

**STATUS OF OCCUPATIONAL SAFETY AND HEALTH
IN FLOUR MILLING COMPANIES IN NAIROBI
KENYA**

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**Status of Occupational Safety and Health in Flour Milling
Companies in Nairobi Kenya**

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**A Thesis Submitted in Fulfilment for the Degree of Master of
Science in Occupational Safety and Health in the Jomo Kenyatta
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DECLARATION

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

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DEDICATION

To my loving wife Fraciah, for her support and encouraging words as I pursued my degree. To my lovely daughter, Joy and parents.

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I would like to thank God for keeping me in good health during the entire period of my studies. To him is the glory.

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ACRONYMS/ABBREVIATIONS

| | |
|--------------|--|
| dB(A) | Average weighted sound level in decibel at A weighted system |
| DOSHS | Directorate of Occupational Safety and Health Services |
| HSA | Health and Safety Authority |
| HSE | Health and Safety Executive |
| ILO | International Labour Organization |
| NSSA | National Social Security Association, Zimbabwe |
| NIOSH | National Institute for Occupational Safety and Health, USA |
| OSH | Occupational Safety and Health |
| OSHA | Occupational Safety and Health Act, Kenya |
| PPE | Personal Protective Equipment |
| SPSS | Statistical Package for Social Sciences |
| WHO | World Health Organization |
| WMSD | Work-Related Musculoskeletal Disease |

DEFINITION OF TERMS

| | |
|--------------------------------------|---|
| Hazard | A situation that poses a level of threat to life, health, property, or environment. |
| General workers: | Includes all workers (apart from the management team), working in different departments such as loaders, millers, packers in the packaging unit, workshop workers and the drivers. |
| Nature of injury: | a variable that identifies the principal physical characteristic(s) of the injury or disease. |
| Occupational health services: | the sum total of the programmes and activities performed for the purpose of attaining the highest level of health and safety of the workers and their families. |
| Ugali: | a dish made of maize flour (cornmeal), millet flour, or Sorghum flour cooked in boiling liquid (water or Milk) to a porridge- or dough-like consistency. It is the most common staple starch featured in the East and Central Africa. |

ABSTRACT

Flour milling business is an important industry in the Kenyan economy as it provides maize flour (for ugali) and wheat flour to almost all the households. The study aimed at assessing occupational safety and health hazards in 11 flour milling companies in Nairobi-Kenya registered by the Directorate of Occupational Safety and Health Services. The study employed a descriptive design which used proportionate sampling methods to select the 310 participants but only 257 respondents filled and returned the questionnaires (response rate of 82.9%). Respondents were the factory staff who had worked for more than 6 months in management, milling, packaging, loading/offloading and workshop. Structured questionnaires were used to collect quantitative data which was analysed using statistic package for social sciences version 17. The study found out that the milling processes, maintenance works on the machines, loading and offloading of grains/flour, workshop activities and the packing activities were the main activities constituting safety and health hazards in the flour milling companies. Dust related health problems reported included wheezing, coughs and blocked chest problems. Other ailments believed to be as a result of the flour milling work were low back pains, joint pains and eye problems. 65.4% of the workers agreed that they had been trained on the safety and health hazards they were exposed to. The common injuries/incidents reported are, musculoskeletal problems (44%) (Pain in the muscles and skeleton), minor cuts (27%) (Cuts managed only by first aiders), major cuts (13%), (cuts managed by first aiders and referred for medical help), had dislocation (8%), fractures (5%) and amputation (3%). The major cause of accidents in the flour milling companies were unguarded machines (40%); slippery floors (14.4%); Inadequate/lack of PPE (11.7%); Poor or lack of housekeeping (10.9%); inadequate or lack of lifting equipment (10.5%); Trips/slips or falls (7.8%) and Neglecting Safety Procedures (4.7%). The study recommends the flour milling companies to ensure health and safety audit, health and safety risk assessment, noise survey, dust survey and fire safety audit are conducted regularly by qualified personnel and that action plans to implement recommendations provided there in should also be developed and the same shared with DOSHS and follow up done. The study also recommends guarding of all moving parts of the machines that can cause harm, ensure all floors are even, avoid slippery floors, use mechanical aid for lifting/ carrying heavy loads ensure grains/flour are packaged in small packages not exceeding 50kg. Adopt lock out tag out system for all maintenance works on machines. Finally, the study recommends regular training of all the employees in regards to occupational health and safety, fire safety and first aid. The trainings should be conducted by qualified professionals who are licensed by DOSHS.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Many people spend a significant fraction of the day and night at work in order to meet their economic and social needs. During work, people are often faced with various risks and safety hazards, which can expose them to a myriad of adverse health problems. Depending on the nature of work, occupational hazards can be associated with a variety of factors including physical, chemical, and biological agents as well as unfavourable working conditions among others (Ajeel & Al-Yassen, 2007). According to Kumar, Verma, and Neetika (2016) approximately 75% of the world labour force is living in developing countries but only between 5-10% have access to occupational health services and therefore the presence of hazards in the work place due to factors such as dust, heat stress, noise, toxic chemicals, and dangerous machines which leads to huge burden of work-related injuries, death and diseases is very common.

Understanding the inherent correlation between work and employee's health is crucial in acknowledging and practicing occupational safety and health. Occupational safety and health is a multi-disciplinary issue that seeks to protect the health, safety and the welfare of workers involved in various forms of employment in order to achieve a safe working environment (Muchangi, 2009). In line with the International Labor Organization (ILO) and World Health Organization (WHO) regulations, ensuring occupational safety and health is a fundamental right of workers around the world (Boateng & Amedofu, 2004).

Kenya has made significant progress towards attainment of occupational safety and health particularly through enactment of the Occupational Health and Safety Act No. 15 of 2007 and the promulgation of the new Constitution of Kenya (Mitullah & Wachira, 2011). Despite the presence of institutional and legal frameworks addressing work related safety and health issues, workers in many sectors, including

manufacturing industries, especially flour milling, remain highly vulnerable to occupational health hazards and risks.

The workers in the agricultural industry are highly exposed to hazards in their work environment, such as dust, unfavourable microclimatic conditions, excessive noise and insufficient light. In addition, there are numerous safety and health hazards associated with grain handling operations, among them suffocation and falls are the two leading causes of deaths. Other hazards include fires, explosions, electrocutions, and injuries from improperly guarded machinery. Exposures to grain dust and associated airborne contaminants can also occur; such contaminants include moulds, chemical fumigants, and gases associated with decaying and fermenting silage (Ijadunola, *et al.*, 2004).

The hazardous work operations are not identified and therefore no measures are put in place to ensure that the workers are not injured. Between 2005-2008, Health Safety Executive (HSE, 2006) averaged injury incidence rate at 1215 per 100,000 workers. According to Workplace Health and Safety Queensland 2011, approximately half of these injuries occur while a worker is performing a manual task (for example lifting, moving, or putting down objects) (McCunney, 2007).

Muchemedzi and Charamba, (2006) define occupational health as a science concerned with health in its relation to work or working environment. According to Oxenburgh *et al.*, (2005), the health and safety of all employees is closely linked to the company's productivity in all workplaces. In most cases, Occupational Safety and Health (OSH) is largely measured by negative outcomes such as workplace injury and illness but these measures have a shortfall, for instance, a low incidence of injury does not necessarily mean that adequate safety systems and controls are in place (HSE, 2006). At some flour milling factories, attention is mainly on negative outcomes. As long as there are no serious accidents, occupational safety and health policies and practices are not carried out fully. As a result, threats to employees' safety are not eliminated in time because accident-prone areas are not recognized and taken care of before accidents occur. It is therefore important that the conditions that

pose threat to the safety and health of the workers are identified and addressed (Oxenburgh *et al.*, 2004).

1.2 Statement of the problem

Iraj, et al., (2011) argues that the worker spends about one third of their time at the workplace. During this time, they are exposed to various hazards including noise, dust, vibrations, heat and harsh chemicals among others. The Occupational Safety and Health Act (GOK, 2007) has various provisions for the safety, health and welfare of workers and all persons lawfully present at workplaces in Kenya. Despite the fact that the Government of Kenya has put in place legislations to safeguard the safety and health of workers, the number of accidents at workplaces has continued to increase (Muchiri, 2008). For instance the number of accidents between 2001 and 2007 in Nairobi was 1,035 accounting for 12,941 man days lost. This high number of accidents and the attendant losses is attributed to failure to control workplaces hazards and noncompliance with the legal and regulatory framework regarding Occupational Safety and Health (OSH) (Muchiri, 2008).

Workers at flour milling companies are exposed to considerable hazards like manual handling, inhalable dust, noise, working in confined spaces mainly silos as well as slip, trip and falls. Workers normally load and offload long trucks without using any lifting aids; most of those workers involved in loading and offloading are paid on piece work. They experience occupational health and safety problems, with high rates of injuries, fatalities and incapacitation due to lack of health and safety, or lack of implementation of OSH policy (Ndirangu & Namusonge, 2014). Despite this, the researcher did not find systematic studies that have been carried out to investigate the occupational safety and health hazards in this industrial sector in Kenya, Most research focused on outcomes such as productivity, profit, and turnover and worker satisfaction. The study sought to find out the status of the occupational safety and health hazards in flour milling companies in Nairobi. Furthermore, health and safety programmes in many industries are poorly implemented raising serious concerns on the issues of staff health and safety.

1.3 Justification

Most flour milling companies aim at maximum productivity from their workforce and equipment. There is however a number of occupational hazards affecting staff in the production departments at flour milling companies in Kenya leading to decreased employee productivity. As the duration of a person's employment in an unpleasant environment increases his/her fitness is compromised leading to reduced performance due to absenteeism as workers seek treatment, increased spending by the company on treatment of workers injured in the course of duty and increased insurance premiums.

Nairobi is home to various major industries and small scale industries in and around the city. These industries are majorly involved in small-scale consumer goods (plastic, furniture, batteries, textiles, clothing, soap, cigarettes, flour), agricultural products, horticulture, oil refining, aluminium industries, steel industries, lead industries, cement industries and motor vehicle assemblies. Industrial growth has in turn resulted to creation of employment opportunities for many people. Therefore there is need to examine the status of the occupational safety and health hazards by flour milling industries in Nairobi to ensure that the health and safety of workers is safeguarded.

1.4 Research questions

1. What are the main activities that constitute the occupational safety and health hazards in milling companies in Nairobi?
2. What is the nature of injuries in flour milling companies in Nairobi?
3. What are the causes of the identified injuries and their control measures?

1.5 Objectives

1.5.1 Main objective

The main of the study was to determine the status of the occupational safety and health in flour milling companies in Nairobi

1.5.2 Specific objectives

1. To establish the main activities that constitute the occupational safety and health hazards in flour milling companies in Nairobi Kenya
2. To establish the nature of injuries in flour milling companies in Nairobi Kenya
3. To determine the causes of the identified injuries and their control measures in flour milling companies in Nairobi Kenya

1.6 Hypothesis of the study

1.6.1 Null hypothesis (H_0)

There are no significant occupational health and safety hazards associated with flour milling companies in Nairobi Kenya.

1.7 Conceptual framework

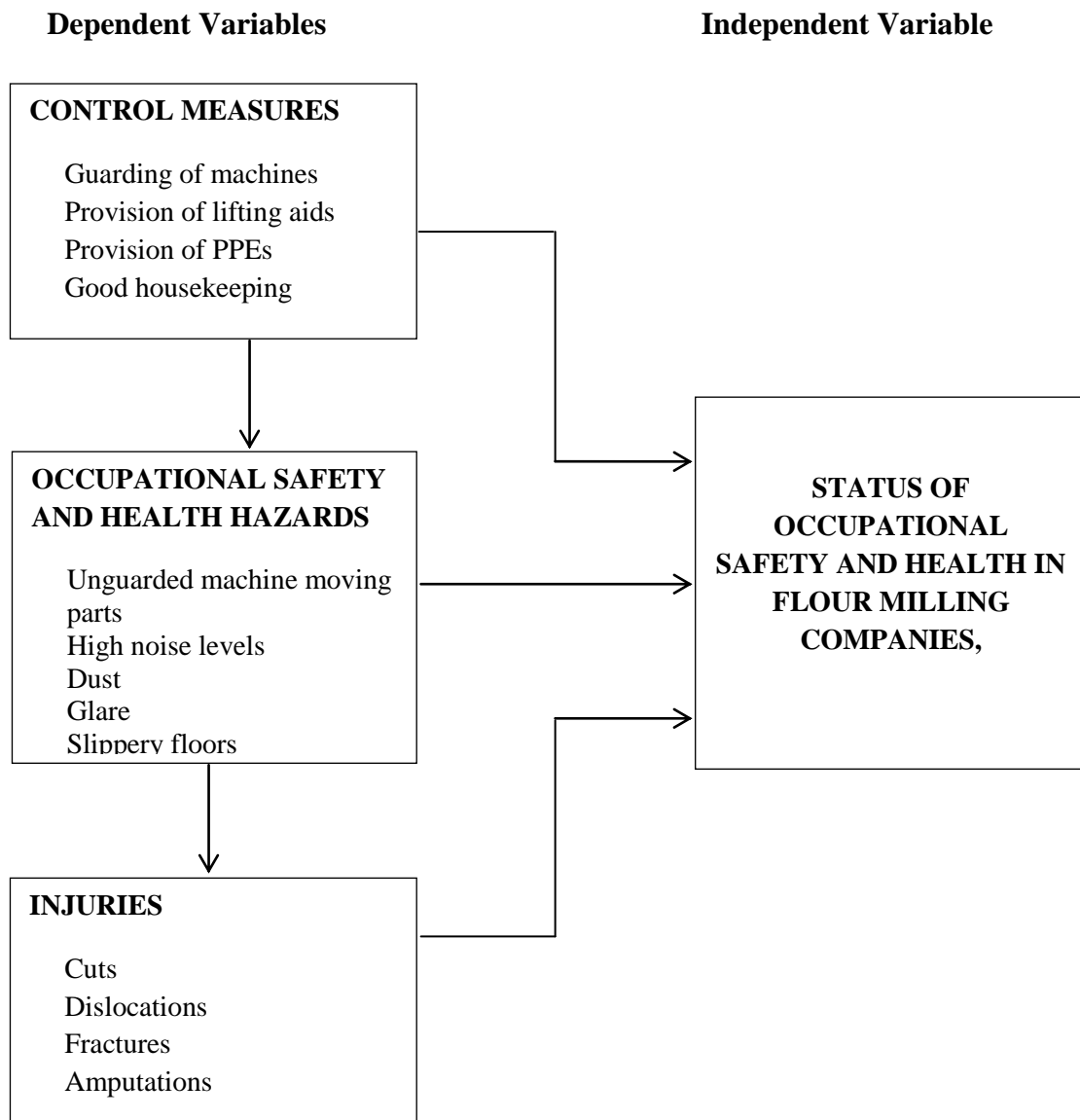


Figure 1: Conceptual frame work

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Flour milling can trace its origins back to prehistory, but the modern systems known as gradual reduction flour mills have only been developed over the last 200–300 years. Grain handling facilities, as defined by the Occupational Health and Safety Administration (OSHA) Grain Handling Standard, include: grain elevators, feed mills, flour mills, rice mills, dust pelletizing plants, dry corn mills, soybean flaking operations, and the dry grinding operations of soy cake. The modern flour-milling process according to ASABE, (2007) can be separated into six very distinct areas:

1. The break system – the first grinding stages for the wheat;
2. Scalping, grading, dusting – the separation of the ground materials after each of the break rolls;
3. The scratch system – the final removal of bran from the system, although sizing systems are more commonly used in modern plants;
4. Purifiers – the cleaning up of semolina stocks (endosperm fragments) by grading and aspiration to remove bran fragments;
5. The reduction system – the reduction of semolina to flour;
6. Flour dressing – the separation of flour from the other materials (mainly bran).

