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HACETTEPE UNIVERSITY
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OCCUPATIONAL HEALTH AND SAFETY STATUS IN KAMUKUNJI JUA KALI MICRO AND SMALL SIZED METAL ENTERPRISES

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Occupational Health Program
Masters' Thesis

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THESIS SUPERVISOR
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APPROVAL PAGE

Department	:	**Occupational Health and Occupational Diseases**
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This study has been accepted and approved as a Master of Science thesis in the program of Occupational Health by the Examining Committee, whose members are listed below.

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APPROVAL

This thesis has been approved by the committee above in conformity of the regulations and by laws of Hacettepe University Graduate Programs and has been accepted by the Board of Directors of the Institutes of Health Sciences.

Prof.Dr. Ersin FADILLIOĞLU
Institute Director

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DEDICATION

This document is dedicated to all those who have contributed historically to the betterment of workers' health, those who are doing so now and to those who will keep pursuing the noble task until the achievement of safe and decent work for all.

ABSTRACT

Keitany K.K. Occupational health and safety status in Kamukunji *Jua kali* micro and small sized enterprises. Hacettepe University, Institute of Health Sciences, Department of Occupational Health and Occupational Diseases, Master of Science Thesis for Occupational Health Program, Ankara, 2014. The study aimed to give an overview of occupational health and safety situation in Kamukunji *Jua Kali* enterprises' area, Nairobi: workplace characteristics, socio-demographic features and working life characteristics of the employers and employees, health and safety practices, hindrances and possible solutions to improve occupational health and safety conditions. Data was collected from 222 workplaces, 88.8% participation rate was achieved. A descriptive study design was implemented. Three types of questionnaires were used in data collection: Workplace assessment form filled by the researcher, employer questionnaire, and an employee. Most enterprises (81.9%) had some or all of tasks done in open air, 63.8% had inadequate working space, and a mean of 3.48±1.9 employees per enterprise. The most common hazards were mechanical and sharp objects (99.5%), and noise (98.2%) and heat (78.6%); hazard control measures were inadequate. Most of the respondents were male (99.1% of employers and 76.8% of employees). The employers' and employees' mean ages were 44.7±5.2 and 29.8±5.4 respectively. 98.6% of employers worked actively in the enterprise beside managerial duties. Health and safety audit not carried out in over 97.2% of enterprises. Over 94.0% of respondents acknowledged presence of hazard in workplace with over 73.8% reporting headaches, muscular pains in the shoulder and neck as health effects resulting from work. Planning difficulties (26.8% employers), inadequate support from the government were listed as serious hindrances by majority (32.3% employers, 88.7% employees), over 60% of employees also considered lack of information on health and safety as serious obstacle to safety and health. This study concludes that there are quite a lot of hazardous exposures in the *jua kali* SME sector with low health and safety practices. There is need for better OSH services and more focused analytical and interventional researches.

Key words: occupational health and safety, micro and small enterprises, metal enterprises, workplace hazards

ÖZET

Keitany K.K. Kamukunji *Jua Kali* bölgesinde mikro ve küçük ölçekli metal işletmelerinde faaliyet gösteren işyerlerinde iş sağlığı ve güvenliği durumu. Hacettepe Üniversitesi Sağlık Bilimleri Enstitüsü, İş Sağlığı ve Meslek Hastalıkları Anabilim Dalı, İş Sağlığı Programı Yüksek Lisans Tezi, Ankara, 2014. Çalışmada, Nairobi' de bulunan 'Kamukunji *Jua Kali'* işletmelerinin; işyeri özellikleri, sosyodemografik yapıları, işçi ve işverenlerin çalışma yaşamı özellikleri, iş sağlığı ve güvenliği uygulamaları ile bu alandaki gelişimin önündeki engeller ve muhtemel çözüm önerileri hakkında genel bir bakış açısı sunmaya odaklanılmıştır. Veriler 222 işyerinden toplanmıştır. Bütün sorular tamamıyla yanıtlanmasa da çalışma yüksek katılımla gerçekleştirilmiştir (% 88,8). Tanımlayıcı tipte çalışma planlanmış ve yürütülmüştür. Veriler üç tip anket kullanılarak toplanmıştır: Araştırmacı tarafından doldurulan çalışma ortamının değerlendirilmesi anket, işveren anketi ve işçi anketi. İşletmelerin büyük bir kısmında (% 81,9) işlerin bir kısmı ya da tamamı açık alanda yapılmaktadır, %63,8' inde çalışma ortamı elverişsizdir ve işletme başına ortalama 3,48±1,9 işçi çalışmaktadır. İşyerlerinde en sık karşılaşılan tehlikeler %99,5 görülme yüzdesi ile mekanik tehlikeler ve sivri nesneler, %98,2 ile gürültüdür. Tehlikelerin kontrolü için yapılan ölçümler yeterli değildir. Çalışanların çoğu erkektir (% 99,1 işveren ve% 76,8 işçi). İşveren ve işçilerin ortalama yaşları sırasıyla 44,7±5,2 ve 29,8±5,4' tür. İşverenlerin %98,6'sı yöneticilik işlerinin yanında işyerinde aktif olarak çalışmaktadır. İşletmelerin %97,2' si denetim görmemiştir. %94' ün üzerinde katılımcı; baş ağrısı, omuz ve boyundaki kas ağrılarının %73,8'in üzerinde işyeri ortamından kaynaklandığını bildirmişlerdir. Çoğunluk tarafından (%32,3 işveren, % 88,7 işçi) planlama güçlükleri, devlet desteğinin eksikliği, %60'ın üzerinde işçi tarafından iş sağlığı ve güvenliği konusundaki bilgi eksikliği sağlık ve güvenlik önünde ciddi engeller olarak görülmektedir. Bu çalışma *jua kali*' de KOBİ sektöründe düşük iş sağlığı ve güvenliği uygulamaları ile çok sayıda riske maruz kalım olduğunu ortaya koymaktadır. Bu alanda daha iyi iş sağlığı ve güvenliği hizmetleri sunulması, analitik ve girişimsel çalışma yapılmasına ihtiyaç vardır.

Anahtar kelimeler: iş sağlığı ve güvenliği, metal işkolu, küçük ve orta ölçekli işletmeler, işyeri ortam faktörleri.

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LIST OF ABREVIATIONS

DNA	Deoxyribonucleic Acid
DOSHS	Directorate of Occupational Safety and Health Services
EU	European Union
EUR	Euro (currency)
FCAW	Flux core arc welding
GDP	Gross Domestic Product
GMAC	Gas Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
HAVS	Hand-arm-vibration syndrome
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
HOT	Hazard Observation Tool
HTV	Hand transmitted vibration
ILO	International Labour Organisation
IR	Infrared
KES	Kenya Shilling (currency)
KJKA	Kamukunji Jua Kali Association
MAC	Maximum Allowable Concentration
MAG	Metal active gas welding
MIF – IADB	Multilateral Investment Fund of the Inter-American Development Bank
MIG	Metal inert gas
MMA	Manual metal arc welding
MSEs	Micro and Small sized Enterprises
OHS	Occupational health and Safety
PAW	Plasma arc welding
PPE	Personal Protective Equipment
SAW	Submerged arc welding
SD	Standard deviation
SMAC	Shielded metal arc welding

SMEs	Small and Medium sized Enterprises
T.C.	Türkiye Cumhuriyeti
TIG	Tungsten inert gas
TVL	Threshold Limit Value
UNDP	United Nations Development Program
USD	United States Dollar
UV	Ultraviolet
VOC	Volatile organic compound
WBV	Whole body vibration
WHO	World Health Organisation

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1. INTRODUCTION AND OBJECTIVES

1.1. Introduction

Work is very important for development and the wellbeing of people. Unfortunately almost every aspect of work has some form of risk to individual's safety and health. Developments in occupational health and safety over the years have focused on improving the conditions in which men and women work as well as promoting the provision of health services so as to meet the needs and the expectations of workers, and provide an assurance for their safety and health. However, despite the progress achieved, there are still significant variations in occupational health and safety performance levels and disparities among different countries, economic sectors, and based on the size of enterprises (1).

Access to occupational health services among the working population approaches 100% in developed countries but as low as below 3% in the developing countries. The coverage is generally lower in developing countries and large emerging economies particularly in small enterprises, among the self-employed, and in agriculture and the informal sector. (2).

Kenya is one of the developing countries with a high proportion of the working population working in the informal sector and small-scale agriculture. (3). Out of a population of over 38.9 million people, occupational health and safety services can be accessed only by about 4% of the working population. (2).

