EFFECTS OF SAFETY AND HEALTH TRAINING ON ACCIDENTS/INJURIES’ REDUCTION, AMONG WORKERS OF CHEMICAL PROCESSING FACTORIES IN NAIROBI, KENYA.

BY

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AUGUST 2011
DECLARATION

This thesis is my original work and has not been presented for a degree or other award in any other university.

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DEDICATION

This thesis is dedicated to my wife Margaret and my grand children Elsie and Jeshurun for their forbearance and encouragement during the course of study.
ACKNOWLEDGEMENTS

First, I thank God for enhancing my determination during my study. I convey my sincere thanks to my supervisors Dr M. Keraka and Dr O. Anyango both of Kenyatta University for their professional guidance and tireless efforts in assisting me during the course of study. My appreciation goes to the Ministry of Labour particularly, the Directorate of Occupational Safety and Health Services for their advice in choosing the study sites. I am indeed grateful to Kenyatta University for providing library, particularly, the computer laboratory from which I enjoyed the internet facilities. I sincerely thank Kenya Medical Training College for having given me time off for study, especially during my course work. I am very grateful to all factories from where I did my research for having allowed me access to their premises. I am grateful to my daughter Alice Diang’a Nyang’on for providing very useful materials that enabled me undertake research work successfully. I am generally grateful to my son Geoffrey: daughters Roseline, Julie and Clare for their love, support and encouragement during my study. A lot of thanks to all my colleagues in the MPH class, particularly, Dr Anino and Mr.Khasewa, you have really inspired me.

May the God Almighty bless you all.
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ABBREVIATIONS AND ACRONYMS

DOHSS - Directorate of Occupational Health and Safety Services
ILO - International Labour Organization
KNBS - Kenya NATIONAL Bureau of Statistics
OSHA - Occupational safety and health administration
OSHAct - Occupational Safety and Health Act, 2007
SPSS - Statistical Package for Social Sciences
TW - Trained workers
UTW - Untrained workers
WHO - World Health Organization
ABSTRACT

The training and supervision of inexperienced workers, was found necessary because of the occupational hazards that may result into accidents/injuries. The main objective was to determine the effects of safety and health training on the reduction of accidents/injuries among workers in chemical processing factories in Nairobi. The study was conducted in six factories in Industrial area and in three factories in Ruaraka. Data were collected using questionnaire, checklist, interviews, reviewing of curriculum, records, focus group discussion and none participatory observations. Data were analyzed using Statistical Package for Social Science (SPSS). Descriptive statistics were used to organize and summarize data into frequencies, percentages and presented in the form of tables and charts. Chi-Square tests were used to interpret results between these associations which were considered significant whenever p-value was < 0.05. The statistical tests of association between training and studied variables were done. Variables that were significantly associated with training were provision of safety policies ($\chi^2=13.534, df=1, p=0.001$), policy formulation process ($\chi^2=46.146, df=3, p=0.0001$), reason for use of safety appliances ($\chi^2=21.071, df=3, p=0.0002$), reason for accidents/injuries’ reduction ($\chi^2=55.057, df=4, p=0.0004$), safety improvement ($\chi^2=41.390, df=7, p=0.0003$) and safety deterioration ($\chi^2=11.035, df=4, p=0.026$). It was revealed that adequate safety and health training creates safety culture within the workforce, failure of which workers may not only be injured but may end up with fatal injuries. The study concluded that there was significant association between the training and accidents/injuries’ reduction, because the study found a 100 percent decline in major cases in factories with training and meager decline in major cases in those without training, table 4.6 refers. Likewise, the association between training and the change in occurrence of accidents was significant ($\chi^2=46.142, df=2, p=0.0001$). Based on these findings, it is recommended that respondents are accorded the right to participate in the policy formulation process, maximum category of protective appliances are acquired for use and safety and health training be regularly undertaken so as to create a safety culture within the workforce.
CHAPTER 1: INTRODUCTION

1.1 Background

World Health Organization, (2008) cited the recommendations, to the medical practitioners in 1700 AD by Bernado Ramazzin which required that a doctor should add to the questions for the patient - “What is your occupation?” And the International Labour Organization (ILO) was founded on the basis of conditions of labour and its constitution includes measures to be taken for protection of workers against injury arising out of employment (ILO, 2008). After having recognized the global magnitude of occupational injuries, diseases and deaths, and the need for further action to reduce them, and recalling that the protection of workers against injury arising out of employment is among the objectives of the ILO as set out in its Constitution (ILO, 2006); furthermore the Alma Ata Resolution No 14 of 1978, of the World Health Conference specifically urged the Director General for World Health Organization to develop Occupational Health Care as an important distribution to social call and directed member states to maintain supportive and sustainable environment at work (ILO, 2008).

As a result, the following pertinent ILO conventions, to be precise, prevention of major industrial accidents of 1993 (No 174), chemicals of 1990 (No 170), Occupational safety and health convention of 1981 (No 155), whose requirement include the recording of regular health and safety training, was brought in force (ILO, 2008). In the developing world, particularly, Singapore the Work Safety and Health Act (WSHA) emphasizes the importance of managing Workplace Safety and Health (WSH) proactively, by requiring stakeholders to take reasonably practicable measures that ensure the safety and health of all individuals affected in the course of work. The Occupational Safety and Health (OSH) framework aims to cultivate good safety habits in all individuals, so as to create a strong safety culture at the workplace http://www.gov.sg accessed on 8th October 2009
In Sub-Saharan Africa especially, Namibia, data regarding the type and cause of accidents are incomplete and details about circumstances associated with each accident and any contributory factors may be understated or even overlooked (AMWEELO, 2000). In Kenya, the Ministry for Labour, made workplace safety and health committee rules and according to the rules, it is mandatory that occupier of every factory to which these rules apply to establish a safety and health committee which is responsible for conducting workers education programmes, failure to which an occupier will be guilty of an offense and liable to punishment (GOK, 2004).

In conformity with the training requirement, the Directorate of Occupational Health and Safety Services developed a curriculum whose contents embrace occupational safety and health management that has been in use since 2005 and over 10,000 workers within Nairobi have been trained (DOHSS, 2004). According to GOK, (2007) the enactment of occupational safety and health Act, 2007 was gazetted, and sections 9, 11, 21, 22, 42, 55, 77, 81, 84, 99, 126 and 127 specifically deal with safety or accidents/occupational diseases or training and or supervision of inexperienced workers. Moreover, the Act is applicable to all workplaces.

1.2 Problem Statement

As a result of the ever-increasing pace of worldwide liberalization of trade and economies, as well as technological progress, the number of occupational accidents and diseases are increasing in many developing countries. It is estimated that every year over 1.2 million workers are killed due to work-related accidents and diseases and 250 million occupational accidents and 160 million work-related diseases are occurring globally. The economic loss related to these accidents and diseases are estimated to amount 4% of world gross national product (ILO-OSH, 2001). And for NIOSH, (2004)
the direct costs arising from occupational injuries are estimated at $45.8 billion and indirect costs may range up-to $229 billion. But according to Rantanen, (2002) the toll of the world’s total accident burden is much higher: 250 million accidents, leading to some 335,000 fatalities a year; a problem that corresponds in scale to epidemics of communicable diseases on global scale; however, declining trends have yet to emerge nor are they likely to happen without specific global preventive programmes aiming to increase awareness. But for Muchiri, (2003) most African countries site lack of adequate training and information as a major drawback to the development of occupational safety and health (OSH) and added that the availability of training at various levels is scarce, mainly because of lack of trainers, curricula and training materials.

In support, Rukunga, (2001) states that epidemiological injury data from developing countries are poor and true occurrence and severity are not known. The Government of Kenya having made workplace safety and health committee rules in 2004 and DOSHS having developed a curriculum and trained over 10000 workers in Nairobi; nonetheless, Ochieng et al., (2005) describes Kenyan condition of work in relation to accident/injury protection as sadly inadequate. It is now necessary to find out how curriculum contents relate with human and workplace safety in chemical industries; and whether supportive and sustainable environment exists at work in line with Alma Ata recommendations.

1.3 Justification

According to Karin Olsson et al., (2003) in today’s work life, it is important to keep up to date your knowledge in occupational health and safety and to find new ideas for the future. Since the curriculum development by the Directorate of Occupational Health and Safety Services has not been tested in terms of effectiveness to address occupational accidents at workplace and limited research has been done in Kenya.
The findings of this study will, therefore, establish the existence of safety and rules and determine the influence training has on the studied variables. It will further determine the association between training and accidents/injuries’ reduction, safety improvement, safety deterioration within the workplace. It will finally recommend the way forward.

