work; and to protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work. This Act applies to all workplaces where any person is at work, whether temporarily or permanently. Therefore the act and its provisions apply to the Timber industry since the industry site is regarded as a factory. The Act provides for duties of both employer/occupier and the employees in ensuring the safety, health and welfare at work. Safety and Health committee**-**The Act requires every occupier to establish a safety and health committee at the workplace in accordance with regulations prescribed by the Minister if there are twenty or more persons employed at the workplace; or the Director directs the establishment of such a committee at any other workplace. Safety and health Audits **-** the Act in Section 11 requires the occupier of a workplace to cause a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a safety and health advisor, and a copy thereof sent to the Director.

2.2.1 Enforcement Mechanisms of Safety and Health Regulations

Enforcement mechanisms are part of safety and health management. An organizational framework must be set up to facilitate the implementation of the policy. A structure that clearly defines the duties and responsibilities of the various levels as far as safety is concerned must be designed. It should ensure that safety is integrated rather than separated from production thereby facilitating total commitment to safety. Safety and health organization on a site includes the following: Safety officer, supervisor, worker, safety Committee, safety Representatives and Government representative. In Kenya the safety, health and welfare of workers is the Occupational Safety and Act (OSHA) which was enacted in 2007. This Act was enacted to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces, and also to provide for the establishment of the National Council for Occupational Safety and Health and for connected purposes. The purpose of this Act is to secure the safety, health and welfare of persons at work; and to protect persons other than persons at work against risks to safety and health arising out of, or in connection with, the activities of persons at work.

This Act applies to all workplaces where any person is at work, whether temporarily or permanently. Therefore the act and its provisions apply to the sawmilling industry since the sawmill site is regarded as a factory. The Act provides for duties of both employer/occupier and the employees in ensuring the safety, health and welfare at work. OSHA (2007) requires the use of personal protective equipment (PPE) to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. If PPE is to be used, a PPE program should be implemented. This program should address the hazards present; the selection, maintenance, and use of PPE; the training of employees; and monitoring of the program to ensure its ongoing effectiveness. The PPE required in the sites include; eye protection and face protection, hearing protection, respiratory protection, hand and arm protection, foot and leg protection, head protection and body and fall protection mechanisms.

Adetokunbo (2004) asserts that employers have legal duties to maintain woodworking machines to reduce noise and to maintain noise control equipment in good condition. Furthermore, the same source added that, faulty machines contributed tremendously to most accidents and injuries in the woodworking environment. These sawyers splitting the wood into different categories of plank and shapes are exposed to cut by blade of faulty machine or out of their careless attitude at work. In addition, European Agency for Safety and Health at work (2012) maintains that, "Risk increases when proper damping techniques are not applied, machines are not maintained, tools are not alternated and workers use a vibrating tool for a long period without break. HSE (2007) posited that the first concern of any management in industry is to do business profitably, without understanding that safety, health programme and care for the environment embrace profitable ways of operating effectiveness to achieve comparative goals.

2.3 Conceptual Review

This section reviews the relevant literature on the study objectives to establish the research gaps and provide a guideline along which this study was conducted. Research has shown that injuries and illness in the wood working sector of Mutare in Ghana are caused by exposure to occupational hazards (Kunfaa, 2007). Hazards include any aspect of technology, or activity that poses risks. The level of risk is primarily the combination of two factors: the level of toxicity or amount of energy present and the degree of exposure (NSSA, 2007).

Health and safety in the wood working sector can only be pursued comprehensively, integrating all spheres of work, (Steenkamp, 2002). The nature of work in wood processing industries, type of equipment and material handled present on the job all influence the nature of hazard (Judd, 2004). Occupational injuries in the timber sector represent significant public concern. Timber related accidents induce emotional and financial costs to both families and society. In Italy, the timber processing industry rates as one of most hazardous occupations. Accidents and injuries are as a result of conveyor systems, rapid moving parts of machines (blades, saws), falls and slips, kickbacks, wood handling, and vehicle accidents (Boy, 2002).

Colman et al., (2007) noted that rotating devices, cutting or shearing blades, in running nip points and meshing gears are typical examples of potential sources of workplace injuries while crushed hands , severed fingers, amputations and partial blindness are typical wood working accidents. In Gabon's timber processing industry, in 2007 and 2008 data collected on work related accidents through the National Social Security Bureau indicated that the largest percentage of work related accidents were in public utility industries (30.1%), timber processing (21.5%) and commerce (16.5%). Wood processing in Gabon is a dangerous occupation which involves more than 30% of the active population. In 2007-2008 accidents involving contact with objects and equipment exceeded all other events accounting for 64.1% of traumatic occupational accidents. Approximately a quarter (24.6%) of these occurred among the timber processing workers in Gabon. Further out of a total of 825 injuries the proportion linked to wood processing was 21.5%. In this group 24.2% of woodworkers were injured in 2007 and 19.3% in 2008. With regard to nature of work related injuries and disorders; open wounds 48.6% , traumatic injuries 29.9%, borne and spine injuries 17.5% and multiple traumatic injuries 7%. Hence National Social Security Bureau programme gathers epidemiological information that helps to understand more about accidents linked to timber processing.

In Nigeria, Oyo and Osun in wood processing industries, a total of 140 injury cases were recorded among 640 workers. Results indicated that mill operators suffers highest rates of 83% while moving planks of wood into milling machines such as moulder machine, timber stacking accidents accounted for 36% while transport accidents is 22%. Furthermore injuries occurring to body parts include upper limb 68%, back and lower injuries 58% and less prominent lower injuries at 13%. In the case of Nigeria wood processing industries, a major risk factor noticeable in the factory was age factor of machines and equipment in use. Most of the machines were obsolete, with most of the safety guards removed and non-functional and the concept of health and safety rules for operations in timber processing do not give preference to basic safety training in hazardous operations. None of the workers had attended safety training in the previous years. In most cases most of the workers entered the timber industry not as trained wood industry workers with a requisite professional knowledge. This had exposed most of the workers to some untold level of hazards (Bello 2010).

Findings in the wood working industries in Zimbabwe relate well with those in countries such as Italy and Tanzania. According to these studies the majority of workers in the wood processing industries worked under extremely hazardous conditions without the appropriate protective clothing (Boy 2002, Rongo et al. 2004). Boy (2002) noted that the wood working industry in Italy ranks among the most hazardous industries in that country. The potential sources of workplace injuries include rotating devises, cutting or shearing blades, in-running nip points and meshing gears while crushed hands, severed fingers, amputations and blindness are the typical accidents. The records from the medical sectors of the wood-working enterprises revealed that the common types of health complaints that included respiratory, pulmonary, dermatological, ophthalmic, musculoskeletal (especially backache).

As observed by Adei and Kunfaa (2007) in their study of wood processing industries in Ghana, occupational exposure to ergonomic hazards in the wood processing industries of Mutare were mainly due to lifting weights and uncomfortable posture during working hours. Workers could stand up to as long as seven hours of an eight hour shift. Matoone (1997) observed that back pain was the main complaint that resulted from awkward work postures such as prolonged standing, bending or kneeling. Workers are also exposed to chemical hazards such as gas toxin, glue, sodium chloride, aerolites, casmite, oxygen, acetylene and gas oil as also observed by Adei and Kunfaa (1997). There is need to have material data sheets as a way of raising the workers awareness on safe ways of handling the chemicals. According to McCann and Babin (2007) there is need for good dilution ventilation and additional protective gear such as goggles and NIOSH-approved toxic dust masks for workers in the chemical industry.

In a study carried out in New Zealand Wallart (2002) noted that noise exposure is a well-known hazard in wood processing industries, with a higher proportion of employees exposed to noise. A survey in Alberta wood processing industry revealed that on average wood processing machines produced 90 to 100dB thus employees were at risk from noise induced hearing loss.

Wallart(2002) argues that, noise abatement at source might be considered an unattainable goal, but simple solutions such as properly positioned barriers, machine isolation and double wall enclosures have been recognized for some time in most wood processing countries in developed countries. For instance in New Zealand in Hawkes Bay, wood processing industry has drastically reduced noise emissions from an average of 98 dB to 86dB. In South Africa, Noise Induced Hearing Loss (NIHL) was a leading compensable condition between 2000 and 2002. In Zimbabwe there are no collated NIHL statistics (Mazibuko 2005). The problem of noise in developing countries has not been well researched and documented, though exposure limits have been set by most national governments and international organizations. These limits generally vary between a limit of 85 or 90dB for an 8 hour shift, (NSSA 2009). In Zimbabwe, in terms of the Factories and Works (General) regulations Section 6, the limit for exposure to noise is 90dB(A) for an 8 hour shift and internationally an administrative level of 85dB.

These controls are essential to control noise from machinery in processing and manufacturing industries to safeguard workers health. The target for industry is to therefore ensure that noise levels are kept to or below the recommended limit of either 90 or 85dB (A). Several possibilities to control noise are available such as administrative and engineering, NSSA (2009). Stackers comprised the largest occupational group among the 20 workplaces. In addition to the usual wood processing risks such as wood dust, noise and heat, workers reported exposure to night shift, sharp metals and objects, heavy lifting and pulling movements, flying and falling objects, awkward positions, slips and trips, meeting production quotas and stress. Workers were also exposed to precariousness, improper amenities, poor health, safety and hygiene conditions and inadequate medical services. In a study carried out in Zimbabwe (Jerie 2011) has shown that the use of personal protective equipment was poor and inappropriate in the wood processing industries. All workers apart from management and medical staff acknowledged receiving a pair of security shoes/ boots and two overalls every year. The workers could be seen wearing their nose masks, but some had the nose masks on their foreheads as they found them uncomfortable. Workers also perceived the sawdust extractors to be inefficient because some of the sawdust was left in the air thus exposing workers to wood dust inhalation and body exposure. Similar findings were made by Matoone (1997) in his study of wood working enterprises in Lesotho. Table 3 shows that less than 50% of the required protective equipment was provided.