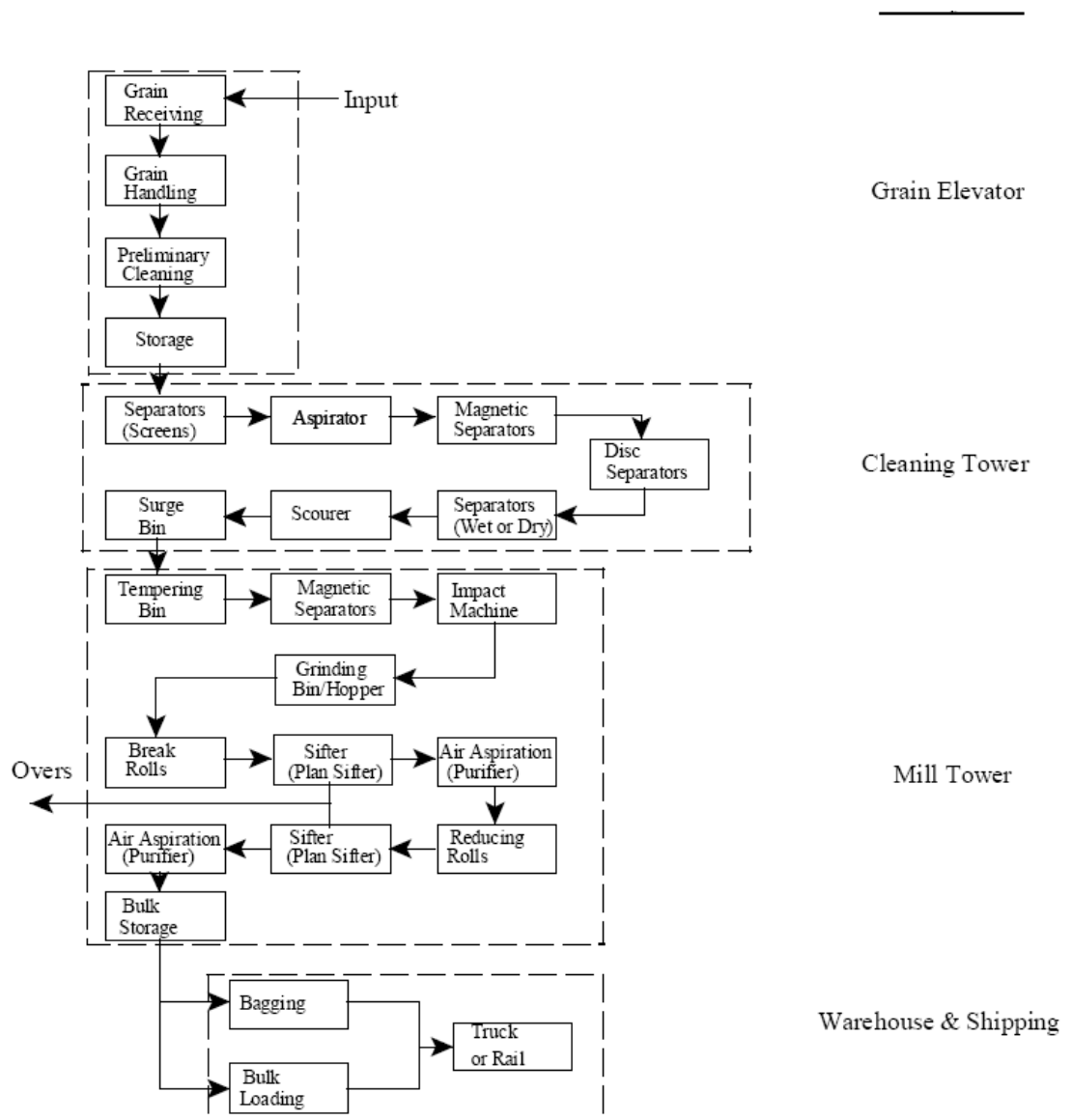


Figure 2.1: A process lay out of a typical flour mill

(Source: ASABE, 2007)

2.2 Theoretical Review

2.2.1 Causes of accidents

Muchemedzi and Charamba (2006) explain that accidents do not arise from a single cause but from a combination of factors which act simultaneously. A potentially unsafe situation does not cause an accident until someone is exposed to it. Accidents are caused by the result of unsafe acts or practices (the human element that results from poor attitudes, physical conditions and lack of knowledge or skills to enable one to work safely). They are also caused by the result of unsafe conditions of equipment or materials.

According to HSA (2006) accidents and illness can have a widespread impact on individuals and their families. Many will find that their working life is significantly affected: they may be unable to return to work, need a change of job or role to accommodate new restrictions or be conscious that they now approach their work with a level of caution and deliberation not previously in evidence; many will also experience longer-term physical problems. There are also immediate and longer-term economic consequences, both in terms of loss of income (most evident in the construction sector) and the need for extra expenditure associated with the accident or illness. When it results in permanent disability, the consequences are disastrous for both the victim and the company. The victim loses his earning capacity and ability to enjoy a normal active life, and the society and company are deprived of his/her skill and contribution to production.

2.2 Causes of occupational accidents

Muchemedzi and Charamba (2006) established that the majority of accidents (98%) do not just happen, instead people who perform unsafe acts and create unsafe conditions cause them and therefore accidents are preventable. Katsuro (2010) found out that most food factories do not abide by set OSH regulations. Most accidents are so minor that they have no visible injury or damage. Taking care of these minor problems results in a reduction or elimination of the major ones. There are four

factors that explain the link between productivity and employees' overall health and safety (Katsuro et.al., 2010): the need for more innovative ways to reduce the high rates of workplace injury and illness; the pressure to reduce the social and economic costs of injury and illness, particularly compensation costs; the need to improve labour productivity without employees needing to work longer hours and/or taking on more work; the need to offer good working conditions as an enticement to recruit and retain skilled workers in a tight labour market.

According to Nadine and Jennifer, (2013) the primary beneficial impact of occupational health and safety on productivity is reduced absenteeism. The health risks and failure of employees to participate in fitness and health promotion programmes are associated with higher rates of employee absenteeism. There is need for much emphasis on the employer's participation in ensuring that OSH programmes and policies are existent. If these OSH practices are set, it is more likely that the worker participates in order to preserve his/her life (Nadine & Jennifer, 2013). However, absenteeism may be encountered but may be completely neither unjustified on medical grounds nor attributable to unsafe conditions or hazardous events in the workplace. It is difficult to demonstrate conclusively the extent to which business prosperity benefits from good health and safety or on the contrary, to say that prosperous businesses have good health and safety because they are able to afford it (Health and Safety Executive [HSE], 2006). However, based on available evidence, the Occupational Health and Safety Reports argue that there is clearly a vicious circle in that a healthy and happy workforce is more productive, leading to increased investment in health and safety to reduce accidents, which in turn leads to further productivity gains.

The HSE, (2006) further explains that genuine productivity gains can be realized by those businesses that invest in high performance health and safety practices. However, the HSE (2006) also recognizes that there is need to have a positive attitude by many organizations if they are to move on from simply attaining minimum legal compliance toward implementing the best practice of OSH. For those organizations that make the transition, the rewards are well worth the effort. In other words, when an organization is committed to OSH best practice and implements it in

a properly managed manner, the result is a win-win situation that benefits both the workforce and the organization for which they work. There is need for a workplace improvement in terms of occupational health and safety for the benefit of the employer and the employee in order to increase productivity.

Occupational safety and health hazards are classified into six categories; these are physical, chemical, mechanical, biological, ergonomic and psychological. (GOK, 2007, International Labour Organisation [ILO], 2001) All these hazards negatively affect employees' OSH that resultantly causes low productivity. For example, psychological hazards include monotony which causes mental stress and decreases productivity (Muchiri, 2008).

The Directorate of Occupational Safety and Health Services, Kenya has data on the sound levels and the duration of time that an employee should be exposed to the noise. This implies that the employer should be aware of the noise intensity that is produced during plant operations and should protect the employee from noise. Most workers in the flour milling companies are not protected from that noise especially the ones in the milling section. This exposure to loud noise lowers employee morale and productivity. Most OSH statutory instruments state that it is the employer's obligation to provide a safe working environment for the workers. These regulations further clarify that it is the duty of the employer to disclose accident statistics to DOSHS and Workers and to keep appropriate records. An employee should be informed of the dangers that are eminent in their work. These statutes, further, stipulate that this information should be posted on areas that all workers can see, for example notice boards. Workers commonly refuse to work because of the health risk involved in their work and this can be used as an indicator of poor OSH in the workplace.

In most developing countries according to Mengesha and Bekele (2005), workers rarely consider safety of their jobs due to the high levels of unemployment in such countries (>70%). Since income is hard to earn and there are no efficient economic security social nets, a worker opts to work in any environment that is risky than losing a precious job. Therefore, data on stop-work, because of an unhealthy

situation, is virtually nil in the developing countries. McCunney (2007) demonstrates that the health risks and failure of employees to participate in fitness and health promotion programmes are associated with higher rates of employee absenteeism. McCunney's (2007) contribution can only be valid if the fitness programmes are in place. There is need for the employer's participation in ensuring that OSH programmes and policies are existent. If these OSH programmes are in place, it is more likely that the worker participates in order to preserve his/her life. Towers (2003) explain that it is important to empower, educate and persuade workers to exercise their powers in the protection of their OSH. Employees are left to form their own OSH committees which are not taken seriously by the management.

2.2.2 Dust

2.2.2.1 Dust in flour mills

"Flour dust" refers to dust coming from finely milled or otherwise processed cereal. Hypersensitivity reactions as well as irritant symptoms caused by flour dust constitute a well-recognized occupational problem world-wide (Neitzel, 2004). Most data on flour dusts have been derived from studies on wheat (*Triticum sp.*) and rye (*Secale cereale*), and to a lesser extent on barley (*Hordeum sp.*) and oats (*Avena sativa*). From the point of view of hazard assessment, all these taxonomically related cereals, belonging to the family *Poaceae*, are relevant. The allergens they contain have been shown to cross-react with each other, indicating that these allergens are common to different species. Flour from corn or maize (*Zea mays*) is not included in the present risk assessment, as maize flour seems to present a low allergenic potency and less cross-sensitization with other cereal grain flours (Parker et al 2007). Other sensitizing flour dusts from non-cereal grains, such as soy (*Glycine hispida*) and buckwheat (*Fagopyrum esculentum*) are also excluded for taxonomical reasons. The flour dust in the bakery industry may contain several other non-cereal components, so called dough-improvers, such as a variety of enzymes (*e.g.* α -amylase of various origin, malt enzymes, cellulase, hemi-cellulase, xylanase), chemical ingredients (*e.g.* preservatives, bleaching agents, antioxidants), flavourings, spices, and other additives (*e.g.* baker's yeast, egg powder, sugar) as well as contaminants such as

storage-related mites and microbes (Neitzel, 2004). Several of these components are sensitizers. α -Amylase is an important sensitizer small amounts of which (0.1 to 1.0 mg/g flour) are naturally present in wheat. A-Amylase may be of different origin which may determine its 2 allergenic properties (Vanhanen 2000); most commonly it is derived from fungal organisms such as *Aspergillus oryzae* or *A. niger*. The dose-response data used for the present risk assessment are derived from studies on cereal flour dust sensitization, and therefore this recommendation applies to flour dust from wheat and other cereals (Scoel, 2008).

2.2.2.2 Grain dust

Grain dust is a complex mixture of husk particles, cellulose hairs and spikes, starch granules, spores of fungi, insect debris, pollens, rat hair, and approximately 5 percent mineral particles. The mean particle size of the airborne dusts may be less. Meo and Al-Drees, (2005) studied lung function in forty-six male flour mill workers and a similar number of male control subjects in Pakistan. All participants were non-smokers with the age range from 18 to 65 years. The subjects were matched for age, height, weight and socioeconomic status. The results showed that the flour mill workers in Pakistan, like grain workers elsewhere, are at an increased risk of developing occupationally related pulmonary function impairments. The results suggest that there is an urgent need to improve dust control measures and the health status of flour mill workers.

2.2.2.3 Physical and biochemical properties of dust

Wheat is the primary cereal grain used in bread making. Seeds are composed of endosperm (85%), husk (13%) and germ (2%). The milling process separates the endosperm from husk and germ and reduces the particle size of the endosperm. Wheat flour is made from the endosperm. This wheat flour contains starch and four different groups of proteins (water soluble albumins, globulins, prolamins (gliadin), and glutelins (glutenin)). Both gliadins and glutenins form viscous complexes, called gluten, which determine the structure and texture of bread to a great extent. The proteins present in flour dust are potential allergens. The strongest allergic potency

has been observed with water-soluble albumin fractions *in vitro* (Baldo & Wrigley 1978), but the allergic potency of gliadin, globulin and glutenin protein fractions should not be ruled out (Walsh *et al.*, 2003).

The number of potent dust flour allergens from these four protein fractions is large. In one study, 40 different allergens were identified by crossed immunoelectrophoresis (Boateng and Amedofu, 2004). Burdorf *et al.* (1994) reported that each patient showed an individual IgE-binding pattern with 4 to 50 different protein spots in the immunoblots. The IgE-antibodies in sensitized reacted with several of these flour allergens, although individual reaction profiles showed large variability (Agata & Rafał, 2015). Airborne flour dust particle sizes have been measured by several investigators. Lillienberg and Brisman (1994) showed a bimodal distribution of aerodynamic diameters of flour dust, using an IOM dust spectrometer. The smallest particles were around 5 μm , and the bigger ones around 15-30 μm . Over 50% of the particle mass had an aerodynamic diameter over 15 μm . Using the IOM personal inspirable aerosol spectrometer, Burdorf *et al.* (1994) estimated that the thoracic fraction contributed 39% to the total mass of inhalable dust. The respirable fraction (particles ≤ 4) amounted to 19%. Smith, Parker and Hussian, (2000) measured that approximately 9%, 52% and 20% of the airborne flour proteins were borne on particles 6 μm diameter in the bakery dough-brake, bakery roll-production and in the flour mill-packing areas, respectively. The investigators concluded that in dusty areas up to 20% of the airborne flour particles are of a diameter ($\leq 5\mu\text{m}$) likely to allow them to be deposited in the bronchial airways and alveoli.

2.2.3 Noise

Noise is considered as any unwanted sound that may adversely affect the health and wellbeing of individuals or populations by causing disturbance of man's work, rest, sleep, and communication; or by damaging his hearing and evoke other psychological, physiological, and possibly pathological reactions. It can also be considered as a wrong sound, in the wrong place at the wrong time. Similarly, noise pollution is defined as unwanted electromagnetic signal that produces a jarring or

displeasing effect and which interferes with human communication, comfort and health (Bhatia, 2001). Hence from the acoustics point of view, sound and noise constitute the same phenomenon of atmospheric pressure fluctuations about the mean atmospheric pressure; the differentiation is greatly subjective. What is sound to one person can very well be noise to somebody else (Nelson & Schwela, 2001).

In the industrial premises, it is important to remember that the objective of noise control is not to reduce noise for its own sake, but for the sake of the receiver, usually the human ear. Hence the straight forward approach recommended to be used for noise control is the source-path-receiver concept (Liu, 1999).

2.2.3.1 Effects of noise

Negative effects of noise on human beings are generally of a physiological and psychological nature. Hearing losses are the most common effects among the physiological ones. It is possible to classify the effects of noise on ears in three groups: acoustic trauma, temporary hearing losses and permanent hearing loss (Nadine & Jennifer, 2013). Blood pressure increases, heart beat accelerations, appearance of muscle reflexes, sleeping disorders may be considered among the other physiological effects. The psychological effects of noise are more common compared to the physiological ones and they can be seen in the forms of annoyance, stress, anger and concentration disorders as well as difficulties in resting and perception (Kumar, Verma, & Neetika, 2016).

The health effects of noise exposure can also be classified as non-auditory and auditory. Non-auditory effects include stress, related physiological, behavioral effects and safety concerns. Auditory effects include hearing impairment resulting from excessive noise exposure. Noise-induced permanent hearing loss is the main concern related to occupational noise exposure. The main auditory effects include acoustic trauma that refers to sudden hearing damage caused by short burst of extremely loud noise such as a gun-shot that rupture the tympanic membrane or dislocate the ossicular chain and results in permanent hearing loss, tinnitus (ringing

or buzzing in the ear) and temporary hearing loss (Bhatia, 2001). Noise is not the only industrial hazard to hearing.

Noise induced temporary threshold shift (NITTS) occurs immediately after exposure to a high level of noise. There is gradual recovery when the affected person spends time in a quiet place, however complete recovery may take several hours. Permanent hearing loss, also known as noise induced permanent threshold shift (NIPTS), progresses constantly as noise exposure continues month after month and year after year. The hearing impairment is noticeable only when it is substantial enough to interfere with routine activities. At this stage, a permanent and irreversible hearing damage has occurred. Noise-induced hearing damage cannot be cured by medical treatment and worsens as noise exposure continues. Generally, noise-induced hearing loss (NIHL) is a cumulative process which comes as a result of both high levels of noise and exposure times over a worker's work history (Nadine & Jennifer, 2013).

In the workplace, hearing loss can be caused by blunt or penetrating head injuries, explosions, and thermal injuries such as slag burns sustained when a piece of welder's slag penetrates the ear drum. All these conditions are treatable and reversible. Sensori neural hearing loss results from deterioration of the cochlea, usually due to loss of delicate hair cells from the organ of corti. Among the many common causes of sensory hearing loss are continuous exposure to noise in excess of 85 dB, blunt head injury and exposure to ototoxic substances. Impulsive noises, such as gunfire, appear to be particularly damaging (Nelson & Schwela, 2001).

2.2.3.2 Noise control in industrial premises

As far as industrial setting is concerned, the most effective approach to noise control is to redesign or replace noisy equipment. If this is not possible, significant reductions in noise levels can be achieved by structural and mechanical modifications or the use of mufflers, vibration isolators and noise protection enclosures (Nelson & Schwela, 2001). The best way of controlling noise at its source is to replace noisy machines with quieter machines or trying to reduce noise by redesigning the machine after purchase. Substituting a quieter process, machine, or

tool is another method of controlling noise. For instance welding is a quieter substitute for riveting, drilling for punching, pressing and rolling for forging. Besides engineering controls noise reduction and isolation can be approached through machine mounting or by architectural means. If machines are spaced adequately apart noise levels can be within acceptable limits.

Noise control in a transmission path can be achieved by absorbing the sound along the path or by deflecting the sound in some other direction by placing a reflecting barrier in its path. Using the absorptive capacity of the atmosphere is a simple and economical method of reducing the noise level. If enough distance is available between machines, the amount of noise produced becomes minimized (Kumar, Verma, & Neetika, 2016). The distance from a point source is doubled; the sound pressure level is lowered by 6 dB. If a soft, spongy material is placed on the walls, floors and ceiling the reflected sound is diffused and soaked up (absorbed). Sound-absorbing materials such as acoustical tile, carpets, and drapes placed on ceiling, floor, or wall surfaces can reduce the noise level (Nelson & Schwela, 2001). Placing physical barriers, screens, or deflectors in the noise path is an effective way of reducing noise transmission. Sometimes enclosing a noisy machine in a separate room or box is more practical and economical than quieting it by altering its design, operation, or component parts.

