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Causes and Frequency of Accidents Among Food Laboratory Workers in Mombasa County, Kenya

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ABSTRACT

Kenya has put in place legislations to safeguard the safety and health of workers, but still the number of accidents at workplaces has continued to increase. According to the Directorate of Occupational safety and health Services (DOSHS) Annual Report, the Coast region was leading with the number of fatal accidents at 42 and non-fatal accidents at 842 for the year 2004. The DOHS Annual Report (2010) reported an increase to 1742 accidents, where 34 were fatal and 1713 were non-fatal in the coast region. Literature from various parts of the world has identified numerous causes of accident. Human error plays a big role in accident causation, behavioral factors such as improper attitude, lack of knowledge, lack of skills and inadequate physical and mental condition. Carelessness and reckless behavior, inattention or fatigue, inadequate or unsafe equipment and lack of adequate training increase the probability that an accident will occur. However, not much has been documented in Kenya, particularly in food laboratories. The paper therefore presents the causes and frequency of accidents in food laboratories within Mombasa County .The target population was 200 food laboratory workers from all the thirteen food laboratories in Mombasa county out of which 50% was the sample representative. Simple random sampling was used to identify those to be issued with questionnaires. Data collected was analyzed both qualitatively and quantitatively using the SPSS computer software and results were presented in tables as percentages and frequencies.Results indicated that slips and falls are the main cause of accidents as was stated by 43% of respondents. The results also showed a strong inverse correlation between the work experience and accident occurrence. A regression identified on three factors that are main cause of accidents: Drug use, Poor working environment and lack of adequate training.

1.0 Introduction

An occupational accident is an unwanted, unplanned and uncontrolled event affecting people, the workplace and society (ILO,2009).It is also an event which has been used as the basis for organized safety work in companies from soon after the Industrial Revolution(Grimaldi&Simonds,1984). The International Labour Organization (ILO) defines occupational accident as an occurrence which results in a fatal occupational injury and / or non-fatal occupational injury.

Occupational Accidents according to WHO (2001) affect about 70 percent of adult men and up to 60 percent of adult women throughout the world. An estimated 40 million adults are finally affected or lose their lives in the industrial sector (WHO 2008). Such Occupational accidents contribute to absenteeism, light duty assignments or other work restrictions, high turnover, and higher workers' compensation costs (Sweane*t al*, 2003).

Despite global efforts to address OSH concerns, it is estimated that 2 million work related fatalities still occur every year (ILO, 2009). In addition, there are more than 330 million occupational accidents and 160 million work related diseases that affect workers every year (Marksmen, 2004). The ILO (2009) estimates that more than $1.25 trillion, which is equivalent to 4% of the world's Gross Domestic Product (GDP), is lost each year due to occupational accidents and diseases.The table below shows the global trend on occupational accidents and work-related diseases.

Table 1.0. Global trend on occupational accidents and work related diseases.

Year	Fatal occupational accidents		Non-fatal occupational accidents (at least four days absence)		Fatal work-related diseases
	Number	Rate[a]	Number	Rate[a]	
1998	345,436	16.4	263,621,966	12,534	
2000					2,028,003
2001	351,203	15.2	268,023,272	12,218	
2002					1,945,115
2003	357,948	13.8	336,532,471	12,966	
2008	320,580	10.7	317,421,473	10,612	2,022,570
2010	352,769	11.0	313,206,348	9,786	
2011					1,979,262

[a] Number of occupational accidents per 100,000 persons belonging to labour force

Source: Olga &Ogor (2013)

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According to Dorman(2000), the food industry includes a wide range of subsectors, such as the slaughter, preparation and preservation of meat; the manufacture of dairy products; canning and preserving fruits and vegetables; canning, preserving and processing fish and seafood; the manufacture of vegetable and animal oils and fats; grain milling; the manufacture of bakery products; the manufacture and refining of sugar; the production of cocoa, chocolate and sugar confectionery; and the manufacture of animal feeds. The drink industry covers the distillation and blending of spirits and the production of wine, malt liquors, soft drinks, fruit juices.

