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POTENTIAL WORKPLACE RISKS AND HAZARDS ENCOUNTERED BY FACTORY EMPLOYEES IN ELDORET MUNICIPALITY, KENYA

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ABSTRACT: *Work place disasters have become a major global concern. Industrial hazards including accidents, dangerous procedures, infrastructure failures or specific human activities cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. UN/ISDR (2009). This paper sought to identify the workplace hazards that employees are exposed to in line of duty. The study made use of survey and evaluation designs. Purposive sampling was used to select the industries and simple random sampling to select the study units. The study units included; Managerial staff and workers of large, middle and small scale factories in Eldoret, labor officers in the Ministry of labor (Public Health Officers), fire brigade officers, Kenya National Environment Management Authority and the Kenya Red Cross Society Regional officials. Interviews and questionnaires were used for data collection from administrators and other factory employees while observation was used to identify risks within the workplace. Data from the research was analyzed using descriptive statistics, frequencies, t-test, x^2-square and ANOVA. The study concluded that; mechanical (367) and physical (108) total number of injuries were the highest in the industrial workplaces in the last five years. Thus a high number of employees are exposed to risks mainly mechanical (64%) and physical (51%) risks in large scale industries in Eldoret Municipality in Kenya. This study was quite significant, putting emphasis on the need for employees to know and identify their workplace hazards for safety and health.*

KEYWORDS: Workplace Safety, Hazards, Occupation Health and Safety Act.

INTRODUCTION

The ILO (2005) report indicates that in 2003, a total of 2.31 million workers died in the whole world due to accidents and diseases at work. These statistics could be higher considering the fact that there has been a high rate of under-reporting particularly in the developing countries. Occupational accidents and diseases resulted in loss of skilled manpower, human suffering and huge economic loss arising from reduced capacity to produce. ILO (2005) estimated the cost of the accidents and diseases at work to about 4% of Gross National Product of each country. This was higher in developing countries where safety performance was still low compared to the developed countries (GoK, 2011).

Hazards/Dangers in Workplace

A study carried out by Percy (2011) in New Zealand showed that skill gaps put employees at risk because they did not fully understand their workplace health and safety information, documentation and paperwork. The research also revealed that all industries' workplace health and safety documents consistently used unfamiliar, specialist and formal vocabulary (e.g. spillage, adversely affected, critical) that were difficult for most employees. Such unfamiliar words and overly formal language confused employees or were misinterpreted by employees

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especially those who spoke English as a second language and by people with lower literacy skills. Employees therefore were at risk since they did not understand their employer's health and safety policies and rules, hazard information and safety procedures.

According to WorksafeNB (2014) employers have a responsibility to protect workers against health and safety hazards at work. It also posits that workers have a right to know about potential hazards and to refuse any kind of work that they believe is dangerous. Workers have a responsibility to work safely with hazardous materials. The workers, to protect themselves, need to learn to recognize and prevent hazards in their workplace. Therefore, the various workplace dangers were discussed in order to create employee awareness of hazards in various industries they were exposed to so as to enable them identify risks.

Myers indicated that, manufacturing was a diverse sector with many workers engaged in the production (tasks) of commodities such as food, textiles, chemicals, machinery, metals, electrical equipment, and nonmaterial. It involves the mechanical, physical, or chemical transformations of materials, substances, or components into new products for example; milk or water bottling, fish packaging, ready-mixed concrete production, prescription lenses grinding; wood preserving, electro planting or lapidary for the trades; fabricating signs, rebuilding machinery, ship repair, machine shops and tire retreating (Myers, 2005). These processes, materials and substances put workers at risk if risk management is not put into consideration and integrated into factory plans.

Workplace hazards have been grouped into five types by occupational health advocates as indicated by (ENVISNIOSH, 2012; Queensland Government, 2009; Myers, 2005; NIOSH, 2011; WorksafeBC, 2010; Rosenstock, *et al.,* 2006; AHS, 2013). According to these writers some of the potential dangers/ hazards in work place include:

Physical Hazards

AHS (2013) showed that, physical hazards cause injury to workers when an object, piece of equipment or material comes in contact with a worker. They may be kinetic, electrical, pneumatic, hydraulic, etc. This paper sought to establish the existence of the following physical hazards in the identified categories of industries: Flash arc, working at heights, exposure to unguarded or unprotected electrical equipment, working with high voltage equipment, working with powered equipment, Pinch points, Nip points, exposure to electromagnetic fields, incorrect wiring, loose surface conditions, wet surface conditions, object(s) on the floor, blocked walkways, poor design or lay-out of work area, uneven surfaces, Small or inadequate walkways, as well as unguarded machines, unguarded equipment or work areas, overhead hazards, sharp edges and fast moving equipment, force of movement, repetition of movement, awkward postures, sustained/static postures, contract stress, vibration, poor work station design, lighting conditions, temperature extremes, humidity extremes, exposure to sunlight/UV radiation and restricted/confined spaces that have been indicated by GoO (2013) as very crucial.