1.4 Research Questions

1. What are the effects of safety and health training in the reduction of accident/injury among the workers of chemical factories?
2. How does training influence types and frequency of occurrences on accidents/injuries at workplace?
3. How does safety and health curriculum address issues of human and workplace safety?

1.5 Null Hypotheses

1. There is no significant association between safety and health training and accidents’/injuries’ reduction, among workers in chemical processing factories.
2. There is no change in the occurrence and frequency of accident/injury between trained and untrained workers.

1.6 Broad Objective

To investigate effects and influences safety and health training have on workers in chemical factories in Nairobi.

1.6.1 Specific Objectives

1. To establish the existence of safety and health policy and the provision of rules.
2. To determine the influence training has on the health policy’s formulation process and its popularity; usefulness of the safety rules, use and reason for use of existing safety appliances.

3. To determine the association between training and change in the occurrence of accidents/injuries, accidents/injury’s reduction, safety improvement and safety deterioration.

1.7 Anticipated Output

The following outputs are anticipated:

- It may call for a different training approach and reveal a call for the participation of both workers and the management.
- It will serve as a guideline for both the training authority and the occupiers, as a result the occupiers are expected not only be beneficiaries but benefactors as well.
- The safety and health training may be entrenched in the National Primary Health Care structure.
- It will assist in the review of the current curriculum and enlighten the trainer’s vision in respect to both negative and positive impacts.

1.8 Delimitation of the Study

The selection of the study population was limited to those working in the production unit.

1.9 Definition of Operational Terms

Accidents - An accident is an unexpected, unplanned and unwanted event that disrupts work and results in human injury, disease or death; a
worker who accidentally slips and falls may not have an injury.

Audit - periodical evaluation of working environment and organizational management system in a factory or workplace for prevention of accidents, occupational diseases, ill health or damage to property.

Effect - Result, An outcome or consequences of safety and health training

Influence - The power that safety and health training has to affect the studied Variables

Injury - This is a physical harm which may be either minor or major in character. As a result of an accidental fall a worker may either have bruise (minor) or a fracture (major) injury.

Management - The occupier and the management staff of a factory.

Occupier - The person or persons in actual occupation of a workplace, whether as the owner or not and includes an employer.

Regular employee - A person employed on permanent, temporary, or contract terms, by the visited factories including their contractors or suppliers

Safety culture - The value of safety or the instance of valuing safety as a priority, for example, workers are accustomed to safety.

Workplace - Includes any land, premises, location, vessel or thing at, in, upon, or near which, a worker is, in the course of employment.
CHAPTER 2: LITERATURE REVIEW.

2.1 The Safety and Health Policy and Safety and Health Rules.

2.1.1 Safety and Health Policy

It is asserted in Cipd, (2008) that forward-thinking organizations recognize that managing their people is just as important to success as control of financial and capital resources. Some organizations are moving towards promoting a concept of wellness as preventive measure to address employee's health.

2.1.2 Safety and Health Rules

According to BS OHSAS, (2007) organizations of all kinds are increasingly concerned with achieving and demonstrating sound occupational health and safety performance by controlling their risks, consisted with their policy and objectives. They do so in context of increasingly stringent legislation and other measures that foster good occupational health and safety practices. And for Cal/OSHA-Guide, (2005) rules and procedures should be written for new exposures when they are introduced into the workplace. But GOK, (2007) states that the occupier of a workplace having designed any procedure should have this procedure tested at regular intervals.

2.2 Safety Policy Formulation Process

In view of policy formulation, ILO, (2006) requires that, each ILO member state shall promote a safe and healthy working environment by formulating a national policy, in line with national conditions and practice, in consultation with the most representative organizations of employers and workers; and in that policy, shall promote basic principles such as assessing occupational risks or hazards; combating occupational risks or hazards at source; and developing a national preventative safety and health culture that includes training.
2.3 Safety Policy’s Popularity

As concerns policy’s acceptance ILO-OSH, (2001) stipulates that the National Policy for Occupational Safety and Health– Management Systems (OSH-MS) should be formulated by competent institution(s) in consultation with employers’ and workers’ organizations, avoiding unnecessary bureaucracy and defining clearly functions and responsibilities of the implementer.

2.4 Safety Appliances

Personal protective equipment (PPE) is the first line of defense against job site hazards that can cause serious injury or illness. All field employees should be trained on what personal protective equipment to use in every work situation (HBR, 2009). And according to Greg, (2004) it is emphasized that when Personal Protective Equipment (PPE) comes into play, some forms of PPE are required daily on some job sites, but a clear communication with the employees, letting them know the PPE requirements and the management’s expectations.

2.4.1 Usage of Safety Appliances

In selecting PPE the employers should take the fit and comfort of PPE in consideration because those which fit well and are comfortable to wear will encourage employees’ use. Although, the use of PPE is required, the use of engineering and work practice, by placing a barrier between the hazard and employee and changing the way in which employees perform their work respectively, should always remain in force (OSHA, 2003)
2.5 Types and Occurrence of Accidents/injuries

Although India had reported 222 fatal accidents, ILO estimated the true number of fatal accidents in India at 40,000, and suggested that such statistics from developing world showed, only a fraction of the real toll of work-related fatal accidents and diseases, and that reporting systems and coverage of occupational safety and health in many developing countries are poor and in some cases deteriorating (ILO, 2005). Supportively, Mbatha, (2009) asserted that due to 56 percent shortage of experts within the directorate of occupational health and safety services, technical inspectors were overstretched in the 102,000 formal workplaces registered by 2007 resulting in inefficient safety and health coverage, hence many workplaces do not conform to the required safety and health standards and added that the Government has no statistics on the number of workers injured on duty and what happens to them thereafter.

Among the National Institute of Occupational Safety and Health's principal activities are: giving greater attention to the determination of the prevalence, source, and nature of occupational injuries and to determine whether there is an unsafe situation in a workplace caused by new or poorly understood materials or conditions, such as chemicals. These are done with a view to enhancing the state of occupational safety and health and to preventing their occurrences (NIOSH, 2004).

2.5.1 Common Accidents/injuries

The International Labour Organization, (2005) reported that number of accidents and deaths has lessened in the industrialized countries. But the number of accidents- in particular fetal accidents appears to be increasing. Every day, on average, 5,000 or more women and men loose their lives because of work-related accidents in the developing world.
All human races have basic rights and freedom regardless of his social status; particularly “the right to life”, and this right is enshrined in the universal declaration of human rights and the constitution (GOK, 2006). Moreover, it is revealed in Ochieng, (2005) that work conditions in Kenya remain pathetic and the role of education is yet to be appreciated. But Karin Olsson et al., (2003) stressed the importance of keeping up to date one’s knowledge in occupational safety and health and to look for new ideas that would assist in the future.

2.5.2 Accidents/injuries’ Prevention

International Labour Organization, (2006) recognized that occupational injuries have a negative effect on productivity, economic and social development. And the World Health Organization (WHO) reiterates that every worker should know what chemical he/she uses and how hazardous they are; and priority should be given at enclosing chemicals at source and monitoring the workplace rather than enclosing workers in protective gear and medically monitoring them; and that this ought to be emphasized through training (WHO, 2004).

Every employer shall establish, implement and maintain effective Injury and Illness Prevention Program in writing (Cal/OSHA- Guide, 2005). In addition, personal injuries and illnesses arising out of work situations impose a substantial burden upon the workforce. (http:/www.lawschool.cornell.edu accessed on 8th October 2009

According to Medical Academy of Latvia, (2003) more emphasis has not been put on communication/education. However, the following important Conventions that have been brought into force, are yet to be ratified by Kenya, and these include - prevention of major industrial accidents, 1993 (No 174); chemicals, 1990 (No 170) (ILO, May 2008). Since there is cost element, it is stated in OSHA-Guide, (2005) that safety
organizations, states, small business owners and major corporations alike have now realized that the actual cost of a lost workday injury is substantial, and that for every dollar you spend on the direct costs of a worker’s injury or illness, you will spend much more to cover the indirect and hidden costs.