Workers in these industries can be exposed to dust and chemicals in a number of ways when spraying, they can inhale the chemicals during and after spraying, the chemicals can be absorbed through the skin, and the workers can ingest the chemicals if they eat, drink, or smoke without first washing their hands, or if drinking water that has become contaminated with the chemicals. 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 (Mutemi, 2005).

The human error is often indicated when the causes of accidents are not found in the technical systems. A technical perspective on safety leaves the person involved with an individual responsibility. As the injury 'only' affects the operator, he/she is to answer for the accident and therefore also to blame (Reason, 1990). The human errors made by i.e. designers, manufacturers of machines, purchasers, maintenance personnel, administrators, management or safety analysts, that may contribute to an accident are seldom analyzed or brought forward despite their contribution to the whole complexity of risks (Sundström-Frisk, 1996).

Reason (1990) distinguishes two kinds of error: active errors, committed by the sharp-end personnel where effects are felt almost immediately, and latent failures with adverse consequences that may lie dormant within the system for a long time, only becoming evident when they combine with other factors to breach the system's defences. Latent failures can contribute to a number of different accidents, and can increase the likelihood of active failures through the creation of local factors promoting errors or violations. Reason (1990) also stated that there is a growing awareness that it is more important to uncover and remedy the latent failures resulting from poor design, incorrect installation, faulty maintenance and bad management decisions than to minimise the error of the individual operator.

A study conducted by Danso (2005) stated that poor working conditions may have an effect of the health and safety of the workers. These unhealthy or unsafe working conditions can be found in any workplace.

The individual workers are very often prone to accidents associated with their work because of inadequate safety provisions. The major occupational health hazards identified included Physical hazards: lighting, extreme heat, ventilation, noise, intense physical activity, electric shock, dust, fire and vibration;Chemical hazards: exposure to diesel oil, lubricating oil, and carbon monoxide; Mechanical hazards: vehicle, abrasive/cutting tools, hand tools, cranes and lifting gears, and contact with hot parts of machines; Ergonomic hazards: repetitive work, poor work posture, long standing times, lifting heavy objects; and Psychological hazards: stress, excessive overtime, and lack of job control.

This literature is from most countries including Kenya however it focuses on workplaces in general and other studies focus on building industries. There is lack of relevant studies on major causes of accidents in food laboratory workers. This study sought to establish the causes and frequency of accidents among food laboratory workers in Mombasa county.

2.0 Research Methodology

The study adopted descriptive survey study in an attempt to explain the causes of accident occurrence among food laboratory workers. Descriptive survey study was used because it is best suited to answer the 'how' research questions in the study. Orodho (2005) stated that the target population is the aggregate of elements of interest to the researcher. The target population in this study was the food laboratory workers in Mombasa County.

The study sampled 100 respondents; this followed the recommendations by Nkapa, (1997) that, for a population running into hundreds, the sample size should be 50%. The researcher therefore sampled at least 50% subjects from each institution as listed in table below. In ensuring a good representativeness of the sample, the study adopted simple random sampling to identify those to get questionnaires, the required number of staff was picked randomly from each institution.The Table below shows the food laboratory institutions in Mombasa County, the population and the sample size used for each of them.

Table 1.1. Population of workers and Sample Size.

Institution name	Population of laboratory workers	Sample size
Kenya Bureau of Standards	20	10
SGS (Societegenerale de surveillaince)	30	15
Polucon testing service	22	11
Government chemist	20	10
Bureau Veritas	6	3
Kenya marine fisheries research institute	32	16
Intertek testing services	20	10
Sea harvest	6	3
Wanainchi marine	10	5
Pwani oil	13	7
Diamond industries	10	5
Mombasa maize millers	6	3
Transafrica fisheries	5	2
Total	200	100

Primary data for the study was gathered using self-administered questionnaires, supplemented by interviews and observations schedules. The questionnaire contained closed ended multiple choice questions as well as short answer questions. Secondary data derived from published material such as journals and books with content material related to the study was also used. The questionnaires were physically distributed to the correspondents at their respective workplace. Data collected was analyzed both qualitatively and quantitatively using the SPSS computer software and results were presented in tables as percentages and frequencies.