Chemical Hazards

Chemical hazards are substances which, because of their characteristics and effects cause harm to human health and safety. The chemical hazards include exposure to vapors, gases, mist, dusts, fumes and smokes. Some of the chemical activities that expose workers to risks include: Chemical reactions, Production of chemicals, Chemical incompatibility, Chemical storage,

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Flammable Substances, Combustible substances, Carcinogenic substances, Mutagenic substances, Teratogenic substances, Oxidizing substances, Corrosive substances and Pressurized containers (Myers, 2005; ENVISNIOH, 2012; UQ, 2010; AHS2013).

Mechanical Hazards

ENVISNIOH (2012) indicated that, mechanical hazards in industries are due to machinery protruding moving parts and lead to 10% of industrial accidents. Therefore, understanding workplace hazards is vital for workplace health and safety and this can only be achieved through installing reliable hardware and equipment. Hattangandi (2005) observed that failure of electrical and machinery equipment is caused by visible or measurable defects that are not recognized in time. Hattangadi(2005) posits that mechanical hazards are due to failure mechanism. This is a physical or chemical process through which failure mode is reached, for example;

i) Due to excessive alternating tensile and comprehensive stresses at a point in a steel component, fatigue cracks develop and grow until the component fractures.

ii) Due to chemical action between lubricating oil and a rubber O-ring, the later expands and causes the air- motion to get jammed.

Psycho-Social Hazards

The psycho-social hazards arise from the workers' failure to adapt to an alien psychosocial environment. Frustrations, lack of job satisfaction, insecurity, and emotional tension are some of the psychosocial factors that determine the physical and mental health of the workers/employees (ENVISNIOH, 2012). Dagne (2011) indicated that the threat of terrorism is a very serious issue that also contributes to psychosocial hazards. Psychological hazards cause workers mental distress or distraction. It is critical that psychological hazards are thoroughly identified and controlled. Examples of psychological hazards workers are exposed to include: Violence in the workplace, working alone, over/under worked, worker phobias, poor leadership, lack of motivation, no procedures, bullying and harassment, client/patient aggression, fatigue and shift work (AHS, 2013).

Biological Hazards

Biological hazards are organisms or substances produced by organisms that may pose a threat to human health and safety. Biological hazards are caused by biological agents. These are living things or products of living things that cause illness and diseases to humans. Biological agents include viruses, bacteria and fungi, as well as parasitic worms and some plants. These agents can be inhaled, eaten (ingested) or absorbed. They multiply quickly once inside the body and can be passed from one person to another (Peel schools Organization, 2013). Biological hazards workers are exposed to include: Blood or other body fluids or tissue, Human waste, Anthrax, Fungi/moulds, Bacteria and viruses, Poisonous plants, Animal waste, Threat of insect or animal bites and Drugs / cytotoxic substances (AHS, 2013).

Workers may be exposed to infective and parasitic agents at the place of work, leading to diseases such as; brucellosis, leptospirosis, anthrax, hydatidosis, psittacosis, tetanus, encephalitis, fungal infections and schistosomiasis. Persons working among animal products (e.g. hair, wool and hides) and agricultural workers are exposed to biological hazards as well as those working in hairdressing and beauty industry (ENVISNIOH, 2012).

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Literature on the practical transformation of materials, substances or components clearly indicated that a worker may encounter mechanical, physical or chemical hazards in their workplace. These hazards vary in effect and magnitude depending on the type of tasks one is undertaking for example fracture injuries are the highest particularly in the wood manufacture and the construction industries. The vulnerability to risks and the impact of hazards depends on the workers awareness, involvement in risk reduction/ management by avoiding risks and undertaking control measures. This is only possible if there is integration of DRR in industrial plans through effective communications and consultation between the management and the employees.