In the wood-working industries of Zimbabwe, occupational safety, health and hygiene are not perceived as an urgent priority. The management or company owners do not provide adequate finance for maintenance as well as the purchase of protective clothing. There is no much attention given to the safety of processing machines, equipment, tools as well as their link to health requirements. There is no guarantee of safe and healthy working conditions from employers or an adequate regime for their rest and nutrition. Employees are also only provided the barest of protective clothing they need and without any instructions of how to use it. Workers also indicated that exposure to dust and noise was due to the lack of control at source. Despite being aware of a number of occupational and environmental health hazards, there are no clear policies for the woodworking sector. Some of the measures used in the sector are outdated and do not comply with occupational safety and health standards. These tended to discourage employees from adhering or applying them.

Wood dust is classified by the Occupational Safety and Health Administration OSHA (1985), as a hazardous substance and is subject to the Hazard Communication Standard. Until 1985 wood dust was regulated by OSHA under the Nuisance Dust Standard. Research has shown that wood dust is not just ordinary dust. Hardwoods and soft woods in timber processing industries have different airborne levels of permissible exposure limits. Among the hardwoods, beech and oak used in furniture manufacturing have severe health hazards associated with them than softwoods. However, the extent of these hazards and the associated wood types has not been clearly established. Wood-dust becomes a potential health problem when wood particles from processes such as sanding, smoothing and moulding become airborne. Breathing these particles may cause allergic respiratory symptoms, mucosal and non-allergic respiratory symptoms. Woodworkers are vulnerable to health hazards posed by their working environment. In Australia all wood dust is classified as carcinogenic. Exposure to sawdust is liable to cause dermatitis and allergic respiratory infections. The majority of machine operators in Australia are reported to have been diagnosed of respiratory infectious diseases due wood dust. When a worker is sensitized to wood dust, he/she is prone to suffer from an allergy reaction after repeated exposure. Other effects of wood dust are eye irritation, nasal dryness, irritation to eyes and the nose and frequent dryness. However, dust extractors have been put in place to minimize wood dust at their source of production, (IFC 2007).

According to OSHA (2003), dust exposure should be controlled through the adoption and maintenance of effective extraction and filtration systems which are supplemented by use of personal protective equipment such masks and respirators. In a study carried out in American, Graham (2004) indicates that level of education influences worker health and safety in the workplace, appropriate skills needed to achieve social status and make healthy lifestyle choices. She writes that studies exploring adverse health effects of the psychosocial work environment show that individuals in positions that are characterized by routinized work with little supervision have low self-esteem and higher stress levels. This leaves them prone to workplace hazards and leads to adverse effects on production by way of absenteeism. Workplaces exert either a positive or negative influence on worker behaviour (Graham, 2004). She argued that the risk of death before reaching retirement age was two and a half times higher for men and women in unskilled occupations than for those in professional positions. Both men and women are the most highly educated tend to live longer and have more disability-free years than their less educated counterparts. She also found a number of American studies to show that those with less education run greater risks.

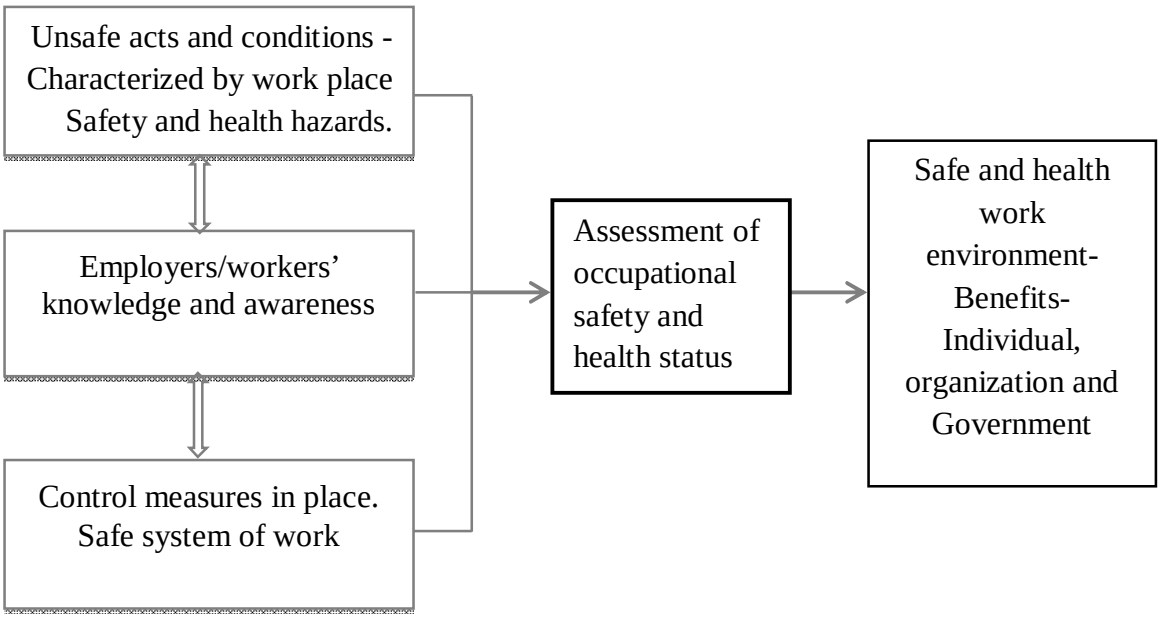
Parboteeah and Kapp (2007) in their study of ethical climates and workplace safety behaviour found that egoistic behaviour relates positively to injuries and negatively to safety in the workplace. Traumatic occupational accidents and diseases in the wood sector represent a significant public health concern. Work-related accidents induce enormous emotional and financial costs to families and to society (Balsari et al., 1999). Unfortunately, work related accidents and diseases continue to be serous in the world. The human and economic costs of occupational accidents and diseases remain high and call for concerted efforts to handle them (Abongomera 2008). The ILO (2008) estimates that more than 2 million workers die each year from work related accidents and diseases and this is probably an underestimation. The International Labour Organisation (ILO) estimates that workers suffer 270million accidents and at least 335 000 fatal injuries annually. Avoidable occupational diseases affect 160 million people every year.

Muchemedzi (2007) observed that the global work force stands at 2.8 billion with approximately 300,000 employed in the wood and wood products industry and globally, 2.2 million work related fatalities and 270 million occupational injuries occur annually. The largest number of fatalities is associated with the timber industry with 92.4 deaths per 100 000 workers in 2006, a decrease from 118 in 2002. In 2008 the number of fatalities increased to 116 deaths per 100 000 workers. Tiedemann (1998) asserted that the largest number of accidents related to wood processing occurred around 10:45am. Longer work duration increases the risk of errors and near errors, and decrease the workers vigilance. In 1998 Europe's wood and wood products industry suffered around 90 000 work accidents involving more than three days off-duty from work. Timber processing accidents and illnesses rose by 5.0% in the period 1996 to 1998. In Italy, the wood processing industry in general rates as one of the most hazardous occupations. Rotating devices, cutting or shearing blades, in running nip points, and meshing gears are examples of workplace injuries, while crushed hands, severed fingers, amputations and blindness are typical wood working accidents (Boy 2002). Colman et al., (2007) added to the hazardous wood working, high noise levels from operating machinery, dust conditions and work related musculo-skeletal disorders from repetitive movements that are likely to affect health of employees.

In Libreville, Gabon, the majority of formal employees are in the wood processing in which logs of wood are transformed into various finished products. Wood processing in Gabon is a dangerous occupation and it involves more than 30% of the active population. Out of 825 injuries, wood processing constituted 24.2% of wood workers injured in 2007 and 19.3% in 2008. During the 2007 and 2008 period accidents involving contacts with equipment exceeded all other events accounting for 64.1% of traumatic occupational accidents in wood processing (Colman et al., 2007). The need to prevent occupational hazards leading to occupational injuries has been of growing interest and a great challenge to the governments and industries in the wood processing sector (Mutetwa, 2005). Unfortunately, little research has focused on the field of occupational health especially relating to occupational hazards (WHO 2005). NSSA (2009) indicated that an annual occupational mortality rate of 1 249 per 100 000 workers was witnessed in Zimbabwe in the past decade.

2.4 Conceptual Framework

From the conceptual framework, employee engagement is the dependent variable and effective communication and innovative practices are the independent variables.



Independent Variables Dependent Variable

Figure 2.1: Conceptual framework for occupational Safety and Health

3.0 Research Methodology

This chapter covers the materials and methodology which was adopted for the study. The methodology used includes study design, data sources, population sampling, sample determination, data analysis and presentation. It also describes the research instruments, their application and reliability.

3.1 Research Design

The study employed a descriptive survey design. A survey design is also used to facilitate the collection of a considerable amount of data quickly, efficiently and accurately (Oso & Onen, 2005). Mugenda and Mugenda (2003) defined survey research as an attempt to collect data from members of a population in order to determine the current status of the population with respect to one or more variables This research strategy was preferred because it permits the collection of data through questionnaires administered to a sample. The data collected by this design used to suggest reasons for particular relationships between independent and dependent variables (Saunders & Thornhil, 2007).

3.1.1 Study Area

The research was carried out in Nakuru County in the central rift valley region of Kenya. The study area lies between Latitude 0º 15 South and longitudes 36º and 04º East. Geographically, the study was limited to Njoro, Elburgon, Molo and Nakuru towns. Nakuru county is one of the most active areas with relatively large number of small scale sawmills and timber commercial centers.