3.0 Results and Discussions

The Questionnaire was distributed to all the thirteen institutions. Although the initial response to the questionnaires was slow, an extension to the completion deadline helped in achieving a pleasing response rate of 81 % (n = 81). According to Finchan (2008), with the response rate, the study does not suffer from non- response bias error which

occurs when the response rate is 30% and below, therefore the results can be relied on.

A general invitation had been sent out to both men and women, but a larger percentage of men responded to the questionnaires. This is shown in the table below where 55.6 percent of men responded as compared to 44.4 percent of women. The unequal gender distribution was attributed to the general gender disparities in the formal employment in the country. For example, the Kenya Economic Survey (KNBS, 2010) indicated that there is 69.5% male employees compared to 30.5 of female.

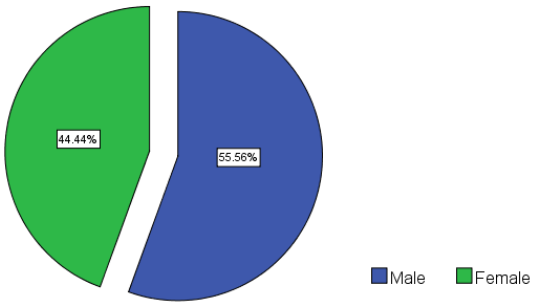

Figure 1.0. Response rate.

Most of the respondents (61.73%) were Degree Holders in the areas related to food Science and microbiology. The distribution of the education level is shown in Figure 1.1 below. Compared to a study by Agumba (2011), unlike the food industry, most of employees in the Hotel industry in coastal region were Diploma and Certificate holders.

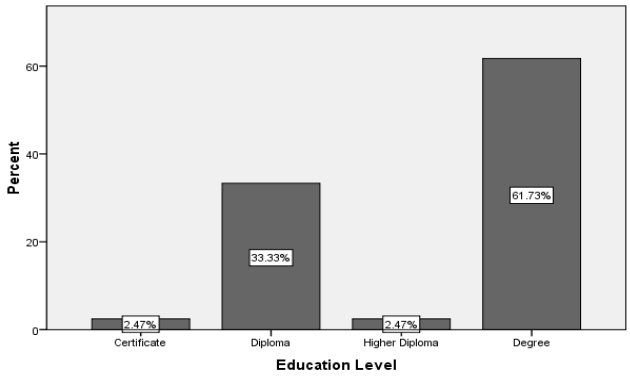

Figure 1.1. Distribution of the education level.

The duration of stay in their current working station was investigated and the feedback was as shown in figure 1.2below. Most of the respondents (55.6%) have worked in the current position between two and five years. All the respondents were on permanent employment basis.

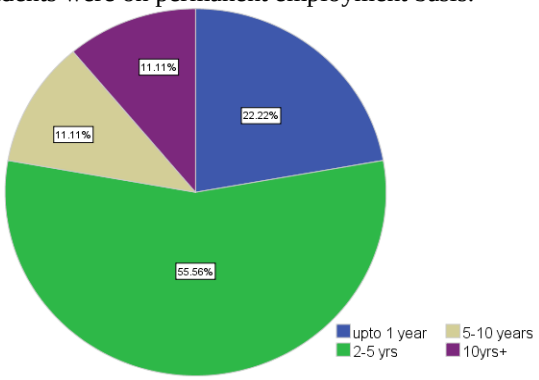

Figure 1.2. Duration of stay.