The Small and Medium Sized Enterprises (SMEs) have gained significant attention over the recent years and are thought to be playing a more significant role in the growth of strong economies as well as promoting social advancements; this is achieved through the generation of more employment opportunities which increases the capacity towards the achievement of rapid economic growth (4). The sector is growing fast in Kenya with Micro and Small Enterprises (MSEs) employing 42% of the working population, and accounting for 75% of all modern establishments in the country as at 2011 (3). The small enterprises encounter more problems and challenges as compared to the large establishments in dealing with occupational health and safety matters. (5).

Most of the SMEs start with low capital, are characterised by small scale operations in both production and service delivery. They use old equipment, outdated production processes while at the same time face difficulties on technical innovativeness, and low ability for safety interventions.

SMEs have also been noted to have weak basic management whereby the owner/manager is the key player and their opinion on health and safety matters maybe the final. (6, 7). The administration lack professional management skills, inadequate attention and lack of training on safety as well lacking professional safety management personnel. (8). Most of the owners and persons running these enterprises have limited knowledge on the safety law. They are therefore more likely to exploit and utilise all avenues towards economic prosperity than put emphasis on safety and may totally ignore to allocate recourses to health and safety activities. Other areas related to safety that may suffer from lack of adequate attention include investing on employees via technical training, purchase of safety and protective equipment, and upgrade as well as maintenance of tools and machines. (9).

Considering that a huge proportion of population is employed, and the possibility of long periods of time spent on this sector's workplaces, occupational safety and health is of significant importance. This research, therefore, sought to elucidate some of the health and safety problems encountered by people working in the sector and hopefully the outcome will aid in promotion of existing good practices the development of appropriate interventions where necessary. The study focused on getting the general health and safety status in Kamukunji *Jua kali* micro and small sized metal establishments;

The Kamukunji *Jua kali* enterprises were chosen for the study because it has an organisational structure in place with defined population and within it, a cluster of several micro and small enterprises.

1.2. OBJECTIVES

1.2.1. Specific short term objectives

Aim of this study is to;

1. Find out workplace characteristics and working conditions,
2. Find out the socio-demographic features and working life characteristics of the employers and employees,
3. Find out occupational health and safety practices in Kamukunji *Jua Kali* small and sized metal enterprises.

1.2.2. Long term objective

The long term objective of the study is to increase the understanding of the occupational safety and health condition in small businesses in Kenya especially in the metal sector; the current situation, point out areas of weakness with need for intervention, and practices that can benefit from positive reinforcement. This in the long run, hopefully will provide some guidance toward improvements in health and safety and foster economic productivity of in the small enterprises.

2. BACKGROUND INFORMATION AND REVIEW OF LITERATURE

2.1. Occupational Health

The main interest of occupational health is in obtaining an understanding of the interactions and relationship between human health and their work with the primary objective of achieving and maintaining the highest state of health while enhancing workers' productivity. Work is known to have a positive effect on peoples' health as it is the source of livelihood and social development. Work can also be detrimental to health through exposure to hazardous agents and unsafe working conditions resulting in occupational diseases, work related ill health and occupational accidents. The achievement of target product quality or desired level of service is hindered by workplaces' unsatisfactory health and safety conditions. Despite this close relationship between work and health, worker's health cannot solely be determined by workplace interactions but also by other factors: personal socio-demographic characteristics; social community out of workplace and the environmental factors that envelop the community; economic development, government policies and legislations among others. Therefore, with the understanding that a person's health is a result of a dynamic interaction of total life experiences, a holistic approach in occupational health is paramount.

"Occupational health is the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs." (10).

"Occupational safety and health (OSH) is generally defined as the science of the anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment." (11).

The main areas of interest are; the workplace environment, working conditions, organizational structure, workers and their social interactions. Focused interventions to improve safety and health in these areas enhance the wellbeing of the individuals and boost the productivity.

Occupational Safety focus on the immediate and short term occurrences associated with the workplace that can be detrimental to workers' health or put their safety at risk. Whereas, occupational health on the other hand is concerned with long term ramifications on health that occur due to workplace exposures: The health effects that may take days, months, a few years to several decades to manifest.

Occupational health and safety therefore, deals with both short term health risks as well as the delayed health ramifications that may arise several years later after workplace exposures.

There are some basic principles of practice in occupational health that if well observed aid in the achievement of the OHS targets:

2.1.1. Appropriate work placement;

Workers should be suited for the specific tasks that they are expected to perform at the workplace. Personal features like age, sex, physical strength, presence of any pre-existing medical conditions, level of education, personal habits among others should be put into consideration and balanced with the work demands. This is achieved through use of pre-employment medical examinations which assess the potential employees' fitness to carry out specific duties in the job description. The examination puts into consideration the person's personal, medical and occupational histories; physical examination; and laboratory investigations where necessary. This ensures that workers are well suited for the work they do therefore fostering their health, reduce the possibility of illnesses, accidents and injuries that could arise due to workplace exposures. Pre-employment medical examinations also contribute to a databank with a wealth of information on health of the employees. The information serve as a baseline for comparisons when there are changes in the health status at the course of employment or even later.

2.1.2. Evaluation of workplace environment factors;

Environmental factors in the workplace can affect negatively employees' morale, concentration, safety, health, and their productivity. These effects can be ameliorated through evaluation of the various factors in work environment. The evaluation process comprises identification of hazards in the work environment and

assessing the risk of negative outcomes (injury or illness) from the hazards. The factors to be looked into include but not limited to: physical agents (noise, temperature, vibration, lighting, radiation, and pressure); chemicals; dust; biological and infectious agents. Other areas of significance in evaluation are; working space, the quality of equipment, the layout of the working area, and the structures housing the work environment. Hazards in the workplace can be identified through literature on the particular workplace type and activities, asking for any possible hazards from employer, supervisor and workers; on site survey (walk through) at the working area; analysis of workplace data on accidents, injury, near misses, and illnesses; consultations with other interested parties like government agencies, workers' unions, and occupational health specialist. With guidance from occupational hygienist, the environmental factors should be measured and recorded and with the set standards e.g. Maximum Exposure Concentration (TVL: Threshold Limit Value), and Maximum Allowable Concentration (MAC), control measures can be put in place and further recommendations made.

The likelihood and the severity of harm caused by hazardous condition on agent are the two factors considered in assessing the risks posed by hazardous factors in work environment. Likelihood refers to a quantifiable probability of an adverse event (illness, injury, accident, or incident) occurring as a result of the hazard. When likelihood is very high, immediate interventions to control the hazard are highly recommended. Severity refers to the grading of the outcome of hazard exposure (the seriousness of injury, accident, illness, or incident). When the fatalities are many, the consequences are considered to be extremely severe. After determination of the risk level posed by a hazard, depending on the level of risk, it is then advisable to plan intervention (when necessary) and allocation of resources towards risk control and risk minimisation measures.

2.1.3. Control of workplace risks;

The risks at the workplace, based on the findings of risk assessment of individual hazards can be controlled by putting in place a series of preventive measures. The control measures are implemented in a hierarchy with priority at controlling the hazard from the source then later at the person level.

- The highest priority is elimination of risk from work environment;
- When risks cannot be eliminated, it can be attenuated by substitution of materials, equipment or processes with less hazardous ones;
- The third level is the engineering control focusing on isolating and protecting people from hazards;
- Administrative control targets the workers through education, training, work schedules (rotation) to minimise exposure to hazards.
- Utilization of Personal protective equipment (PPE) is least effective and lowest in the hazard control hierarchy. It is only adopted other control measures have been tried or cannot be put to use. The PPE include provision and proper usage of hearing protection, breathing masks, gloves among others.

After application of appropriate control measures, monitoring need to be carried out continuously to check for new hazards and ensuring that the measures put in place are constantly working well.

2.1.4. Periodic medical examinations;

Periodic medical examinations are to be done regularly where the frequency depends on the amount and type of hazardous exposures present at the work place as well as the susceptibility of the worker. Some duties may demand strict medical surveillance and therefore the need for detailed and frequent medical assessments. The aim of this examination is to look out for early changes in the body that might indicate onset of abnormalities and thus providing an avenue for prompt intervention which can help in preventing the development of occupational disease. In cases where disease might have already developed, early diagnosis is made increasing the possibility of full recovery on treatment and thereby also bringing down the expenditures on healthcare.

It is also useful in evaluation of existing preventive strategies as well offering a good opportunity for provision of health education and advice to the workers on issues pertaining to health and safety and the workplace risks.

Employers with the help of health and safety personnel can identify workers at higher risk or high exposures to hazardous agents at the time of initial employment and at the course of employment.

2.1.5. Provision of health services in workplace;

Occupational health services are more focused on preventive aspect than curative care, and meant to provide guidance to both employers and employees to establish and keep their workplaces safe and healthy. These services also provide an opportunity to ensuring that the employees are mentally and physically adapted to their work. That should in turn assist towards the achievement of optimal physical and mental wellness. (12). In addition to the preventive health services, basic curative care and first aid care should be provided to the employees. The types of health service required depend on legislative requirements, the size and nature of enterprise.