3.2 Target Population

According to Castillo (2009), a research population is generally a large collection of individuals or objects that is the main focus of a scientific query. Nakuru County has 37 registered and operational saw mills. Out of the 37 sawmill, 8 are large saw mills, 7 medium while 22 are small saw mills. The study targeted all the 11029 workers comprising of chain saw operators, log transporter drivers, mechanics; sawmill machine operators and employer's managers from the 37 sawmills. Further, the study concentrated on the medium and large scale sawmills because they are more operational than the small ones. This criterion was purposely chosen because it is known that the medium and large scale sawmills have comparatively more workers than the small ones and their operations relevantly describe the average sawmilling enterprises in Kenya today (KFS 2008). The target population consisted of men and women workers above eighteen (18) years of age.

3.3 Sampling Frame

According to Silverman (2005), the sampling frame should be large to allow the researcher to make inferences of the entire population. The sample frame for this study comprised of 260 respondents from commercial banks in Nakuru Central Business District.

Table 3.1 Sample Frame

Participant	Target population	Percentage (%)
Senior Managers	20	7.7
Middle Level Managers	63	24.2
Junior Bank Staff	177	68.1
Total	**260**	**100.0**

3.4 Sample Size and Sampling Technique

A sampling frame is a list of all the items where a representative sample is drawn for the purpose of research. Sampling must be so large that it allows a researcher to feel confident about the sample representativeness and it allows the researcher to make inferences of the sampling frame and the entire population (Silverman 2005). In this research, a two stage sampling strategy was adopted. The first stage involved sampling the number of saw mills in the four town centres (Njoro, Elburgon, Molo and Nakuru). The second stage stratified sampling involved taking a simple random sample from each stratum represented by different categories of workers. The sample size of **11029** for the five strata (chain saw operators, log transporter drivers, mechanics, sawmill machine operators and employer's managers) was determined using the mathematical approach by (Brewer & Miller, 2003).

3.4.1 Determination of Sample Size

If there is no estimate available of the proportion in the target population assumed to have the characteristics of interest, 50% should be used as recommended by Fisher et al.(1994) as quoted by (Mugenda and Mugenda, 2003). Therefore, 9 saw mills were targeted (5 large and 4 medium) with 1020 employees located in Njoro, Elburgon, Molo and Nakuru town respectively as shown in table 3.1

Table 3.1: Number of Sawmills Per Town

Type of Saw Mill	Njoro	Elburgon	Molo	Nakuru	Total
a) Large sawmills	3	2	2	1	8
b) Medium Sawmills	2	2	1	2	7
Total	**5**	**4**	**3**	**3**	**15**
50% (Large Sawmills)	2	1	1	1	4
50% (Medium Sawmills)	1	1	1	1	5
N= 50%(a+b), Approximately	3	2	2	2	9

N=Number of sawmills per town.

3.4.2 Sampling the Strata (Category of Work)

Using Miller and Brewer (2003) formula for sample determination, a simple random sample was drawn from each stratum to obtain a sample size which was totaled up to get the study sample size.

Table 3.2: Number of workers Per Stratum and Town

Category of work	Number of Sawmills and Workers Per Category				
Areas	Njoro (3)	Elburgon (2)	Molo (2)	Nakuru (2)	Total
Chain saw operators (loggers)	735	476	476	476	2163
Log transporter drivers	433	292	292	281	1298
Mechanics	1005	681	670	671	3027
Sawmill machine operators	1438	962	963	962	**4325**
Employer's Managers	76	54	43	43	**216**
Total	**3687**	**2465**	**2444**	**2433**	**11029**

$$\mathbf{n} = \frac{\mathbf{N}}{\mathbf{1} + \mathbf{N}(\boldsymbol{\alpha})^{\mathbf{2}}}$$

Where, **n** is the Sample size, **N** is the Sampling frame, α is the Error margin (0.05) and **1** is the Constant.

If **n** =386 $\mathbf{n} = \frac{\mathbf{11029}}{\mathbf{1+11029\ (0.05)^2}}$

$\mathbf{n} = \frac{\mathbf{11029}}{\mathbf{28.5725}}$

n = 386

Table 3.3: Sample Size Distribution per Strata

Category of work	Logging/sawmill workers	sample size
Chain saw operators (loggers)	2163	76
Log transporter drivers	1298	45
Mechanics	3027	106
Sawmill machine operators	4325	151
Employer's Managers	216	8
Total	**11029**	**386**

Table 3.4: Sample size distribution among the sawmills

Category of work	Njoro(3)	Elburgon(2)	Molo(2)	Nakuru(2)	sample size
Chain saw operators (loggers)	25	17	17	17	**76**
Log transporter drivers	16	12	12	5	**45**
Mechanics	35	27	22	22	**106**
Sawmill machine operators	50	33	34	34	**151**
Employer's Managers	3	2	2	1	**8**
Total	**129**	**91**	**87**	**79**	**386**

3.4.2 Sampling Technique

The study adopted stratified random sampling method to draw respondents from the target population. Bryman and Bell (2007) have pointed out that stratified sampling "ensures that the resulting sample was distributed in the same way as the population in terms of the stratifying criterion". Stratified sampling is a good approach and method when there is a good statistical database available. It gives flexibility to the researcher to make a decision on identification and allocation of the units for the strata. It also gives possibilities to use and make more than just one stratifying criterion (Bryman & Bell 2007).When selecting the sampling frame and the sample size; the local conditions formed a significant basis in the decision making for this research study. The most important selection criterion was the location of the forest plantations in Nakuru County and the saw mills. Another aspect in the strata selection focused on work categories (chain saw operators, log transporter drivers, mechanics; sawmill machine operators and employer's managers). This was important to have an even distribution of the units within the sampling frame and the sample. The strata consisted of chain saw operators, log transporter drivers, mechanics; sawmill machine operators and employer's managers. A selection of a simple random sample from each of the resulting strata was made. This minimized the sampling errors or biasness of the sample.

3.5 Data Collection Instrument

The study employed a semi-structured questionnaire (appendix I) and a checklist (appendix II) was used in identifying the occupational hazards and risks associated with sawmill industries and describe the awareness of employees on Occupational Safety and Health in the working areas. Apart from the employees, questionnaires were administered to work-place managers who, as part of their general duty of care, are required to ensure the effective application of OSH policy and practice in their work environment. The questionnaires assessed the occupational safety and health status of the saw milling industry. The aim of the questionnaire and checklist was to generate reliable and valid data from a high proportion of population within a reasonable time period at a minimum cost. The use of a questionnaire is relatively cheap and a quick way of obtaining information. The questionnaires had both closed ended and open ended. The closed ended questionnaires aided the coding and analysis of responses whilst the open ended facilitated richness and intensity of responses.

(a) Interviews

According to Kvale (1996), research interviews try to understand something from the subjects' 'point of view' and to uncover the meaning of their experiences. Interviews allow people to convey to others a situation from their own perspective and in their own words. The interview was conducted with the institutions involved in Occupational safety and Health. These institutions include: Directorate of Occupational Safety and Health, National Environment Management Authority and Kenya Bureau of Standards.

(b) Direct observation

Direct observation was also used in which guided work site visits to sawmilling sites were performed to directly observe and document the identified hazards, tasks, job site organization, work practices, equipment and tools being used. Noise level measurements were taken at selected locations within the saw mill when the operations were on during day time using a sound level meter type D-1422C and collected data was analyzed.

3.8 Data Processing and Analysis

The data collected was edited, collated to eliminate errors and coded for analysis using the Statistical Package for Social Sciences (SPSS version 19) tool. The coded data was analyzed both quantitatively and qualitatively. Descriptive analysis in form of frequencies, graphs, percentages, and means were conducted. This was followed by correlation analysis (chi-square analysis) to draw inferences between independent variables and the dependent variable. Cross tabulation was also used to determine the proportion of people who use a particular facility against their age, sex or educational background. Qualitative technique was used to assess people's perceptions regarding the type of hazards they are exposed to and health facilities. Noise levels collected were analyzed and compared with the standards [Threshold Limit Values (TLV),] adopted by International Labour Organization (ILO), World Health Organization (WHO), DOSHS standards and National Environmental Management Authority standard and DOSHS standards.

4.0 Results and Discussion

4.1Demographic Characteristics of the Respondents

The study targeted a sample size of 386 respondents out of which 370 filled and returned the questionnaires giving a response rate of 95.9%. This response was very good enough and representative of the target population and conforms to Mugenda and Mugenda (2003) stipulation that a response rate of 50% is adequate for analysis and reporting but a response rate of 70% and above is excellent. Findings in Figure 4.1, the study found that sawmills in Njoro had 34%, Elburgon 23%, Molo 22% and Nakuru 21% of the respondents. The study further established that sawmills in Njoro employed more workers than sawmills in Elburgon, Molo and Nakuru respectively. The more the number of workers the more likely a hazard may harm a worker in the saw mills. This imply that lack of hazard awareness in sawmills in Njoro would mean a significant number of workers being exposed to occupational health hazards while working.