3.1 Frequency of Accident Occurrences

The study revealed that an average of thirty (30) accidents occurred quarterly in food laboratories within Mombasa County. This was achieved through examination of accident records. The study then sought to check what the respondents' experience was in terms of accident occurrence. Most of the respondents (66.7%) have witnessed an accident taking place in their presence. Although most of respondents witnessed an accident, just a few of the respondents (22.2%) have ever suffered an accident. This is shown in figure 1.3 below. The respondents were asked to react on the types of accidents that commonly occur in the laboratories. Through an open ended question, majority (43%) of the respondents reported that slip and fall accidents were the leading accident types. These accidents can happen in any work environment and the injuries sustained can range in severity. Some of the most common types of injuries suffered in slip and fall accidents include fractures, sprains, knee injuries and hand or wrist injuries. However, 35% also suggested that the common types of accidents were machine injuries especially when the employees are not very conversant with the machines they are operating.There were also respondents (22 %) who also reported that chemical and fire burns were common in the laboratories.The question was an open one and the respondents had freedom to respond with more than one type.

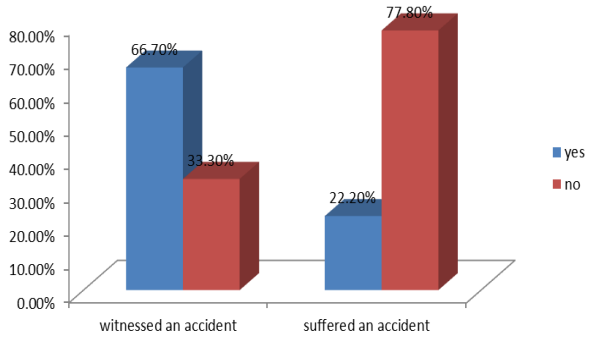

Figure 1.3. Accident occurrence.

This could be interpreted to mean the most of the employees in the laboratories were very careful while handling machines, chemicals and other operations. It was also observed that most of the employees who did not suffer any accident were diploma, post graduate and higher Diploma holders and they had worked for over two years. This could mean that the level of education and work experience could lead to reduced accident occurrences. The study tried to establish the statistical correlation between level of education and accident occurrence. The results are as shown in the table below.

Table 1.2. Correlations between Education level and Accident Occurrence.

		Education Level	Accident Occurrence
Education Level	Pearson Correlation	1	.385**
	Sig. (2-tailed)		.001
	N	81	81
Accident Occurrence	Pearson Correlation	.385**	1
	Sig. (2-tailed)	.001	
	N	81	81

**. Correlation is significant at the 0.01 level (2-tailed).

The results of the Pearson correlation show that there is no relationship between education level and accident occurrence. This is because the resulting Pearson correlation value (0.385) is far from one which indicates no correlation.

The results can be interpreted to mean that education level is not correlated with accident Occurrence. The results differ with a research carried out by Karaguven (1999) on

textile workers in Finland which concluded that there is a great correlation between education level and accident occurrences.

The research also sought to establish the relationship between work experience and accident occurrence and the results were as shown in the table below.

Table 1.3. Correlations between Work Experience and Accident Occurrence.

		Work Experience	Accident Occurrence
Work experience	Pearson Correlation	1	-.659**
	Sig. (2-tailed)		.001
	N	81	81
Accident Occurrence	Pearson Correlation	-.659**	1
	Sig. (2-tailed)	.001	
	N	81	81

**. Correlation is significant at the 0.01 level (2-tailed).

The results of the Pearson correlation show that there is a strong relationship between the work experience and accident occurrence. This is because the resulting Pearson correlation value (-0.659) is closer to one which indicates a strong correlation. The results mean that changes in work experience are strongly correlated with accident Occurrence. The resulting value was negative which could be interpreted to mean that an increase in the duration of years worked leads to reduction in the rates of accident occurrence. The results also showed statistically significant correlations of 0.001 between the two variables. That means, increases in duration of years of worked do significantly relate to decreases in accident occurrence.

The results from the above correlation concur with the research Benley et al. (2002), McCall &Harwrtz (2005), Bell &Grosheckry (2006) and Chi et al. (2005) whereby their research show that the relationship between work experience and accidents occurrence is of a negative linear trend. That is, as an employee's work experience increases, their likelihood to cause an accident decreases.