Practitioners of Occupation Health and Safety for industries have classified hazards that put employees at risk into physical, chemical, biological, mechanical and psychosocial; however literature reveals that there are natural hazards like earthquakes, flooding or tsunamis that put employees at risk in their workplace. Terrorism is also seen as a hazard in the workplace. Natural disasters and terrorism can cause traumatic incidences or technical failures leading to illness, injury or death (NIOSH, 2013). NIOSH (2010) recommends that all workers need to be involved in response activities to help their coworkers and reduce the risk of experiencing stress associated with traumatic incidences like severe injuries, dead bodies or body parts or loss of colleagues.

The author of this study suggests therefore that this classification of hazards should be placed into direct and indirect contact of employees. In this case hazards are grouped as those that affect the employees due to direct contact during processes and indirect as those like natural hazards, terrorist attacks and wars. The other alternative classification could be internal (those that are from the factory and industry) and external (those that originate from outside the workplace like natural hazards terrorism or wars). It is also clear from the literature that impact of hazards in the workplace varies in effect and magnitude. Some have light impact (one can be treated and continue working), others long term effect (cause disability such that one may not continue working) while others have a fatal impact.

Some practitioners believe that accidents in the workplace are due to human traits and action while others incline on systems cause. However Holden (2008) argues that accidents are caused by multiple factors due to complex interactions of numerous work systems elements, human and non-human. This study, by identifying hazards in workplace, hoped to create awareness of risks workers were exposed to in Eldoret, Municipality in Kenya.

MATERIALS AND METHODS

The study was conducted in two large scale industries; Raiply woods on Kenya-Uganda road three kilometers from Eldoret town center and Ken Knit on Eldoret-Nairobi road half a kilometer from Eldoret town center. Two middle level industries; the Rift Valley Bottlers opposite the Eldoret Law Courts and Pyramid Packaging Ltd off Kisumu road, and, two small scale industries; the Maize Milling Company and Maji Matamu Laundry in town Eldoret, Kenya.

The target populations included; Managerial staff and workers in the selected factories, Labor officers in the Ministry of labor, Ministry of Industrialization, fire brigade officers, Public health officers, National Environment Management Authority (NEMA) and the Kenya Red

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Cross Society Regional officials. The factory workers provided information on workplace safety and health and disaster preparedness. The officials from the ministries of health, labor, environment and the Kenya Red Cross provided information on the activities they were involved in and how they interact with factories to ensure workplace safety and health as well as community and environmental protection from factory disasters.

The study adopted survey and evaluation research designs. According to Babbie (2010) in "The Practice of Social Research" in a survey design the respondents are selected and standardized questionnaires administered to them.

Purposive sampling (criterion sampling) was used to select industries that meet the various categories of industries – small, medium and large scale industries. A stratified random sampling method was used to collect data from each of the workers in the departments. All the workers in every department were involved in the study so as to assess the percentage of employees injured or ill due to workplace disasters. For workers who were off duty and those who work in shifts filled questionnaires at the time they reported on duty to ensure all employees participated. It also helped to assess the rate of accidents or injuries in the workplace. From the study, the number of employees who were trained on disaster management and preparedness was known.

The study made use of a formula by the Division of the National Education (2008) to determine the stratified random sample size for the three categories of industries as:

Where,

$$S=X^2 NP (1-P) \div d^2 (N-P) + X^2 P (1-P) \text{ …….. Equation 3.1}$$

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 proportion (assumed to be 0.5 since this would provide the maximum sample size).

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

Information collected from factory workers was analyzed using SPSS software, tabulation was used for summary while percentages was used to calculate the magnitude of work place injuries and work loss days due to illness. Frequencies and percentages were used to show the hazardous levels in industries of various risks. One way ANOVA was used to compare the vulnerability of each of the various scales of industries, to assess variations of qualifications of employees within and between factories

RESULTS AND DISCUSSIONS

Employees have a right to know about potential hazards and to refuse work that they believe is dangerous. Analysis was conducted for this study, and results presented in bar charts. Also a Chi-square (χ^2) test analysis was conducted (see Figure 1).

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The bar chart in Figure 1shows various hazards encountered at the work places. In this study, electrical, mechanical, chemical, fire, steam, and dust were found to be the common causes of injuries in most industries in Eldoret Municipality. The mechanical injury had the highest percentage of 38.5%. This indicates that in most industries, workers were more vulnerable to mechanical injuries than fire injuries which constitute 5% of the risks.