The Government of Kenya therefore took a step in making, in her workplace and committee rules, mandatory for occupier of each factory to establish safety and health committee, which is responsible for conducting workers education programmes (GOK, 2004). And later enacted Occupational Safety and Health Act, 2007, and in this Act, twelve (12) sections specifically, address safety, accidents, diseases or training issues (GOK, 2007).

2.5.3 Training and its Relevancy to Injury Prevention

The federals Occupational Safety and Health Administration (OSHA); training unit provides occupational safety and health training for both the public and private sector employers and employees (OSHA, 2007). And training is one of the most important elements of any Injury and Illness Prevention Program. It allows employees to learn their job properly, brings new ideas into the workplace, reinforces existing ideas and practices, and puts your program into action (Cal/OSHA- Guide, 2005).

2.5.4 Reduction of Accidents through Training

As regards the reduction of accidents at workplace, the Alaska Occupational Safety and Health Section focuses on reducing occupational injuries by offering training which provides assistance to employers to identify and eliminate serious workplace hazards. And it has been realized that reducing workplace accidents can have a significant impact on the high cost of doing business in the state (AOSH, 2009). But the long-term
Objective of ICWUC, (2007) is to prevent work-related harm by training workers on how to best protect themselves, their communities and the environment. And in case, an employee is injured, accurate records may provide valuable information to the safety and health professional as to whether or not the element of training contributed to the cause of the incident (www.osha.gov) accessed on 06/10/2009.

2.6 Safety Improvement and Deterioration

Each ILO's member state shall promote continuous improvement of occupational safety and health to prevent occupational injuries by the development, in consultation with the most representative organizations of employers and workers of a national policy, national system and a national programme (ILO, 2006). The efforts to improve daily activities involve linking already implemented activities such as risk prediction, near-accident reporting and "five S" efforts (sort, straighten, shine, sustain, and standardize), with risk assessment techniques, thereby raising safety awareness among employees; but the programme that spontaneously improve health and safety levels at workplace is based on a check list of every aspect of safety and health activities, including systems and every day activities (KONICA, 2008). The deterioration of a workplace safety may come about due to apathy, bad beliefs and play game of office politics. It is time to get rid of the beliefs that hold us back, and this may be achieved only through education. (http://www.sedasoft.com accessed on 08/10/2009)

2.7 Curriculum Contents

The curriculum course contents include – causes and prevention of accidents/injuries, investigation of occupational accidents/injuries, safety in the use of chemicals, selection and maintenance of personal protective appliances and safety and committee rules (DOHSS, 2004). Adequacy and appropriateness of the training program's curriculum
Development instructor training, distribution of course materials and direct student training including the duration of training, course content, and course schedules/agendas; and adequate monitoring of student safety, progress, and performance during the training should be considered (OSHA, 2009). With regard to importance, OSHA, (2009) states that occupational safety and health training delivers a solid curriculum of important safety concepts with an emphasis on best practices for implementing and managing a safety and health programme.

2.7.1 Curriculum Addressing Personal Safety

Nations are expected to be mindful of ILO’S declaration on fundamental principles and rights at work (ILO, 2006). And as regards AKOSH, (2009) it is indicated that employees who make a workplace safety or health complaint are protected from employer's retaliation. And in Cal/OSHA, (2005) as an employer, you must ensure that all employees are knowledgeable about the materials and equipment they are working with, what known hazards are present and how they are controlled.

2.7.2 Curriculum Addressing Workplace Safety

As a responsible employer, you want to provide a safe work environment for all of your employees (Greg, 2006). Whereas, ILO, (2006) in its Philadelphia's declaration provided for a solemn obligation in furthering, among nations, programmes which will achieve adequate protection for life and health of workers in all occupations.
CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter explains the methodology that was used in the entire study. The chapter looks at study design, study variables, location of the study, target population, sampling techniques, sample size determination, research tools, pilot study, validity, reliability, data collection technique, data analysis and ethical consideration.

3.2 Study Design

A cross sectional comparative study was used. The study design provided information about the presence and strength of associations between the studied variables, permitting the testing of hypothesis about such associations. The study was done in the months of September and October 2009. The study aimed at the determination of effects of safety and health training in respect to accidents/injuries' reduction among trained and untrained workers in chemical processing factories.

3.3 Study Variables

The dependent variable or the outcome of interest was the reduction of accidents/injuries among the chemical factory workers. The independent variables were all the other parameters and exposures of interest including provision and level of acceptance of safety policy and rules, the policy formulation process, appropriate safety mechanism, improvement and deterioration of safety at work and training. The extraneous variables were sex, level of education, occupation and daily activities; and place of residence.
3.4 Location of the Study

The study was conducted in chemical processing factories with regular employ of twenty or more workers within the main industrial area along enterprise road and Ruaraka in Babadogo of Nairobi area as shown below and appendix 5. This is where most Kenyan industrial processes take place hence the hub of industrial economy. Given that Kenya desires to be industrialized by the year 2030, the country should therefore, focus on industrial growth including the health of the workers.

3.5 Target Population

The target population to which the study findings were projected was the community of workers employed in the chemical factories in Nairobi, who underwent safety and health awareness and empowerment creation training and those who did not. According to Kenya National Bureau of Statistics these were 26844 workers (GOK, 2009). The training was done by the Directorate of occupational safety and health services and their appointed agents during the years 2007 and 2008. The study focused on the following factories – pesticides, solvents, and fertilizers manufacturing workers which were
considered as the population at the highest risk in the present study. This according to GOK, (2009) was found to be 2420 workers.

3.6 Sampling Technique and Sample size Determination

3.6.1 Sampling Technique

The factories were identified on the basis of either having undertaken safety and health training or not on almost equal numerical strength. There were sixteen chemical factories registered with the Directorate of Occupational Safety and Health Services (DOSHS) at the time of the study. Factories were stratified into those which had undertaken safety and health training and those which had not. Preliminary study revealed that out of the nine with training, three were manufacturing industrial chemicals. Similarly, one factory among the seven without training was manufacturing the same industrial chemicals. Industrial chemical workers were not part the researcher’s targeted workers.

The twelve stratified factories were all selected for the study. These were, six with training and six without training. Three factories (one with training and two without training) declined because a similar study was going on within their premises. Therefore, the study was undertaken in the remaining nine factories – five with training and four without training. Once a factory had been selected, the study was limited to the workers in the production units. All the workers found in the production section, with their consent, were included in the study. The number involved was 117 respondents comprising of 62 from the trained stratum and 55 from the untrained stratum (Table 3.1)
Table 3.1: Distribution of respondents according to factory status

<table>
<thead>
<tr>
<th>Factories</th>
<th>Factory status</th>
<th>Number of respondents</th>
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<td>TW</td>
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<tr>
<td>Galaxy paints /coating</td>
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<td>11</td>
</tr>
<tr>
<td>Henkel chemicals</td>
<td>TW</td>
<td>11</td>
</tr>
<tr>
<td>High chem. essentials</td>
<td>UTW</td>
<td>14</td>
</tr>
<tr>
<td>Ideal manufacturing</td>
<td>UTW</td>
<td>13</td>
</tr>
<tr>
<td>Murphy chemicals</td>
<td>UTW</td>
<td>11</td>
</tr>
<tr>
<td>Sadolin paints</td>
<td>UTW</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>117</strong></td>
</tr>
</tbody>
</table>

TW = Trained Workers: UTW = Untrained Workers

3.6.2 Sample size Determination

The sample size was determined using a formula as given by Kothari (2004)

Given that \( n = \frac{Z^2 pqN}{e^2 (N-1) + (Z^2 pq)} \)

Where \( n = \) the desired sample size

\( Z = 1.96 \) at 95% confidence interval (CI)

\( p = \) proportion of the target population with the desired characteristics (The whole chemical factories workforce) is 9% (GOK, 2009)

\( q = \) proportion of target population not having the desired
Characteristics = 1- p= 0.91

\[ e = \text{level of statistical significance set (0.05)} \]
\[ N = \text{the population size = 2420} \]

Therefore the sample size was calculated as follows:-

\[ N = \frac{1.96^2 \times 0.09 \times 0.91 \times 2420}{0.05^2 (2420 - 1) + 1.96^2 \times 0.09 \times 0.91} = 119.67 \]

The Desired Sample size = 119

3.7 Research Tools

The research tools used were questionnaires, interviews, accident Register, training curriculum, focus group discussion and observation check list.