As an administrative approach of noise regulation for the workers, the amount of continuous exposure to high noise levels must be limited. For hearing protection, scheduling noisy operation for short intervals of time each day over several days is preferable to a continuous eight-hour run for a day or two (Neitzel, 2004). In industrial or construction operations an intermittent work schedule benefits not only the operator of the noisy equipment but also other workers in the vicinity. A personal hearing protection device is any device designed to reduce the level of sound reaching the ear drum. Ear muffs and ear plugs are the main types of hearing protectors. Molded and pliable earplugs, cup-type protectors and helmets are commercially available as hearing protectors. Such devices provide noise reductions from 15 to 35 dB (Liu, 1999).

2.4 Legal Framework

2.4.1 Managing OSH

According to ILO (2001), Occupational safety and health, including compliance with the OSH requirements pursuant to national laws and regulations, are the responsibility and duty of the employer. The employer should show strong leadership and commitment to OSH activities in the organization, and make appropriate arrangements for the establishment of an OSH management system. The system should contain the main elements of policy, organizing, planning and implementation, evaluation and action for improvement, as shown in figure 2 below.

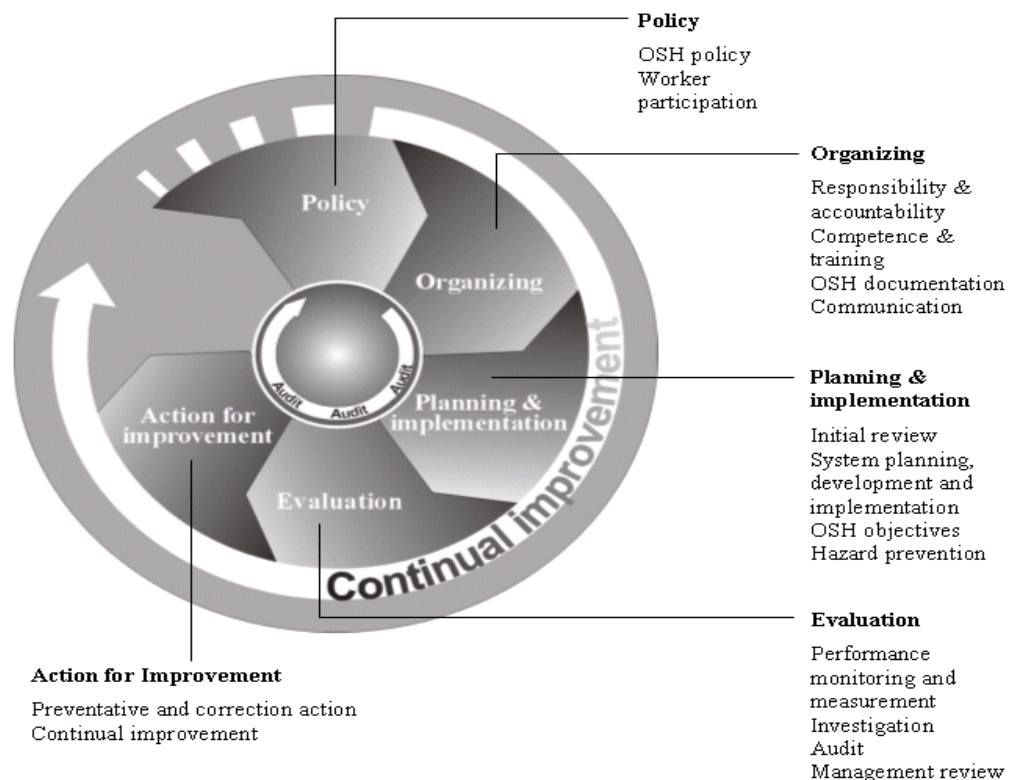


Figure 2.2: Main elements of the OSH management system (ILO, 2001).

2.3.2 Occupational Health and Safety in Kenya

The National Profile on Occupational Health and Safety (ILO, 2013) recognizes the Constitution of Kenya as the supreme law, and lays the foundation for all other laws. Although it is not specific on OSH, it provides, in the Bill of Rights, the right for every citizen to fair labour practices, reasonable working conditions, and a clean and healthy environment. (Constitution of Kenya, 2010 Articles 69,)

According to the National Profile on Occupational Safety and Health (2013), the history of OSH in Kenya dates back to 1950, with the introduction of the Factories Act (GOK, 1951 cap 514). In 1990 this Act was amended to the Factories and Other Places of Work Act, to enlarge its scope. The Occupational Safety and Health Act (OSHA) and the Work Injury Benefits Act (WIBA) were enacted in 2007, and are now the principal laws that govern OSH in the country.

In Kenya, OSH is managed by the Directorate of Occupational Safety and Health Services (DOSHS). DOSHS is the designated national authority for collection and maintenance of a database, and for the analysis and investigation of occupational accidents and diseases, and dangerous occurrences. The purpose of OSHA, 2007, is to secure the safety, health and welfare of people at work, and to protect those not at work from risks to their safety and health arising from, or in connection with, the activities of people at work.

The purpose of WIBA, 2007, is to provide compensation to employees for work-related injuries and diseases contracted in the course of their employment, and for connected purposes.

2.3.3 Subsidiary laws that deal with OSH issues

2.3.3.1 The Factories and Other Places of Work (Safety and Health Committees) Rules, L.N. No. 31/2004

These rules apply to workplaces with 20 or more regular employees. They require the occupier to set up safety and health committees with equal representation of management and workers.

The functions of the committee include conducting safety and health inspections, investigating accidents, and making recommendations to the occupier on improvements for the promotion of a safe and healthy working environment.

2.3.3.2 The Factories and Other Places of Work (Noise Prevention and Control) Rules, L.N. No. 25/2005

These rules apply to workplaces where activities result in noise levels that could impair or damage employees' hearing ability. They specify the permissible levels of noise, and require the occupier to carry out noise measurements, develop a noise prevention programme to reduce noise levels, and provide hearing protection.

2.3.3.3 The Factories and Other Places of Work (Fire Risk Reduction) Rules, L.N. No. 59/2007

These rules apply to workplaces, and require the occupier to put appropriate measures in place to prevent the occurrence of fires within their premises. They address the safe handling, storage and transportation of flammable substances. They also require the occupier to provide means of evacuation, fire detection systems, firefighting equipment, and firefighting teams.

The rules prescribe annual fire safety audits, the formulation of a fire safety policy, and training of workers on fire safety issues.

2.3.3.4 Factories and Other Places of Work (Hazardous Substances) Rules, L.N. No. 60/2007

These rules apply to workplaces where workers are likely to be exposed to hazardous substances. They require the occupier to prevent employees from exposure to such substances by putting various control measures in place, or, where these are not reasonably practical, to ensure that personal protective equipment (PPE) is provided. They prescribe occupational exposure limits (OEL) for hazardous chemical substances, safe handling, use and disposal of hazardous substances.

2.3.3.5 The Factories and Other Places of Work (Medical Examination) Rules, L.N. No. 24/2005

These rules apply to workplaces where employees are engaged in occupations that expose them to hazards that might harm their health. They specify occupations requiring medical examinations, and the types of examination of employees at the employer's cost.

2.3.3.6 The Factories (First Aid) Rules, L.N. No. 160/1977

These Rules apply to workplaces, and require the occupier to put in place appropriate measures to ensure that those injured at work receive necessary medical attention. The Rules specify the contents of the first-aid box in accordance with the number of workers, and the training of first-aiders.

2.3.3.7 The Factories (Eye Protection) Rules, L.N. No. 44/1978

These rules apply to workplaces, and require the occupier to protect their employees against exposure that is injurious to the eyes.

2.3.3.8 The Factories (Electric Power Special) Rules, L.N. No. 340/1979

These rules apply to the generation, transformation, conversion, switching, control, regulation, distribution and use of electrical energy in workplaces. They require the occupier to put appropriate measures in place to eliminate electrical hazards within

their premises by the insulation of conductors, and by the provision of circuit breakers and personal protection.

2.4 Previous Related Studies

Flour dust has been associated with several health related problems. In a study by Iraj et al (2011) on wheat flour mills in Iran, they confirmed that workers at flour packing workstations were exposed to an appreciably higher level of respirable dusts than others ($p < 0.05$) and that workers such as packers, sweepers and sift operators who were directly exposed to flour inhaled more flour dusts than others. Zuskin et al. (1994b) showed that most respiratory symptoms in a group of confectionery workers were caused by irritation of the respiratory tract by flour dust inhalation.

An investigation by Agbola (2012) on the impact of health and safety management on employee safety at Ghana Ports Authority revealed that there are poor health and safety management practices, poor training on safety, lack of information on dangerous chemicals and hazardous materials, lack of monitoring and enforcement of safety rules as well as essential safety equipment. On the contrary, Yiquan et al (2012) noted that after developing and implementing a new framework to cultivate good safety culture in workplaces, Singapore saw a drop in workplace fatalities between 2004 and 2010 from 4.9% to 2.2% per 100,000 workers.

A study by Truchon and Fillion, (2000) to establish the role of psychosocial risk factors in work-related low back pain, concluded that both lifting and awkward postures were important contributors to the risk of low-back disorder. However, studies done in India by Saiyed and Tiwari (2004) does not concur with the above observation in that when transferring raw material (grains) from silos to the process area, the transportation is mechanically operated and automatic. So the hazard of suffocation in the grain area while emptying or shifting the grains was eliminated.

O'Toole (2002), conducted an employee safety perception survey over a 45 month period at a Concrete producer within the United States of America. The study found that leadership commitment to safety generated the strongest positive perception and that this perception was closely associated with a reduction in the workplace injury

rate. A supervisor as the immediate hierarchical position for the worker plays a pivotal role in a company's health and safety practices. Most of the safety procedures and monitoring means, which are formulated by the senior management, are usually implemented by supervisors. Nelson and Schwela (2001), found out that when supervisors engage in safety-promoting behaviour's, employees perceive a positive safety climate and get more involved in appropriate safety behaviour's thus avoiding more injuries and pain, due to increased awareness and focus on safety. Employees who observe their leaders behaving safely at work will more likely behave in a safe manner, while regarding their leaders as role models (O'Toole, 2002).

In a case of Kenya research done by Ndirangu & Namusonge (2014), it established that attitude, leadership, motivation and organizational culture were significant factors affecting the implementation of occupational safety and health at Kenya vehicle manufacturers. Further, a study by Muchangi (2009), revealed organization culture, structure, and resistance were the major factors affecting the successful implementation of occupational health and safety strategies at East African Portland Cement Company limited. Lukoko, Chege and Musiega (2014) analyzed the impact of occupational safety and health practices on employee performance at Mumias Company. Their study revealed that occupational hazards affect job performance; this was attributed to high levels of ignorance on occupational hazards at the workplace.

CHAPTER THREE

MATERIALS AND METHODS

3.1 The Study design

A descriptive cross sectional study design was employed for this study and since the research was a fact finding survey, this type of research design according to Chandran, (2004) is the most recommended. The descriptive design was used since it ensures complete description of the situation as it is, making sure that there is minimum bias in the collection of data and to reduce errors in interpreting the data collected. The design also provides a detailed and highly accurate picture of the situation that can be very useful in literature review (Cooper & Schindler, 2008).

3.2 Study area and Population

The study was carried out at selected flour milling companies in Nairobi County, Kenya. Most of the companies under investigation were based in Nairobi's industrial area in Kenya. According to the DOSHS, there are more than 25 registered milling companies employing more than 2,000 workers within the country. Only eleven of the flour mills were in Nairobi. According to DOSHS, these eleven companies employ a total of about 1,600 workers who were considered in the study. The milling companies in Nairobi were conveniently chosen for the study due to limitation of resources. All the eleven flour milling companies were coded since their actual names had been withheld for confidentiality, were included in the study. Workers in the milling companies were targeted for this study and every worker had an equal chance of being included in the study. The management team which comprise of managers, supervisors and safety and health officers were targeted for category one. The second category included the general workers in different departments such as loaders, millers, packers in the packaging unit, workshop workers and the drivers.



Figure 3.1: Map of Kenya

Source: Kenya Bureau of Statistics, 2013

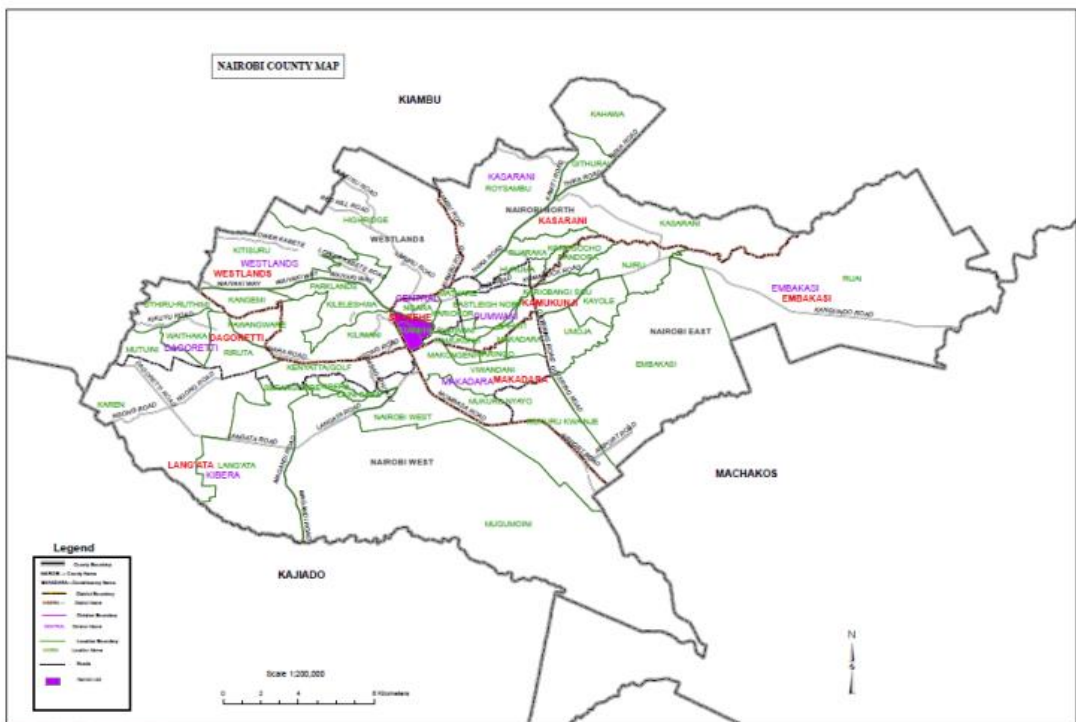


Figure 3.2 A Map of Nairobi county

Source: Kenya Bureau of Statistics, 2010

3.4 Sample size determination

Estimation of sample size using Krejcie and Morgan (1970) was employed.

$$s = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)}$$

$$= \frac{3.841 \times 1600 \times 0.5(1-0.5)}{0.05^2(1600-1) + 3.841 \times 0.5(1-0.5)}$$

$$= \frac{1536.4}{3.9975 + 0.96025}$$

$$= 310$$

$$= 310$$

$$= 310$$

s = required sample size.

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size (1600).

P = the population proportion (assumed to be .50 since this would provide the maximum sample size).

d = the degree of accuracy expressed as a proportion (.05).

310 employees were sampled to participate in this study.

3.5 Sampling method

The eleven milling companies in Nairobi were sampled for this study. Since the companies employ different number of employees, proportionate to size sampling was used to determine the number of respondents from each company as shown in the Table 1. Number of respondents to participate from each company was determined by dividing the number of workers in each company by the total number of workers in the sampled flour milling companies (population size-1,600) multiplied by the sample size (310)

Table 3.1: Flour Millers in Nairobi

| Code | Total No. of Workers | No. of Management sampled | No. of General Workers | Total No. sampled |
|---------------------|-----------------------------|----------------------------------|-------------------------------|--------------------------|
| FMC 1 | 105 | 3 | 17 | 20 |
| FMC 2 | 129 | 4 | 21 | 25 |
| FMC 3 | 86 | 3 | 14 | 17 |
| FMC 4 | 281 | 12 | 42 | 54 |
| FMC 5 | 76 | 3 | 12 | 15 |
| FMC 6 | 25 | 2 | 3 | 5 |
| FMC 7 | 320 | 17 | 45 | 62 |
| FMC 8 | 28 | 2 | 3 | 5 |
| FMC 9 | 98 | 4 | 15 | 19 |
| FMC 10 | 302 | 15 | 44 | 59 |
| FMC 11 | 150 | 6 | 23 | 29 |
| <u>TOTAL</u> | <u>1600</u> | <u>71</u> | <u>239</u> | <u>310</u> |

The flour milling companies were clustered in terms of departments/units and, simple random sampling method was used to select the study participants. The clusters were the management team, milling unit, packaging, loading, workshop and others. The numbers of participants were selected per cluster in order to add up to the required total sample size depending on the participant's workload in the respective clusters.

3.6 Inclusion and Exclusion criteria

3.6.1 Inclusion Criteria

- i. Only the flour millers that had been registered with Doshs were included in the study as they were deemed to have some occupational safety and health management system which would ensure the study achieves its objectives.

- ii. Only workers who had worked in the milling companies for more than six (6) months were included in the study, this was because they were deemed to have more knowledge and experience with regards to exposure to hazards in the flour mill companies.

3.6.2 Exclusion Criteria

- i. Flour milling companies that had not been registered by the DOSHS were not involved in the study.
- ii. Workers who had worked in the milling companies for less than six (6) months were not included in the study as they were deemed to have less knowledge and experience with regards to exposure to hazards in the flour mill companies.