On the other hand, 10% of the respondents indicated that none of these hazards had been observed in their industries. It was found out that most of these respondents worked in small scale industries like laundry and others which do not engage in a lot of chemical and mechanical operations. Thus their small size of activities reduced vulnerability.

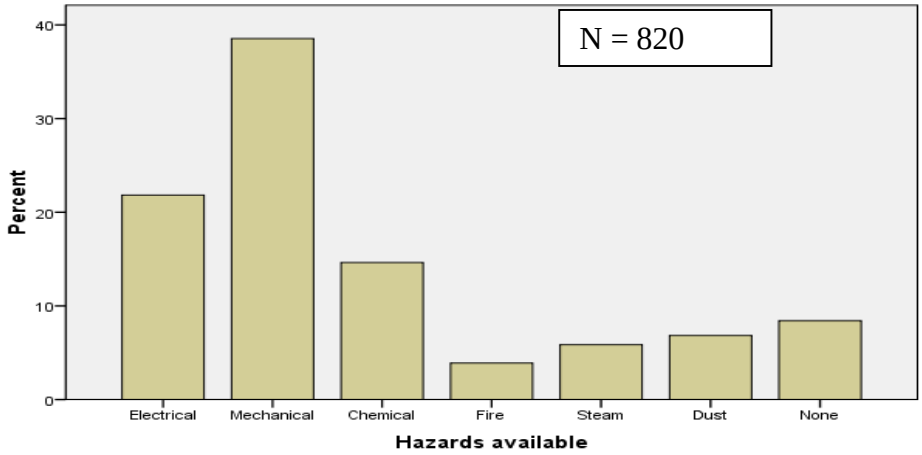

Figure 1 Hazards encountered in Eldoret Municipality industries in Kenya

The same variable was analyzed using a Chi-square test, which indicated that the calculated χ^2 teststatistic, for 6 degrees of freedom, is 524.700. Additionally, it indicated that the significant value (0.000) was less than usual threshold value 0.05. This therefore suggested that there was a highly significant ($P<0.01$) variation of the hazards available in the industries in Eldoret Municipality.

Physical Hazards

Literature indicated that physical hazards cause injury to workers when an object, piece of equipment or material comes in contact with a worker. Physical hazards identified by this study included; fire, steam, dust and glass. From Figure 1, physical hazards that workers were exposed to when put together attributed to 16% of the total hazards in the workplace. Plate1 clearly depicts the dangers likely to be encountered while loading and off-loading the timbers. The timbers loaded seem to exceed the required height. Overloading is dangerous but most people working in industries seemed to ignore and take it as the easiest way to save time and resources.

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Plate 1Forklift with pieces of wood at RaiPly wood in Eldoret Municipality, Kenya

The analysis indicated that amongst all the physical hazards, dust/fumes and spillages were highly experienced than others, showing a percentage of 28% each. This could depict a situation where workers slide on slippery floors or even inhale chemical dusts, if not well protected.

Open electrical cables were another cause of physical hazard in industries, bearing 24%. In some cases, open electrical cables also led to fatal encounters.

From the analysis shown in figure 2, it was found that though it was only 5.6%,arranging commodities in exceeding heights, as well as noise, fire outbreaks, and broken glasses each at 5%were still dangerous.

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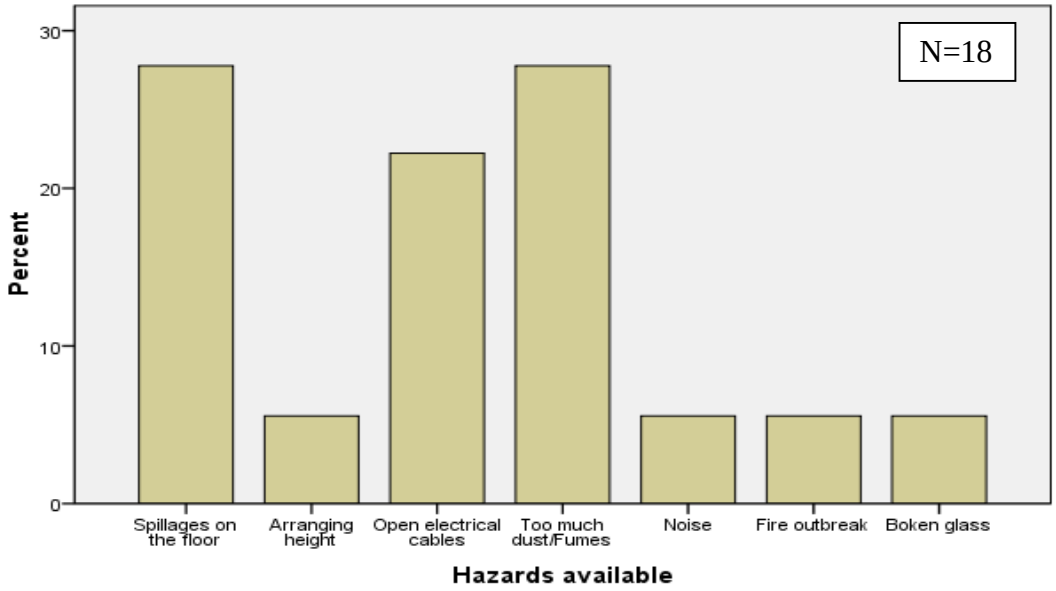