3.8 Pilot Study

A pilot study was done at a randomly selected factory (High chem. Essentials). This was used to test and make final modifications on the questionnaire and checklist. The factory workers’ level of education was secondary and above. This made them answer questions very well and enabled detects some typographic errors which assist in the modification of the final tools.

3.8.1 Validity

Validity was ensured by consistent uniform administration of questionnaire that was filled by the interviewee with the supervision of the researcher. This was to maintain the trust and anonymity hence freedom to answer questions in the best way an interviewee felt fit.
3.8.2 Reliability
Observations confirmed the non use of chemical monitoring devices as indicated by the respondents on the questionnaire. The reduction of accidents following the training was as well confirmed on the actual perusal of accident register duly filled and kept as required.

3.9 Data Collection Technique.
Questionnaire with and open ended questions for seeking opinion, was given to each respondent; and providing ample time, each was asked to record his/her own response. This ensured anonymity. The researcher interviewed key informants – supervisors, managers, and occupational safety and health officers; reviewed curriculum, accidents’ register and materials, and administered checklist – based on a non participatory observation.

Data for qualitative part of the study was collected using focus group discussion. The purpose of the focus group discussion was to identify difficulties the workers were experiencing at their workplaces, and have not been addressed.

The key formants were the management staff of the factories visited and ministry for labour officials, particularly Occupational Safety and Health Officers. They assisted in collection of retrospective information. The management staff availed the accident registers and documents pertaining to past safety and health training. The Occupational Safety and Health Officers provided information pertaining to the targeted chemical factories within their areas of jurisdiction in Nairobi.
3.10 Data Analysis

The descriptive statistical methods were used to analyze the data using Statistical Package for Social Science (SPSS) software. The descriptive statistics were used to organize and summarize data into frequencies, percentages and presented in the form of tables, charts. The utilization of Statistical test of association between; provision of safety policy and rules; use of personal protective devise; formulation process of safety and health policy; usefulness of safety rules; reduction of accidents/injuries; safety improvement; safety deterioration; relevance of curriculum and training was undertaken. Hence chi-square tests, through tabulation, were used to interpret results between these associations and the training. The test was considered statistically significant wherever p-value was < 0.05.

3.11 Ethical Considerations

Permission was sought from the board of post graduate studies of Kenyatta University, Ministry of Higher Education and Science and Technology and the factories involved. The respondents’ participation was on voluntary basis. The respondents assured confidentiality with all the information provided in both the questionnaires and during interviews.
CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents results of quantitative and observational findings. The section embraces socio-demographic state related to the workers; existence and acceptance safety and health policies; policy formulation process and its popularity; usefulness of safety rules; types and use of safety mechanisms; accidents/injury reduction; safety improvement and deterioration.

4.2 Results

4.2.1 Socio-Demographic Factors related to Factory Workers

The study established that the majority (79.5%) of the respondents were males. 84.6% had attained secondary and college levels of education. It can be deduced from this attainment that a large number of workers in chemical industries could very well understand the training materials. It was also shown that the respondents (44.4%) were machine operators who were directly involved in chemical processing. Likewise the other cadres too either handle or remain in the precinct of manufacturing process. Regarding daily activities 58.1% of the respondents were engaged in actual handling of chemicals and their products. The majority (91.5%) work for 8 hours daily. Therefore, appropriate training in both self and workplace safety was quite necessary. More respondents were low income earners because the result showed that 71 (60.7%) resided in low income residential areas (Table 4.1).
Table 4.1: Distribution of respondents according to socio-demographic Factors (n= 117)

<table>
<thead>
<tr>
<th>Variables– socio-demographic factors</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>24</td>
<td>20.5</td>
</tr>
<tr>
<td>M</td>
<td>93</td>
<td>79.5</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>100</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>18</td>
<td>15.4</td>
</tr>
<tr>
<td>Secondary</td>
<td>66</td>
<td>56.4</td>
</tr>
<tr>
<td>College</td>
<td>33</td>
<td>28.2</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>100</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General worker</td>
<td>34</td>
<td>29.1</td>
</tr>
<tr>
<td>Machine operator</td>
<td>52</td>
<td>44.4</td>
</tr>
<tr>
<td>Management</td>
<td>8</td>
<td>6.8</td>
</tr>
<tr>
<td>Mechanic</td>
<td>4</td>
<td>3.4</td>
</tr>
<tr>
<td>Supervisor</td>
<td>19</td>
<td>16.3</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>100</td>
</tr>
<tr>
<td><strong>Daily activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning working area</td>
<td>2</td>
<td>2%</td>
</tr>
<tr>
<td>Maintenance</td>
<td>4</td>
<td>3%</td>
</tr>
<tr>
<td>Management</td>
<td>8</td>
<td>7%</td>
</tr>
<tr>
<td>Processing</td>
<td>68</td>
<td>58%</td>
</tr>
<tr>
<td>Sorting products</td>
<td>16</td>
<td>14%</td>
</tr>
<tr>
<td>Supervision</td>
<td>19</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>100</td>
</tr>
<tr>
<td><strong>Working hours</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 hours</td>
<td>10</td>
<td>8.5</td>
</tr>
<tr>
<td>8 hours</td>
<td>107</td>
<td>91.5</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>100</td>
</tr>
<tr>
<td><strong>Residence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low income</td>
<td>71</td>
<td>60.7</td>
</tr>
<tr>
<td>Medium income</td>
<td>43</td>
<td>36.7</td>
</tr>
<tr>
<td>High income</td>
<td>3</td>
<td>2.6</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>100</td>
</tr>
</tbody>
</table>

4.2.2 Safety and Health Policy and Safety Rules in Chemical Factories

The study sought the existence of the safety policy in the factories. It was then established that among the trained respondents (98.4%) were aware of the existence of safety policy; while among the untrained respondents (76.4%) were aware. This Shows significant relationship between training and existing safety and health policy p-value = 0.001 < 0.005. But there was no significant relationship between training and the awareness on the existence of safety rules in the factories p-value = 0.260 > 0.05. This may be attributed to the fact that safety rules are generally provided in all factories with or without safety training (Table 4.2).
Table 4.2: Relationship between training and safety policies and rules (n=117)

<table>
<thead>
<tr>
<th>Level of knowledge on safety policy</th>
<th>Does safety policy exist?</th>
<th>Factory status</th>
<th>Total</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TW</td>
<td>UTW</td>
<td></td>
</tr>
<tr>
<td>PDNE</td>
<td>1 (1.6%)</td>
<td>13 (23.6%)</td>
<td>14 (12.0%)</td>
<td>$\chi^2 = 13.534$</td>
</tr>
<tr>
<td></td>
<td>PE</td>
<td>61 (98.4%)</td>
<td>42 (76.4%)</td>
<td>df = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>103 (88.0%)</td>
<td></td>
<td>p-value = 0.001</td>
</tr>
<tr>
<td>Total</td>
<td>62 (100%)</td>
<td>55 (100%)</td>
<td>117 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

PDNE = Policy does not exist; PE = Policy exists

<table>
<thead>
<tr>
<th>Level of knowledge on safety rules</th>
<th>Do safety rules exist?</th>
<th>Factory status</th>
<th>Total</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TW</td>
<td>UTW</td>
<td></td>
</tr>
<tr>
<td>RDNE</td>
<td>7 (11.3%)</td>
<td>3 (5.5%)</td>
<td>10 (8.5%)</td>
<td>$\chi^2 = 1.270$</td>
</tr>
<tr>
<td></td>
<td>RE</td>
<td>55 (88.7%)</td>
<td>52 (94%)</td>
<td>df = 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>107 (91.5%)</td>
<td></td>
<td>p-value = 0.260</td>
</tr>
<tr>
<td>Total</td>
<td>62 (100%)</td>
<td>55 (100%)</td>
<td>117 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

RDNE = Rules do not exist; RE = Rules exist

4.2.3 Participation in Formulation Process and Popularity of Existing Safety and Health Policy.

4.2.3.1 The Formulation Process of Safety and Health Policy.

Whole some participation in health safety policy formulation is considered as an important element of effective implementation of the policies. The study established a holistic participation among trained respondents because majority (82.3%) of them indicated that management, supervisors and workers participated in policy formulation process compared to untrained respondents (20.0%). Therefore a significant association
between training and policy formulation process existed p-value= 0.0001 < 0.05 (Table 4.3).