2.1.6. Health education and counselling

Health education is one of the most important fundamental principles of practice in occupational health that it can aid in ensuring and sustaining a health workforce. It is a key component in health promotion, enabling individuals in the workplace to understand what they deal with in the work environment, the consequences of the exposures and how to protect themselves from effects of the hazards. This therefore helps workers increase control over the factors that affect their health.

It first focuses on raising awareness about the health risks associated with hazardous substances, agents and processes in the workplace, the health effects and preventive measures. Considering the fact that people spent a third of their adult life at work, and keeping in mind that work and work environment affect the wellbeing of individuals and subsequently the whole community, it provides for a good setup for delivery of health education and advancement of health promoting activities. There are other factors outside the workplace that have an influence on the workers' health and therefore it is prudent to offer health education and counselling services on other determinants of health which may not be so related to the work or work

environment. Health education and counselling is beneficial to individual workers, enterprises and the community at large in that it helps in improving workers' knowledge and abilities in managing their health both in and out of the work environment.

2.2. Small And Medium Sized Enterprises (SMEs)

The small and medium sized enterprises (SMEs) are businesses, companies or establishments whose number of employees, income or asset base do not exceed specific limits. Classification of these enterprises has country, region and organization variations and their contribution to employment and economy varies considerably across countries

There are mainly three criteria that organizations and countries use to define a SME; the number of employees, total assets, and annual revenue. Most developed countries categorise establishments that employ 10-250 workers under SMEs while others set the upper limit at 500 employees, where as in developing economies organizations with over 250 are considered to be among the large firms.

Table 2.1 Classification of the SMEs by some leading international institutions (15).

Institution	Maximum number of Employed	Maximum Revenue	Maximum Assets
World Bank	300	USD 15,000,000	USD 15,000,000
MIF – IADB	100	USD 3,000,000	
African Development Bank	50	none	none
Asian Development Bank	Utilizes definitions from specific governments		
UNDP	200	none	none
EU	250	EUR 43,000,000	EUR 50,000,000

The European Union considers them as enterprises with less than 250 employees, overall annual asset that do not exceed EUR 43 million, while at the same time having annual turnover that do not exceed EUR 50 million (13). But

individual countries within the union have their own limits. Further classification has also been made to sub divide these enterprises into micro, small and medium sized; with less than 10 employees, 20-50 employees and 50-250 employees respectively (14).

SMEs are important engines of job creation and economic growth especially in developing economies and are therefore central in development. It is estimated by World Bank statistics that these enterprises contribute to over half of the GDP (51.5%) in developed countries with 13% being from informal sector. However, in developing economies the contribution to GDP is still low (15.6%), but majority (47.2%) of them operate in the informal economy (16).

2.3. Small And Medıum Enterprıses And *Jua Kali* Sector In Kenya

2.3.1. Introduction and definitions

The SMEs in Kenya are governed by the Micro and Small Enterprises Act, 2012; enacted by the National Assembly in 2012 and offer structural and legal guidelines for establishment and regulation as well as promoting the advancement the small enterprises.

The government of Kenya subsequently established Micro and Small Enterprise (MSE) Authority whose mandate is to oversee the implementation of the Micro and Small Enterprises Act which became law in January 2013 (17).

Micro enterprise is defined as an industry, trade, firm, service, or a business activity with annual turnover that is not more than KES 500,000 and/or with less than 10 employees. The act also sub-classifies some the enterprises under this cluster according to their capital and the sector of economy they operate in. The registered capital and input on equipment, machinery and the plant should not be more than KES 10 million for enterprises in manufacturing industry; and not more than KES 5 million for the enterprises that provide services and/or engage in farm activities.

A small establishment on the other hand has 10 to 50 employees, and its turnover annually range is KES 500 to KES 5 million. While on the basis of capital, asset and the sector of economy: the registered capital and input on equipment, machinery and the plant ranges from KES 10 million up to KES 50 million for

enterprises in manufacturing industry; whereas those enterprises that provide service and/or engage in farm activities the limit on assets and capital is from KES 5 million to KES 20 million.

The act also provides for the registered enterprises to come together in groups of not less than thirty five MSEs to form Associations that can access common services and mobilize resources to promote development of their members' enterprises. The associations can further form umbrella organizations.

Enterprises with 50 to 99 employees and a turnover between KES 5 million and KES 800 million are considered a medium-sized though not considered under the act of 2012 but by 2009 bill (17).

2.3.2. Significance and Distribution

Small and medium enterprises contribute significantly to the country's economy. The sector is very important in creation of employment opportunities and in turn aiding economic growth at the national level. Approximately 80% of the working population in Kenya was employed in this sector as of 2011 statistics. However, despite the high percentage of the population being absorbed for employment, the contribution towards GDP stood low at 20% (18). There has been a commendable growth in SMEs as compared to 1994 data where the sector employed about a third of the working population and making a contribution of 13% towards GDP.

Most of the MSMEs are in the informal sector. They are characterized by a wide range of diversity in activities. They are spread across all sectors of economy ranging from production and manufacturing to service industry. It was estimated in a survey done in 1999 that there were 1.3 million MSEs employing 2.3 million people. 73% represented those in the informal sector (18). These figures have since then been on the rise.

2.3.3. *Jua kali* the Informal Economy

The informal economy is commonly referred to *Jua kali* which is a *Swahili* word meaning 'hot sun'. This has been used to refer to the small businesses where a significant proportion of Kenyan population is involved in and often work in

challenging working conditions mainly in the open with no protection from the scorching sun. Those working in *Jua kali* engage in a wide range of activities and involve workers of different skills including but not limited to motor technicians, carpenters, wood and stone crafters, artisans vendors and street hawkers, shoe-makers and repairers. It also includes those in the agriculture, tailoring, hair-caring, textile trading, grocery and food shops, and dealers in electrical works, metal work, and masonry among others. Majority of those working in the sector are exposed to and lack protection form health hazards. They encounter difficulties raising capital, accessing healthcare, and have increased susceptibility to poor health owing to exposures in the workplace as well as due to the inadequacy of shelter from extremes of weather and natural calamities. Most of the enterprises' work environment is deficient of adequate safe drinking water, supply of electric power, drainage and sanitary facilities. The employees do not have adequate technical and safety training, insurance cover and social security services (19, 20).

In order to aid combat the challenges faced by these establishments; government, non-governmental organizations and the enterprises have put together their efforts towards the common goal of economic development and descent work.

There is formal recognition and positive affirmations of the important role played by the sector in generation of employment and its contribution towards economic advancement. There are efforts of integrating informal establishments into national economic plans, provision of financial support, and penning down of written policies and legislations to support the sector. With the support of donor societies and nongovernmental organizations, there have been interventions in technical training, provision of health insurance, research, product branding and marketing. Some enterprises come together to form associations that aid in supporting their cause.

2.3.4. Kamukunji *Jua kali* metal Enterprises

Kamukunji Jua Kali Association (KJKA) is an alliance comprising several business entities within the kamukunji area towards a common benefit of the whole community. It brings together more than 450 micro and small enterprises with over

5000 people working in these businesses[1]. The Association was founded in 1983 and officially registered in 1992. It has been supporting the Kamukunji *jua kali* workers in their businesses by providing representation, security, awareness campaigns and marketing of the *Jua Kali* products and services (21).

The group, though focused mainly on metal work activities, there are also business support services non-metal related work. The businesses can be placed in basic categories of: suppliers, producers, sellers, and service providers. The supplying businesses consist of hardware stores, paint stores and scrap metal suppliers. Producing businesses use these materials to create various metal products. The selling businesses buy the products from the producers and sell them to the customers. Most Kamukunji businesses combine production and selling in one business where more often than not the owner is responsible for the sales, while the employees do most of the production. In addition, there is also a services sector which provides foodstuffs, transportation, and sanitation. However, this kind of classification is not mutually exclusive since a single enterprise can be involved in more than one business process. Some of the specific activities include trading in metal raw material (both new and scrap metal sheets and rods), supply of cutting, grinding and folding materials, electric and gas welding equipment, and supply of paints and polishing materials. There is also a group of artisans concerned with production and maintenance of metal management equipment that are used to handle, cut, fold and reshape metal products. The leading category and most important are those involved in the manufacture of metal products; and are organised based on the final product they manufacture. There are a wide range of products some of which include wheelbarrows, sewing machine stands, chips and chaff cutters, metal boxes, energy saving cooking stoves and aluminium cooking pans, construction and building materials, agricultural and animal feeding equipment. There are subordinate processes in metal processing like heat treatment, cleaning of metal products and aluminium plating. Some people are involved in provision of welfare services, maintenance and promotion of sanitary environment (21).