3.7 Instruments of data collection

3.7.1 Observation

The study used observational method as one of the data collection tool. The following parameters were observed using an observation checklist and the conditions were recorded; the general condition of the machines, the work place layout, housekeeping within the industry, worker behaviour and movement within the industry, lighting and general ventilation within the industries. The observed safety and health issues were classified as either satisfactory or unsatisfactory and required action

3.7.2 Questionnaire survey

Questionnaires were used to collect data in the flour milling companies. Two different questionnaires were prepared one for the management team and another one for the general workers. The researcher used the drop and pick method of

administering questionnaires to the respondents. This method was appropriate since it encouraged prompt responses from the respondents.

3.7.3 Review of existing records

The researcher reviewed documents which include; the health and safety audit reports, health and safety risk assessment reports, noise survey reports, dust survey reports, training records, accidents and occupational diseases records with the main aim of establishing the safety and health hazards in the milling companies.

3.8 Validity of Instruments

Validity in this study was ensured by including only those questions that helped achieve the set objectives in the questionnaire and carrying out very objective interviews devoid of any form of personal bias.

3.9 Reliability of instruments

A pilot study was done to ensure reliability of the research instruments.

3.10 Data Management and Analysis

The researcher used descriptive statistics for the study. Descriptive statistics (frequency and cross tabulations) were used to generate frequency tables. The principal investigator reviewed the data collection tools regularly for completeness. Data backup was done by using flash disks, CDs, DVDs and other forms of storage. Files containing the data were password encrypted for data safety. Data cleaning for errors and outliers was done before analysis. Data was stored in electronic storage devices; DVDs, USB, and files containing the data were password encrypted.

Quantitative data analysis was aided by SPSS (Statistical Package for Social Sciences) Version 17 to produce mean score, percentages and frequencies. Percentages are the most widely used and understood standards proportions. (Kangu, Onwong'a, Mamati, & Osongo, 2010). SPSS Version 17 has got descriptive statistics

features that assist in variable response comparison and gives a clear indication of response frequencies (Mugenda, 2008) or SPSS Statistics 17.0 is a comprehensive system for analyzing data. SPSS Statistics can take data from almost any type of file and use them to generate tabulated reports, statistical analyses (Marija, 2008).

3.11 Ethical Considerations

Permission to carry out the study was sought from the Jomo Kenyatta University of Agriculture and Technology and the flour milling industries where the study was done. Consent of all the human participants were sought from the participants. The objective of the study was explained to the companies' management and the study participants. Questionnaires were assigned unique codes and the results of each individual questionnaire were kept in strict confidence. Participation in the study was voluntary and the participants were given an option of withdrawing from the study at will. A case where a participant withdrew from the study his or her data was not used in the final analysis of the results.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

In this chapter data obtained from the observation, questionnaires and review of secondary data was examined, analysed and a presentation of the finding done.

4.1 Demographic Characteristics of the respondents

4.1.1 Response rate

The study's target population was 310 respondents. However, only 257 questionnaires were returned duly filled in, this makes a response rate of 82.9% as shown in Table 4.1 below. This response rate is acceptable and representative and conforms to Mugenda and Mugenda (2003) stipulation that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent.

Table 4.1: Response rate

| Questionnaires | Frequency | Percentage |
|----------------|------------|------------|
| Returned | 257 | 82.9% |
| Not returned | 53 | 17.1% |
| TOTAL | 310 | 100 |

4.1.2 General Workers Characteristics

A total of 257 respondents (71 management staff and 186 general workers) drawn from 11 selected flour milling companies in Nairobi County participated in the study. The study focused on staffs who were directly working in the flour mills and their supervisors/ managers. Regarding respondents gender, 164(88.2%) general workers were male while 22(11.8%) were female. In terms of education level, 57(30.6%) workers had completed primary school, 90(48.5%) had secondary school education, while the rest 39(20.9%) had diploma and above. In terms of work experience,

11(5.9%) had up to 1 year of work experience, 88(47.4%) had between 2-3 years of experience and 22(11.8%) had between 3-5 years of experience while 65(34.9%) had over 5 years of work experience in their respective flour milling companies.

Table 4.2: Characteristics of the general workers in the study

| Years of experience | | Level of education | |
|----------------------------|--------------|---------------------------|--------|
| | (%) | | |
| 0-1 year | 5.9 | Primary education | (30.6) |
| 2 to 3 years | 47.1 | Secondary education | (48.5) |
| 3 to 5 years | 11.8 | Diploma and above | (20.9) |
| Over 5 years | 35.2 | | |
| Total | 100.0 | | |

4.1.2 Characteristics of the management staff in the studied flour milling companies

A total of 71(100%) management staff drawn from the 11 flour milling companies took part in the study as shown in Table 4.3.

Table 4.3: Managers and their respective flour milling companies

| Company | (n) | (%) | Male (%) | Female (%) |
|----------------|------------|--------------|-----------------|-------------------|
| FMC 1 | 4 | 5.6 | 5.1 | 6.1 |
| FMC 2 | 6 | 8.5 | 10.3 | 6.1 |
| FMC 3 | 5 | 7.0 | 5.1 | 9.1 |
| FMC 4 | 9 | 12.7 | 12.8 | 12.1 |
| FMC 5 | 8 | 11.3 | 5.1 | 24.2 |
| FMC 6 | 2 | 2.8 | 1.3 | 6.1 |
| FMC 7 | 16 | 22.5 | 30.8 | 3.0 |
| FMC 8 | 2 | 2.8 | 3.8 | 3.0 |
| FMC 9 | 8 | 11.3 | 12.8 | 9.1 |
| FMC 10 | 7 | 9.9 | 7.7 | 15.2 |
| FMC 11 | 4 | 5.6 | 5.1 | 6.1 |
| Total | 71 | 100.0 | | |

Of the 71(100%) management workers who participated in the study, 50(70.4%) were male while 21(29.6%) were female. Figure 4.1 shows the gender distribution of management staff per company.

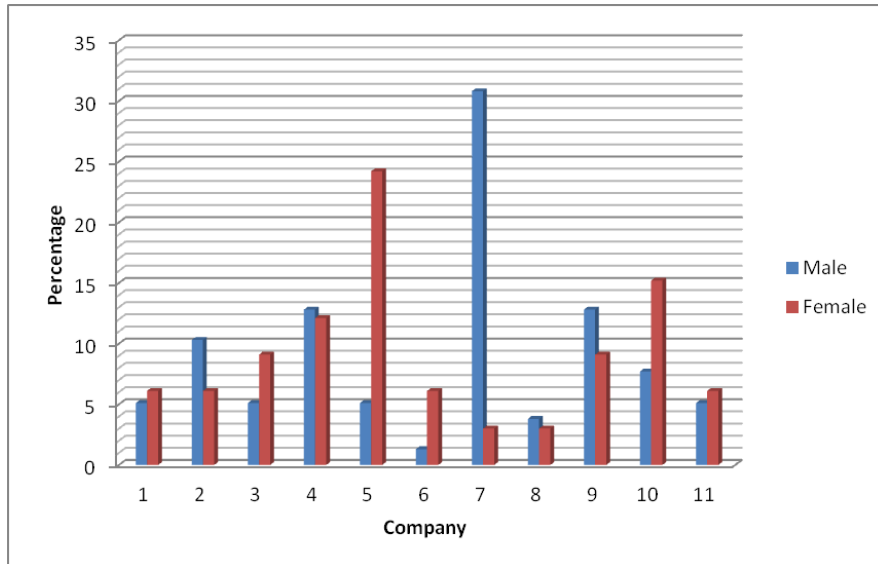


Figure 4.1: Management workers' gender distribution per flour milling company

Regarding education level, 2(2.8%) of the management staff's from the flour milling companies had attained primary level of education, 11(15.5%) had attained secondary level of education, 39(54.9%) had attained diploma level of education while the remaining 19(26.8%) had Bachelors degree as their highest education level attained (Figure 4.2).

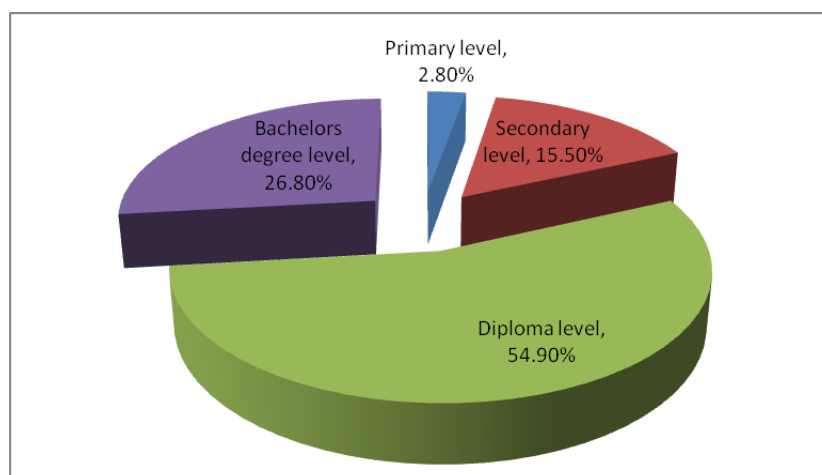


Figure 4.2: Management staff educational level

Regarding the marital status, 26(36.6%) management staff were single, 43(60.6%) were married while the divorced and widowed were 1(1.4%) each as illustrated in Figure 4.3.

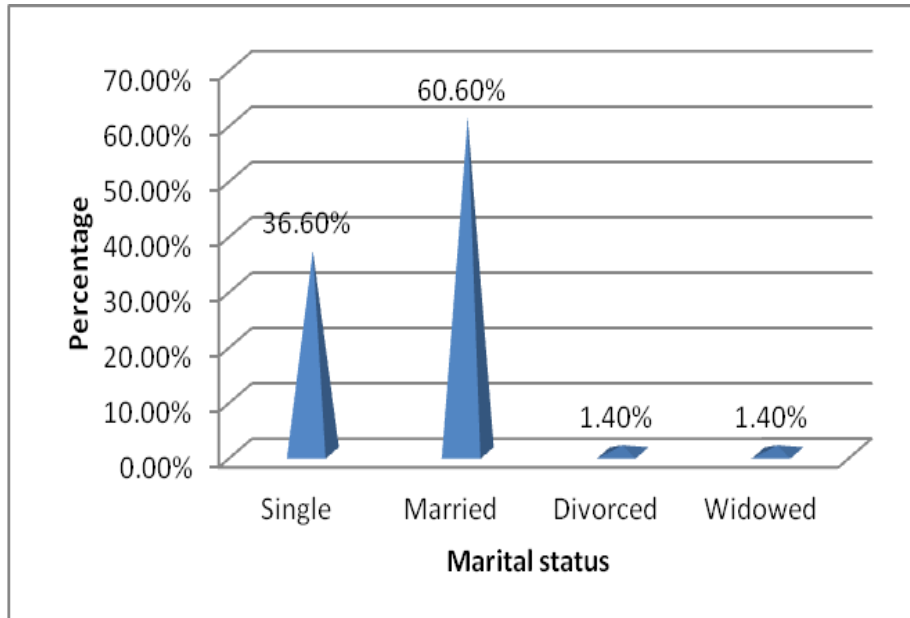


Figure 4.3: Marital status of the management staff

Work experience was evaluated and 13(86.7%) management staff who had worked for 7-12months were working 8 hours per day while 2(13.7%) were working for more than 8 hour per day in this category. The second category was 13 months to 2 years work experience and 18(81.8%) of the management staff's this category was working for 8 hours while 4(18.2%) were working for more than 8 hours per day. Of those who had worked for more than 2 years, 20(58.8%) were working for 8 hours per day while 14(41.2%) were working for over 8 hours per day. The p-value ($p > 0.05$) indicates that there was no statistical significance between work experience and the average working hours per day (Table 4.4)

Table 4.4: Work experience and number of working hours per day

| Years worked | Company code: | 8 hours (%) | Over 8 hours (%) | Total (%) |
|---------------------|----------------------|--------------------|-------------------------|------------------|
| 7- 12months | FMC 1 | (2)100.0 | | (2)100.0 |
| | FMC 3 | (2)100.0 | | (2)100.0 |
| | FMC 4 | | (1)100.0 | (1)100.0 |
| | FMC 5 | (3)100.0 | | (3)100.0 |
| | FMC 6 | (1)100.0 | | (1)100.0 |
| | FMC 7 | (2)75.0 | (1)25.0 | (3)100.0 |
| | FMC 10 | (2)100.0 | | (2)100.0 |
| | FMC 11 | (1)100.0 | | (1)100.0 |
| | Total | (13)86.3 | (2)13.7 | (15)100.0 |
| 13months- 2 years | FMC 1 | (2)100.0 | | (2)100.0 |
| | FMC 2 | (1)100.0 | | (1)100.0 |
| | FMC 3 | (1)100.0 | | (1)100.0 |
| | FMC 4 | (3)60.0 | (2)40.0 | (5)100.0 |
| | FMC 5 | (3)100.0 | | (3)100.0 |
| | FMC 6 | (1)100.0 | | (1)100.0 |
| | FMC 7 | (2)100.0 | | (2)100.0 |
| | FMC 8 | (1)50.0 | (1)50.0 | (2)100.0 |
| | FMC 9 | (1) 50.0 | (1) 50.0 | (2)100.0 |
| | FMC 10 | (2)100.0 | | (2)100.0 |
| | FMC 11 | (1)100.0 | | (1)100.0 |
| | Total | (18)81.8 | (4)18.2 | (22)100.0 |

Table 4.4 continued...

| Years worked | Company: | 8 hours (%) | Over 8 hours (%) | Total (%) |
|---------------------|-----------------|--------------------|-------------------------|------------------|
| Over 2years | FMC 2 | (4)80.0 | (1)20.0 | (5)100.0 |
| | FMC 4 | (3)50.0 | (3) 50.0 | (6)100.0 |
| | FMC 5 | (1)100.0 | | (1)100.0 |
| | FMC 6 | (1)100.0 | | (1)100.0 |
| | FMC 7 | (6)60.0 | (4)40.0 | (10)100.0 |
| | FMC 8 | (1)100.0 | | (1)100.0 |
| | FMC 9 | (2)33.3 | (4)66.7 | (6)100.0 |
| | FMC 10 | (1)50.0 | (1)50.0 | (2)100.0 |
| | FMC 11 | (1)50.0 | (1)50.0 | (2)100.0 |
| | Total | (20)58.8 | (14)41.2 | (34)100.0 |

4.2 Activities that constitute occupational safety and health hazards in the flour mills

Milling process, carrying out of maintenance works on the machines, loading and offloading of grains/flour and packing were identified as some of the hazardous processes in flour milling companies. Regarding the source of hazards in flour milling companies; 121(65.1%) respondents identified milling process as a hazardous work activity, 107(57.5%) identified carrying out of maintenance as hazardous process while 124(66.7%) respondents identified offloading and loading of grains as an activity causing hazard, respectively. 143(76.9%) respondents identified workshop activities like welding, grinding, cutting, and 103 (55.4%) respondents identified packing activities in the flour milling companies as constituting safety and health hazards at their respective workplaces.

The milling process has rollers which rotate to crush the grains and sifters which produce high noise levels [$>90\text{dB(A)}$] and vibration which the workers felt could cause them harm. Maintenance works on machines can cause harm if not properly carried out especially when done when machines are running. The packing activities were observed to expose the workers in that section to high dust levels.

In 11(100%) of the companies studied, they had installed the state of the art packing machines which fill and seal the flour bags/packets thereby minimizing the direct contact of the worker and the flour. In (3)27.3% the flour mills studied, 35% of their packing of the flour was done manually whereby the workers fill the flour to the bags and this activity generates a lot of flour dust which is inhaled by the workers especially those who do not wear the respirators (PPE). This indeed reduced the exposure of the flour dust to the worker but it was however found that some minimal dust still managed to escape and reach to the worker. Furthermore, it was established that when these automated machines break down, the affected companies results to manual packing of the flour when the machines are being repaired due to the high demand of the flour. Other workers who are exposed to the high dust levels are the sweepers and the sifter operators. This observation was in line with a study by Iraj et al (2011) on wheat flour mills in Iran where they confirmed that workers at flour packing workstations were exposed to an appreciably higher level of respirable dusts than others ($p < 0.05$) and that workers such as packers, sweepers and sift operators who were directly exposed to flour inhaled more flour dusts than others. Flour dust has been associated with several health related problems. In this study, flour dust was mentioned to cause respiratory problems such as wheezing, coughing and blocked chest problems among some respondents. Data analysis showed that there was a significant statistical relationship ($P < 0.05$) between exposure to dust and respiratory problems.

Carrying of heavy loads from the trucks to the stores or silos, or carrying flour from the packing areas to the stores or waiting trucks was another activity identified as a hazard. The grains are usually packed in 90kg while flour is packed in bales of 24kg and bags of 5kg, 10kg, 20kg, 50kg and 70kg. Workers involved in loading/offloading are usually engaged on short term contracts and are paid piecemeal; this makes workers to overload themselves with the main aim of ensuring they take home more money. This is made worse by the fact that the floors are un-even/slippery and the grains contain dust which the workers inhale while carrying the loads as most of them do not use the provided respirators arguing that it inhibits breathing. However

for only one of the companies, the maximum load was 50kg which was in line with the *Ergonomic Guidelines for Manual Material Handling*, (2007) guidelines on lifting. Some respondents in the study complained of low back pains and joint pains and this was associated with heavy loading/offloading. A study by Seindler A et al (2002) concluded that both lifting and awkward postures were important contributors to the risk of low-back disorder. In this study the frequency of ailments as a result of heavy loads was significant ($p < 0.05$).