Table 4.3: Participation in policy formulation process (n=117)

<table>
<thead>
<tr>
<th>Participants in policy formulation</th>
<th>Who participates in policy formulation?</th>
<th>Factory status</th>
<th>Total</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TW</td>
<td>UTW</td>
<td>(\chi^2 = 46.146)</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>2 (3.6%)</td>
<td>2 (1.7%)</td>
<td>df = 3</td>
</tr>
<tr>
<td></td>
<td>Management alone</td>
<td>2 (3.2%)</td>
<td>13 (23.6%)</td>
<td>p-value = 0.0001</td>
</tr>
<tr>
<td></td>
<td>Management and Supervisors</td>
<td>9 (14.5%)</td>
<td>29 (52.7%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Management, supervisors and workers</td>
<td>51 (82.3%)</td>
<td>11 (20.0%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>62 (100%)</td>
<td>55 (100%)</td>
<td>117 (100%)</td>
</tr>
</tbody>
</table>

4.2.3.2 The Popularity of the Safety and Health Policy

The study sought the popularity of the existing policies with the workers. The finding showed that the policy was popular with 87.10% of the trained respondents, but popular only with 23.60% of the untrained group. A significant association between training and policy popularity was established (Figure 4.1).
4.2.4 Influence of Training on the Usefulness of Existing Rules

The researcher tried to find out the respondents’ perception on the usefulness of the existing safety rules. The finding showed that the majority of the trained respondents (92%) found the rules useful, hence knew the rules; while 51% of the untrained workers too considered the rules useful. Although it was found that the higher number (92%) of workers who considered the rules useful was among the trained group, more than a half of the untrained workers too indicated that the rules were useful. This confirmed the fact that rules were existing in all factories, and that almost all trained workers regarded them as useful because of their training background (figure 4.2).
4.2.5 The Use and Reason for Use of Safety Appliances

4.2.5.1 The Use of Safety Appliances

The researcher tried to look for the safety appliances used in the factories visited. The finding showed three categories of safety practices namely, low, medium and maximum. The low category was the safety to workers’ body alone (glove, eye shield, overcoat, and footwear), the medium comprised safety of the body and the use of respirators and maximum embraced the body, use of respirators and chemical monitoring device. The study shows that the trained respondents employed 5% of maximum category, 92% of medium category and 3% used low category of safety while of the untrained respondents employed 53% medium category, 47% employed low category and none employed maximum category of safety (Figure 4.3).
Figure 4.3: Distribution of respondents according to the use of Safety Appliances

Key

<table>
<thead>
<tr>
<th>Low (Body alone)</th>
<th>Medium (Body + respirators)</th>
<th>Maximum (Body + respirator + Chemical monitoring)</th>
</tr>
</thead>
<tbody>
<tr>
<td>gloves, overcoats, eye shield, foot and head protective appliances</td>
<td>Disposable respirator, half mask, full face &amp; powered respirator</td>
<td>Detector tube, Draeger multi gas/vapour detector and or chemical monitoring appliance</td>
</tr>
</tbody>
</table>

4.2.5.2 The Reasons for Use of Safety Appliances

The respondents’ perception on the reasons for use of safety mechanism was considered as an important element in the use of safety mechanism. The finding showed that 47.3% of the untrained respondents indicated personal interest and 12% indicated safety and health training as the reason for using safety mechanism. There was a significant association between the training and the reason for use safety appliances  

p-value = .0002 < 0.05. See table 4.4.
Table 4.4: Respondents’ perception for the use of safety appliances 
(n= 117)

<table>
<thead>
<tr>
<th>Safety mechanism</th>
<th>Reason for use of safety mechanism</th>
<th>Training status</th>
<th>Total</th>
<th>Chi-Square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TW</td>
<td>UTW</td>
<td></td>
</tr>
<tr>
<td>Personal interest</td>
<td></td>
<td>20 (32.3%)</td>
<td>26 (47.3%)</td>
<td>46 (39.3%)</td>
</tr>
<tr>
<td>Personal safety</td>
<td></td>
<td>3 (4.8%)</td>
<td>8 (14.5%)</td>
<td>11 (9.4%)</td>
</tr>
<tr>
<td>Safety and health Training</td>
<td></td>
<td>32 (51.6%)</td>
<td>7 (12.7%)</td>
<td>39 (33.3%)</td>
</tr>
<tr>
<td>Supervision</td>
<td></td>
<td>7 (11.3%)</td>
<td>14 (25.5%)</td>
<td>21 (17.9%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>62 (100%)</td>
<td>55 (100%)</td>
<td>117 (100%)</td>
</tr>
</tbody>
</table>

4.2.6 Accidents/injuries’ Reduction and Reason for the Reduction.

4.2.6.1 Decrease in the Occurrence of Accidents/injuries

The study aimed at ascertaining the relationship between the training and accidents’ reduction among the respondents, following safety and health training. It was found that the trained respondents 82.8% compared to 20.3% of untrained indicated that there was change, and that change was the decrease of accidents/injuries. A significant relationship between the training and change in the occurrence of accidents/injuries existed p-value = 0.0002 <0.05 (Table 4.5).
Table 4.5: Decrease in the occurrence of accidents/injuries (n=117)

<table>
<thead>
<tr>
<th>Change in the occurrence of accidents</th>
<th>Reduction of Accidents</th>
<th>Factory status</th>
<th>Total</th>
<th>Chi- square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TW</td>
<td>UTW</td>
<td></td>
</tr>
<tr>
<td>ANR</td>
<td>10(17.2%)</td>
<td>43</td>
<td>53</td>
<td>17.2%</td>
</tr>
<tr>
<td></td>
<td>43(72.9%)</td>
<td></td>
<td></td>
<td>72.9%</td>
</tr>
<tr>
<td></td>
<td>53 (45.3%)</td>
<td></td>
<td></td>
<td>45.3%</td>
</tr>
<tr>
<td>AR</td>
<td>48(82.8%)</td>
<td>12</td>
<td>60</td>
<td>82.8%</td>
</tr>
<tr>
<td></td>
<td>12(20.3%)</td>
<td></td>
<td></td>
<td>20.3%</td>
</tr>
<tr>
<td></td>
<td>60 (51.3%)</td>
<td></td>
<td></td>
<td>51.3%</td>
</tr>
<tr>
<td>NI</td>
<td></td>
<td>4</td>
<td>4</td>
<td>6.8%</td>
</tr>
<tr>
<td></td>
<td>4 (6.8%)</td>
<td></td>
<td></td>
<td>3.4%</td>
</tr>
<tr>
<td></td>
<td>4 (3.4%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>58 (100.0%)</td>
<td>59</td>
<td>117</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>59 (100.0%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>117 (100.0%)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ANR = Accidents not reduced: AR = Accidents reduced
NI = No idea

4.2.6.2 The Reason for Accidents/injuries’ Reduction

Similarly, the study sought the factors that brought about the reduction of accidents/injuries. The trained respondents 56.5% compared to 14.5% of the untrained group indicated that the factor behind the reduction was safety and health training. It was therefore, evident that trained workers, recognized safety and health training as responsible for the reduction of accidents among themselves. A significant association between training and reason for accidents/injuries’ reduction was established \(p\)-value = 0.0004 < 0.05 (Table 4.6).
Table 4.6: Respondents’ perception of the reduction of accidents/injuries (n= 117)

<table>
<thead>
<tr>
<th>Decrease of accidents</th>
<th>What has brought about decrease?</th>
<th>Factory status</th>
<th>Total</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TW</td>
<td>UTW</td>
<td></td>
</tr>
<tr>
<td>No decrease</td>
<td></td>
<td>5 (8.1%)</td>
<td>3 (69.1%)</td>
<td>43 (36.8%)</td>
</tr>
<tr>
<td>Professional training</td>
<td></td>
<td>8 (12.9%)</td>
<td></td>
<td>8 (6.8%)</td>
</tr>
<tr>
<td>Safety and health training</td>
<td></td>
<td>35 (56.5%)</td>
<td>8 (14.5%)</td>
<td>43 (36.8%)</td>
</tr>
<tr>
<td>Supervision</td>
<td></td>
<td>5 (8.1%)</td>
<td></td>
<td>5 (4.3%)</td>
</tr>
<tr>
<td>Workers effort</td>
<td></td>
<td>9 (14.5%)</td>
<td>9 (16.4%)</td>
<td>18 (15.4%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>62 (100%)</td>
<td>55 (100%)</td>
<td>117 (100%)</td>
</tr>
</tbody>
</table>