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[1]Communication from Kamukunji Jua kali Association official

2.4. Characteristics Of SMEs

SMEs are numerous in number, accounting for 90% of businesses and more than 50% of employment worldwide (16). In Australia SMEs employ approximate of 3.5 million people which is nearly half of the workers and constitute approximately 97% of the total enterprises in Australia. (22). Small enterprises comprise 99.8% of all the enterprises in Turkey employing 76.7 % of the working population (23). In Kenya the registered micro and small enterprises are over 1.3 million and SMEs employ over 80% of the workforce (18). These enterprises are not only many but also widely dispersed and are represented in almost all sectors of the economy. This presents a huge difficulty to those responsible for inspection and enforcement of safety standards.

Small enterprises have low financial power and therefore may not afford services of health and safety advisors and other OHS services. They give priority to making a profit than on safety (8). These enterprises experience high occupational risks but their resources to control the risks are low.

They experience difficulty in recognising relevant regulations (24). In addition, they have difficulties interpreting regulations and therefore it is not easy for them to comply with the set rules and legal requirements for safe work environment (25). Both the employers and employees of SMEs often have low basic knowledge and minimal appreciation of the importance of workplace health and safety hence do not put effort in seeking further enlightenment on safety and safe practices (26-28.)

Majority of the SMEs are in the informal sector. This coupled by the small size of the enterprise lock them out of some of the protective occupational health legislations e.g. according to the Kenya OSH act, Health and safety committee is a requirement in only those establishments with 20 or more employees (29). This leaves those not covered by the legislations at the mercy of the enterprises' owners to assign individual worker(s) responsibility over health and safety matters in the workplace. Compliance with legislative demands is also complicated by the fact that most of small enterprises may not be legally registered.

There is high turnover of both enterprises and employees and several activities may be carried out in a single business with an employee performing more than one task. The high staff turnover affect the workers' competence as they don't

stay long enough to gain necessary experience. They perform different and often more than one tasks depending on the jobs available and the activities that need to be done even if they have no training on that field of duty.

The employees in the sector do not enjoy the benefits of collective bargaining power because they have very little or no representation in trade unions (14).

Close social relationships between the employer and the employees and use of family labour is common. The principal owners enjoy close relationship with the primary employees ranging from family ties, hailing from same neighbourhoods, mentor-mentee bonds and friendships. These close bonds are the ones that control and run the enterprises instead of administrative and managerial system. Health and safety issues are also handled by individuals rather than an established responsible body and often the employer and employees collaborate to meet the necessary supervisory checks and inspections by regulatory institutions irrespective of whether the conditions actually meet the required standards. The rules are used to keep the business afloat and not primarily focusing on the health and safety of the workers.

SMEs witness higher frequency of accidents but often trivialised hence under reporting and inadequate risk assessment and management (30, 31, 32).

SMEs lack strong administrative structure and may not have a separate administrative entity in the system for health and safety, and also have difficulties in record keeping. A survey carried out on 102 small workplaces in Sri Lanka showed that a functioning safety committee was available in 5 (4.9%) industries while workers trained in occupational safety and first aid, were present only in 18.6% (n = 19) and 23.5% (n = 24) of the factories respectively. Accidents were recorded only in 16 (15.7%) factories. Separate meal room and a changing room were available in 62.7% (n = 64) of the factories (33). Another study in Sri Lanka involving 743 workers in various sectors (food and beverages, apparel, fabricated metal product sector and non-metallic mineral product) in small enterprises (with less than 20 employees) showed that 71% were male, 6% of workers had a pre-employment medical examination and periodic medical examinations; 38% were using personal protective equipment, 47% reported that compensation claims were paid for accidents at the factory. 62% of the workers knew how to use a first aid box (34).

This sector is often characterised by long durations of work. A survey done in Kenya investigating how the small enterprises contribute towards household and national economy revealed that on average, the enterprises operated for 55 hours in a week. 67% worked for over 45 hours per week (35).

Employer and employee in these enterprises have low level of general education, limited knowledge on the safety law and inadequate training on safety and health. The entrepreneurs are therefore more likely to exploit and utilise all avenues towards economic prosperity than put emphasis on safety and sometimes totally ignore to allocate recourses to health and safety activities. Other areas related to safety that may suffer from lack of adequate attention include investing on employees via both safety and technical training, purchase of protective equipment, and upgrading and keeping tools and machines in conditions that work well (9).

The perception of risk by small enterprises is poor and easily accept high hazard levels considering them as part of what they have to face day to day in order to keep their enterprises up and running. This is often demonstrated by the fact that despite managers' demonstration of vast knowledge on hazards in their work environment, they fail to carry out risk assessment and management, and when audits are performed reveal extremely hazardous conditions (6, 36). There is also tendency to focus only on activities that have a direct effect on production like equipment maintenance and overlook those that have little effect on output like job rotation(9).

A survey carried out in small enterprises in Canada (103 manufacturing metal products and 120 in the garment sector) showed that health and safety committee as stipulated by the legislation was found only in 4.5% of the enterprises and mainly those with 25-50 employees. 37% of employers considered the cost to be an obstacle, and 30% thought that the lack of training, prioritising on production than safety concerns, and lack of time to be the barriers towards safety. Majority (69.9%) of the metal enterprises had 1-5 employees and did not have a written health and safety policy. (37).

Within the same country the incidence rate for workplace injuries in SMEs for the period 1995–1996, was 15.5% (38).

The larger SMEs however, enjoy the benefits of safety and good work environment just like big companies. A study done in Thailand (369) targeted

businesses with 20-299 employees dealing with high value export commodities found average work duration to be 8 hours per day (92.1%) and 47.2 hours per week. 98.6% had access to clean drinking water; 72.5% had a good hygienic places for eating; the sanitation was good with clean sanitary conveniences in 98.2% of the enterprises; 73.9% had areas for resting within the enterprises; and 77.9% provided work clothing to their employees. A plan for control and prevention of fire hazard was available among 85.7% of the enterprises. The common hazards were excess noise (66.1%), heat (51.4%) and monotonous job (44.3%). Over 92% had regular safety inspections, accident reporting and investigation, 87.1% had assigned safety responsibility. 73.9% of the enterprises had arrangements in place for the workers to be trained on workplace safety and health (39).

2.5. Health And Safety In Metal Industry

There are variety of activities, processes, raw materials, products and by-products in the metal industry. An understanding of what happens in the enterprises provides an insight towards the identification of the hazards present in the work environment. Knowledge on the happenings in a workplace guides in foreseeing possible incidents, diseases and injuries that may befall the workers. This information, in turn guide in planning and putting in place specific control measures for the prevention of work related ill health and injuries among those working in the metalwork sector. (40).

Some of the processes in the metal industry include but not limited to, "setting up and operating fabricating machines to cut, bend, or straighten metal; shaping metal over anvils, blocks, or forms, using a hammer; operating soldering and welding equipment to join sheet-metal parts; inspecting, assembling, and smoothing seams and joints of burred surfaces." (41).

Hazards in the work environment can be classified into five main categories: physical, chemical, biologic, ergonomic and psychosocial. Exposure to hazards may produce immediate or delayed response depending on the hazard's inherent characteristics, the intensity, frequency and duration of exposure as well as the exposed individuals' characteristics. The hazard characteristics are determined by the process type, process conditions and the environment in which they are generated.

The ILO has listed some of "the most common causes of injury and illness in the iron and steel industry: slips, trips and falls on the same level; falls from height; unguarded machinery; falling objects; engulfment; working in confined spaces; moving machinery, on-site transport, forklifts and cranes; exposure to controlled and uncontrolled energy sources; exposure to asbestos; exposure to mineral wools and fibres; inhalable agents (gases, vapours, dusts and fumes); skin contact with chemicals irritants (acids, alkalis), solvents and sensitizers; contact with hot metal; fire and explosion; extreme temperatures; radiation (non-ionizing, ionizing); noise and vibration." Other sources include electrical faults, pathological biological agents, and ergonomic hazards ranging from awkward postures, repetitive motions and manual handling of equipment and heavy loads.

The underlying causes however, are inadequate or lack training on health and safety, lack of clear policy on safety and health, poor organizational structure, inadequate proactive preventive measures, deficiencies in supervision, failure to carry out workplace audits and inspection. The limitations in provision of first aid and emergency care, poor access to medical services and social security are some of the challenges towards health and safety in the industry (40).

2.5.1. Physical hazards

The physical hazards include the extremes of temperature (heat and cold), noise, lighting, vibration, radiation and pressure.