Working in silos used mainly for storage of grains was identified as an activity that constitutes safety and health hazards in flour mills by 30.1% while the others 69.9% had a contrary opinion. This is because only two of the flour milling companies under investigation had silos for storage of grains. Regarding office work, 88.7% of the management staff identified activities in the offices like wrong sitting postures, long sitting hours, working on unergonomically designed workstations as activities constituting to safety and health hazards in the flour mills. This result contradicted the one by Smith *et al.*, (2000), in their study in UK flour milling industries where they found out that there was low awareness on office safety because it was not prioritized by most of the occupiers.

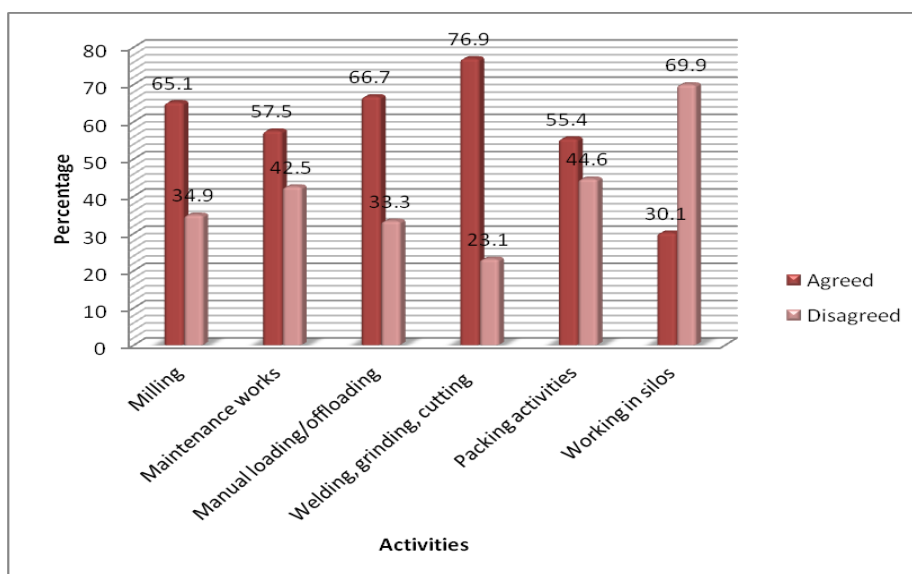


Figure 4.4: Activities constituting occupational safety and health hazards in the flour mills

4.2.1 Identified hazards in the flour milling companies

Unguarded machinery was identified as a hazard by, 66(35.5%) workers from the flour milling companies as shown in Table 4.8. The study observed that there were unguarded machines in some companies which could expose the workers to occupational hazards.



Plate 4.1: Unguarded milling machines

On the issue of high hazardous noise, all the general workers from the flour milling companies confirmed that high noise levels were present at their workplaces. 118(63.4%) workers from the flour milling companies confirmed that milling machines produced high noise levels while 68(36.6%) said that the noise produce by those milling machines was tolerable. Regarding noise produced by heavy equipment like the trucks; 80(43.0%) workers from the flour milling companies confirmed that heavy equipment in their respective companies produced high noise levels while 106(57.0%) said that those machines produced tolerable noise. Regarding the workshop noise; 113(60.8%) workers from the flour milling companies stated that workshop activities produced high noise levels while 73(39.2%) stated that workshop activities produced tolerable noise.

A review of the noise survey reports from flour milling companies indicated that indeed some sections in the flour mills have high noise levels [$>90\text{dB(A)}$] which include the milling area, workshop, sifters, intake hoppers, Destoner and separators

as shown in table 4.5. It is good to note that most companies had taken the action of providing their workers with earmuffs and earplugs due to high noise/hazardous levels but it was observed that most workers in these sections were not using the given appropriate PPEs during the study. The p-value indicates that there was statistical significance between noise sources (milling machines and workshop activities) and the noise perception (p=0.00)

Table 4.5: Areas with high noise levels (db(A))

| Company Code | Roll mill section | Separators | Destoner | Intake hopper | Sifter | Workshop |
|--------------|-------------------|------------|----------|---------------|--------|----------|
| FMC 1 | 98.2 | 90.9 | 90.9 | 89.6 | 89.2 | 77.2 |
| FMC 2 | 94.8 | 90.0 | 89.6 | 94.8 | 94.3 | 89.2 |
| FMC 3 | 93.6 | 88.2 | 90.2 | 96.9 | 90.3 | 67.8 |
| FMC 4 | 96.7 | 99.4 | 85.4 | 91.2 | 89.8 | 100.0 |
| FMC 5 | 90.3 | 92.1 | 87.9 | 77.7 | 87.7 | 94.2 |
| FMC 6 | 94.1 | 95.6 | 93.9 | 99.7 | 88.1 | 94.1 |
| FMC 7 | 89.7 | 90.2 | 94.7 | 91.9 | 93.3 | 97.5 |
| FMC 8 | 96.2 | 87.3 | 79.8 | 79.1 | 87.2 | 95.4 |
| FMC 9 | 92.1 | 91.0 | 90.2 | 92.1 | 90.1 | 96.4 |
| FMC 10 | 90.3 | 91.5 | 88.3 | 86.3 | 87.3 | 88.9 |
| FMC 11 | 91.2 | 89.3 | 92.1 | 87.9 | 92.3 | 94.3 |

Legend:

| Colour code | Noise rating | Implication |
|-------------|-------------------------------------|--|
| | Less than 85dB(A) | Safe noise levels |
| | Above 85Db(a) but less than 90dB(A) | Noise levels which require the occupier to develop and implement an effective noise control and hearing conservation programme |
| | More than 90dB(A) | High noise levels. Workers should not to be exposed to such noise levels without hearing protection. Occupier must develop and implement an effective noise control and hearing conservation programme |



Plate 4.2: Worker observed wearing ear muff in one of the companies

Dust was also identified as a hazard in the flour milling companies with 176(94.6%) workers from the flour milling companies confirming that dust hazards were present in their workstations. the management staff, 15(21.1%) stated that the wheezing problems they had were related to flour dusts, 36(50.7%) stated that their coughs problems they had were related to flour dusts while 20(28.2%) stated that the blocked chest problems they had were related to flour dusts as shown in Table 4.6. The p-value indicates that there was statistical significance relationship between experiencing problems related to flour dust and employee health ($p=0.03$), because those agreeing to the effects were handling flour and grains directly.

Review of the dust survey (Pm10) reports available 9(81.8%) of the flour mills studied revealed that the areas with high dust levels are packing, intake and storage areas with average levels of 9.60, 10.90 and 8.40mg/m³ respectively.

Table 4.6: Dust and related health problems among the management staff

| Company Code | Wheezing (%) | Coughs (%) | Blocked chest (%) | Total (%) | p-value |
|---------------------|---------------------|-------------------|--------------------------|------------------|----------------|
| FMC 1 | 66.7 | 33.3 | | 100.0 | |
| FMC 2 | 62.5 | 25.0 | 12.5 | 100.0 | |
| FMC 3 | | 100.0 | | 100.0 | |
| FMC 4 | 40.0 | 40.0 | 20.0 | 100.0 | |
| FMC 5 | 16.7 | 83.3 | | 100.0 | |
| FMC 6 | | 50.0 | 50.0 | 100.0 | |
| FMC 7 | 26.3 | 63.2 | 10.5 | 100.0 | 0.03 |
| FMC 8 | | 50.0 | 50.0 | 100.0 | |
| FMC 9 | 16.7 | 66.7 | 16.7 | 100.0 | |
| FMC 10 | 19.0 | 45.0 | 36.0 | 100.0 | |
| FMC 11 | 25.0 | 50.0 | 25.0 | 100.0 | |
| Total | 21.1 | 50.7 | 28.2 | 100.0 | |

A total of 115(62.2%) of the workers from flour milling companies with respiratory complications believed that their problems were as a result of their work, 59(31%) with low back problems believed that their problems were as a result of their work, 6(3.4%) with joint pains and eye problems each respectively believed that those problems were as a result of their work as shown in Table 4.7.

Table 4. 7: Ailments/conditions related to work among the workers in the companies

| Company: | Respiratory complication (%) | Low back pain (%) | Joints Pain (%) | (%) Eye problems | Total (%) | p-value |
|-----------------|-------------------------------------|--------------------------|------------------------|-------------------------|------------------|----------------|
| FMC 1 | 66.7 | 33.3 | | | 100.0 | 0.04 |
| FMC 2 | 66.7 | 33.3 | | | 100.0 | |
| FMC 3 | 75.0 | 25.0 | | | 100.0 | |
| FMC 4 | 42.9 | 42.9 | 14.3 | | 100.0 | |
| FMC 5 | 66.7 | 33.3 | | | 100.0 | |
| FMC 7 | 81.3 | 12.5 | | 6.3 | 100.0 | |
| FMC 8 | 66.7 | 33.3 | | | 100.0 | |
| FMC 9 | 33.3 | 44.4 | 11.1 | 11.1 | 100.0 | |
| FMC 10 | 50.0 | 50.0 | | | 100.0 | |
| FMC 11 | 50.0 | 50.0 | | | 100.0 | |
| Total | 62.2 | 31.0 | 3.4 | 3.4 | 100.0 | |

Employees working in the production area (packing, millers, and intake area.) were found to have respiratory symptoms such as coughing, sneezing, stuffy or runny nose while at work. On examination they were found to have enlarged inferior turbinate an indication of allergic Rhinitis that shows they are being exposed to allergens such as dust.

Heavy load (50kg and above) was classified as hazard in which 113(60.8%) general workers from the flour milling companies confirmed that heavy load were present at their respective work stations. A total of 117(62.9%) workers from the flour milling companies confirmed that hazards related to poor housekeeping (sliding, slip and skid) were present in their workplace. Regarding excessive vibrations as a hazard, 73(39.2%) workers from the flour milling companies agreed that excessive vibration hazards were present in their workplaces while 113(60.8%) disagreed with this statement. The study observed that workers were carrying 90kg bags (grains) and up to 72kgs for the flour (Upto three bales each at 24kg)., refer to plate 1 and 3. These loads are heavy and not in line with the *Ergonomic Guidelines for Manual Material*

Handling, (2007) guidelines on lifting. Some sections of the floors were uneven and some slippery with a lot of noise and vibrations from heavy machinery.



Plate 4.3: Workers involved in carrying of heavy load

Regarding the workshop activities, 89(47.8%) confirmed that welding fumes hazards were present in their respective companies. On welding glare, 101(54.3%) workers from the mainly in the workshop identified it as a hazard. It was observed that some workers involved in the welding, grinding and cutting had PPE while others were working without the PPE's. A total of 115(61.8%) general workers agreed that other hazards (noise from cutting and grinding, exposed energised electrical cables, and uneven floors) were present in their respective companies. The results are summarized in Table 4.8 below.

Table 4.8: Identified hazards in the flour milling companies

Table 4.8a Lifting heavy loads

| Variable | Company: | Yes (%) | No (%) | Total |
|----------------------------|-----------------|----------------|---------------|--------------|
| Lifting Heavy loads | FMC 1 | 80.0 | 20.0 | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | | 100.0 | 100.0 |
| | FMC 4 | 66.7 | 33.3 | 100.0 |
| | FMC 5 | 67.0 | 33.0 | 100.0 |
| | FMC 6 | 60.0 | 40.0 | 100.0 |
| | FMC 7 | 50.0 | 50.0 | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 66.7 | 33.3 | 100.0 |
| | FMC 10 | 55.0 | 45.0 | 100.0 |
| | FMC 11 | | 100.0 | 100.0 |
| | Total | | 60.8 | 39.2 |

Table 4.8 b: High noise levels

| Variable | Company: | Yes (%) | No (%) | Total |
|--------------------------|-----------------|----------------|---------------|--------------|
| High noise levels | FMC 1 | 100.0 | | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | 100.0 | | 100.0 |
| | FMC 4 | 100.0 | | 100.0 |
| | FMC 5 | 100.0 | | 100.0 |
| | FMC 6 | 100.0 | | 100.0 |
| | FMC 7 | 100.0 | | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 100.0 | | 100.0 |
| | FMC 10 | 100.0 | | 100.0 |
| | FMC 11 | 100.0 | | 100.0 |
| | Total | | 100.0 | |

Table 4.8 c: Working with unguarded machines

| Variable | Company: | Yes (%) | No (%) | Total (%) |
|---------------------------|-----------------|----------------|---------------|------------------|
| Unguarded machines | FMC 1 | 50.0 | 50.0 | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | 100.0 | | 100.0 |
| | FMC 4 | | 100.0 | 100.0 |
| | FMC 5 | | 100.0 | 100.0 |
| | FMC 6 | | 100.0 | 100.0 |
| | FMC 7 | | 100.0 | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 33.3 | 66.7 | 100.0 |
| | FMC 10 | 100.0 | | 100.0 |
| | FMC 11 | | 100.0 | 100.0 |
| | Total | | 35.5 | 64.5 |

Table 4.8 d: Excessive vibrations

| Variable | Company: | Yes (%) | No (%) | Total |
|----------------------------|-----------------|----------------|---------------|--------------|
| Excessive vibration | FMC 1 | | 100.0 | 100.0 |
| | FMC 2 | | 100.0 | 100.0 |
| | FMC 3 | | 100.0 | 100.0 |
| | FMC 4 | 33.3 | 66.7 | 100.0 |
| | FMC 5 | | 100.0 | 100.0 |
| | FMC 6 | | 100.0 | 100.0 |
| | FMC 7 | 100.0 | | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | | 100.0 | 100.0 |
| | FMC 10 | | 100.0 | 100.0 |
| | FMC 11 | 100.0 | | 100.0 |
| | Total | | 39.2 | 60.8 |

Table 4.8.e: Welding fumes

| Variable | Company: | Yes (%) | No (%) | Total (%) |
|----------------------|-----------------|----------------|---------------|------------------|
| Welding fumes | FMC 1 | 100.0 | | 100.0 |
| | FMC 2 | | 100.0 | 100.0 |
| | FMC 3 | 100.0 | | 100.0 |
| | FMC 4 | 100.0 | | 100.0 |
| | FMC 5 | | 100.0 | 100.0 |
| | FMC 6 | | 100.0 | 100.0 |
| | FMC 7 | 100.0 | | 100.0 |
| | FMC 8 | | 100.0 | 100.0 |
| | FMC 9 | 33.3 | 66.7 | 100.0 |
| | FMC 10 | | 100.0 | 100.0 |
| | FMC 11 | 100.0 | | 100.0 |
| | Total | | 47.8 | 52.2 |

Table 4.8 f: Glare from welding fumes

| Variable | Company: | Yes (%) | No | Total (%) |
|---------------------------|-----------------|----------------|-------------|------------------|
| Glare from welding | FMC 1 | | 100.0 | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | | 100.0 | 100.0 |
| | FMC 4 | 100.0 | | 100.0 |
| | FMC 5 | 100.0 | | 100.0 |
| | FMC 6 | | 100.0 | 100.0 |
| | FMC 7 | 100.0 | | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 66.7 | 33.3 | 100.0 |
| | FMC 10 | 75.0 | 25.0 | 100.0 |
| | FMC 11 | | 100.0 | 100.0 |
| | Total | | 54.3 | 45.7 |

Table 4.8 g: Other hazards (exposed electrical cables, working in confined spaces (Silos, work at height:

| Variable | Company: | Yes (%) | No | Total (%) |
|-----------------|-----------------|----------------|-------------|------------------|
| Others | FMC 1 | 66.7 | 33.3 | 100.0 |
| | FMC 2 | | 100.0 | 100.0 |
| | FMC 3 | 100.0 | | 100.0 |
| | FMC 4 | 100.0 | | 100.0 |
| | FMC 5 | | 100.0 | 100.0 |
| | FMC 6 | 100.0 | | 100.0 |
| | FMC 7 | 100.0 | | 100.0 |
| | FMC 8 | | 100.0 | 100.0 |
| | FMC 9 | 100.0 | | 100.0 |
| | FMC 10 | 100.0 | | 100.0 |
| | FMC 11 | 80.0 | 20.0 | 100.0 |
| | Total | | 61.8 | 38.2 |



Plate 4.4: Signage on high noise levels

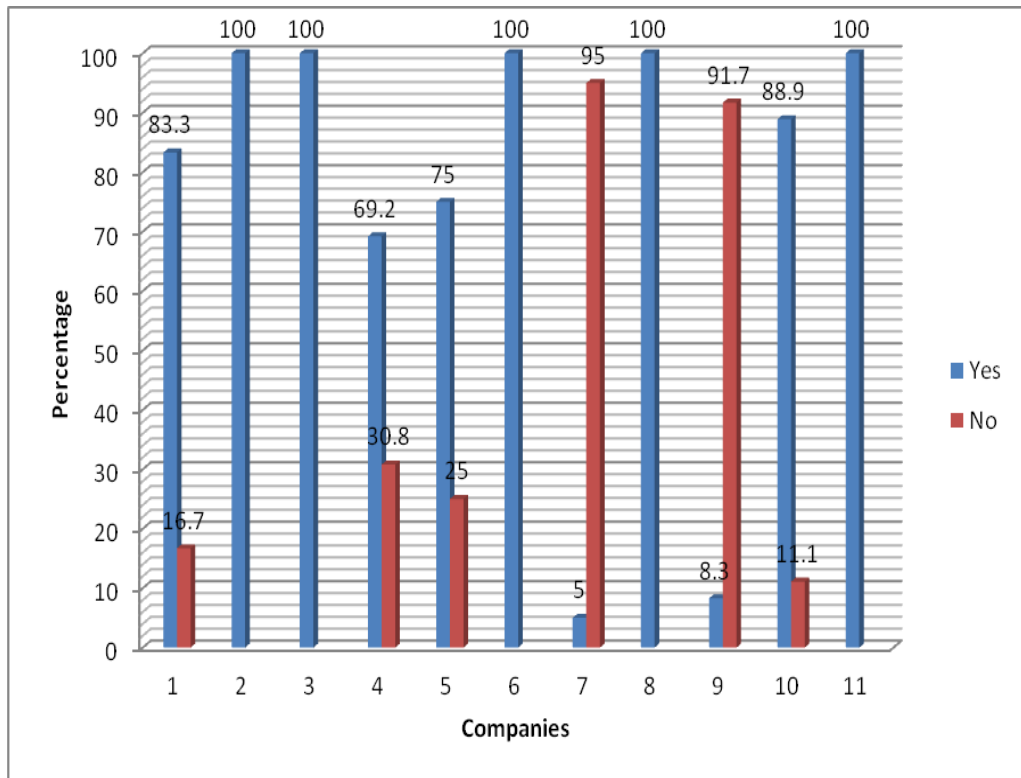


Figure 4.5: Provision of safety and health information like high noise levels

4.2.3 Check list results on safety activities

Observational checklist was used to determine the status of each of the flour milling company in order to capture data that could not be captured by questionnaires. The status was categorised as; satisfactory and unsatisfactory which requires action.