4.2.6.3 Accidents/Injuries’ Reduction in the Registers

The study further sought confirmation of the reduction through accident registers kept by all the factories that were visited. The finding showed a drastic drop of from 100% for major cases (whole body burn, asphyxia, systemic poisoning, and fractures) and reasonable drop of 58.9% for minor cases (irritation of eyes, skin and respiratory tract; open cuts, sprain, bruises and chemical intoxication) among the trained respondents but a meager drop of 17% for major cases and 18% for minor case was recorded among the untrained group. There is significant relationship between training and accidents/injuries’ reduction (Table 4.7).
Table 4.7: The reduction of accidents/injuries

<table>
<thead>
<tr>
<th>Accidents/Injuries</th>
<th>Minor</th>
<th>Major</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>TW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before training</td>
<td>146</td>
<td>14</td>
<td>160</td>
</tr>
<tr>
<td>One year after training</td>
<td>60 (59%)</td>
<td>0 (100%)</td>
<td>60</td>
</tr>
<tr>
<td>UTW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without training</td>
<td>108</td>
<td>6</td>
<td>114</td>
</tr>
<tr>
<td>After one year without training</td>
<td>89 (18%)</td>
<td>5 (16.7%)</td>
<td>93</td>
</tr>
</tbody>
</table>

Source - accidents Registers kept as requirement by each factory

Key

Minor = Irritation of the eye, skin and respiratory tract, open cuts, bruises, chemical intoxication and lesser burns

Major = Whole body burns, asphyxia, systemic poisoning and fractures

TW = Trained workers
UTW = Untrained workers

4.2.6.4 The Number of Accidents/injuries before Safety and Health Training

The number of accidents/injuries prior to undertaking safety and health training amongst the nine factories visited were ranging between 108 to 146 for minor cases and 6 to 14 for major cases. The pesticides factories had the highest number whilst fertilizer factories had the least of cases in both trained and untrained strata as shown in figure 4.7 and 4.8.
Table 4.8: Number of accidents/injuries according to type of product by trained stratum – before training.

<table>
<thead>
<tr>
<th>Year 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory status</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>TW</td>
</tr>
<tr>
<td>TW</td>
</tr>
<tr>
<td>TW</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Table 4.9: Number of accidents/injuries according to type of production by untrained stratum – before training.

<table>
<thead>
<tr>
<th>Year 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory status</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>UTW</td>
</tr>
<tr>
<td>UTW</td>
</tr>
<tr>
<td>UTW</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

4.2.6.5 The Number of Accidents/injuries after Training

Following training, the reduction of accidents/injuries was quite significant in both minor and major cases within the trained stratum. Pesticide factories still had the highest number of cases and fertilizer factories remained with the least (Tables 4.10). Reduction was confirmed by comparing year 2007 and year 2008, as shown in tables 4.8 and 4.10.
Table 4.10: Number of accidents/injuries according to type of product - with training after 1 year

<table>
<thead>
<tr>
<th>Factory status</th>
<th>Type of product</th>
<th>Number of factories</th>
<th>Number of Accidents/injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minor</td>
</tr>
<tr>
<td>TW</td>
<td>Fertilizer</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>TW</td>
<td>Solvents</td>
<td>1</td>
<td>29</td>
</tr>
<tr>
<td>TW</td>
<td>Pesticides</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>5</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

4.2.6.6 The Number of Accidents/injuries Without Training

Similarly, the reduction in occurrence of accidents/injuries in factories which did not undertake training was quite minimal. The reduction was confirmed by comparing year 2007 and year 2008, as shown in tables 4.9 and 4.11.

Table 4.11: Number of accidents/injuries according to type of product - without training after 1 year

<table>
<thead>
<tr>
<th>Factory status</th>
<th>Type of product</th>
<th>Number of factories</th>
<th>Number of Accidents/injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Minor</td>
</tr>
<tr>
<td>UTW</td>
<td>Fertilizer</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>UTW</td>
<td>Solvents</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>UTW</td>
<td>Pesticides</td>
<td>2</td>
<td>53</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>5</strong></td>
<td><strong>89</strong></td>
</tr>
</tbody>
</table>
4.2.7 The Relationship between Training and Safety Improvement

Safety training was considered as one of the important parameters in enhancing safety improvement in the working situation. It was found that the most (51.6%) of the trained group indicated that safety training was responsible for the safety improvement, and 12.7% of the untrained group indicated their reason for improvement as safety and health training. It implies that improvement was achieved mainly as a result of training, hence relationship between training and safety improvement existed p-value = 0.0003 < 0.05 (Table 4.12). Results from focus group discussions indicated that the training was informative and beneficial because their safety awareness had been created. The respondents who took part in making rules and formulating policies considered both the rules and policies as theirs. They (respondents) wanted the training to be undertaken annually.

Table 4.12: Distribution of respondents in agreement with their safety improvement responses (n= 117)

<table>
<thead>
<tr>
<th>Reason for safety improvement</th>
<th>Why safety improvement?</th>
<th>Factory status</th>
<th>Total</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TW</td>
<td>UTW</td>
<td></td>
</tr>
<tr>
<td>Job training</td>
<td></td>
<td>8 (12.9%)</td>
<td>5 (9.1%)</td>
<td>13 (11.1%)</td>
</tr>
<tr>
<td>No improvement</td>
<td></td>
<td>9 (16.4%)</td>
<td>9 (7.7%)</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td></td>
<td>2 (3.6%)</td>
<td>2 (1.7%)</td>
<td></td>
</tr>
<tr>
<td>Personal interest</td>
<td></td>
<td>2 (3.2%)</td>
<td>2 (1.7%)</td>
<td></td>
</tr>
<tr>
<td>Professional training</td>
<td></td>
<td>1 (1.6%)</td>
<td>3 (5.5%)</td>
<td></td>
</tr>
<tr>
<td>Safety and health training</td>
<td></td>
<td>32 (51.6%)</td>
<td>7 (12.7%)</td>
<td>39 (33.3%)</td>
</tr>
<tr>
<td>Supervision</td>
<td></td>
<td>13 (21.0%)</td>
<td>7 (12.7%)</td>
<td>20 (17.1%)</td>
</tr>
<tr>
<td>Work experience</td>
<td></td>
<td>6 (9.7%)</td>
<td>22 (40.0%)</td>
<td>28 (23.9%)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>62 (100%)</td>
<td>55 (100%)</td>
<td>117 (100%)</td>
</tr>
</tbody>
</table>

$\chi^2 = 41.390$  
df. = 7  
p-value = 0.0003
4.2.8 The Relationship of Training and Safety Deterioration

Similarly, the study sought the factors that brought about the safety deterioration. The finding showed that, trained respondents 45.2% chose lack of safety training compared to 25.5% of the untrained respondents who indicated the same. However, there was a significant association between training and the safety deterioration p-value = 0.026 < 0.05 (Table 4.13).

Results from the management (key informants) interviewed also indicated that rules and policies were acceptable where the workers were involved in the making and formulation process respectively; the usage of safety appliances was acknowledged and safety awareness among the workers increased. The labour officials, particularly, occupational health officers provided the number and location of the targeted factories. The officials indicated that training, as a requirement, was undertaken annually.

<table>
<thead>
<tr>
<th>Safety deterioration</th>
<th>Why safety deterioration?</th>
<th>Factory status</th>
<th>Total</th>
<th>Chi- square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TW</td>
<td>UTW</td>
<td></td>
</tr>
<tr>
<td>Ineffective job orientation</td>
<td>22 (35.5%)</td>
<td>16 (29.1%)</td>
<td>38 (32.5%)</td>
<td>$\chi^2 = 11.035$ df. = 4 p-value = 0.026</td>
</tr>
<tr>
<td>Lack of safety &amp; health training</td>
<td>28 (45.2%)</td>
<td>14 (25.5%)</td>
<td>42 (35.9%)</td>
<td></td>
</tr>
<tr>
<td>Limited professional training</td>
<td>6 (9.7%)</td>
<td>14 (25.5%)</td>
<td>20 (17.1%)</td>
<td></td>
</tr>
<tr>
<td>Long hours of work</td>
<td>6 (9.7%)</td>
<td>9 (16.4%)</td>
<td>15 (12.8%)</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>2 (3.6%)</td>
<td>2 (1.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>62(100.0%)</td>
<td>55 (100.0%)</td>
<td>117(100.0%)</td>
<td></td>
</tr>
</tbody>
</table>
4.2.9 Curriculum on Issues of Personal and Workplace Safety

4.2.9.1 Personal Safety

The study tried to find out whether curriculum was addressing human safety. Findings showed that majority 86% of the trained workers compared to 18.2% among the untrained respondents indicated that curriculum addressed their personal safety. Whereas untrained respondents (82%) had no idea. A significant relationship between then use of the curriculum and personal safety was realized (Figure 4.4).