Thermal conditions

Heat

Heat is commonly understood as high temperature. Risks come about in conditions where temperature and/or humidity are unusually high, exposure to high radiant heat. In addition, other factors that can increase the heat risk are; high rate of performance in the work process, and working under the cover of heavy protective clothing. Heat is a potential physical hazard in almost any work place and particularly in tropical climates. The body core temperature is normally regulated at 37 ± 0.5^{o}c and temperatures above 43^{0}C lead to failure of thermoregulation mechanisms.

The exchange of heat energy from one medium or object and the human body can occur through radiation, conduction, and convection. Heat balance between the human body and its surroundings can be expressed by the equation

$$S = (M \pm W) \pm R \pm C \pm K - E - RES \ [W/m2]$$

Where S is rate of heat storage, M is the rate of metabolic heat production, W is work performed, R, C, and K are gain or loss of heat by radiation, convection and conduction respectively, and E is heat loss by evaporation from skin and RES is heat exchange by respiration. This balance is affected by work performed and the rate of change in the store of heat in the body.

Heat stress refers to the net thermal load which a worker may be exposed whereas heat strain is the response both physiological and behavioural resulting from the applied heat stress.

When worker's physiologic capacity to compensate for thermal stress is exceeded, it results in impaired performance, increased risk of accidents, and clinical signs of heat illness. Discomfort results in mild forms of heat stress. Prolonged exposures to mildly hot environment may cause irritability, lassitude, decreased morale, increased anxiety and inability to concentrate. Increased exposure to heat can result in heat rash, heat cramps, heat exhaustion and finally heat stroke. (42).

Other consequences of extreme heat include cataracts, and aggravation of other medical conditions like cardiovascular and endocrinal disorders (43).

When heat cannot be eliminated, risk assessment and management is required to mitigate the safety and health consequences that can arise from extreme temperatures. It is important to eliminate the hazard or reduce the risks to the lowest practicable levels. Special consideration is made on work situations where there is increased risk of heat stress due to use of protective clothing against hazardous substances and where respiratory protectors are needed but less likely to be used because of discomfort.

Control of heat stress can be achieved by increasing the distance between the equipment and the exposed workers, reduction of surface temperatures through change of operational temperature, surface insulation and reduction of heat

emissions using radiation barriers between the surface and the working environment, water-cooling the hot surfaces, and use of portable reflective shielding. Other control measures include insulation and ventilation with cool dehumidified air, air conditioning and air movement, and evaporative cooling.

Worker selection is important to identify those with increased risk e.g. those with cardiovascular, renal, endocrine disorders, and those on low sodium diet. There is need for provision of sufficient time for acclimatization to a hot environment.

Training workers on the signs and symptoms and effects of heat and heat stress, preventive measures and emergency care is important. Use of work- rest plan in hot work environment is a feasible administrative control measure. Personal protective equipment such as gloves, aluminized reflective clothing, insulated cooling jackets can be used where appropriate.

Despite the utilization of all controls to prevent the negative consequences of high temperatures, there is always a remnant of background risk. Therefore, strict and continuous supervision of employees and look out for early signs and symptoms of heat stress in order to evacuate them from work environment as soon as possible when need be. There is also need for first aid equipment and trained competent personnel to carry out rescue activities and provide emergency care.

Cold

Cold stress arises when temperature is unusually low, high wind speed against a background of low temperatures. Working for long durations in a cold environment without protective clothing and use of bare hands increase the risk of cold stress.

Outdoor workers during cold weather are particularly at risk. Other workers affected include those working with liquefied gas and dry ice. The body responses to exposure to cold environment by reducing heat loss from skin surface by peripheral vasoconstriction and increasing metabolic heat production through shivering.

The health effects of cold include frostbite, trench foot, chilblains and general hypothermia. Body core temperature below $31^{o}C$ leads to loss of consciousness and death. Heat loss is accelerated if the body surface is wet. General hypothermia occurs in prolonged exposures to cold and physical exhaustion and commonly occurs in air

temperatures of between -1^{0}C and +10^{o}C but can also occur at air temperatures as high as 18^{o}C and 22^{o}C in water especially when there is fatigue. There is increased susceptibility to the effects of cold on people at extremes age, those with medical conditions like hypothyroidism, malnutrition and adrenal insufficiency.

Cold temperature diminishes the quality of work performed by hand especially when fine details are involved. Temperatures below 15^{o}C reduce the sensitivity of the fingers resulting in decreased manual dexterity and consequently increasing the risk of accidents. Handling of cold metal objects at work can result in local freezing and metal-skin adhesions.

Personal and environmental factors determine the control measures for thermal protection against cold. Appropriate control measures against cold are necessary to prevent its injurious effects especially to body extremities and maintenance of core body temperatures above 36°C. Personal factors include level of body activity which is related to metabolic rate, exposure duration, and clothing, whereas the atmospheric temperatures, environmental factors are ambient air temperature, wind velocity, radiant conditions and presence of precipitation. Where warm shelter is not available to eliminate the hazard, clothing is the most important means of protection against cold stress. In windy and wet environments clothing should be windproof and waterproof respectively. The impermeable clothing however may not be suitable for workers involved in intense physical activity to avoid accumulation of condensed water vapour beneath the waterproof layer. Absorbent material may be used on the under layer and the clothing be loosely fitted with openings around the neck and with inbuilt air vents. (44).

Total body protection against cold is required in work environments where temperatures are below 5^{o}C whereas at temperatures less than 16^{o}C provisions to keep hands warm are recommended if fine work is to be performed with bare hands (43).

Workers should be educated to recognize warning signs of cold injury and hypothermia such as pain in the extremities and severe shivering. (42).

Noise

Noise is unwanted sound. Sound perception result from rapid fluctuations in the ambient pressure caused by vibrating object or sudden expansion of gases.

The amplitude (sound pressure level) of sound pressure waves is measured in decibels (dB) representing loudness which is an indicator of change in the sound pressure wave relative to the ambient air pressure/reference pressure. Many tone frequencies of sound interact resulting in complex mixture of loudness and pitch of noise. Continuous/steady-state noise has relatively constant intensity. Intermittent/ fluctuating or interrupted noise has occasional drops in intensity. Impact or impulse noise is characterized by sharp bursts and decline of sound intensity.

The effects of noise exposure are determined by the noise level and frequency, duration of exposure and individual susceptibility. It can be nuisance resulting in disturbance, loss of sleep and fatigue. High noise levels with long exposure duration can result in noise-induced hearing loss. Noise may also interfere with communication resulting in nervous fatigue, distract attention and concentration, mask perception of verbal safety warnings, signals and alarms hence an increased risk of occupational accident and injury.

Other systems affected by noise include: cardiovascular (peripheral circulatory and heart problems, brood pressure), endocrine and immune system assumed to be mediated effects on autonomic nervous system. (45, 57).

Control focuses on elimination of noise producing machines and processes that are not necessary, then substitution with preference to those generating less noise. Barriers can then be employed through enclosure of the noise source, increasing the distance between worker and the source of noise. Appropriate personal protective equipment can then be utilised as final option. If verbal communication is difficult at arm's length because of noise, it is assumed, as a rule of thumb that potentially hazardous noise levels is present and hearing loss prevention strategies should be used. (42).

Workers should be educated on the effects that a noise on health and general safety and, symptoms of adverse effects of exposure to high levels of noise, the precautions necessary especially those requiring workers' intervention and the use of hearing-protection devices, need for regular audiometric testing, identification and

reporting on new or unusual sources of noise that they become aware of; and the role of audiometric examination. Workers should also be informed on non-auditory effects and social consequences of noise induced hearing loss (57)

Vibration

Vibration is mechanical oscillation of a surface around its reference point, and basically classified into whole body vibration (WBV) and segmental vibration. Main example is the hand transmitted vibration (HTV). Whole-body vibration exposure occurs when the body is supported on a surface that is vibrating e.g. on trucks, tractors and other transport vehicles, and when working near vibrating industrial machinery. Hand-transmitted vibration exposure results from various processes in which vibrating tools or work pieces are grasped, pushed by the hands or fingers.

Whole body vibration is associated with higher incidence of musculoskeletal, neurologic, circulatory and digestive (secretion and motility) system disorders. Low back pain, intervertebral disk damage, spinal degeneration, autonomic nerve dysfunction and slowing of peripheral nerve conduction have been also been associated with WBV. Other noted effects include bone abnormalities (intervertebral osteochondrosis, calcification of intervertebral disks), adverse reproductive effects (spontaneous abortion, congenital malformation and menstrual changes), and visual disorders at 60-90 Hz vibration (resonating frequency of the eyeballs) (42, 46).