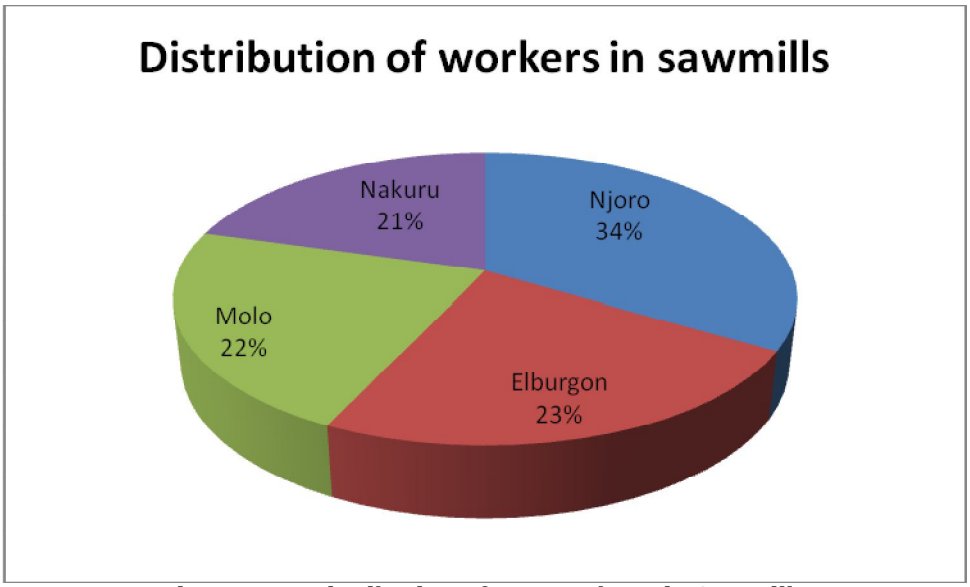


Figure 4.1: Distribution of Respondents in Sawmills

4.1.1 Gender Distribution of the Respondents

The study sought to establish the gender distribution of the respondents. From the findings, the males formed the majority of the respondents at 60.0% and the females at 40.0% as shown in Table 4.1

Table 4.1: Gender Distribution of the Respondents

Gender	**Frequency**	**Percent (%)**
Male	222	60.0
Female	148	40.0
Total	**370**	**100.0**

4.1.2 Age Category of the Respondents

All the respondents of the research worked in the participating sawmill industries. Their age distribution from the findings shown in Table 4.2: shows that the labor force of the sawmilling industry in Nakuru County is relatively young. This was based on the fact that majority of the respondents 27.6% were aged 25-34 years followed by 25.1% aged between 35-44 years of age. Those aged 55-65 years were the least at 10%.

Table 4.2: Age Category of the Respondents

Age Categories	**Frequency**	**Percent (%)**
18-24 years	56	15.1
25-34 years	102	27.6
35-44 years	93	25.1
45-54years	82	22.2
55-65 years	37	10.0
Total	**370**	**100.0**

4.1.3 Level of Education of the Respondents

The study sought to establish the highest levels of education attained by the respondents. The results in Figure 4.2, majority of the respondents (48.6%) had attained secondary school education, 8.6% diploma level, and 9.0% lower primary while 4.1% had attained university degree level and only 0.8 % of the workers had masters' degree level of education and above. of education respectively. The results in this respect clearly indicated that supervisors, managers and directors had better vocational education than the other workers. Since most of the workers had attained secondary level education, they understood safe working procedures. Therefore, they were less likely to get injured as compared to those who had attained lower primary and upper primary education levels.

The level of education is also important especially during hazard awareness creation through training and following of safe work and safety procedures. With most of the workers having secondary education (48.6%), implied that was easy to implement the organizations safety and health policies.

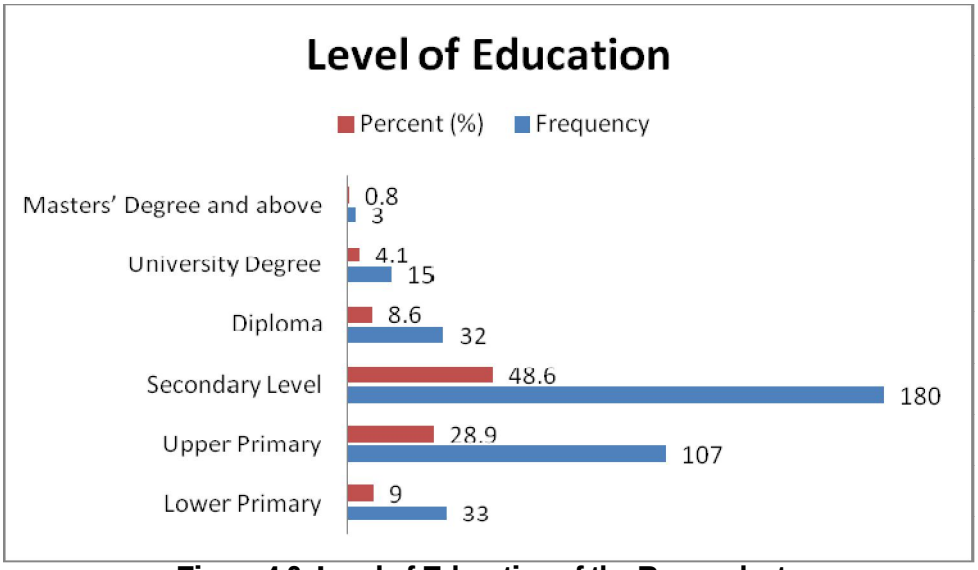


Figure 4.2: Level of Education of the Respondents

4.1.4 Respondents' Sector in the Sawmill Industry

The study further sought to find out the sector of the sawmill industry in which the respondents worked. From the findings shown in Figure 4.3, majority of the respondents were in wood packing and stacking (50.2%) followed by sawmill machine operators at 25.7 %. Log transport drivers formed 10.6%, mechanics 9.7% while supervisors and managers formed 3.8%.

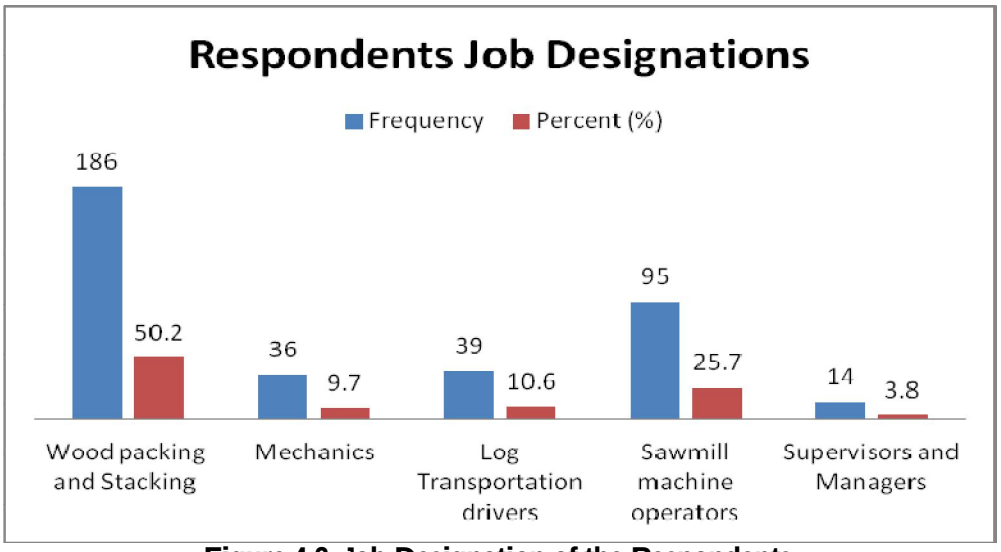


Figure 4.3: Job Designation of the Respondents

4.1.5 Working Experience in the Current Job

The study sought to establish the period of engagement of the respondents in their current job designations. From the findings in Table 4.3, majority (38.1%) of the respondents had worked with the sawmill industry for over 2-5 years followed by those between 6-10 years (25.4%) and 8.2% had worked between 21-30 years respectively as shown in Table 4.3. The workers had been employed for an average of 7.4 years (range 6-10 years). From the results, it can be concluded that the workers experiences and competences in sawmilling activities vary a lot and so is the competences of the workers at different levels. Those who had worked for longer periods had more experience in the sawmilling sector than the majority who had worked for 2 to 5 years.

Table 4.3: Period of Engagement in the Current Job

No. of Years	Frequency	Percent (%)
0-1 years	53	14.3
2-5 years	141	38.1
6-10 years	94	25.4
11-20 years	50	13.5
21-30 years	30	8.2
31-40 years	2	0.5
Total	**370**	**100.0**

4.2 Safety and Health Hazards Employees are exposed to in Sawmills

4.2.1 Workplace Safety and health hazards

When asked to list hazards at the work place, the workers listed exposure to wood dust (81%), noise(78%) and fires (82%), exposure to heavy lifting and pulling movements (41%), flying and falling objects (33%), sharp metals objects and running machines (57%), slips and trips (13%), meeting production targets (17%) awkward positions (19%), improper conveniences with poor health hygiene conditions 10% and lack of safety equipment like helmets, aprons and gloves (76%) as illustrated in Table 4.4. Other hazards identified were contact with the moving parts or the hot exhaust system of the chainsaw; exposure to exhaust gases and fumes; hazards arising from manual handling operations; exposure to noise from blade contact with the tree and vibration from the handles; falls from a height; In-running nip points ; reciprocating movement; chemical hazards from exposure to coatings, finishing, adhesives, solvent vapors; handling lubricating oils and petrol and coming into contact with sap from the tree which might lead to dermatitis; flying particles such as tree bark and sawdust; uneven ground or wet grass which could lead to slips and falls; falling objects such as branches or the tree itself; contact with overhead services; hazards arising from adverse weather conditions such as wind, rain and UV radiation from the sun and stings or bites from insects or reptiles.

Table 4.4: Types of reported safety and health hazards experienced by respondents

Hazards exposed	Frequency	Percent (%)
wood dust from sawing and hand Sanders	300	81%
Noise	303	82%
Fire and explosion hazards	118	32%
sharp metals objects and running machines	192	52%
Heavy lifting and pulling movements	152	41%
Flying and falling objects	122	33%
Slips and trips	58	13%
Meeting production targets	63	17%
Awkward positions	70	19%
Inconveniences with poor health hygiene conditions	37	10%
Lack of safety equipment like helmets, aprons and gloves	281	76%

4.2.2 Accidents at the Work Place

According to NSSA (2007), accidents and injuries in the sawmilling industry are caused by exposure to occupational hazards. Hazards include any aspect of technology, or activity that poses risks. The level of risk is primarily the combination of two factors: the level of toxicity or amount of energy present and the degree of exposure. The study further probed the respondents on accident occurrence at their work place. The findings indicated that majority of the workers have not had major accidents at the work place. The low significance 0.000 which is less than 0.05, suggests that there is a big difference between those who have been involved in accidents and those who have not. The chi square value asymptotic significance indicates the awareness on accidents at work is significant in exposing workers to hazards as indicated in Table 4.5.