![Figure 4.4: Relationship between training and whether curriculum addresses personal safety](image)

4.2.9.2 Workplace Safety

Similarly, 84% of the trained workers indicated that curriculum addresses workplace safety, while 18% of the untrained group did indicate that curriculum addressed their workplaces safety. A significant association between the use of the curriculum and workplace safety was established (Figure 4.5).
4.3 Discussion

Sven Ove Hansson and Christina Ruden (2008), in their research work found a wrong assumption to the effect that whenever the toxicity of a chemical was unknown, it was treated as having no or low toxicity. And according to Ngowi and Partanen, (2002) statistics on pesticide poisoning generated by a deficient Sub-Saharan African health care system is unreliable and the burden of pesticide-related illness and injury is difficult to determine. Supportively, Jukka Takala, the Director of the ILO Safe Work Programme said, the sad truth is that in some parts of the world, many workers probably die for lack of an adequate safety culture (ILO, 2005).

The study began by looking at the respondents’ demographic status, which showed majority 79.5 were males, therefore, a male’s domain; more 56.4% had secondary school, 28.2% college and 15.4% primary levels of education; majority of whom were
considered trainable and that with proper safety and health training, their understanding of their personal and workplace safety could well be improved. The majority of the respondents were machine operators whose major activity was the chemical processing and a daily working period of eight hours, as indicated in Table 4.1. It is within this period that accidents are likely to occur, hence a need for adequate training on safety.

The study findings indicated that, among the trained respondents 98.4% and 88.7% confirmed the existence of safety policy and safety rules respectively. But among the untrained respondents, 76.4% and 94% confirmed the existence of safety policies and rules respectively (Table 4.2). This is in line with, ILO, (2006), which requires each member state to formulate a national safety policy. Whereas, in Cal/OSHA-Guide, (2005), rules and procedures should be written for new exposures when they are introduced into the workplace. And GOK (2007) legally stipulates that the occupier of a work place having designed any procedure should have that procedure tested at regular intervals. Through interviews, the researcher similarly confirmed that although the trained group, in ideal situation, knew that the safety policy need to be formulated by management, supervisors and workers; it was as a matter of fact, a management affair.

The findings confirmed the existence of association between training and formulation of safety and health policy; p- value = 0.0001 <0.05 A higher number especially the trained group 82% indicated that the formulation of safety policy was a triad undertaking, that was, by the management, supervisors and workers, as indicated in table 4.3. But in reality, the ideal situation as found out during the researcher’s interview with supervisors and management staff, this was purely a management issue. Although supervisors’ training on safety was a common phenomenon as was asserted by the interviewees, this was found to be a management agenda, concerned mainly with the
safeguard of the facilities and its machinery. The workers Right to participate in the planning of health policy and to approve the provision and ownership of personal protective appliances if encouraged would enhance safety practice.

It also confirmed significant association between the training and workers’ perception on the popularity of safety and health policy; 87.1% and 23.6% of trained and untrained workers respectively concurred that the existing policies were popular (Figure 4.1). A significant relationship between training and workers’ perception on the usefulness of safety rules was found because trained respondents (92%) compared to untrained respondents (51%) indicated that rules were useful (Figure 4.2). Supportively, OSHA, (2007) confirmed that training is one of the most important elements of injury prevention programme because; in addition to allowing employees to learn their job properly it brings new ideas and finally reinforces existing ideas and practices. BS OHSAS, (2007) reaffirms that organizations are increasingly concerned with achieving and demonstrating sound occupational health and safety performance by increasing stringent legislation that foster good occupational health and safety practices.

Most trained workers 92% as compared to 53 % of untrained workers use medium categories of safety mechanism (figure 4.3). The training reinforces the need for use of the available personal protective devices, as was found in the research done by Carol, (2008) on chemical workers, that those who have been trained showed higher usage. An indication that the existence of chemicals within the working atmosphere is not ascertained. As result some substances such as carbon monoxide and carbon dioxide which are product of combustion, in concentration form in inhaled air, is sufficient to cause diminution in oxygen levels and render the affected workers disoriented hence vulnerable to injuries such as cuts, falls, burns and collapse. It was established that while
majority of untrained workers used safety mechanism either for their personal interest or personal safety, the trained respondents used safety mechanism as a result of safety and health training (Table 4.4).

A significant reduction of accidents - 86% for minor and 100% for major accidents was noted among the trained as compared to a meager reduction of 18% for minor and 17% for major accidents among the untrained group as shown in table 4.6. Therefore, the occurrence of accidents would remain high wherever the training was not encouraged. It was also observed that all factories visited had accident register duly filled inline with the occurrence of a particular accident/injury as indicated in table 4.7. According to ILO, (2005) it is reiterated that every day; on average, some 5,000 or more women and men around the world lose their lives because of work related accidents in the development world. However, a research done by Otieno, (2000) in Babadogo industrial area Nairobi, found that accidents were major occupational health problem among factory workers. The trend of a decline in accidents during the years 2007 and 2008 existed among the trained group.

The result showed significant association between training and safety improvement, p-value = .0002 < .05 (table 4.11) and safety deterioration, p-value 008 <.05 (Table 4.12). Therefore, to foster safety improvement and discourage safety deterioration regular safety and health training need to be maintained by all chemical factories.

Finally the study showed a significant association between training and the use of curriculum contents in respect to personal and workplace safety, p-values = .0002 < .05 and 0004 < .05 respectively (Figure 4.4) and Figure 4.5). As a safeguard, AOSH (2009)
emphasized that employee who makes workplace safety and a health complaint is protected from employer’s retaliation.

The training, as a legal requirement, is undertaken annually, and whoever hadn’t taken the training in his/her current employer might have taken the training with his/her previous employer.
CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction
This chapter outlines the implications of the study findings; and gives conclusions based on the research findings, recommendations and suggestions.

5.2 Summary of Findings
The influence of training on the existing safety and health policies; participation in the formulation and popularity of safety policies; use of safety mechanism; accidents/injuries’ occurrence and reduction; improvement and deterioration of health and safety was established. And finally, the training curriculum had significant association with both personal and workplace safety. It was also found that the training had no significant association with the provision of rules. It was ascertained by the researcher that, for the survival of any factory, the rules must be put in place with or without safety training.

5.3 Conclusion
The study set out to determine the effects of safety and health training in the reduction of accidents/injuries among workers of chemical factories in Nairobi.

The first objective was to find out whether there were safety policies and rules. The study finding indicated that the trained respondents (98.4), compared to untrained (76.4) were aware of the existence of safety policies at their workplaces. Regarding rules, 88.7% of trained respondents compared to 94% of untrained respondents indicated that safety rules existed.
The second objective was to establish the influence training had on health policy formulation process, usefulness of safety rules and use of safety appliances. The findings established that there was higher participation, in the policy formulation process, among the trained respondents (82%) compared to 20.8% of the untrained group. The policy was popular to 87.1% amongst the trained respondents as compared to 54.7% of untrained respondents. The trained respondents (92%) indicated that the rules were useful but the untrained respondents (49%) said the rules were not popular. As for safety appliances, the majority of the trained respondents (92%) employed medium category comprising body protective and respirators, but 47% of untrained respondents employed low category, that was, body protection without respirators. Only 5% among trained stratum employed maximum protective appliances compared to none amongst the untrained stratum.

The third objective was to explore any association between training and change in the occurrence of accidents/injuries, accidents/injury’s reduction, safety improvement and safety deterioration. The findings of the study showed that there was a significant relationship between training and the change in the occurrence of accidents/injuries (Table 4.4). The drastic drop in the number of accidents/injuries was shown following safety and health training, particularly in major accidents/injuries. There was minimal decrease in the change and occurrence of accidents/injuries as shown by factories without training. The pesticides factories had the highest number of accidents/injuries whilst fertilizer factories had the least of cases in both trained and untrained strata as shown in figures 4.7 and 4.8. Most 51.6% of trained stratum chose safety training as responsible for the existing safety improvement in their workplaces. There was significant relationship between training and safety improvement. Whereas, 45.2% of the trained stratum indicated that lack of safety training brought about the existing safety
deterioration in their workplaces. Significant association between training and safety deterioration was established.