Segmental vibration is associated with degenerative osteoarticular lesions in elbows and shoulders, and neurovascular syndrome; Hand-arm-vibration syndrome (HAVS)/ vibration white finger/ traumatic vasospastic disease. There is decreased hand sensation and dexterity, decreased grip and strength due to sensory and motor changes in HAVS and consequently interference in workers' performance.

Vibration of head or eyes, of displays themselves (both of which can affect the perception of displays); of body or limb can affect the manipulation of controls may result in increased risk of accidents and have a negative effect on productivity.

Vibration can be controlled by elimination or avoiding use of high risk tools, mounting vibrating machines on vibration isolators (anti-vibration mounts), and regular maintenance of vibrating tools because worn components may increase

vibration levels. Seating in vehicles and vibrating static machines should be designed to minimize transmission of vibration to the operator, and permit an ergonomically good working position.

Workers exposed to significant vibration hazards should be trained about the hazards and risks in use of vibrating tools, effects of vibration and control measures especially those within their control which can minimize risk e.g. proper adjustment of seating and working positions, correct handling and use of hand tools, and encourage early reporting of any symptoms.(40).

Non-ionizing and optical radiations

These are ultraviolet (UV), visible and infrared (IR) radiation. UV and visible portions of the spectrum produces photochemical reactions. In the IR region, all of the absorbed radiant energy is converted into heat. Exposure of the eyes to visible and IR radiation can cause thermal injury to the retina and damage to the lens, and can result in the formation of cataracts.

The sun's ray is the main source of Ultraviolet radiations and too much exposure can cause cancer. The other sources of these radiations are wielding processes, laser, plasma torches, fluorescent and incandescent light emitting equipment. Corneal and conjunctiva inflammations can occur due to eye exposures to ultraviolet radiations.

Exposures to electromagnetic radiations which are emitted by machines and equipment when electricity is conducted through them, may cause irritation of the skin, alterations in mood, changes in reproductive and immune system, cardiac activity, as well as causing brain cancers. (47).

2.5.2. Chemical hazards

Chemicals hazards in the work environment can be solids, liquids, gases dust, fumes, mists, vapours, and small and fine particulate matter. These substances can cause health problems when ingested, inhaled or upon absorption via skin. Others can produce adverse effects on the body surface in form of irritation and burns. These chemical agents include metals, acids, alkali, and solvents.

The hazardous chemicals encountered by metal workers arise from the processes they are involved in; welding, torch cutting, soldering, brazing, grinding resulting in exposures to nickel, lead, chlorinated compounds, iron, manganese, cadmium, copper, zinc, aluminium, chromium, and tungsten.(40, 48). These exposures cause wide range of health problems which include sub-acute toxic effects of lead, neuropathy, nasal septum cancers from nickel and hexavalent chromium exposures.

Fumes may contain lead, cadmium, zinc and other welding fumes. Proper usage of welding helmet can help in reducing exposure to welding fumes by up to 71% **(**49).

The pigment used in metal coatings (paints, varnishes, lacquers, enamels, putties and shellacs) can be avenues of lead, cobalt, cadmium, zinc, and chromium exposures. (50).

Solvents that are utilised in painting and coating processes often contain alcohol, esters, glycol, ketones, aromatic as well as aliphatic hydrocarbons, many of which are flammable, explosive and carcinogenic to humans.

The acids and heated alkaline solution that are used to treat and clean metal cause irritations on mucous membranes and skin. These solutions have inherent caustic and corrosive characteristics which can cause serious eye injuries (51).

Dust exposures occur in grindings, cleaning of dry earthen floors, cement-clay mixing and from general environmental pollutants. These include silica, asbestos, and kaolin; most of which are associated with lung pathologies- silicosis and asbestosis.

Some of the mists encountered in the metal industry result from the various chemicals used in cleaning, treatment and protection of metal surfaces from oxidative processes and include those of chromic acid, sulphuric acid, alkali and oil mists.

Vapours that can be of concern in metal processes are mercury and solvent vapours- Volatile organic compound (VOC)

Gases range from carbon monoxide, hydrogen cyanide, hydrogen sulphide and oxides of nitrogen. When soldering process utilizes ammonium chloride solders,

hydrochloric acid and ammonia gases are emitted, exposure to these results in irritations of the airway.

2.5.3. Biological Agents

Bacteria: Clostridium tetany, Legionella pneumophila

Fungi: Moulds which are present virtually everywhere where there is moisture and organic material. Exposures occur via inhalation of contaminated air, consumption of contaminated food and touching infected materials. (52).

Parasites: Mites which can cause extreme discomfort and infestations

Vectors that include mosquitoes, houseflies, rodents, ticks

Others in biological category include snakes, spiders and scorpions and other animals.

2.5.4. Unfavourable weather conditions

Severe weather conditions can present in diverse range of events such as extremes of temperature, high ultraviolet index from direct sun's rays, thunderstorms, lightning, flooding from heavy rains, and wind. These situations can occur anywhere and take many forms, threatening the safety of the workforce. Extreme weather conditions cause lost time and site closure, but worse, they can put workers health and safety at risk.

The ultraviolet index which is an indicator of the strength of UV radiation from the sun are of high concentrations over equator and high mountains. The intensities of the radiations are also modified by other factors including ozone concentration in the stratosphere, cloud cover, reflective characteristic of surfaces, and altitude. The health effects of exposures to UV radiations vary from simple skin sunburn to accelerated skin ageing, eye cataracts, immunosuppression, skin cancers and other damages to DNA (53).

Table 2.2. Health hazards in welding processes (50*).

Welding Process	Hazards
Gas welding and cutting	
Welding	Metal fumes, nitrogen dioxide, carbon monoxide, noise, burns, infrared radiation, fire, explosions
Brazing	Metal fumes (especially cadmium), fluorides, fire, explosion, burns
Soldering	Fluxes, lead fumes, burns
Metal cutting and flame gouging	Metal fumes, nitrogen dioxide, carbon monoxide, noise, burns, infrared radiation, fire, explosions
Gas pressure welding	Metal fumes, nitrogen dioxide, carbon monoxide, noise, burns, infrared radiation, fire, explosions
Flux-shielded arc welding	
Shielded metal arc welding (SMAC); "stick" arc welding; manual metal arc welding (MMA); open arc welding	Metal fumes, fluorides (especially with low-hydrogen electrodes), infrared and ultraviolet radiation, burns, electrical, fire; also noise, Ozone, nitrogen dioxide
Submerged arc welding (SAW)	Fluorides, fire, burns, infrared radiation, electrical; also metal fumes, noise, ultraviolet radiation, ozone, and nitrogen dioxide
Gas-shielded arc welding	
Metal inert gas (MIG); gas metal arc welding (GMAC)	Ultraviolet radiation, metal fumes, ozone, carbon monoxide (with CO_2 gas), nitrogen dioxide, fire, burns, infrared radiation, electrical, fluorides, noise
Tungsten inert gas (TIG); gas tungsten arc welding (GTAW); heliarc	Ultraviolet radiation, metal fumes, ozone, nitrogen dioxide, fire, burns, infrared radiation, electrical, noise, fluorides, carbon monoxide
Plasma arc welding	Metal fumes, ozone, nitrogen dioxide, ultraviolet and infrared

(PAW) and plasma arc spraying; tungsten arc cutting	radiation, noise; fire, burns, electrical, fluorides, carbon monoxide, possible x rays
Flux core arc welding (FCAW); metal active gas welding (MAG)	Ultraviolet radiation, metal fumes, ozone, carbon monoxide (with CO_2 gas), nitrogen dioxide, fire, burns, infrared radiation, electrical, fluorides, noise
Electric resistance welding	
Resistance welding (spot, seam, projection or butt welding)	Ozone, noise (sometimes), machinery hazards, fire, burns, electrical, metal fumes
Electro-slag welding	Burns, fire, infrared radiation, electrical, metal fumes
Flash welding	Electrical, burns, fire, metal fumes
Other welding processes	
Electron beam welding	X rays at high voltages, electrical, burns, metal dusts, confined spaces
Arcair cutting	Metal fumes, carbon monoxide, nitrogen dioxide, ozone, fire, burns, infrared radiation, electrical
Friction welding	Heat, burns, machinery hazards
Laser welding and drilling	Electrical, laser radiation, ultraviolet radiation, fire, burns, metal fumes, decomposition products of work piece coatings
Stud welding	Metal fumes, infrared and ultraviolet radiation, burns, electrical, fire, noise, ozone, nitrogen dioxide
Thermite welding	Fire, explosion, infrared radiation, burns

*Source, Philip A., Lyndon G., Welding and thermal cutting, ILO Encyclopaedia of Occupational Health and Safety, 4th ed. http://ilocis.org/documents/chpt82e.htm#JD_Table82.6

Evaluation of hazard exposures in a scrap metal recycling facility by use of hazard observation tool (HOT) and self reported exposures showed that employees tend to report their exposures to hazardous agents higher as opposed to the findings

observed by specialists. The workers' self report also rated higher the use of control measures to counter the hazards when compared to the realities as noted using HOT. The leading exposures according to HOT (N=677) were noise (71%) and awkward working positions (77%) and repetitive motions (66%). Self reporting among the workers (N=46) revealed noise, dust/fumes (91% each) and repetitive motion (83%) as the common exposures. The study recommended need for interventions on health and safety control measures because the workers were highly exposed to various hazards **(**54).