Table 4.5: Accidents at the Work Place

Category	Observed	Expected	Residual
Yes	154	1	153
No	216	369	-153
Total	**370**		

Chi square = 23472.44 degree of freedom = 1
Asymptotic significance = 0.000

4.2.3 Areas Prone to Accidents in Sawmills

In addition, the study wanted to find out the areas where the accidents or injuries occurred and the findings are illustrated in Figure 4.4. The findings established that the majority of the respondents encountered accidents at the sawmill workshops and production areas at 45.1%. In addition, 40.8% indicated that they encountered accidents at the sawmill yards and surroundings. 14.1% encountered accidents on the road way while transporting logs to the saw mills. A good safety and health management system would focus on creating hazard awareness to the groups in the sawmill yards, workshops and production areas because most of the workers experience injuries in these areas. These findings are congruent to those of Steenkamp (2002) who posited that Health and safety in the wood working sector can only be pursued comprehensively, integrating all spheres of work. The nature of work in wood processing industries, type of equipment and material handled present on the job all influence the nature of hazards (Judd , 2004).

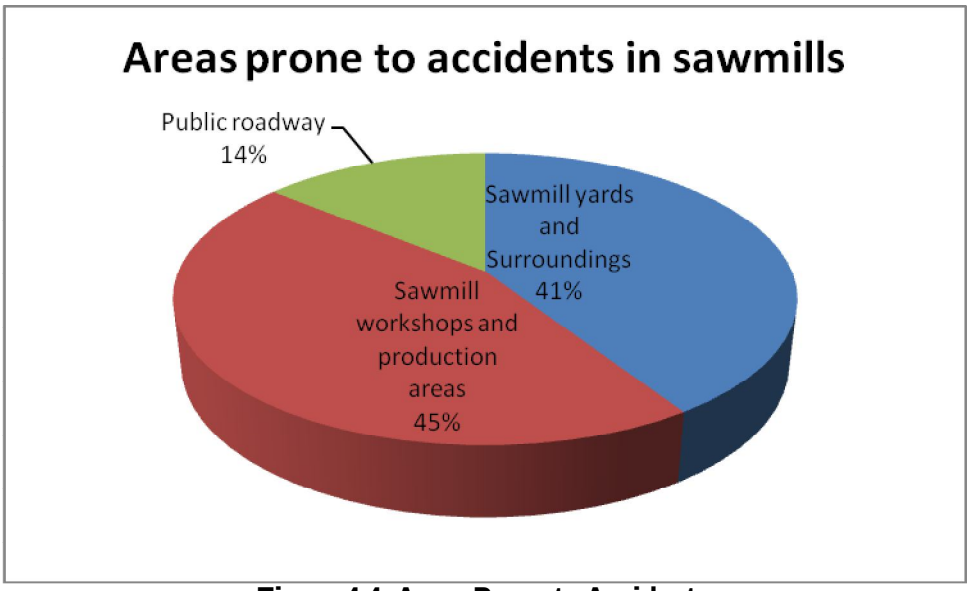


Figure 4.4: Areas Prone to Accidents

4.2.4 Activities Involved in During Accidents

In addition, the study found that the workers being injured were involved in different activities at the sawmill industries. Table 4.6: shows 18.1% were involved in moving logs, 20.0% while doing maintenance and 35.9% during saw milling activities using circular saws and other machines. 12% experienced injuries while moving timber to stacks and 13.2% during log transport. The study revealed that majority of the workers experienced injuries at the point of operation where work is performed on the material while using circular saws and other machines in the saw mills. At the point of operation the stock is cut, shaped, bored, or formed. Most woodworking machines use a cutting and/or shearing action. The findings support those of Boy (2002) who carried a study in the Italian sawmill industries and established that the timber processing industry rates as one of most hazardous occupations. Accidents and injuries occur as a result of conveyor systems, rapid moving parts of machines (blades, saws), falls and slips, kickbacks, wood handling, and vehicle accidents.

Table 4.6: Activities Involved in During Accidents

Activity	Frequency	Percent (%)
Moving Logs	67	18.1
Maintenance	77	20.8
Milling using circular saws and other machines	133	35.9
Log Transport	49	13.2
Moving Timber to stack	44	12.0
Total	**370**	**100.0**

4.2.5 Nature of Injuries Experienced

Table 4.7 illustrates results showing that majority of the sawmill workers suffered from lacerations or cuts while a few (0.6%) experienced heart attacks. 5.7% experienced fractures, 30.3% had bruises, 10.3% had sprains and 10.8% reported having had strains. Therefore, on the nature of injuries experienced in the sawmill industry; the workers were exposed to a wide range of injuries with varying extents. The injuries imply that although majority of the workers have been trained on safety, they should continually hold refresher trainings and empowerments to reduce the injuries experienced. Workers that have been trained on safe procedures are less likely to suffer injuries or ill health. Workers not trained on safe work procedures to use when undertaking various activities at work learn how to work through other methods such as observation or relying on informal methods from colleagues. On various body parts in which the workers experienced injuries, the study findings revealed that the majority 31.4% had laceration injuries followed by the bruises at 10.8% while the least experienced injuries were heart attacks at 0.6% as shown in Table 4.8.

Table 4.7: Nature of Injuries

Activity	Frequency	Percent (%)
Fracture	21	5.7
Bruises	112	30.3
Laceration	116	31.4
Sprain	38	10.3
Strain	40	10.8
Heart attack	2	0.6
Burn	32	8.7
Others	9	2.2
Total	**370**	**100.0**

The study established that majority of the respondents suggested that in order to reduce the rate of accidents, the sawmills should provide safety precaution measures, train and educate workers on occupational safety, observance of machine layouts, provision of protective gear and use right tools at the right time. The findings supports the study by Colman et al. (2007) which posited that rotating devices, cutting or shearing blades, in running nip points and meshing gears are typical examples of potential sources of workplace injuries while crushed hands , severed fingers, amputations and partial blindness are typical wood working accidents. Bello (2010) established that in Nigeria, more injuries occurring to body parts include upper limb 68%, back and lower injuries 58% and less prominent lower injuries at 13%. The body injuries recorded in tables 4.7 and 4.8 were largely due to not using personal protective equipment when manually handling of heavy logs by a number of workers rather than using the conventional conveyors. Such injuries are also attributable to movement of sawn products such as log transport, loading and offloading, lumber stacking and transport of timer to market, during equipment maintenance including restoration, repair and routine maintenance of mill and saw filling. During log loading, a number of workers often constitute themselves to conveyor pushing and rolling heavy logs into the saw table. This often leads to accumulated stress which causes lower back injuries and other health hazards.

Table 4.8: Part of Body Involved in the Injuries

Part of Body Injured	Frequency	Percent (%)
Ankle	37	10.0
Arm	39	10.5
Back	24	6.5
Body/multiple	27	7.3
Chest	24	6.5
Eye	32	8.7
Foot	40	10.8
Hand	50	13.5
Head	30	8.1
Leg	35	9.5
Shoulder	26	7.0
Other	6	1.6
Total	**370**	**100.0**

4.2.6 Inadequate Facilities in Sawmills

The researcher further sought to find out which facilities were inadequate at the work places in the saw mills. According to the results in Figure 4.5: indicates that 59.1% of the respondents indicated that there were no spare parts for some sawing machines; 10.0% indicated that there were no timber drying and sanitation facilities, 20.0% indicated there were no new machinery while 10.9% cited lack of training centers for technological advancement skills. From the findings, it can be inferred that most of the sawmills should buy new machines and spare parts for their machinery, invest in timber driers to avoid losses as a result of timber developing defects and also embrace the idea of technology training centers to improve their efficiency and capabilities to produce quality timber and timber products. According to Bello (2010), Nigeria wood processing industries, a major risk factor noticeable in the factory was age factor of the machines and equipment in use. Most of the machines were obsolete with most of the safety guards removed and non functional. It was also noted that from the study, the respondents notion about the concept of health and safety rules for operations in timber processing do not give preference to basic safety training in hazardous operations.