The curriculum as part of safety improvement had significant association with training because 86% of the trained stratum indicated that curriculum contents were addressing personal safety. 84% of the trained respondents said that curriculum contents were addressing their workplace safety. Evidently, the significant association between training and the studied variables and in accidents’ registers is attributable to awareness-cum-empowerment training.

Testing of the null hypothesis (H₀) that there was no association between training and accidents/injuries reduction was done through computation of Pearson’s chi-square statistics. The result showed that there was significant association between training and accidents/injuries reduction p-value = 0.0004 < 0.05. Likewise, the null hypothesis that there was no change in the occurrence of accidents between trained and untrained workers was tested, and an association between training and occurrence of accidents was established p-value = 0.0002 < 0.05. The trend as observed by the researcher during the years 2007 and 2008 showed significant decline of accidents among the trained respondents compared with a meager decline among the untrained respondents in the year 2008.
5.4 Recommendations

i. The right to participate in the policy formulation process by workers is enforced.

ii. Maximum category of protective appliances should be acquired for use by workers

iii. Safety and health training be undertaken for both enhancement of accidents/injuries’ reduction and creation of safety culture at work.

5.5 Suggestions for Further Research

i. It is suggested that research be done to determine the relationship between accidents/ injuries and work performance.

ii. Further research also is suggested to study the nature of association between accidents/injuries and job loss

iii. It is suggested that further research to be done to determine practical measures that can be used to improve the utilization of safety and health training.
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6.0 APPENDICES

Appendix 1

6.1 Questionnaire for Chemical Processing Workers.

IN RESPECT TO: - EFFECTS OF SAFETY AND HEALTH TRAINING ON ACCIDENTS’/ INJURIES’ REDUCTION, AMONG WORKERS OF CHEMICAL PROCESSING FACTORIES IN NAIROBI

This schedule must be treated with confidentiality. It will not be used for any other purpose other than the one it is intended for, that is, for training purposes.

Date……………………..

A. Socio- demographic information

1. Name of your factory  (Name coded)……………………………………

2. Sex of respondent

   : 1. Male
   : 2. Female

3. Educational level

   : 1. None
   : 2. Primary
   : 3. Secondary
   : 4. College / University

4. Occupation of respondent

   : 1. Supervisor
   : 2. Mechanic
   : 3. Machine operator
   : 4. Others (specify)………………………………………………

5. Work specification

   1. What are your daily activities?

      : 1. Operating machines
      : 2. Processing chemicals
      : 3. Packing chemicals
      : 4. Supervision of work
      : 5. Others (specify)………………………………………………

   2. How long do you remain working in chemical handling area daily?

      : 1. 4 hours
      : 2. 6 hours
      : 3. 8 hours
      : 4. Others Specify …………..

6. Place of residence

   : 1. specify…………………………………………………………...
B. Safety and Health Policy

1. Is there safety and health policy?
   - 1. Yes
   - 2. No
   - 4. Others (Specify) …………………………………………..

2. Who participate in the formulation of Safety and Health Policy?
   - 1. Management alone
   - 2. Management and Supervisors
   - 3. Management, Supervisors and Workers
   - 4. Others (Specify) ……………………………………………

3. Is health policy popular among the workers?
   - 1. Yes
   - 2. No
   - 4. Others (Specify) …………………………………………..

4. Does the company provide you with specific safety rules and regulations?
   - 1. Yes
   - 2. No

5. If yes; do you find them useful during your working period?
   - 1. Yes
   - 2. No
   - 3. If No; state reasons …………………………………………..

C Safety Mechanism

1. Which personal protective appliances do you use?
   - 1. Dust coats
   - 2. Aprons
   - 3. Headgears
   - 4. Gloves
   - 5. Protective boots
   - 6. Face mask
   - 7. Chemical monitoring appliances
   - 8. Breathing apparatus Specify ……………………………..
   - 9. Others Specify ……………………………………………

2. What prompts you to use these personal protective appliances?
   - 1. Order from management
   - 2. My personal interest
   - 3. As a result of safety and health training
   - 4. Others (specify) ……………………………………………

D Types and occurrence of accidents /Injuries

1. The following minor and major accidents/injuries were common
   - 1. Minor: (quantify) ……………
   - 2. Major: (quantify) ……………
2. The following minor and major accidents /injuries are still common.
   : 1. Minor: (quantify) ....................
   : 2. Major: (quantify) ....................

3. After the training; is there any change in the occurrence of these accidents /Injuries?
   : 1. Yes
   : 2. No

4. If yes, what is this change?
   : 1. The decrease in occurrence of accidents / Injuries
   : 2. The increase in occurrence of accidents / Injuries
   : 3. Others (specify) ............................

5. If the change is the decrease in occurrence of accidents / Injuries, in your view, what brought about this decrease?
   : 1. The professional training
   : 2. Workers’ effort
   : 3. Safety and health training
   : 4. Supervision
   : 5. Others (specify) ............................

E.1. Have you been trained on safety and health?
   : 1. Yes
   : 2. No

F. What has brought about safety improvement in the workplace?
   : 1. Safety and health training
   : 2. On the job training
   : 3. From professional training
   : 4. Work experience
   : 5. Supervision on usage of safety gears
   : 6. Others (specify) ............................

G. What has brought about safety deterioration?
   : 1. Lack of safety and health training
   : 2. Ineffective job orientation
   : 3. Limited professional training
   : 4. Limited supervision
   : 5. Long hours of work
   : 6. Others Specify ............................

H. Curriculum (Safety and Health Training) Coverage, for safety improvement
1. Does the curriculum address your safety and health?
   : 1. Yes
   : 2. No
   : 3. If No state reasons ............................

2. Does the curriculum address workplace safety?
   : 1. Yes
   : 2. No
   : 3. If No state reasons ............................
Appendix 2

6.2 Check List

Name of factory (coded)............................

Date...................................................

Is there safety policy?
: 1. Yes
: 2. No

Is there workplace safety and health committee?
: 1 Yes
: 2 No

Which chemicals are in use? ..........................
........................................................................

Are the workers protected?
: 1. Yes
: 2. No

Do the workers wear personal protective appliances all the time?
: 1 Yes
: 2 No

Do the employees report unsafe condition and accidents/injuries to their supervisors?
: 1. Yes
: 2. No

Do the supervisors initiate immediate action(s) to correct unsafe conditions acts?
: 1. Yes
: 2. No

Are records of past accidents available?
: 1. Yes
: 2. No

Which accidents/injuries are common? ..................
........................................................................

Do the available records show an increase of accidents/injuries?
: 1. Yes
: 2. No
Is the workplace tidy?
  : 1 Yes
  : 2 No

Are there safety posters/health fairs etc to promote health and safety?
  : 1. Yes
  : 2. No

Is there certificate of registration of a workplace from the Directorate of OSHS?
  : 1. Yes
  : 2. No

When was the last safety and health training undertaken?
(Specify) ……………………………………………………………

Which firm carried out the safety and health training?
(Specify)…………………………………………………………
…………………………………………………………
Appendix 3

6.3 Focus Group Discussion (PGD) Guide

I would like to inform you (respondents) that your participation in this study is very important. Your awareness of safe workplace would be ascertained and this will be beneficial to you since safety and health training enhances such awareness. The information obtained will be used only for the purpose of this study and will not be divulged to any other unconcerned persons.

The following questions need to be honestly answered: -

1) What do you think safety and health training is for?
2) Are there benefits workers acquire from this training?
3) How do you consider your personal participation on: -
   • The making of safety rules?
   • The formulation process of factory policies?
   • Procurement of personal protective appliances?
4) How frequent would you like the training be done?
Appendix 4

6.4: Key Information Interview Guide

A. Factory Management

1) What is the source of the existing safety rules and safety policies?
2) Do you involve your workers in the making of rules and the policy formulation process?
3) Do you involve your worker in sourcing for personal protective appliances?
4) What was gained in the last safety and health training?

B. Ministry of Labour Officials- Occupational Safety Officers

1) Which chemical factories are registered with your office?
2) Where are they (chemical factories) situated within Nairobi?
3) Which ones have had safety and health training in the years 2007 and 2008?
4) Do factories request for such training on their own?
Appendix 5

6.5: Map of Nairobi City showing Industrial Establishment