3.2 Causes and frequency of accidents

The table below shows the list of causes of accident as reported by the respondents.

Table 1.4. Causes of Accidents.

Causes	Frequency	Percent
Lack of adequate Training on health and safety rules	33	41
Non provision of adequate protective clothes and equipment	9	11.5
Human error	3	4.2
Drug and substance use	18	22.3
Lack of experience	13	16
Poor Supervision	4	5
Total	81	100

The results from the study showed that lack of adequate training on safety and health rules was the main cause of accident. The results also show that a number of accidents that occur could also be as a result of drug and substance use. This is based on 41% and 22.3% response from table above. Many of these accidents are as a result of the worker failing to follow the safety procedures that have been put into place by the company where he or she works.

According to Bureau of Labor Statistics (2009), majority of industrial injuries happened in the service-related industry when the proper equipment is not used by personnel and when personnel attempt to use improper tools to work on equipment. This can damage the machines and create a safety hazard. However based on the observation by the researcher, the workers in nine (9) laboratories were provided with the information on the safe operation of the machines and frequent maintenance was also present, the machines were reliable and had a guarantee. Therefore, it can be stated that there are minimal chances that status of machinery could cause accident in the laboratory.

Bureau of Labor Statistics (2009) also noted that when personnel are not trained properly or adequately, industrial accidents are more likely to occur. Workers should be taught how to operate the equipment in the way it was designed to be used. They should also learn to employ correct safety procedures when they are operating the equipment. Employees should be well versed in what to do if something goes wrong so that they can work to correct the problem quickly before it gets out of control. Based on the data capture sheet in eleven (11) laboratories where research was carried out even though training was carried out, there was minimal evidence of training in laboratory safety practices equipment operation and good laboratory practices. This therefore explains the reason why 41% of the respondents stated that lack of training was the main cause of accident among laboratory workers.

The research also observed the presence or absence of Personal Protective equipment so that a comparison with the respondent's feedback can be done. It was observed that eleven (11) laboratories provided for the Personal Protective equipment (PPE) and an accommodation for clothing to the staff members. Therefore, the result of 11.5 % by respondents is in agreement with the fact that PPEs are provided and that they could not be the main cause of accidents in the laboratories.

3.3 Regression Analysis

Analysis of the main causes of accident as indicated by respondents was conducted; the causes analyzed included drug use, working environment, trainings on safety and use of protective equipment. By looking at the sig. column the constant, drug use, working environment and trainings on safety contribute significantly to the model derived from the results.

Table 1.5. Regression Coefficients 1.

coefficient	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	SE	Beta		
(Constant)	2.629	.773		3.400	.001
Drug Use	.208	.116	.216	1.789	.003
Working environment	.031	.125	.030	.245	.004
Use of protective equipment	.053	.091	.075	.588	.558
Trainings on Safety	.759	.252	.39	3.01	.003

a. Dependent Variable: Accident occurrence

The second, third and fifth rows of data in the table above show that the coefficients for Drug use, Working Environment and Trainings on safety are statistically significant at 0.05 significant level. This indicates that these three factors mainly led to accident occurrence among food laboratory workers. The results generated from the regression coefficient table could be interpreted to mean that one-unit increase in drug use could lead to 20.8% increase in accident occurrence in food laboratories, one-unit increase in trainings on safety could lead to 75.9% decrease in accident occurrence in food laboratories.

Majority argued (43%) that slip and fall accidents were the leading accident types however (35%) also stated that the common types of accidents were machine injuries. A big number of respondents (22 %) also thought that chemical

and fire burns were common in the laboratories. Most (30.9% and 28.4%) of the respondents associate accidents with ignorance and lack of personal consciousness to health and safety rules.

accident. A regression analysis was carried out and identified three factors that could be the main cause of accidents: Drug use, Poor working environment and lack of adequate training.

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