Figure1: Percentages of hazards in industries in Eldoret Municipality, Kenya

The same variable was analyzed using a Chi-square test; it indicates that the calculated χ^2 teststatistic, for 6 degrees of freedom, is 9.222. Additionally, it indicates that the significance value (0.161) is more than usual threshold value 0.05. This suggests that there no significant (P>0.01) variation of the hazards available in the industries in Eldoret Municipality.

Chemical Hazards

Chemical hazards were identified as the third highest in ranking to mechanical and electrical. Observation checklist revealed that almost all the industries apart from maize milling had at some level chemical processes going on in the industries. This therefore becomes an area of concern; industrial owners and employees have to undertake measures to curb chemical hazards.

From figure 2, spillages and fumes had the highest percentage of 27.8%. These fumes and spillages could be toxic chemicals used in the industries. If workers are not well protected, this can cause suffocation and corrosion of internal body organs when inhaled; chemicals can form toxic compounds in the body and result to death.

Mechanical Hazards

Mechanical hazards according to literature review are due to protruding parts and thus require that there should be proper installation of reliable hardware and equipment. That failure of machinery equipment could be due to measurable defects that are not recognized in time. These contributed 10% of industrial accidents but during the study it was realized that mechanical hazards contributed to 38.5% of accidents (refer to Figure 1).Plate 2 is an unguarded machine that is used for chopping pieces of wood. An interview with a supervisor as having once chopped off a finger of an operator who failed to follow instructions indicated.

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Plate 2: Unguarded machines at RaiPly wood industry in Eldoret Municipality, Kenya

Such accidents can be mitigated through guarding sharp blades, and sharp surfaces. Employers should ensure that operators read the instructions regularly and that they are well acquainted with the machine operations. All instruction should be well portrayed on the very place that the accident is likely to occur as indicated by plate 3 below.

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Plate 3: Operator's instruction for the machine in plate 2 at RaiPly wood in Eldoret Municipality, Kenya

Psycho-Social Hazards

In all the interviews carried out in the industries there were no psychosocial hazards identified or observed. This was associated to Labour union and DOSH which worked together to advocate for workers welfare. Regulations require that all factory workers get registered in a union. These help in ensuring workers follow the health and safety measures regulations.

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Biological Hazards

There were no biological hazards identified through interviews or observations made. This was associated with the level of cleanliness in the factories and yearly inspection by DOSH department of the Ministry of Labour. The effectiveness of inspection was observed by certification letters on the notice boards or in the files of managers or supervisors.

Table 1 Hazards in industries for the last five years in Eldoret Municipality, Kenya

Name of Industry	Physical N	%	Mechanical N	%	Chemical N	%	Biological N	%	Ps N	%
Raiply woods	63	35	106	29	35	23	17	38	39	52
Ken Knit	29	16	133	36	66	43	7	16	25	33
Rift Valley Bottlers	34	18	70	19	21	14	10	22	5	7
Pyramid Packaging	50	28	48	13	29	19	11	24	2	3
Maize Milling Company Ltd	1	1	6	2	0	0	0	0	3	4
Maji Matamu Dry Cleaners	3	2	4	1	2	1	0	0	1	1
Total	180	100	367	100	153	100	45	100	75	100

PS- Psychosocia

Major hazards identified in the sampled work places were as illustrated in table 1. Large scale industries had the highest number of mechanical (367) and physical (180) injuries in their workplaces in the last five years. Despite that fact, biological hazards result in genetic alterations in human bodies, allergy and loss of sense of smell. Allergy and loss of sense of smell were common to the laboratory technicians in most industries.