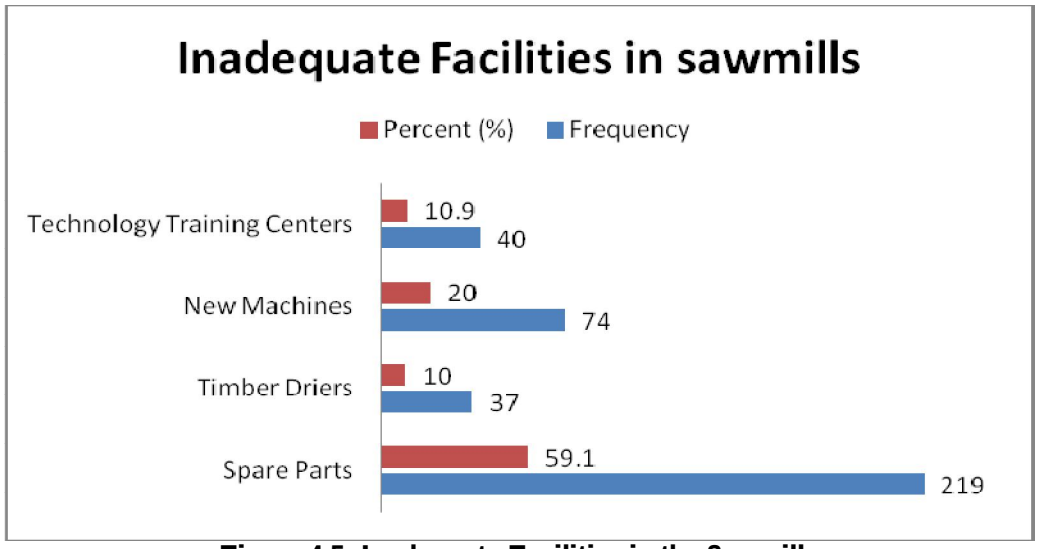


Figure 4.5: Inadequate Facilities in the Sawmills

4.2.7 Descriptive Analysis of Noise Level Measurements

The study further assessed the noise levels in all the saw mills under study in Nakuru County. The aim of the assessment was to establish noise exposure levels in the working environment due to various operations in the saw mills and the results are as shown in Table 4.9 and Table .10. From the findings, the overall measured noise levels in the study area ranged from 58.7 dB (A) to 107.4 dB (A) and 93.6 % of the workers were exposed to noise levels of 90 dB (A) and above for more than 8 hrs daily. 96.6 % of the workers were aware that noise can cause deafness and 86.5

% of the workers were aware that it can be prevented, but only 3.8 % of the workers used hearing protectors of which only 1.3% uses them regularly. 33.8 % of workers had noise related health problems but only 10.7% had sought medical assistance. 37.3 % of the workers had impaired hearing and 83% of those with impaired hearing had worked for more than 6 years. This means that the saw mill workers were exposed to hazardous noise level and they recognized noise as a hazard but initiatives are required to increase use of effective preventive measure.

Table 4.9: Noise level measurement

Ref	Representative Source	Noise Level dB(A)	TVL	Comments
1	Security area (Main Gate)	58.7	60 dB(A)	Acceptable
2	Wood planer area	88.5	90 dB(A)	Acceptable
3	Circular saw	99.8	90 dB(A)	Nuisance
4	Chain saw	105.6	90 dB(A)	Nuisance
5	Jackhammer	107.4	90 dB(A)	Nuisance
6	Drill press	83.1	90 dB(A)	Acceptable
7	Timber work(Machines were not on operation)	62.2	90 dB(A)	Acceptable
8	Drum Sander	77.8	90 dB(A)	Acceptable

The study also asked on what the respondents understood by a risky and safe working environment. They indicated that a risky working environment is one which exposes a worker to danger, has no instructions on how to use tools and has no control mechanisms. On safe working environment, the respondents indicated that it has detailed and documented working instructions and has protective equipment for work.

Table 4.10: Noise Hazard Levels and Impacts on Sawmill Workers

Response	Frequency	Percent (%)
Exposed to 90 dB(A) Noise levels and above	339	93.6
Aware that noise causes deafness	357	96.6
Aware that deafness can be prevented	329	86.5
Using ear protection equipment	14	3.8
Noise related health problems	125	33.8
Impaired hearing	138	37.3

4.3 Assessment of Employers' and Workers' knowledge on Safety and Health Hazards

4.3.1 Descriptive Analysis of Workers' knowledge on Safety responsibility at work places

The study sought to find out who was responsible for workers safety at the work place. According to the results in Table 4.11, 45% fully agreed that both worker and Sawmill owners were responsible for safety at work, 30% said that it is the safety officers' duty to ensure safety and prevention of accidents at the workplace while 25% indicated that everyone is responsible and the employer has more responsibility for safety at work place. According to the preamble to the ILO constitution, the protection of the worker against sickness, diseases, and injury arising out of his employment is a precondition to universal and lasting peace. As a result, millions of employees die, are injured and fall ill every year as a result of workplace hazards (ILO, 2010). The XVIII World Congress on safety and health at work was held in Seoul, Republic of Korea from 29 June to 2 July 2008. The Seoul declaration state that a safe and health working environment should be considered as a fundamental human right and it encourages government to consider ratification of the ILO Promotional Framework for Safety and Health Convention, 2006 (no 187) as a priority, (Hope 2009). Safety and health are basic human rights to be enjoyed by all employees throughout the world.

Table 4.11: Responsibility for Safety at the Work Place

Category	Frequency	Percent (%)
Both Worker and Sawmill owners	167	45.0
safety officers' duty	111	30.0
Everyone and employer has more responsibility	92	25.0
Total	**370**	**100.0**

4.3.2 Causes of Accidents at Work Place

The respondents were asked to identify the causes of accidents in their places of work and the response were as follows and as shown in Table 4.12; 43% said lack of training,23% carelessness and ignorance,19% lack of personal protective equipment PPEs and 15% said oil spillages on work place floors. It was noticeable in most of the mills visited that a major risk factor was the age factor of the machine and equipment in use. Most of the machines are obsolete with most of the safety guards removed or non-functional. On site observation also revealed that environmental safety, work place organization and safe work procedures have not been taken as seriously because there were heaps of wood shavings from planning machine and saw dust accumulation around circular saw and band saw. Little attention was paid to the use of individual protection devices such as wearing of earmuff or plug when operating machine, wearing of hand gloves when moving and stacking logs or sawn lumbers, neither is any preventive measure paid to hazards due to chemical emission from some species of log handled by putting on overall. Accident investigations and documentation are non-existent as evident by the non-availability of accident/injury records in nearly all the sites visited. In addition, all the respondents were in agreement that accidents at the work place can be avoided by training and educating the works on occupational safety and health to increase awareness, provision and use of appropriate PPE, holding tool box talks more often and regularly and sensitizing the workers and employers on safety issues and their implementation.

Table 4.12: Causes of Accidents at the Work Place

Response	Frequency	Percent (%)
Lack of training	159	43.0
Carelessness and Ignorance	85	23.0
Lack of PPE	70	19.0
Spillages	56	15.0
Total	**370**	**100.0**

4.3.3 Consequences of Shortcuts at Workplace

The respondents were also asked about why short cuts are not allowed at the work place and majority pointed out that it was to avoid carelessness, ensure proper handling of tools, avoid unnecessary and dangerous accidents and enable one to find breakdown issues within the shortest time as shown in Table 4.13.

Table 4.13: Consequences of Shortcuts at the Work Place

Response	Frequency	Percent (%)
Avoid Carelessness	52	14.0
Proper Handling of Tools	130	35.0
Avoid Accidents	155	42.0
Fixing Breakdowns	33	9.0
Total	**370**	**100.0**

To identify the importance of wearing proper personal protective equipment at work, the respondents were asked why it was important at the work place. Majority indicated that protective gear helped them to avoid accidents, avoid contact with chemicals and also ensured safety and protection of the workers. On housing keeping, the respondents pointed out that it was all about ensuring everything was at the right place and time. They also indicated that good housekeeping was about making or keeping the work place clean, safe and allow smooth running of the work processes. All the workers, 100% were in agreement that good housekeeping was the responsibility of everyone. The researcher further sought to find out how the sawmills dealt with refuse when the correct refuse bins were not in sight. According to the results in Figure 4.6, 40% of the respondents indicated they collected the refuse in one place, 20% put the refuse in the available bins though not the correct bins while 40% indicated that they threw away the refuse. The findings shows there are gaps in refuse management which should be addressed by the saw mills' management.

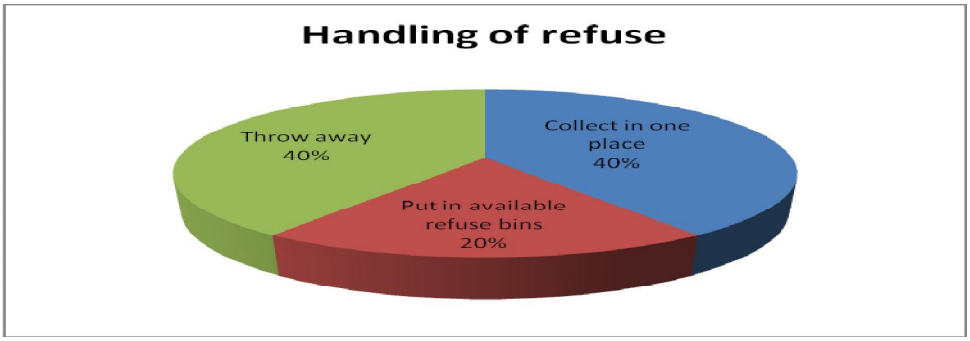


Figure 4.6: Handling of Refuse at work place

4.3.4 Waste Management at Work Place

The study also sought to find out how the sawmills were managing various wastes in regard to occupational safety. Waste disposal system in the saw mills obtained from respondent is shown in Table 4.14, 72% indicated that they use sawdust for agricultural uses and animal bedding, 85% burns waste paper, 76.0% use oil as a lubricant and wood preservative while 10% general waste is taken to designated dump sites for burning. On site observation revealed that environmental safety, work place organization and safe work procedures have not been taken seriously because there were heaps of wood shavings from planning machine and saw dust accumulation around circular and band saws. These refuse management practices leads to increased pollution in the environment which is detrimental to the lives of the sawmill workers.

From available information, in Australia all wood sawdust is classified as carcinogenic. Exposure to sawdust is liable to cause dermatitis and allergic respiratory infections to the sawmill workers. The majority of machine operators in Australia are reported to have been diagnosed of respiratory infectious diseases due wood dust. When a worker is exposed to wood dust, he/she is prone to suffer from an allergy reaction after repeated exposures. Sawdust also causes eye irritation, nasal dryness, irritation to eyes and the nose and frequent dryness. To manage sawdust effectively, sawdust extractors should be put in place to minimize wood dust at their source of production (IFC 2007). This study established that a few sawmills had put sawdust extractors in place. This has consequently exposed sawmill workers to hazards which have a negative impact to their health. According to OSHA (2003), dust exposure should be controlled through the adoption and maintenance of effective extraction and filtration systems which are supplemented by use of personal protective equipment such masks and respirators.