The third European working conditions survey of 2000 pointed out that craft workers experienced high exposures of noise (84%), vibration (59% at least quarter of the time, 25% all the time), and inhalation of fumes, dust and gases (66% over at least a quarter of the time). Painful and tiring positions noted in 92%, moving or carrying heavy loads in 79% of these workers at least a quarter of the time in the workplace. **(**55).

A study on small sized enterprises carried out in Tanzania in 1996 showed that over 90% of workers, based on self reporting findings, were exposed to fumes, noise, sun's radiation, and dust (N=310 workers). Among the professional work groups, 101 were welders, 86 painters and 61 metal workers. The same study demonstrated poor usage of risk control measures and cited lack of personal protective equipment as the main reason for occupational health problems. (56).

2.6. Health and safety in Kenya

Management of Occupational health and safety in Kenya is anchored in the ministry of Labour, under the Directorate of Occupational Safety and Health Services (DOSHS). The directorate has 71 professional OSH officers. However, there are other OSH officers who work in the private sector. There are 49 active registered safety advisers, 30 fire safety auditors, 38 designated health practitioners, and many other professionals such as plant examiners involved in the OSH sector. Master's degree and postgraduate diploma courses are offered by one local university but there are other 75 institutions that offer OSH training for safety and health committee members and help raise awareness on workplace health and safety (65). The government of Kenya has enacted legislation that provides guidance, rules and

regulations on health and safety: *The Occupational Safety and Health Act, 2007* (revised in 2010) (29).

Despite the achievements made in OHS especially in policy and legislation, there are still quite a number of challenges towards achievement of occupational health for all targets:

- Occupational health services are not adequately integrated into all levels of the country's healthcare system, and this makes it difficult to recognize or manage occupation-related conditions, diseases and ill health. A Basic Occupational Health Services (BOHS) programme which will involve local municipal health centres and clinics in generating data, and in recording any suspected occupational disease, accident or illness is still in the planning stages.
- Majority of the people (8.8 million) are employed or self-employed in the informal sector and only about 2 million employed in the formal sector. There is also high number of unregistered small workplaces (approximately 1.3 million).
- Limited number of OHS professional against a large number of workplaces. The DOSHS, with 71 professional OSH officers, is not capable of inspecting the estimated 140,000 workplaces (registered) effectively, and this leaves most workers exposed to OSH hazards without intervention. Low staff levels also mean that reporting and notification of occupational accidents cannot be adequately analysed.

Table 2.3. Statistics for occupational diseases diagnosed in Kenya, 2010–2011

Type of Hazard	Number of workers examined	Number of workers with occupational diseases
Adverse temperatures	241	2
Asbestos fibres	5	1
Cotton dust	446	11
Organic dust	808	16
Fossil fuels	90	29
Noise	3229	118
Organophosphate and other pesticides	1243	39
Repetitive manual work	13	1
Respiratory: solvents	29	1
Silica dust	52	3
Welding alloys	67	1
Total	6223	222

- Low level of literacy and knowledge on safety. Low awareness among employers, worker and other stakeholders of the requirements for recording and notification
- Limited knowledge of occupational medicine of most medical practitioners and more focus on prevalent infectious diseases, and other causes of morbidities.
- Lack of published data on occupational accidents and diseases based on industry type;

Some of the legislative demands significant to this study are found in; part II – The general duties. It requires the employer to ensure the safety, health and welfare at

work of all persons working in his workplace. This is to be achieved through the following duties of the employer:

- Provision of information, instruction, training and supervision as is necessary to ensure the safety and health at work of every person employed
- Ensuring safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances
- Ensuring that every person employed participates in the application and review of safety and health measures
- Carry out appropriate risk assessments in relation to the safety and health of persons employed and, on the basis of these results, adopt preventive and protective measures.
- Ensure a thorough safety and health audit of his workplace to be carried out at least once in every period of twelve months by a safety and health advisor,
- Notify the area occupational safety and health officer of any accident, dangerous occurrence, or occupational poisoning or death in workplace.
- Keep a workplace register which in it include every accident and case of occupational disease

The duties of the employee include:

- Ensure his own safety and health and that of other persons who may be affected by his acts or omissions at the workplace;
- Report situation which would pose a hazard and which he cannot correct.
- Report accident or injury that arises in the course of or in connection with his work

Part VI of the act gives guidance on the general provisions on health which include cleanliness, overcrowding, ventilation, Lighting, drainage of floors and sanitary conveniences. Part VIII provides general safety guidelines in which it dictates that necessary steps be taken to ensure that workstations, equipment and work tasks are adapted to fit the employee and the employee's ability including protection against mental strain; and that machinery, equipment, personal protective equipment, appliances and hand tools used in all workplaces shall comply with the

prescribed safety and health standards and be appropriately installed, maintained and safe guarded. The same part also gives directives for fire control, control of air pollution, noise and vibration.

Part X concerns welfare in the workplaces. Provision of easily accessible safe drinking water is required for all employers as well as sitting facilities that give workers opportunity for rest that may be needed at the course of work. They should also provide and maintain a readily accessible first-aid box or cupboard of the prescribed standard.

Parts XI of the act give directives concerning workplace with hazardous exposures and working with machines: dictates protection of workers under 18 years of age; training of employees at recruitment, change of tasks or on introduction of new technology; provision of personal protective equipment; and medical surveillance. (29).

Definition of terms*

Adequacy of work space: "space of sufficient size for work to be carried out with ease and with necessary free space, and having regard to the nature of the work, an adequate amount of air for each employee. The minimum permissible being ten cubic metres per person (space more than four point five metres from the floor shall be taken into account, and, galleries not part of this space. workroom shall be not less than three metres in height, measured from the floor to the lowest point of the ceiling or, where there is no ceiling, to the lowest point of the roofing material."

Employer: Any physical or legal person that employs one or more workers. Used interchangeably with enterprise owner in this study.

Exposure: The amount of a workplace agent that reaches an individual worker.

Hazard: The inherent potential to cause physical injury or damage to the health of people.

Health and Safety Audit: A systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which defined safety and health criteria are fulfilled.

Occupational accident: An unexpected occurrence, including acts of violence, arising out of or in the course of work which results in a fatal or non-fatal occupational injury.

Occupational disease: Disease known, under prescribed conditions, to arise out of exposure to substances or dangerous conditions in processes, trades or occupations, including but not limited to those specified in the List of Occupational Diseases.

Occupational health services: Preventive and curative services meant to provide guidance to both employers and employees to establish and keep their workplaces safe and healthy and guide towards ensuring that the employees are mentally and physically adapted to their work, and achievement of optimal physical and mental wellness.

Recording: A procedure, specified in Kenya national laws and health and safety regulations, for ensuring that the employer maintains information on: occupational accidents and diseases; dangerous occurrences and incidents.

Reporting: A procedure, specified by the employer, in accordance with national laws and regulations and with the practice of the enterprise, for the submission by workers to their employers, then to specified person or body on behalf directorate of OSH, of information on: occupational accident or injury to health which arises in the course of or in connection with work; suspected cases of occupational diseases; dangerous occurrences and incidents.

Worker: Any person who performs work, either regularly or temporarily, for an employer. Used interchangeably with employee in this study.

Workplace: Area where workers need to be, or to go to, on the instruction of an employer to carry out their work.

Work-related injury: Any personal injury resulting from an occupational accident.

Work-related ill health and diseases: Negative impacts on health arising from exposure to chemical, biological, physical and organizational factors at work.

*Some of the definitions used for the study include adoptions (wholly or in-part) and modifications from Kenya legislations (Mainly Occupational safety and

health act); and from international labour organisation’s directives, conventions and recommendations.

3. METHODOLOGY

3.1. Study area

The study was carried out in Kamukunji *Jua Kali* enterprises' area, Nairobi. The area is in Nairobi County; Kamukunji District, Pumwani Division, Kamukunji Location, Kamukunji Sub-location, Sakwa Road. The area covers approximately 2 hectares and is located to the East of Nairobi's Central Business District (CBD). It is a business centre for about 450 enterprises with approximately 5,000 workers. Its location is within a walking distance from the Nairobi Central Business District (CBD) through Kirinyaga, Landhies and then Sakwa roads.