A Chi-square test conducted indicates that the calculated χ^2 teststatistic for 6 degrees of freedom is 524.700. Additionally, it indicates that the significance value (0.000) is less than usual threshold value 0.01. This suggests that there is a highly significant relationship between the hazards and the type of industry.

The bar chart in Figure 3 depicts that Ken-Knit limited had the highest (17.5%) mechanical hazards among the selected industries. Raiply wood had the highest risk of physical hazards, followed by pyramid packaging, so far having reported 8% cases of injuries and 6%

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respectively, and this varied depending on the nature of work activities as revealed by interviews. Raiply wood limited had both high frequency of both physical and mechanical hazards of 17.5% and 8% respectively. Pyramid packaging, maize milling company and Maji Matamu laundry had very minimal cases of these hazards; this was attributed to the nature of the industry in relation to the materials used for their products as reported during interviews. From observation, workers in the later industries had minimal chances of being exposed to chemical, physical, and biological hazards.

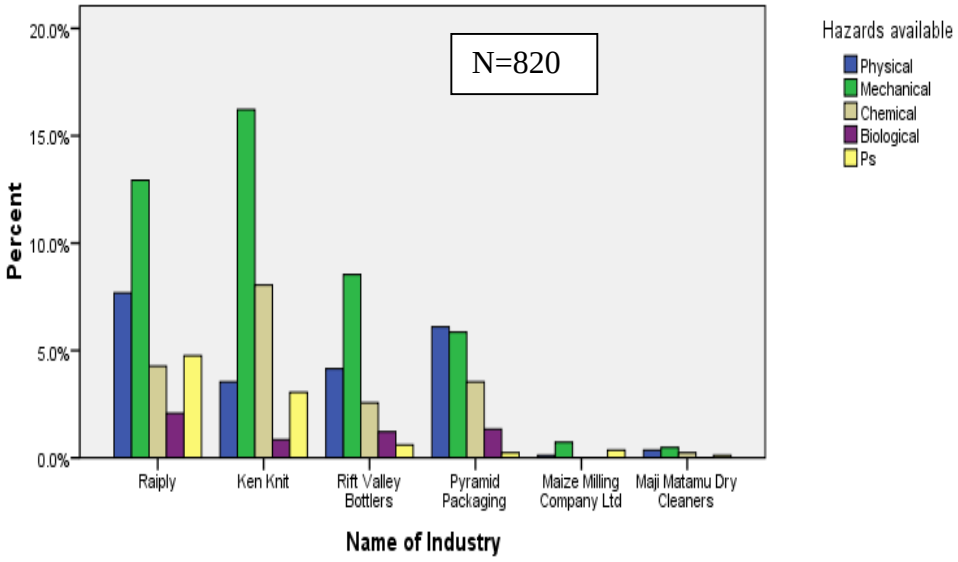

Figure 3: The Frequency of Hazards in Various Industries in Eldoret Municipality, Kenya

It is clear in this chapter that mechanical hazards were more frequent in large scale industries than small scale industries. Physical hazards due to dust, fumes and spillages need to be controlled as they are more frequent especially where chemicals are in use and produce fumes, and where floors are slippery due to spillage. As revealed by interviews Health and safety organization and labour Unions have had positive impact since they played a great role in risk reduction in industries. This has also increased retention of workers in industries therefore reducing psychosocial hazards. Due to regular inspection by DOSH employee working conditions have improved and there were no biological hazards observed or mentioned during interviews.

CONCLUSION

It is important for employees to be aware of the hazards and risks they are exposed to within their workplace. Knowledge empowers workers to work with confidence and be effective and efficient. It is important that employees should acquire a high level of education and be trained on the new and changing technologies. This braces them with knowledge of hazards that are likely to occur and how to handle them. From the study findings it was evident that employers recruit employees with low education level to reduce the cost of production and maximize on the profit. Most large scale and medium scale industries were then conducting trainings of the workers on hazards because it was a requirement by the government which carried out inspection yearly through the Directorate of Occupational Safety and Health Services. This

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indicates the important role of the government and individuals apart from employers in ensuring risk reduction

RECOMMENDATION

Employers should ascertain the knowledge level of their employees on hazards and risks before assigning them duties especially machine operation which was identified as the most hazardous even if they have college certificates. Employees should be made aware that it is their right to have information/knowledge of hazards in their work place and their impact so as to reduce risks.

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