Table 4.14: Waste Management at Work Place

Waste	Management of the waste	Frequency	Percentage
Sawdust Waste	Disposal for agricultural uses and animal bedding	266	72.0
Paper waste	Burnt, Used at locomotive boiler	316	85.0
Liquid (used engine oil)	Used as lubricating oil and wood preservative	281	76.0
General waste	Burnt daily at designated dump site	37	10.0

4.3.5 Handling of Spillage at Work

The survey respondents were asked about what they do when they cause a spill or come across a spillage in the work place. The results in Table 4.15: shows that 30% wiped the spillage using sawdust, 22% collected in one place for re-use while 48% left it for the cleaners to do their job. The results indicate that there is greater likelihood for workers to suffer from accidents as a result of spillages at work especially for those which were left unattended. This is because there procedures to be followed in case of a spillage such as containing the spill, demarcate the area for safety reasons, alerting others of the area and if the spill is from a known substance being of a minimal or a controllable quantity to clean it up immediately were not in place.

Table 4.15: Handling of Spillage at Work

Response	Frequency	Percent (%)
Wipe out the spillage using sawdust	111	30.0
Collect in one place for re-use	81	22.0
Leave it for cleaners	178	48.0
Total	**370**	**100.0**

4.3.6 Fire Drill at Work Place

The research results in Figure 4.7: on fire drill show that (68.2%) of the sawmill workers had experienced fire or explosions at the work place at one time or another due to over drying of timber materials to very high temperatures. When asked on what to do during a fire drill, 42% indicated they will use the fire exit, 20% indicated they will fight off the fire using fire extinguisher while 38% pointed out they will run away from the fire to report to the fire disaster management department. The responses show that procedures for fire disaster management are not adequately in place. Relevant information is not provided on the risks and precautions taken. There are no trained and equipped competent persons to implement fire-fighting measures. Most of sawmills premises are also not provided with appropriate fire detectors, alarms and fighting equipment. The respondents were further asked whether they have ever come across or used defective tools and almost all of them were in total agreement that defective tools were common. In addition, majority of the respondents pointed out that if there were no replacement for defective tools, they continue using the tools. Some who were further probed indicated that they feared that they could lose their jobs if they didn't use the tools. The study also sought to find out if the workers understood what hazards were and majority indicated that it was anything that had potential to cause harm or accident on someone.

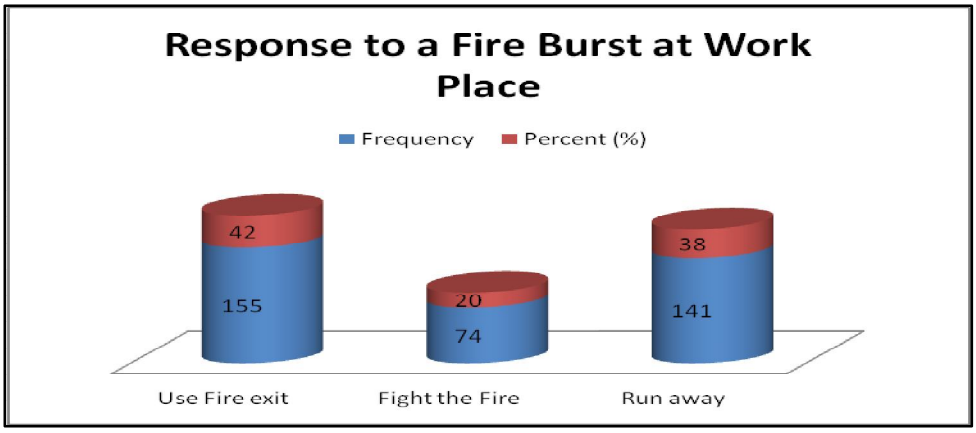


Figure 4.7: Response to Fire drill at Work Place

4.4 Control Measures put in Place at Sawmills

4.4.1 Descriptive Analysis of the Safety Rules in Sawmills

The respondents were requested to respond to the safety rules take care, be observant of what can go wrong, what can cause it and what you can do to prevent it. Majority of the respondents answered that one needs to be sure technically on what they are doing and know the exact procedures leading to the final results of a task. The respondents were also asked about the conditions or signs of emergency workers should always guard against. Majority of the respondents (36%) indicated smoke, spillage or leakage (25%), unusual noise (28%) and electrical fault (11%) as illustrated in Table 4.16.

Table 4.16: Conditions or Signs of Emergency to Guard at Work Place

Response	Frequency	Percent (%)
Smoke	133	36.0
Unusual noise	104	28.0
Electrical fault	93	11.0
Spillage or leakage	40	25.0
Total	**370**	**100.0**

Further, the respondents were asked whether they had safety systems at the work place and all the workers were fully in agreement except that they stressed the need for regular trainings. This they said will go a long way in reducing unnecessary accidents and injuries at the work place. On signing the work permit or time register at work, majority of the respondents indicated that it was just a routine (60%), others indicated that it was meant to address issues with attendance and follow up (22%) and while the rest (18%) were not sure about signing the work permit as shown in Figure 4.8.

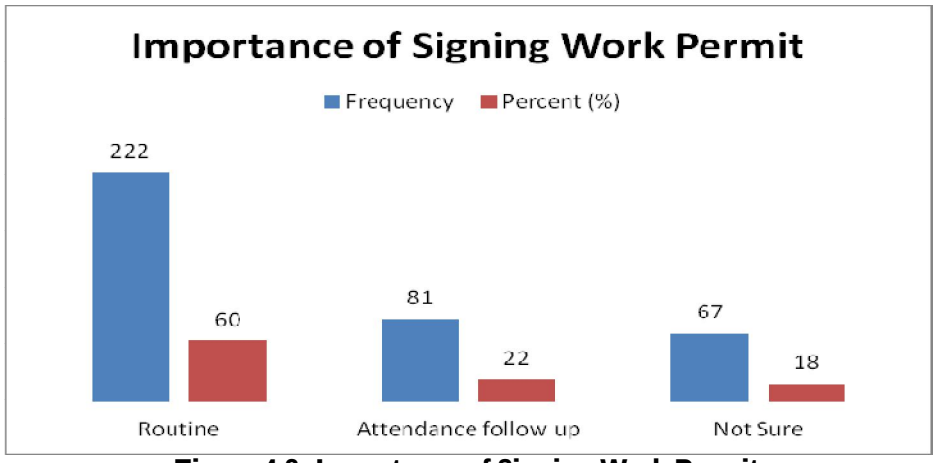


Figure 4.8: Importance of Signing Work Permit

4.4.2 Sawmill workers' occupational Safety and Health training

The main sawmill machine operators such as the circular breakdown saw machine operator, the circular re-saw machine operator, the band saw breakdown machine operator and the band re-saw machine operator are the key workers in the sawmilling operations as illustrated in Table 4.17.

Table 4.17: Training of Sawmill Machine Operators

Machine Operators	Frequency	Percent (%)
Saw machine operators	28	30.3
Circular re-saw machine operator	7	7.1
Band saw breakdown operator	46	48.0
Band re-saw machine operator	14	14.6
Total	**95**	**100.0**

Training of the saw mill operators will ensure the effectiveness and productivity of the saw mill, if they can operate and maintain the machines safely and efficiently. In order to do that, they need training. The training preferred for the machine operators, saw doctors and mechanics was either short course training at the FITC or preferably in-house training at the sawmills. The sawmill owners and supervisors preferred to take the shortest time in trainings and felt they will benefit more if the trainings were conducted at the sawmill premises. All the saw mills were ready to train their workers on safety and environmental health if the courses were to be organized or conducted within the saw mills. The research results in Table 4.17 shows that Saw machine operators 30.3%, Circular re-saw machine operator 7.1%, Band saw breakdown operator 48.0% and Band re-saw machine operator 14.6% of the sawmill machine operators had occupational safety and health education or specific machine safety training. This made only an average of 25.7.0% of the saw mill key workers trained professionally on safety. In fact, this was a clear indication of low training levels, low competence and professional skills at the sawmilling industries studied. This is also an answer to various production constraints, injuries experienced and difficulties in the production of timber and other products.

4.4.3 Training on Sawmill Safety and Technology

The respondents were asked about the vocational education and training in the sawmill sector and technologies. In this regard, the study sought to find out on the level of training of the respondents on safety and technology in the sawmill industry. From the findings in Table 4.18, 80.0% of the sawmill workers did not have any professional education or occupational safety and health training at all. 20% had short course professional training which was mainly received from the FITC in Nakuru, when the institute was still operational and from training institutions and either a college or university which offered short course certificates in occupational safety and health. This findings indicate that majority of the respondents across the various sawmills were not aware of their occupational safety requirements and needs. According to the ILO management guidelines of 2001 the employer being part of management is responsible for the safety and health of the workers.

The ILO safety and health management guidelines of 2001 state that under accountability and responsibility element, safety and health should be considered as a line management responsibility.

Table 4.18: Training on Job Safety

Category	Observed	Expected	Residual
Yes	74	1	73
No	296	369	-73
Total	**370**		

Chi square = 5343.44 degree of freedom = 1
Asymptotic significance = 0.000

Though there is a large number of workers who have not been trained on job safety, the low significance 0.000 which is less than 0.05, suggests that there is a big difference between those who have been trained on job safety and those who have not been trained. The chi square value asymptotic significance indicates the awareness of job safety is significant in exposing workers to hazards. There is therefore need for the saw mills to conduct more trainings to reduce the difference between observed and expected values. The respondents who had been trained further indicated that they were trained on machine handling, keeping the workplace clean, first aid in case of emergency and also on fire safety. Workers at sawmill need to be introduced to the health and safety systems at induction where they are given the main points of the saw mill's health and safety practices and the site-specific safety measures. This should be followed by a visit from the Safety and health officer or manager a month later where he checks that they understood and are using safe practices and the worker and safety manager sign a form attesting to this.