The arrangement and the nature of gangways according to the checklist showed that other than, FMC 1, 7, and 9 which was unsatisfactory and required action, all the rest was generally satisfactory. On exit marking FMC 1, 5, 7, 8 and 9 was satisfactory while 2, 3, 4, 6, 10 and 11 were unsatisfactory. Ventilation in all the companies was satisfactory other than for FMC 1, 7, 8 and 9.

Regarding the Display of Safety and Health Policy, FMC 5, 7, 9 was unsatisfactory and required action while in all the others it was satisfactory. On the Display of Safety Signage; four companies required action (FMC 1, 5, 7 and 9) and the rest was satisfactory. On the Existence of Emergency Facilities, that is Fire Extinguishers, Fire Alarm, Fire Detectors, Fire Exits, Fire assembly points, emergency shutdown buttons, factories 2,3, 4, 6, 10 and 11 had satisfactory results, while the others, FMC 1, 5,7 8 and 9 had unsatisfactory results. On guarding of the machines at the workplace, FMC 1, 2, 7 and 10 was satisfactory while all the others were unsatisfactory as shown in table 4.9 below.

Table 4.9: Check list results on safety activities

Table 4.9 a: Gangways

| Status | Company | Satisfactory | Unsatisfactory |
|-----------------|----------------|---------------------|-----------------------|
| Gangways | FMC 1 | | √ |
| | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | √ | |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | √ | |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 b: Ventilation

| Status | Company | Satisfactory | Unsatisfactory |
|--------------------|----------------|---------------------|-----------------------|
| Ventilation | FMC 1 | | √ |
| | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | √ | |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | | √ |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 c: Exits

| Status | Company | Satisfactory Good | Unsatisfactory |
|-------------------------|----------------|------------------------------|-----------------------|
| Marking of Exits | FMC 1 | √ | |
| | FMC 2 | | √ |
| | FMC 3 | | √ |
| | FMC 4 | | √ |
| | FMC 5 | √ | |
| | FMC 6 | | √ |
| | FMC 7 | √ | |
| | FMC 8 | √ | |
| | FMC 9 | √ | |
| | FMC 10 | | √ |
| | FMC 11 | | √ |

Table 4.9 d: Display of safety and health policy

| Status | Company | Satisfactory | Unsatisfactory |
|------------------------------|----------------|---------------------|-----------------------|
| Display of Safety and | FMC 1 | √ | |
| | FMC 2 | √ | |
| Health Policy | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | | √ |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | √ | |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 e: Display of safety signage

| Status | Company | Satisfactory | Unsatisfactory |
|--------------------------|---------|--------------|----------------|
| Display of Safety | FMC 1 | | √ |
| Signage | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | | √ |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | | √ |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 f: Existence of emergency facilities

| Status | Company | Satisfactory | Unsatisfactory |
|---|---------|--------------|----------------|
| Existence of Emergency | FMC 1 | | √ |
| Facilities, e.g. Fire Extinguishers, Fire Alarm, | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | | √ |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | | √ |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 g: Observance of safe working procedures

| Status | Company | Satisfactory | Unsatisfactory |
|---------------------------|---------------------------|--------------|----------------|
| Observance of Safe | FMC 1 | | √ |
| | Working Procedures | | |
| | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | √ | |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | | √ |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9h: Guarding of machines

| Status | Company | Satisfactory | Unsatisfactory |
|-----------------------------|---------|--------------|----------------|
| Guarding of machines | FMC 1 | √ | |
| | FMC 2 | √ | |
| | FMC 3 | | √ |
| | FMC 4 | | √ |
| | FMC 5 | | √ |
| | FMC 6 | | √ |
| | FMC 7 | √ | |
| | FMC 8 | | √ |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | | √ |

Table 4.9 i: Lifting and carrying of heavy load

| Status | Company | Satisfactory | Unsatisfactory |
|---|----------------|---------------------|-----------------------|
| Lifting and Carrying of heavy load | FMC 1 | | √ |
| | FMC 2 | | √ |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | | √ |
| | FMC 6 | √ | |
| | FMC 7 | √ | |
| | FMC 8 | | √ |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 j Condition of the floors

| Status | Company | Satisfactory | Unsatisfactory |
|--------------------------------|----------------|---------------------|-----------------------|
| Condition of the floors | FMC 1 | | √ |
| | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | √ | |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | √ | |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 k: Housekeeping

| Status | Company | Satisfactory | Unsatisfactory |
|---------------------|---------|--------------|----------------|
| Housekeeping | FMC 1 | √ | |
| | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | | √ |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | √ | |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 l: Workplace Layout

| Status | Company | Satisfactory | Unsatisfactory |
|-------------------------|---------|--------------|----------------|
| Workplace Layout | FMC 1 | √ | |
| | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | | √ |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | √ | |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 m: Insulation and Protection of Electrical Cables

| Status | Company | Satisfactory | Unsatisfactory |
|---|---------|--------------|----------------|
| Insulation and Protection of Electrical Cables | FMC 1 | | √ |
| | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | √ | |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | | √ |
| | FMC 9 | √ | |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 n: Provision and Use of Personal Protection Equipment (PPE)

| Status | Company | Satisfactory | Unsatisfactory |
|---|---------|--------------|----------------|
| Provision And Use of Personal Protection Equipment (PPE) | FMC 1 | | √ |
| | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | | √ |
| | FMC 6 | √ | |
| | FMC 7 | | √ |
| | FMC 8 | √ | |
| | FMC 9 | | √ |
| | FMC 10 | √ | |
| | FMC 11 | √ | |

Table 4.9 o: Supervision

| Status | Company | Satisfactory | Unsatisfactory |
|-------------|---------|--------------|----------------|
| Supervision | FMC 1 | | √ |
| | FMC 2 | √ | |
| | FMC 3 | √ | |
| | FMC 4 | √ | |
| | FMC 5 | √ | |
| | FMC 6 | √ | |
| | FMC 7 | √ | |
| | FMC 8 | √ | |
| | FMC 9 | √ | |
| | FMC 10 | √ | |
| | FMC 11 | √ | |



Plate 4.5: Unsafe working platform



Plate 4.6: Partially guarded machine in the workshop



Plate 4.7: High unsafe stacking and obstructed gangway

4.3 Nature of injuries in flour milling companies studied

4.3.1 Accidents and incidents in the flour milling companies under investigation

Regarding injuries at work, 62(33.3%) workers reported to have been injured at work for the last one year from the date of the study. Out of all those who had been injured, 44% had suffered musculoskeletal problems (pain in the muscles and skeleton), 27% had minor cuts (cuts managed only by first aiders), 13% had suffered major cuts (cuts managed by first aiders and referred for medical help), 8% had dislocation, 5% fractures and 3% had been amputated as shown in the figure below.

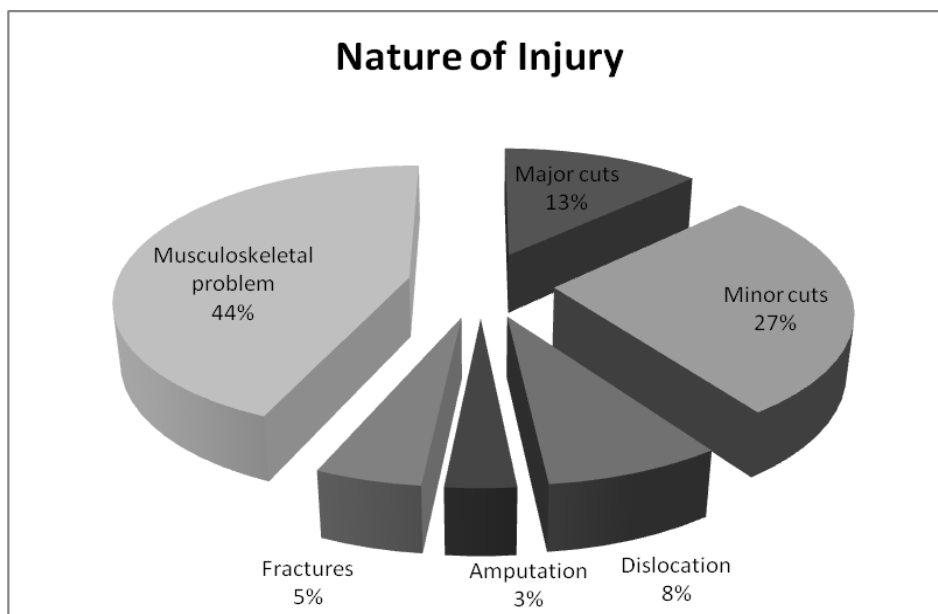


Figure 4.6: Nature of Injury at work

The leading type of non-fatal injury was musculoskeletal problems which could be attributed to lifting/carrying of heavy loads, work postures and movements; repetitiveness and pace of work; force of movements; vibration; increase pressured (e.g., to produce more) and monotonous tasks. This finding was in line with a study by National Institute for Occupational Safety and Health, [USA NIOSH] (2001) which reviewed evidence linking physical task factors (repetition, force, posture and vibration) to the development of work-related musculoskeletal disease (WMSD) of the neck, upper extremity, and low back. The report concluded there is a substantial

body of credible epidemiologic research providing strong evidence of an association between WMSDs and certain work-related physical factors when there are high levels of exposure and especially in combination with exposure to more than one physical factor.

Minor and major cuts were also reported to be experienced in the flour milling companies; these were largely attributed to slips, trip or fall, low overhangs, tools used on the job, exposed sharp surfaces, and many other causes such as unguarded machines and failure to wear the provided PPE.

Some respondents reported to have experienced dislocation, fractures or amputation while at work. Dislocation of the joints and fractures was associated from fall, slip, trip, strain by, and struck by. Electric shock was pointed out as the cause of the amputation in the companies.

Thirty one (50%) workers who confirmed to have been injured while at work, reported to have gotten injuries that did not require them to stay out of work. Likewise 21(33.9%) workers got injuries that made them to stay out of work between 1-7days from the unguarded machines while 10(16.1%) got the injuries while carrying heavy loads on uneven and slippery floors.

Accidents and incidents in the flour mills companies were reported by the employees. According to the result of the investigation, all the workers from the flour milling companies who reported accidents to the human resource office had those accidents investigated by the safety and health representatives. Those who did not report accidents to the human resource office still had those accidents investigated by the safety officers. Seventeen 17(27.4%) workers who reported their accidents to the trained first aider had those accidents investigated while 45(72.6%) workers who reported the accidents to the trained first aider confirmed that those accidents were not investigated as they were minor injuries. Twenty seven (43.5%) who reported to injuries to the health and safety officers confirmed that the reported accidents were investigated while 35(56.5%) reported that the accidents were not investigated. All the workers who did not report accidents to health and safety officers confirmed that the accidents were never investigated.

4.4 Causes of the injuries and their control measures in flour milling companies studied

4.4.1 Causes of accidents

In the flour mills companies under investigation, the participants reported various causes of accidents being; - unguarded machines (40%); slippery floors (14.4%); Inadequate/lack of PPE (11.7%); Poor or lack of housekeeping (10.9%); inadequate or lack of lifting equipment (10.5%); Trips/slips or falls (7.8%) and Neglecting Safety Procedures (4.7%) as shown in the table below

Table 4.10: Causes of Accidents

| Causes of the accidents | Frequency | Percentage (%) |
|--------------------------------------|------------------|-----------------------|
| Unguarded machines | 103 | 40 |
| Slippery floor | 37 | 14.4 |
| Inadequate/lack of lifting equipment | 27 | 10.5 |
| Inadequate/lack of PPE | 30 | 11.7 |
| Neglecting Safety Procedures | 12 | 4.7 |
| Trips/slips or falls | 20 | 7.8 |
| Poor or lack of housekeeping | 28 | 10.9 |
| Total | 257 | 100 |

Working without wearing any personal protective equipment (PPE) may highly increase the probability for getting any undesired injured. According to a study by Dorji and Hadikusumo (2006), many workers refused to wear PPE with various reasons such as feeling uncomfortable with the gears while performing their job and considered it as an obstacle to their work output. The ILO (1996) revealed that some of the workers felt uncomfortable while wearing any types of PPE and it indirectly decreases their work performance.

According to Federated (2007), good housekeeping is a vital function that can improve overall safety performance by reducing the accidents from happening. A good housekeeping program should be well planned and coordinated as well as regularly practice. This is a continuous process which involved in everyone in workplace. Many accidents are credited to the other causes, such as tripping or slipping which are actually results of unsafe condition due to the poor housekeeping.

4.4.2 Control measures

Regarding hazard control measures; 212(82.5%) workers from the flour milling companies reported that their respective workplaces had adequate hazard control measures while 45(17.5%) indicated that their respective workplaces did not have adequate hazard control measures.

On prioritizing safety and health issue; 222(86.4%) workers stated that prioritizing of safety and health issues could help improve work environment. Out of 257 participants, 165(64.2%) suggested that ensuring that machines were guarded would make the work environment safe. A total of 202(78.6%) workers suggested that regular training of workers on safe work practices would improve work environment.

Regarding housekeeping; 138(53.7%) workers suggested that maintaining of good housekeeping would help improve work environment while 119(46.3%) thought otherwise. On provision of mechanical aid for lifting; 187(72.8%) workers stated that providing of mechanical aids for lifting would help improve work environment hence controlling of accidents while 70(27.2%) thought otherwise. On PPE provision; 234(91.5%) workers proposed that the workers should be provided with proper PPE so as to improve the work environment and reduce/control accident while 23(8.5%) thought otherwise. On packaging of grains; 57(22.1%) workers from the flour milling companies suggested that the grains to be packaged in smaller bags so as to reduce accidents hence improving their work environment while 200(77.2%) thought otherwise. These findings are summarised in Table 4.11 below.

Table 4.11: What to be done to control accidents

Table 4.11 a: Prioritise safety and health issues

| Variable | Company Code: | Yes (%) | No (%) | Total (%) |
|--|----------------------|----------------|---------------|------------------|
| Prioritize safety and health issues | | | | |
| | FMC 1 | 50.0 | 50.0 | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | 100.0 | | 100.0 |
| | FMC 4 | 100.0 | | 100.0 |
| | FMC 5 | 100.0 | | 100.0 |
| | FMC 6 | 100.0 | | 100.0 |
| | FMC 7 | 100.0 | | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 66.7 | 33.3 | 100.0 |
| | FMC 10 | 100.0 | | 100.0 |
| | FMC 11 | 50.0 | 50.0 | 100.0 |
| | Total | 86.4 | 13.6 | 100.0 |

Table 4.11 b: Ensure machines are guarded

| Variable | Company Code: | Yes (%) | No (%) | Total (%) |
|------------------------------------|----------------------|----------------|---------------|------------------|
| Ensure machines are guarded | | | | |
| | FMC 1 | 50.0 | 50.0 | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | 100.0 | | 100.0 |
| | FMC 4 | | 100.0 | 100.0 |
| | FMC 5 | 100.0 | | 100.0 |
| | FMC 6 | | 100.0 | 100.0 |
| | FMC 7 | 100.0 | | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 66.7 | 33.3 | 100.0 |
| | FMC 10 | 100.0 | | 100.0 |
| | FMC 11 | | 100.0 | 100.0 |
| | Total | 64.2 | 35.8 | 100.0 |

Table 4.11 c: Train workers on safe work procedures

| Variable | Company Code: | Yes (%) | No (%) | Total (%) |
|---|---------------|-------------|-------------|--------------|
| Train workers on safe work practices | | | | |
| | FMC 1 | 100.0 | | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | 100.0 | | 100.0 |
| | FMC 4 | 33.3 | 66.7 | 100.0 |
| | FMC 5 | 100.0 | | 100.0 |
| | FMC 6 | 100.0 | | 100.0 |
| | FMC 7 | 66.7 | 33.3 | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 100.0 | | 100.0 |
| | FMC 10 | 100.0 | | 100.0 |
| | FMC 11 | 50.0 | 50.0 | 100.0 |
| | Total | 78.6 | 21.4 | 100.0 |

Table 4.11 d: Maintain good housekeeping

| Variable | Company Code: | Yes (%) | No (%) | Total (%) |
|-----------------------------------|---------------|-------------|-------------|--------------|
| Maintain good housekeeping | | | | |
| | FMC 1 | | 100.0 | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | | 100.0 | 100.0 |
| | FMC 4 | 66.7 | 33.3 | 100.0 |
| | FMC 5 | 100.0 | | 100.0 |
| | FMC 6 | | 100.0 | 100.0 |
| | FMC 7 | | 100.0 | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 66.7 | 33.3 | 100.0 |
| | FMC 10 | | 100.0 | 100.0 |
| | FMC 11 | 100.0 | | 100.0 |
| | Total | 53.7 | 46.3 | 100.0 |

Table 4.11 e: Provide mechanical aids for lifting

| Variable | Company Code: | Yes (%) | No (%) | Total (%) |
|--|----------------------|----------------|---------------|------------------|
| Provide mechanical aids for lifting | | | | |
| | FMC 1 | | 100.0 | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | 100.0 | | 100.0 |
| | FMC 4 | | 100.0 | 100.0 |
| | FMC 5 | 100.0 | | 100.0 |
| | FMC 6 | 100.0 | | 100.0 |
| | FMC 7 | 100.0 | | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 33.3 | 66.7 | 100.0 |
| | FMC 10 | | 100.0 | 100.0 |
| | FMC 11 | 100.0 | | 100.0 |
| | Total | 72.8 | 27.2 | 100.0 |

Table 4.11 f: Package grains in smaller bags not exceeding 50kgs

| Variable | Company Code: | Yes (%) | No (%) | Total (%) |
|---------------------------------------|----------------------|----------------|---------------|------------------|
| Package grains in smaller bags | | | | |
| | FMC 1 | | 100.0 | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | | 100.0 | 100.0 |
| | FMC 4 | | 100.0 | 100.0 |
| | FMC 5 | 100.0 | | 100.0 |
| | FMC 6 | | 100.0 | 100.0 |
| | FMC 7 | | 100.0 | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | | 100.0 | 100.0 |
| | FMC 10 | | 100.0 | 100.0 |
| | FMC 11 | | 100.0 | 100.0 |
| | Total | 22.1 | 77.2 | 100.0 |

Table 4.11 g: Provide workers with PPE and enforce their use

| Variable | Company Code: | Yes (%) | No (%) | Total (%) |
|---------------------------------|----------------------|----------------|---------------|------------------|
| Provide workers with PPE | | | | |
| | FMC 1 | 100.0 | | 100.0 |
| | FMC 2 | 100.0 | | 100.0 |
| | FMC 3 | 100.0 | | 100.0 |
| | FMC 4 | 33.3 | 66.7 | 100.0 |
| | FMC 5 | 100.0 | | 100.0 |
| | FMC 6 | 100.0 | | 100.0 |
| | FMC 7 | 100.0 | | 100.0 |
| | FMC 8 | 100.0 | | 100.0 |
| | FMC 9 | 50.0 | 50.0 | 100.0 |
| | FMC 10 | 100.0 | | 100.0 |
| | FMC 11 | 100.0 | | 100.0 |
| | Total | 91.5 | 8.5 | 100.0 |

4.2.2 Training on Occupational Safety and Health

Regarding training on safety and health, 173 (92.9%) workers confirmed that their respective flour milling companies had training programs on safety and health, 168(65.4%) respondents confirmed that they had been trained on the safety and health hazards they were exposed to while at work. 69(26.8%) respondents from the flour milling companies confirmed that they had been trained on safety and health practices in the last one year by their health and safety officers in their respective flour milling companies while 137(53.4%) were trained by external trainers and 51(19.8%) respondents confirmed that they had been trained on safety and health practices in the previous 12 months by their health and safety committees in their respective companies. One hundred and twenty two (65.5%) confirmed that they been trained on first aid at least once.

The p-value indicates that there was no statistical significance between training on safety and health and the use of PPE (Table 4.12).

Table 4.12: Training and duration of training

| Training time | Company: | Health & safety committee (%) | Health & safety officer (%) | External trainers | PPE use | p-value |
|---------------|--------------|-------------------------------|-----------------------------|-------------------|---------|---------|
| Last 12 month | FMC 1 | 20.0 | | 80.0 | 30.0 | 0.13 |
| | FMC 2 | | | 100.0 | 10.0 | |
| | FMC 3 | | 100.0 | | 30.0 | |
| | FMC 4 | | | | 12.0 | |
| | FMC 5 | | | 100.0 | 32.0 | |
| | FMC 6 | 75.5 | 24.5 | | 11.0 | |
| | FMC 7 | 100.0 | | | 22.0 | |
| | FMC 8 | | 20.0 | 80.0 | 16.0 | |
| | FMC 9 | | | | 11.0 | |
| | FMC 10 | | 100.0 | | 9.0 | |
| | FMC 11 | | | 100.0 | 23.0 | |
| | Total | 19.8 | 26.8 | 53.4 | | |

On health and safety information, 32(45.1%) management staff's from the flour milling companies confirmed that they received regular health and safety memos, 32(45.1%) received regular health and safety informations through meetings while 7(9.8%) received these informations through health and safety committees as illustrated in Figure 4.9 below.

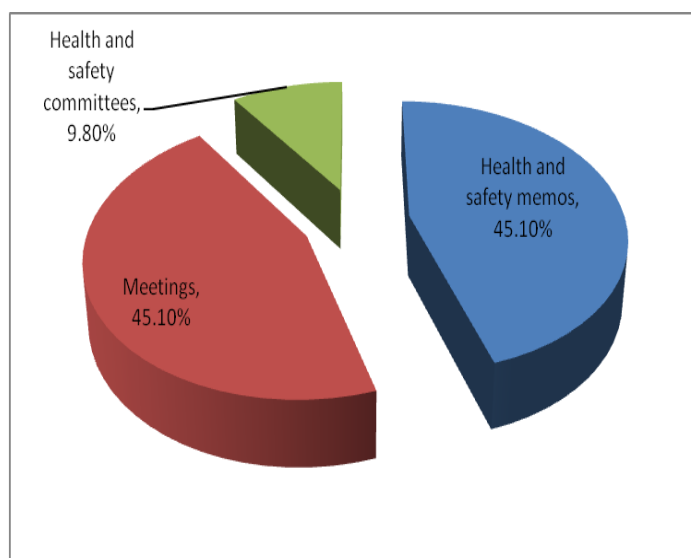


Figure 4.7: Means of regular health and safety information

A total of 181(70.6%) workers from all the flour milling companies indicated that safety and health and related policies were communicated during induction trainings while 75(29.4%) had contrary opinions. Posters were mentioned by 32(12.5%) workers as a means of policy communication in the companies while 224(87.5%) mentioned other means of communication like safety and health manuals and health and safety committee meetings. Those who identified safety and health manuals as a means of communication were 48(18.8%), Safety and health committee was mentioned as a forum for policy communication by 130(50%) workers from the sampled out flour milling companies. They indicated that their policies were communicated during safety and health committee meetings compared to 128(50%) who mentioned other means. Management meetings were identified by 32(12.5%) workers as the means of policy communication.

Table 4.13: Policy communication in the flour mills

| Means of Policies communication | | Has the policy been communicated to all stakeholders? | | | Statistics p-value |
|---------------------------------|-------|---|--------|-----------|-----------------------|
| | | Yes (%) | No (%) | Total (%) | |
| Induction training | Yes | 75.0 | 60.0 | 70.6 | 0.54 |
| | No | 25.0 | 40.0 | 29.4 | |
| | Total | 100.0 | 100.0 | 100.0 | |
| Posters | Yes | 16.7 | | 12.5 | 0.38 |
| | No | 83.3 | 100.0 | 87.5 | |
| | Total | 100.0 | 100.0 | 100.0 | |
| Safety and health manuals | Yes | 25.0 | | 18.8 | 0.27 |
| | No | 75.0 | 100.0 | 81.2 | |
| | Total | 100.0 | 100.0 | 100.0 | |
| Safety and health committee | Yes | 58.3 | 25.0 | 50.0 | 0.25 |
| | No | 41.7 | 75.0 | 50.0 | |
| | Total | 100.0 | 100.0 | 100.0 | |
| Management | Yes | 16.7 | | 12.5 | 0.38 |

On PPE provisions; 62(33.3%) workers were provided with ear muffs/ plugs as PPE, 9(4.9%) were provided with safety shoes, 79(42.5%) were provided with gloves, 7(3.8%) were provided with goggles, 109(58.6%) were provided with aprons and 98(52.7%) were provided with dust masks as PPE as shown in Table 4.14.

Table 4.14: The PPE provided to workers in the flour mills companies

| Company: | Ear Muffs/ plugs (%) | Safety shoes (%) | Gloves (%) | Goggles (%) | Aprons (%) | Dust Masks (%) |
|-----------------|---------------------------------|---------------------------------|-----------------------|------------------------|-----------------------|-------------------------------|
| FMC 1 | 66.7 | | 16.7 | | 34.6 | 16.7 |
| FMC 2 | 25.0 | | 45.8 | | 25.0 | 50.0 |
| FMC 3 | 42.9 | | 57.1 | | | |
| FMC 4 | | | 14.3 | | 57.1 | 28.6 |
| FMC 5 | 75.0 | 8.3 | 8.3 | | 42.9 | 68.3 |
| FMC 6 | 66.7 | 33.3 | 33.8 | | 5.5 | |
| FMC 7 | 11.1 | | 16.7 | | 44.4 | 27.8 |
| FMC 8 | | | 12.8 | 33.3 | 33.3 | 33.3 |
| FMC 9 | 28.6 | 28.6 | | 8.3 | 68.6 | 44.3 |
| FMC 10 | 27.3 | | 36.4 | | 57.3 | 69.1 |
| FMC 11 | 33.3 | | 15.5 | | 23.6 | 66.7 |
| Total | 33.3 | 4.9 | 42.5 | 3.8 | 58.6 | 52.7 |

On the usage of PPE; 112(60%) workers were not using provided PPE because they found them to be uncomfortable while 37(20%) were not using them because they did not find them helpful and 37(20%) because they did not provide them with sufficient protection, respectively as shown in Table 4.18. The p-value indicates that there was no statistical significance association between PPE provision and reasons for not using them (p=0.08).

Table 4.15: Reasons why PPE were not being used in the flour mills companies

| Company: | They are uncomfortable (%) | I don't find them helpful (%) | They don't provide any protection (%) | Total (%) | p-value |
|-----------------|-----------------------------------|--------------------------------------|--|------------------|----------------|
| FMC 1 | 60.0 | 30.0 | 10.0 | 100.0 | 0.08 |
| FMC 2 | 40.0 | 40.0 | 20.0 | 100.0 | |
| FMC 3 | 75.0 | | 25.0 | 100.0 | |
| FMC 4 | 65.0 | 20.0 | 15.0 | 100.0 | |
| FMC 5 | 60.0 | 20.0 | 20.0 | 100.0 | |
| FMC 6 | 50.0 | 20.0 | 30.0 | 100.0 | |
| FMC 7 | 80.0 | 10.0 | 10.0 | 100.0 | |
| FMC 8 | 60.0 | 30.0 | 10.0 | 100.0 | |
| FMC 9 | 75.0 | 25.0 | | 100.0 | |
| FMC 10 | 50.0 | 20.0 | 30.0 | 100.0 | |
| FMC 11 | | | 100.0 | 100.0 | |
| Total | 60.0 | 20.0 | 20.0 | 100.0 | |

During the study, the researcher made several observations regarding the hazard control measures in place which contradicted the findings from the respondents. The researcher found out that guarding of the machines was generally inadequate, housekeeping in most companies required improvement; not all employees were provided with appropriate PPE while some workers were found engaging in unsafe work practices like working on /repairing energized machines.

On the issue of occupational medical examinations, 151(58.8%) respondents agreed that they underwent occupational medical examination compared to 106(41.2%) who disagreed with this statement. However most of the respondents could not differentiate between occupational medical examinations and the food handlers medical exams as required under Food, Drugs and Chemical Substances Act Cap 254.

Regarding safety and health audits 66(92.9%) management staffs confirmed that safety and health audits were conducted after every twelve months, while 5(7.1%) could not define when their health and safety audit were conducted.

Safety and Health risk assessment was also investigated and the response was that 51(71.8%) management staffs indicated that their respective companies conducted safety and health risk assessment every 12 months while 20(28.2%) could not define when safety and health risk assessment were conducted in their respective companies.

On the issue of noise survey, 55(77.5%) staffs stated that their respective companies conducted noise survey in twelve months while 16(22.5%) did not define when the noise survey was conducted in their respective companies. 42(59.2%) management staffs stated that dust surveys had been conducted in their respective companies in the last twelve months while 29(40.8%) did not define when the dust survey was conducted in their respective companies.

Regarding the fire safety audits, 44(61.9%) staffs confirmed that fire safety audits were conducted after every 12 months while 27(38.1%) were either not sure or were not able to define when the fire audits were conducted in their respective companies as shown in Table 4.16 below. All the companies studied reported that there was no fire incident in any of the company reported since their inceptions.

Table 4.16: Occupational safety and health audits and hygiene surveys

| Occupational safety and health audits and hygiene surveys | Audit conducted in last 12 months | |
|---|-----------------------------------|-------------|
| | Yes | Not defined |
| Safety and Health Audits | 92.9% | 7.1% |
| Safety and Health Risk Assessments | 71.8% | 28.2% |
| Noise Surveys | 77.5% | 22.5% |
| Dust Surveys | 59.2%) | 40.8% |
| Fire Safety Audits | 61.9%) | 38.1% |

Most of the respondents from the flour milling companies confirmed that safety and health audit, safety and health risk assessment, noise survey, dust survey and fire safety audit were conducted by qualified personnel. The p-value indicates that there was no statistical significance association between audits and number of accidents reported ($p=0.70$).

The audit reports for the health and safety, risk assessment, fire safety, noise and dust survey were available at the workplaces, however most workers were not aware of the existence of such audits. It was noted that the management of the companies under investigation do not bring to the attention of the workers through the workplace safety and health committees the findings of the audit reports. Most of the management staff were also not aware of the findings of the audits.

Audits are supposed to raise issues on the management of safety and health in workplace and give recommendations on how to improve the same resulting in safer work environments for employee which should translate to reduced number of accidents. These results however do not concur with the findings of a study done by Wagh 2006, where the companies which undergo regular auditing had very good health and safety management systems and reported few accidents.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study concluded that the main activities that constituted the occupational safety and health hazards in the flour mills included the milling process, carrying out of maintenance works on the machines, manual loading and offloading of grains/flour and packing, as well as workshop activities like welding, grinding and cutting.

The common injuries/incidents reported are, musculoskeletal problems (44%) (Pain in the muscles and skeleton), minor cuts (27%) (Cuts managed only by first aiders), major cuts (13%), (cuts managed by first aiders and referred for medical help), dislocation (8%), fractures (5%) and amputation (3%).

The hazards in the flour milling companies include: unguarded machines, high hazardous noise, dust, heavy loads, vibration, welding fumes and glare.

The major cause of accidents in the flour milling companies were unguarded machines (40%); slippery floors (14.4%); Inadequate/lack of PPE (11.7%); Poor or lack of housekeeping (10.9%); inadequate or lack of lifting equipment (10.5%); trips/slips or falls (7.8%) and Neglecting Safety Procedures (4.7%).

Finally, due to the research findings drawn from this thesis, the study fails to accept the null hypotheses which state that there are no significant occupational health and safety hazards associated with flour milling companies in Nairobi Kenya.

6.2 Recommendations

Guard all moving parts of the machines that can cause harm, ensure all floors are even, avoid slippery floors, use mechanical aid for lifting/ carrying heavy loads ensure grains/flour are packaged in small packages not exceeding 50kg. Adopt lock

out tag out system for all maintenance works on machines. Machinery safety audits should also be conducted

Develop clear accident/incident reporting and investigation system in place as well as training workers on safety and health hazards they were exposed to and also provide an insurance scheme to all the workers in the flour milling companies.

Develop Occupational Safety and Health programmes to guide employees to work safely.

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APPENDICES

Appendix 1:Written Consent Form

Dear respondent,

Hallo to you. My name is **Wilson Baru Wachira**, a student at Jomo Kenyatta University of Agriculture and Technology. I am carrying out an occupational safety and health study on management staff, and the workers. I would like to inform you about the study using this form as I request you to participate in it.

Title of the Study

‘An assessment of Occupational Safety and Health Hazards in flour milling companies in Nairobi County’

Purpose

It is to collect and analyze information about the health and safety hazards in flour milling companies. This is in order to ensure that they have a safe and healthy working environment like every other employee as stipulated by the Occupational Safety and Health Act 2007 (OSHA, 2007).

Inconveniences or risks

You will be inconvenienced with your time since the researcher will need you to respond to some questions on a questionnaire. It will take about 10 - 15 minutes at a convenient time to allow minimal interruption in doing your work. No other potential risks are foreseen.

Benefits: You will not get direct benefit as an individual however your participation will contribute to the improvement of occupational safety and health provisions in your workplace.

Alternatives: Your participation in this study is voluntary. You are free to ask questions to the main researcher before you consent to participate or any other time at will as they arise. You are also free to withdraw from the study if necessary without any consequences. However, it will be useful to complete it.

Confidentiality: All the information in the questionnaire and files will be held in confidence. At the end of the study there will be no way to link your name with the data. It will be labelled by study code number and kept in lockable cabinets and only the research staff will have access. Any additional information will be provided to you including the final results

Costs: There is no financial cost to participate in this study.