4.4.4 Toolbox Talk as a Control Measure

In addition, the study sought to find out if the workers held tool box talk before they start working. According to the findings, 40% of the respondents held tool box talk while 60% did not conduct tool box talk. Moreover, those who held tool box talk before starting work further indicated that sometimes it was not regularly conducted and it is tedious and time consuming. Moreover, majority of the respondents confirmed that they were taught to use the right tool for the right work and never to use any tool if one didn't know how it worked. Additionally, the respondents pointed out that the tool box talk was very important in fostering more understanding on machine operations, minimizing accidents and kept on reminding the workers on safety precautions at the work place. The Chi-square correlation analysis further established that majority of the workers did not have tool box talk at the work place. The low significance 0.000 which is less than 0.05 in Table 4.19, suggests that there is a big difference between those who held tool box talk and those who did not. The chi square value asymptotic significance indicates that awareness on tool box talks should be enhanced to ensure sawmill workers are aware of hazards and accidents at the work place. The study asked the respondents on the significance and meaning of various safety signs and color codes at the work place. Majority of the respondents (92%) indicated that red signified emergency or danger. The research results in Table 4.20: further show that there were mixed responses on the other color codes where majority (76%) were not sure about the meaning of yellow color followed by blue color (66%) and red (prohibition) color (52%).

Almost all the workers understood the meaning the red color implied probably from experience. When the researcher further probed the respondents on the reasons why color coding was not well understood, they pointed out that there was no training on color signs or placement of colors at specific points at the work place to indicate a specific action to be undertaken.

Table 4.19: Accidents at the Work Place

Category	Observed	Expected	Residual
Yes	148	1	147
No	222	369	-147
Total	**370**		

Chi square = 21667.56 degree of freedom = 1
Asymptotic significance = 0.00

4.4.5 Safety Signs in Sawmills

Table 4.20: Understanding of safety signs and Color Codes at Work Place

Color Signs	Meaning	Sure (%)	Not Sure (%)
Green	No Danger (Safe condition),First aid	55.0	45.0
Blue	Mandatory, Where protective gear	34.0	66.0
Red	Fire (fire equipment)	92.0	8.0
Red	Prohibition	48.0	52.0
Yellow	Warning, emergency, Hazard, Danger,	24.0	76.0

The researcher also asked respondents on what they were expected to do when an alarm rings. Majority reported that they will seek to know what is causing the alarm before running towards it or acting accordingly. The respondents also indicated that alarms often ring when there is an accident or emergency at the work place. However, most workers opinioned that most of the sawmills did not give them a specific way of acting like running to a central point for head count except for a few which had trained their workers on alarm response. Table 4.21: shows that majority of the workers (53%) did not know what to do with the machine alarms while at work, (32%) pointed out that they will stop the machine and report the matter to their supervisors for action to be taken and 15% did not give their responses.

Table 4.21: Alarm Response at Work

Response	Frequency	Percent (%)
Not know what to do	196	53.0
Stop Machine	118	32.0
No response	56	15.0
Total	**370**	**100.0**

5.0 Conclusions and Recommendations

5.1.1 Conclusions

In order to ascertain the hazards employees are exposed to in the saw mill industries in Nakuru County, the study analyzed the first research question: "What are the safety and health hazards that employee and others are exposed to in the sawmilling industry?" According to NSSA (2007), accidents and injuries in the sawmilling industry are caused by exposure to occupational hazards. As a result, the study established that majority of the workers did not experience accidents at the work place. This implies that awareness about exposure to hazards and accidents at the work should continue to be emphasized. Further, the workers who experienced accidents were exposed to hazards at the sawmill workshops and production areas. Others experienced accidents at sawmill yards and roadway while transporting logs to saw mills.

The study concludes that the saw mills should develop a comprehensive programme to create awareness on safety and health management system with great emphasis on the sawmill yards, workshops and production areas. Most workers experience lots of injuries in these areas. In addition, the study concludes that most workers are exposed to hazards while undertaking various activities in the saw mills which include log transport, maintenance activities, moving and stacking timber and using circular saws. Saw mills should continually hold refresher trainings and empowerments to reduce the injuries experienced. Workers that have been trained on safe procedures are less likely to suffer injuries or ill health. The employees were also exposed to hazards due to lack of spare parts to repair old machines, use of old equipment and lack of training centers for technological advancement skills.

The second research question was addressed by looking on the levels of awareness of personnel involved in timber sawmilling in recognizing hazards and unsafe working practices. In order to analyze this research question, the study approached it from the level of education and vocational training on saw mill aspects. The results has indicated that majority of the employees had attained secondary school education while part of the senior management had masters degrees and above.

Hence, majority of the employees understood safe working procedures and therefore were less likely to be injured compared to those who had attained lower primary and upper primary education levels. The level of education is also important especially during hazard awareness creation through training and following of safe work and safety procedures. However, on the level of training of the respondents on safety and technology in the sawmill industry, the study concludes that majority of the employees did not have any professional education or occupational safety and health training at all. Some workers had attended short courses from the FITC in Nakuru, when the institute was still operational and from training institutions.

A few employees are trained on job safety especially on machine handling, keeping the workplace clean, first aid in case of emergency and also on fire safety. The employees suggested to be trained on occupational Safety and health and other relevant and important subjects such as sawmill technology and production management. The sawmill owners were keen to train machine operators, saw doctors and mechanics on short courses at FITC or preferably in-house training at the saw mills. This is because the sawmill owners considers these group of machine operators as key employees for the survival of their enterprises. This forms only an average of 25.7.0% of the saw mill key employees. These shows there are low training levels, low competence and professional skills at the sawmilling industries studied. This is in contravention to the ILO management guidelines of 2001 the employer being part of management is responsible for the safety and health of the workers. The ILO safety and health management guidelines of 2001 state that under accountability and responsibility element, safety and health should be considered as a line management responsibility. The saw mill workers are exposed to noise levels well above 90 dB (A) for over 8 hours a day and as a result, they are facing health problems related to hearing. Noise protection equipment provided is not sufficient to help workers shield themselves from the impacts of noise.

The third objective of this research study to find out measures put in place by employers in managing occupational safety and health at work places. Lack of comprehensive occupational safety and health policy, poor sawmill layout, poor infrastructure and funding, insufficient number of qualified occupational safety and health supervisors/advisors, poor tools, equipment and general lack of adequate information are among the main problems in the management of safety and health in most sawmills in Nakuru County. The Seoul declaration 2008 state that a safe and health working environment should be considered as a fundamental human right and it encourages government to consider ratification of the ILO Promotional Framework for Safety and Health Convention, 2006 (no 187) as a priority, (Hope 2009). Safety and health are basic human rights to be enjoyed by all employees throughout the world. Therefore, the study delved into finding the safety measures the saw mills had put in place. The study concludes based on the findings that some employees were not sure who was responsible for ensuring there was safety at the work place. According to the preamble to the ILO constitution, the protection of the worker against sickness, diseases, and injury arising out of his employment is a precondition to universal and lasting peace. The saw mills had put in place tool box talks which were adhered to by some employees. Signing of work permits was also implemented though some employees found it tedious and time consuming. Additionally, the employees were taught to use the right tool for the right work and never to use any tool if did not know how it worked. Response alarms and safety signs and color codes were also in place though employees had divergent views on the meaning of the colors. Some employees were trained on how to response to fire drills. Safety rules were also put in place to be followed by employees in the saw mills. Appropriate fire detectors, alarms and firefighting equipment were missing in some sawmills and work places.

5.1.2 Recommendations

Based on the findings of the study, the following recommendations are made with the hope that if implemented there will be improvement in the health of sawmill workers and subsequently boost their productivity in Nakuru county. Nakuru county Government in partnership with the directorate of occupational safety and health and other relevant agencies (Kenya Forestry Service (KFS), Kenya Timber Manufactures Association (TMA), Kenya Forestry College (KFC) and the Forest Industrial Training Centre (FITC) in Nakuru need to organize periodic workshops and training programmes on safety and health to cover proper education on workplace hazards, types and proper use of different protective devices to safeguard their health. There is a need to re-emphasize formal training of sawmill workers by the technical colleges to increase awareness and knowledge of work-related hazards.

The saw mills should develop occupational safety and health policy, safe work methods, statements and a comprehensive training programme to create awareness on safety and health management system with great emphasis on the sawmill yards, workshops, timber stacking, log transport and production areas. The saw mills should continually hold refresher trainings and empowerments to reduce the injuries experienced.

The saw mills should invest in buying new machines, spare parts and build training centers for technological advancement skills. The saw mill owners and management should relook at the consequences of uncontrolled noise is having on their workforce and formulate strategies to train them on noise hazards and provide them with adequate protection equipment.

The saw mills should invest on training the employees on occupational safety and health training, sawmill technology and production management skills. The sawmill owners should focus on training all employees and reduce biasness to machine operators. The saw mills should emphasize on the importance of tool box talks to their employees to avoid unnecessary injuries and accidents at the work place. Safety systems of work such as risk assessments or job safety analysis and permit to work should be developed and implemented. Training on the meaning of safety signs and color codes, response to fire drills and provision of the appropriate personal protective equipment, fire detectors, alarms, fighting equipment and improvement on engineering controls should be urgently addressed.

5.1.3 Further Studies

There is need for research on the effectiveness of training professionals involved in occupational safety and health contributions towards preventing worker exposure hazards in saw mills.

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