Questions: If you have any questions, you can ask at the moment; -----

If you do not have any question at the moment and yet a question may arise later; I do hereby provide you with the contacts that you can use to have any arising matters solved.

Contact:

If you get any questions or concerns about the study or in the event of the study: please contact the principal investigator and/or the representative on; Telephone numbers: 0720 312 257/0735 966 374; P. O. Box 56159-00200-00100, Nairobi; email address: baru.wachira@gmail.com

For any questions concerning your rights as a research participant, please contact: The Secretary, **JKUAT** Ethics Review Committee, P. O. Box 62000- 00200, Nairobi; Telephone numbers:

Should you agree to participate in this study about;

“An assessment of occupational safety and health hazards in flour milling companies in Nairobi County”

Then I do request you to fill a questionnaire attached. It includes; personal information regarding your area of work either, management, workshop etc

If you are in agreement to participate in this study, please sign your name below, indicating that, you have read and understood the nature of the study, your responsibilities as a study participant, the inconveniences associated with voluntary participation in the study as well as an indication that all your concerns regarding the study have been addressed satisfactorily.

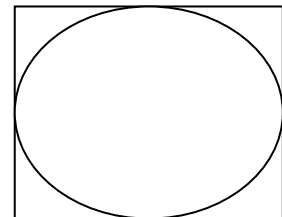
Subject's statement

I have been clearly explained to about this study of; 'An assessment of occupational safety and health hazards in flour milling companies in Nairobi County'

I volunteer to participate in it. I have a chance to still ask questions about it in future if I get any using the contacts I have been given.

I do accept to participate in this study

Name and Signature of study participant and Date



Name and Signature of person obtaining Consent and Date

participant

Thumbprint of

Appendix 2: Questionnaire for Workers

Survey ID number:

Name of interviewer:

Date of interview: **Time started:** **Time finished:**
.....

Company:
.....

Complete address of contact:
.....

Good morning/ afternoon. My name is **Wilson Baru Wachira**, REG NO: **EET32/2174/2011** and I am from Jomo Kenyatta University of Agriculture and technology. I am currently conducting research on the “**An assessment of occupational safety and health hazards in flour milling companies in Nairobi County**”

The purpose of this study is to assess the occupational safety and health hazards in flour milling companies. This survey is undertaken by the Jomo Kenyatta University of Agriculture and technology/ IEET (Institute for energy and environmental technology). It is for research and academic purposes only. I personally assure you that your answers will always be kept strictly confidential and never be revealed to any other person. The only thing I am requesting from you is that you answer the questions truthfully, in your best possible way, and to the best of your knowledge. If you cannot answer some questions, simply say so.

SECTION A: GENERAL INFORMATION OF RESPONDENT

Please Tick one

1. Gender

Male Females

2. Highest level of education

Primary school Secondary school Diploma

Bachelors Degree Masters Degree

3. For how long have you worked in this company?

0- 1year 2 to 3 years 3 to 5 years over 5 year

MANAGEMENT OF SAFETY AND HEALTH

1. Does the workplace have an elaborate health and safety policy

Yes No

2. If yes above (1) Has the policy been communicated to all stakeholders?

Yes No

3. How is the policy communicate

Induction training

Posters

Safety and health manuals

Safety and health committee

Management meetings

Others, Specify _____

4. Do you have a training program on safety and health?

Yes No

5. Does the training program cover the management

Yes No

6. Does induction program incorporate health and safety issues?

Yes No

7. Which of the following comes first when planning your work?

Production Health and safety of workers

Compliance

8. Are the PPE provided to the workers adequate?

Yes No

9. Are workers trained on proper use and maintenance of the PPE?

Yes No

10. Which of the following best describes how PPE are replaced?-----

As soon as they are worn out

Every month

Every six months

On workers request

11. Do the workers go through occupational medical examinations

Yes No

12. Which hazards are present at the workplace?

High noise levels

Unguarded machines

Heavy loads

Poor housekeeping

Excessive vibration

Dust

Welding fumes

Glare from welding

Others, specify _____

13. Does the workplace conduct the following?

Health and safety audit Yes No

Health and safety risk assessment Yes No

Noise survey Yes No

Dust survey Yes No

Fire safety audit Yes No

14. How often are they conducted?

Every six months

Every year

Every two years

Not defined

Other, specify _____

15. If yes are they conducted by qualified persons?

Yes No

16. Are all accidents reported and investigated

Yes No

17. To whom are accidents reported

Human resource office

Trained first aiders

Health and safety officer

18. Does the workplace have hazard control measures?

Yes No

19. What do you think can be done to improve on the work environment?

Prioritise safety and health issues

Ensure machines are guarded

Train workers on safe work practices

Maintain good housekeeping

Provide mechanical aids for lifting

Provide workers with PPE

Package grains in smaller bags

Other,specify_____

End

Thank you very much / Asante sana

Appendix 3: Questionnaire for management staffs

Survey ID number:

Name of interviewer:

Date of interview: Time started: Time finished:
.....

Company:
.....

Complete address of contact:
.....

Good morning/ afternoon. My name is **Wilson Baru Wachira**, REG NO: **EET32/2174/2011** and I am from Jomo Kenyatta University of Agriculture and technology. I am currently conducting research on the “**An assessment of occupational safety and health hazards in flour milling companies in Nairobi County**”

The purpose of this study is to assess the occupational safety and health hazards among workers in flour milling companies. This survey is undertaken by the Jomo Kenyatta University of Agriculture and technology/ IEET (Institute for energy and environmental technology). It is for research and academic purposes only. I personally assure you that your answers will always be kept strictly confidential and never be revealed to any other person. The only thing I am requesting from you is that you answer the questions truthfully, in your best possible way, and to the best of your knowledge. If you cannot answer some questions, simply say so.

SECTION A: GENERAL INFORMATION OF RESPONDENT

Please Tick one

1. Gender

Male Female

2. Highest level of education

Primary school Secondary school Diploma

Bachelors Degree Masters Degree

3. Marital status

4. Single Married Divorce Widowed

5. For how long have you worked in this company?

- 0- 6months 6 months to 1 year over 1 year
6. How many hours do you work on average per day?
8 hours over 8 hours
7. If you work for more than 8 hrs, are you paid overtime
Yes No

SECTION B: SAFETY AND HEALTH ISSUES

1. Did you go for medical examinations before joining the company
Yes No
2. Were you informed of the company's health and safety policy when joining the workplace?
Yes No
3. Were you trained on safety and health when joining the workplace
Yes No
4. Does the workplace produce high noise levels? *(If no go to question 8)*
Yes No
5. If yes ,Is the noise
Too loud Tolerable
6. What are the sources of the noise?
Milling machines Heavy machinery Others,
specify_____
Workshop activities Vehicles
7. Where noise levels are high, are safety and health information like high noise levels, use PPE provided
Yes No
8. Have you ever been injured while at work
Yes No *(if no go to question 14)*
9. If yes, what was the nature of the injury?
Cuts
Dislocation
Electrocution
Burns
Being struck by sharp objects

Other, specify _____

How many days did you stay out of work as a result of the injury

0days 1-7days 8-15days 16-21days

22-28days More than 28days

10. What caused the injury

Unguarded machine Carrying Heavy Load Slippery floor

Uninsulated electrical cables repairing a machine when power is on

Other _____

11. Are you aware of any accidents in the last six months?

Yes No

12. If yes, what happened?

Worker was injured by an unguarded machine

Worker was electrocuted

Worker tripped and fell when carrying a heavy load

Worker was cut by a sharp object

Worker was burnt by a hot object

Other, specify _____

13. To who do you report any injuries

Supervisor Health and safety officer

Human Resource Office Trained first aider

14. Are the reported injuries/accidents investigated

Yes No

15. Are there trained first Aiders at the workplace

Yes No

16. Do you think you are assigned adequate supervision to ensure work is done right

Yes No

17. Have you been trained on the safety and health hazards you are exposed to

Yes No

18. Are you aware of any deaths within the workplace or related to operations in this workplace?

Yes No

19. If yes, what was the cause?

Accidents Health problems related to flour milling

20. Do you experience problems related to flour dust?

Yes No

21. If yes, which ones?

Wheezing

Coughs

Blocked chest

22. Do you suffer from a condition that you have reason to believe has resulted from what you do?

Yes No

If yes, which best describes the condition

Respiratory complication

Low back problems

Pain on joints

Eye problems

22. Have you ever been trained on safety and health?

Yes No

23. If yes, when was the training conducted

Last week Last month Last 3months Last 6months

Last 12 months more than year ago can't remember

24. If Yes, Who did the training?

Health and safety committee health and safety officer External trainers

25. Do you receive regular health and safety information

Yes No

26. How is the message delivered

Posters

Memos

Meetings

Health and safety committee

Others, specify _____

Have you been provided with Personal Protective Equipment (PPE)

Yes No

27. If Yes, which ones?

Ear Muffs/ plugs Safety shoes

Gloves Goggles

Aprons Dust Masks

28. Do you use the protective equipment provided?

Yes No

29. If no, why

They are uncomfortable I don't find them helpful

They don't provide any protection Don't know how to use the

They are not suitable Others, specify _____

30. Have you been trained on proper use and maintenance of PPE

Yes No

31. Have you ever undergone any occupational medical examinations?

Yes No

32. If yes, when

Last six months last one year more than one year ago

33. Do you use any mechanical aid for lifting loads?

Yes No

34. Are sanitary facilities provided?

Yes No --

35. According to you what do you think constitute workplace hazards

High noise levels

Unguarded machines

Heavy loads

Poor housekeeping

Excessive vibration

Dust

Welding fumes

Glare from welding

Other, specify _____

36. In your opinion, do you think working in this workplace is safe?

Yes No

37. If No, what do you think can be done to improve safety and health conditions?

Ensure machines are guarded

Train workers on safe work practices

Maintain good housekeeping

Provide mechanical aids for lifting

Provide workers with PPE

Package grains in smaller bags

Other, specify _____

End

Thank you very much / Asante Sana

Appendix 4: Observation Checklist on Occupational Health and Safety.

| Name of flour milling company: | | Checklist No. | |
|--|----------|---------------------------|----------|
| | | (O) Satisfactory | |
| | | (X) Unsatisfactory Action | |
| | Location | Condition | Comments |
| Safety and health information | | | |
| Is the safety and health policy conspicuously posted at the workplace | | | |
| Are SOP conspicuously posted at the workplace | | | |
| Is adequate instruction in the use of personal protective equipment provided? | | | |
| Is the OSHA,2007 abstract posted | | | |
| Work Process | | | |
| Are the material safety data sheets placed in locations accessible to all employees? | | | |
| Are hazards signaled by signs and tags? | | | |
| Are lockout or tagout procedures in place and followed? | | | |
| Is ventilation equipment working effectively? | | | |
| Is the fume and dust collection hood working effectively? | | | |
| Fire Emergency Procedures | | | |
| Is there a clear fire response plan posted for each work area? | | | |
| Do all workers know the plan? | | | |
| Are drills held regularly? | | | |
| Are fire extinguishers chosen for the type of fire most likely in that area? | | | |
| Are there enough extinguishers present to do the job? | | | |
| Are extinguisher locations conspicuously marked? | | | |
| Are extinguishers properly mounted and easily accessible? | | | |
| Are all extinguishers fully charged and operable? | | | |
| Are special purpose extinguishers clearly marked? | | | |
| Means of Exit | | | |
| Are there enough exits to allow prompt escape? | | | |

| | | | |
|--|--|--|--|
| Do employees have easy access to exits? | | | |
| Are exits unlocked to allow egress? | | | |
| Are exits clearly marked? | | | |
| Are exits and exit routes equipped with emergency lighting? | | | |
| Loading/Unloading Racks | | | |
| Are steps, railings and retractable ramps on raised platforms in good repair? | | | |
| Is the general condition of wiring and junction boxes, etc. in good condition (visual inspection)? | | | |
| Lighting | | | |
| Is the level of light adequate for safe and comfortable performance of work? | | | |
| Does lighting produce glare on work surfaces, monitors, screens and keyboards? | | | |
| Is emergency lighting adequate and regularly tested? | | | |
| Machine Guards | | | |
| Are all dangerous machine parts adequately guarded? | | | |
| Do machine guards meet standards? | | | |
| Are lockout procedures followed when performing maintenance with guards removed? | | | |
| Electrical | | | |
| Is the Electrical Code adhered to in operation, use, repair and maintenance? | | | |
| Are all machines properly grounded? | | | |
| Are portable hand tools grounded or double insulated? | | | |
| Are junction boxes closed? | | | |
| Are extension cords out of the aisles where they can be abused by heavy traffic? | | | |
| Is permanent wiring used instead of extension cords? | | | |
| Tools and Machinery | | | |
| Are manufacturers' manuals kept for all tools and machinery? | | | |

| | | | |
|--|--|--|--|
| Are tools properly designed for use by employees? | | | |
| Are defective tools and machines tagged and removed from service as part of a regular maintenance program? | | | |
| Are tools and machinery used so as to avoid electrical hazards? | | | |
| Is proper training given in the safe use of tools and machinery? | | | |
| Confined Spaces | | | |
| Are the confined space procedures and training available and followed by all involved? | | | |
| Are entry and exit procedures adequate? | | | |
| Are emergency and rescue procedures in place (e.g. trained safety watchers)? | | | |
| Housekeeping | | | |
| Is the work area clean and orderly? | | | |
| Are floors free from protruding nails, splinters, holes and loose boards? | | | |
| Are aisles and passageways kept clear of obstructions? | | | |
| Are permanent aisles and passageways clearly marked? | | | |
| Are covers or guardrails in place around open pits, tanks and ditches? | | | |
| Stairs, Ladders and Platforms | | | |
| Are stairs and handrails in good condition? | | | |
| Are ladders free of defects? | | | |
| Are ladders set up properly before use? | | | |
| Are the elevated platforms properly secured and do they have handrails? | | | |
| Sound Level/Noise | | | |
| Is hearing protection available and used properly? | | | |
| Employee Facilities | | | |
| Are facilities kept clean and sanitary? | | | |
| Are facilities in good repair? | | | |

| | | | |
|--|--|--|--|
| Are hand washing facilities available? | | | |
| Medical and First Aid | | | |
| Are the names of the employees trained as first-aid practitioners on each shift worked posted? | | | |
| Are first-aid kits provided as per jurisdiction's first-aid regulations? | | | |
| Are first-aid supplies replenished as they are used? | | | |
| Personal Protective Equipment (PPE) | | | |
| Is required equipment provided, maintained and used? | | | |
| Is personal protection utilized only when it is not reasonably practicable to eliminate or control the hazardous substance or process? | | | |
| Are the areas requiring PPE usage properly identified by warning signs? | | | |
| Materials Handling and Storage | | | |
| Is there safe clearance for all equipment through aisles and doors? | | | |
| Is stored material stable and secure? | | | |
| Are storage areas free from tipping hazards? | | | |
| Do personnel use proper lifting techniques? | | | |
| Is the size and condition of containers hazardous to workers? | | | |
| Are elevators, hoists, conveyors, etc., properly used with appropriate signals and directional warning signs? | | | |

Appendix 5: Publication Abstract

ABSTRACT

Flour milling business provides a popular food ingredient to many Kenyan households and employment to a sizeable population both directly and indirectly. Assessment of occupational safety and health hazards in 11 flour milling companies in Nairobi-Kenya registered by the Directorate of Occupational Safety and Health Services was done. The study employed a descriptive design which used proportionate sampling methods to select the 310 participants. Structured questionnaires were used to collect quantitative data. The dissertation found out that the milling processes, maintenance works on the machines, loading and offloading of grains/flour, workshop activities and the packing activities were the main activities constituting safety and health hazards in the flour milling companies. Dust related health problems reported included wheezing, coughs and blocked chest problems. Other ailments reported were low back pains, joint pains and eye problems. Majority (87.5%) of the accidents reported were from unguarded machines, others were lack of proper safety and health policies, poor housekeeping, lifting of heavy loads equipment and lack of proper supervision. Workers had been provided with different PPEs but some workers were observed not using the PPEs while working. Most companies under investigation conducted the occupational health and safety audits annually as required by law. The study recommends the flour milling companies to ensure that the various safety audits are conducted regularly by qualified personnel and that action plans to implement recommendations provided there in should also be developed and the same shared with DOSHS and follow up done.

Keywords: Risk assessment, hazards, loads, health, safety, training, accidents and housekeeping

1. INTRODUCTION

Many people spend a significant fraction of the day and night at work in order to meet their economic and social needs (Ajeel & Al-Yassen, 2007). During work, people are often faced with various safety hazards and risks, which can expose them to numerous adverse health problems. Depending on the nature of work, occupational hazards can be associated with a variety of factors including physical, chemical, and biological agents as well as unfavorable working conditions among others (Ajeel & Al-Yassen, 2007). According to Skanberg and Ohlstrom, (2002) around 5 to 10 percent of workforce in developing countries and 20 to 50 in the developed countries have access to some kind of occupational health services and therefore the presence of hazards in the work place due to factors such as dust, toxic chemicals, heat stress, noise, and dangerous machines which causes huge burden of work-related injuries, diseases and death is very usual.

Occupational safety and health is a multi-disciplinary issue that seeks to cushion the safety, health and welfare of employees involved in various forms of employment in order to achieve a safe working environment (Minalah & Wachira, 2011). In check with the International Labor Organization (ILO) and World Health

Appendix 6: Publication Certificate

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