3.2. Study design

A descriptive study design was utilized.

3.3. Study population

The study population included all metal enterprises (461) in Kamukunji *Jua Kali* area under the umbrella of the Kamukunji Jua Kali Association (KJKA). The employees and the employers in the selected enterprises were enrolled in the study.

3.4. Inclusion criteria

The enterprises registered with KJKA, employers who were members of Kamukunji Jua Kali Association with active enterprises in the site for one month and over at the time of study and were willing to participate were included in the study.

The employees that had worked for at least one month in the Kamukunji *Jua Kali* plant and were willing to participate in the study.

3.5. Exclusion criteria

The study excluded workplaces that were not involved in metal work those not registered under Kamukunji Jua Kali Association;
People not employed or employers in enterprises in Kamukunji *Jua Kali* area;
Those who had worked for less than one month in the study area;
Those who declined to fill in the questionnaire or objected to participate in the study.

3.6. Research Method and Sampling criteria

The sample size was calculated by the formula;

$$n = \frac{N\ x\ p\ x\ q\ x\ (Z_{\alpha/2})^2}{(N-1)x\ (E)^2 + p\ x\ q\ x\ (Z_{\alpha/2})^2} x\ (1 + NRR)$$

n: sample size

N= Population size (assumed 450)

$Z_{\alpha/2}$: Critical value for desired confidence degree (1.96 for 95%)

p: Proportion of estimated results (assumed 50%)

q: 1-p

NRR= Non-response rate (assumed 20%)

E= Desired error rate (assumed 5%)

n=208*1.2=250

A random sampling method was used. Target workplaces were picked randomly by choosing a workplace from the Kamukunji Jua Kali Association register which contains about 3000 registered members owning businesses in metal work, 461 of whom were located within the study area. Those with enterprises within the study area (461) were listed down and each assigned a number 1-461. A random number generator on Ms Excel was then used to generate 250 out of the 461 numbers. A total of 250 workplaces were selected based on the random numbers that were generated. With the help of three Kamukunji *Jua Kali* Association's officials and four trained data collection research assistants, questionnaires were distributed to the selected enterprises.

Employees present at the day of data collection, within the specific enterprises, and had worked for at least one month were enumerated and each assigned a number between 1 and the maximum number of employees at that time. A random number generator was used to select one employee. The employer and selected employee were then given their appropriate questionnaires to fill with the aid of a data collection research assistant. The principal researcher, over a 2-5 minute

period for each enterprise, did a quick assessment of the workplaces (hazard observation) and filled the workplace assessment form.

The data collection was done between 3rd of April 2014 and 2nd of May 2014.

3.7. Study variables.

Enterprise's:

- **Type of work environment** (open; no roof, no walls/ no structure housing the workers, closed; enclosed in a structure/housed with both roof and walls, partially enclosed; structure present with only roof but no walls, and mixed type; some workers on the open while others under a building);
- **Adequacy of the working space**, (adequate; sufficient size for work to be carried out with ease and with necessary free space, and with regard to the nature of the work, an adequate amount of air for each employee. The minimum permissible is $10m^3$ per person. workroom not less than three metres in height, measured from the floor to the lowest point of the ceiling or, where there is no ceiling, to the lowest point of the roofing material. Space more than 4.5 metres from the floor and galleries not part of this space);
- **Number of employees**;
- **Main activities at the enterprise**;
- **Hazards in the workplace** (lighting, noise, thermal conditions, ergonomic, electrical appliances, chemical and biological hazardous agents, exposure to extreme weather conditions). The hazard's presence and potential to cause injury was graded on a scale of 0-5; where 0=not present, 1=present, very low magnitude 2=low risk, 3=moderate risk, 4=high risk, 5= very high risk. Exposures rated on a scale of 0-5 (0= Not exposed 1=very low, 2=low, 3=moderate, 4=high 5= very high). The noted hazards were further subjectively characterised into 'magnitudes' based on their potential to cause injury or ill health and the possible extend of injury (1=low magnitude, 2= moderate, 3=high magnitude; Those of high magnitude had inherent capability to cause severe injuries within short durations of exposure). Exposure to the hazards were rated on a scale of 0-5 (0= Not exposed 1=very

low, 2=low, 3=moderate, 4=high 5= very high) in reference to the workers present in the establishments;

- **Adequacy of sanitary conveniences and sanitary conditions** (subjective self report by employers and employees);
- **Presence and adequacy welfare amenities** (food cafeteria, safe drinking water);
- **Use of hazard control measures** (0= none available 1=Never used, 2= almost never used, 3= around half the time, 4= almost always used, 5= used always);
- **Presence of fire control equipment**; any
- **Presence of first aid equipment**; any
- **Whether pre- employment and periodic medical exams are a requirement**;
- **Presence of system for recording accident and ill health** ;
- **Presence of system for reporting workplace accidents;**
- **Whether workplace audit by health and safety advisor in the past one year;**
- **Presence of person(s) responsible for health and safety;**
- **Whether risk assessment and management done in the last one year**.

Enterprise owner/manager's and employees'

- Age;
- Sex;
- Marital status;
- Highest level of education attained;
- Total duration of employment;
- Duration of employment in current enterprise;
- Whether s/he actively works in the enterprise (employers only);
- Type of work done currently;
- Number of work hours in a day;
- Number of working days in a week;
- Presence of personal health insurance cover;

- If not insured, reason for not having a medical insurance;
- Whether had industrial/work training on the current type of work done;
- Whether has had health and safety education,
- Whether had general health education and its topics;
- Whether had periodic medical exam;
- Involvement in workplace accident;
- Personal history occupational diseases and/or work relate ill health;
- Information on presence workplace hazards and types present in the enterprise;
- Obstacles to improving safety and health in the workplace. A scale of 1-5 used (1= Not a problem, 2=Minor problem, 3= Moderate barrier, 4= serious barrier 5=Very serious barrier);
- Suggestions to improving health and safety. A scale of 1-5 (1 = Not a priority, 2 = Low priority, 3 = Medium priority, 4 = High priority, 5 = Essential) was used to indicate priority.

3.8. Pilot study

A pilot study to test the data collection tools was carried out between 27th March and 2nd of April 2014. This targeted 20 work places but received responses from 18 of the selected workplaces, the employer and an employee. Kamukunji's nearby enterprises operating along Ahero Street, Bondo street, and Sakwa road, with similar workplace conditions, were targeted for the pilot study.

3.9. Data collection tools

Three types of questionnaires were utilized for the study (Appendix 1).

1. Workplace assessment form with 7 lead questions filled by the researcher;
2. Employer questionnaire with 34 questions was administered to the employers;
3. Employee questionnaire with 31 lead questions was administered to the employees.

3.10. Data collection analyses and report writing

After the pilot study, minor revisions on the questionnaire (addition of numbers to be marked based on modification of Likert scale) were made. Then the main data collection was carried out in April-May 2014 as stated previously.

3.11. Data analysis

Data entry and analyses were carried out in May through June and subsequently report writing in from June to August the same year. Data analysed using the SPSS Inc. Released 2006. SPSS for Windows, Version 15.0. Chicago, Illinois (Customer no: 114094). MS Word and MS Excel 2007 programs were also used to organize and report the findings. Pearson chi-squared and McNemar Test used to compare some of the findings between the employees and employers. The data collected on socio-demographic features' variables and attributes organized in the normal, ordinal and ratio levels of measurements and also analysed for central tendencies.

3.12. Data presentation

The data is presented by means of conventional tables, charts and different types of graphs and in form of report written in prose.

3.13. Ethical Considerations

Written permission to carry out the study was acquired from the leaders of Kamukunji *Jua Kali* association (Appendix 2). Individual participants assured of the confidentiality of the information collected, and that it was to be used only for purposes of scientific research. Consent from the participants in the study was also sought. No participants' names were recorded. The outcome of the study hopefully will be of used to the benefit of the study population through promoting their health and safety in their respective workplaces.

Ethical approval was obtained from Hacettepe University Ethical committee (Appendix 3).

Table 3.1 Kenya's working population (3).

population	Figures and percentages
Total population	38.6 million(2009 census), 44millon (2012 approximate)
Working population (15-64years)	19.2 million (2012), 47.5% of total population (year 2012)
Formal employment	19.5% of working pop.
Unpaid family labour	0.7% of working pop.
Informal sector*	79.8 of working pop.
Employment to population ratio (working pop.)	69% (year 2009)

*Most of the Micro and small enterprises are in the informal sector: In 1999, they contributed 88.6% of all enterprises and 60.7% were operating without licence; a sample of 2500 MSEs in 2008 showed that 72% were not registered.

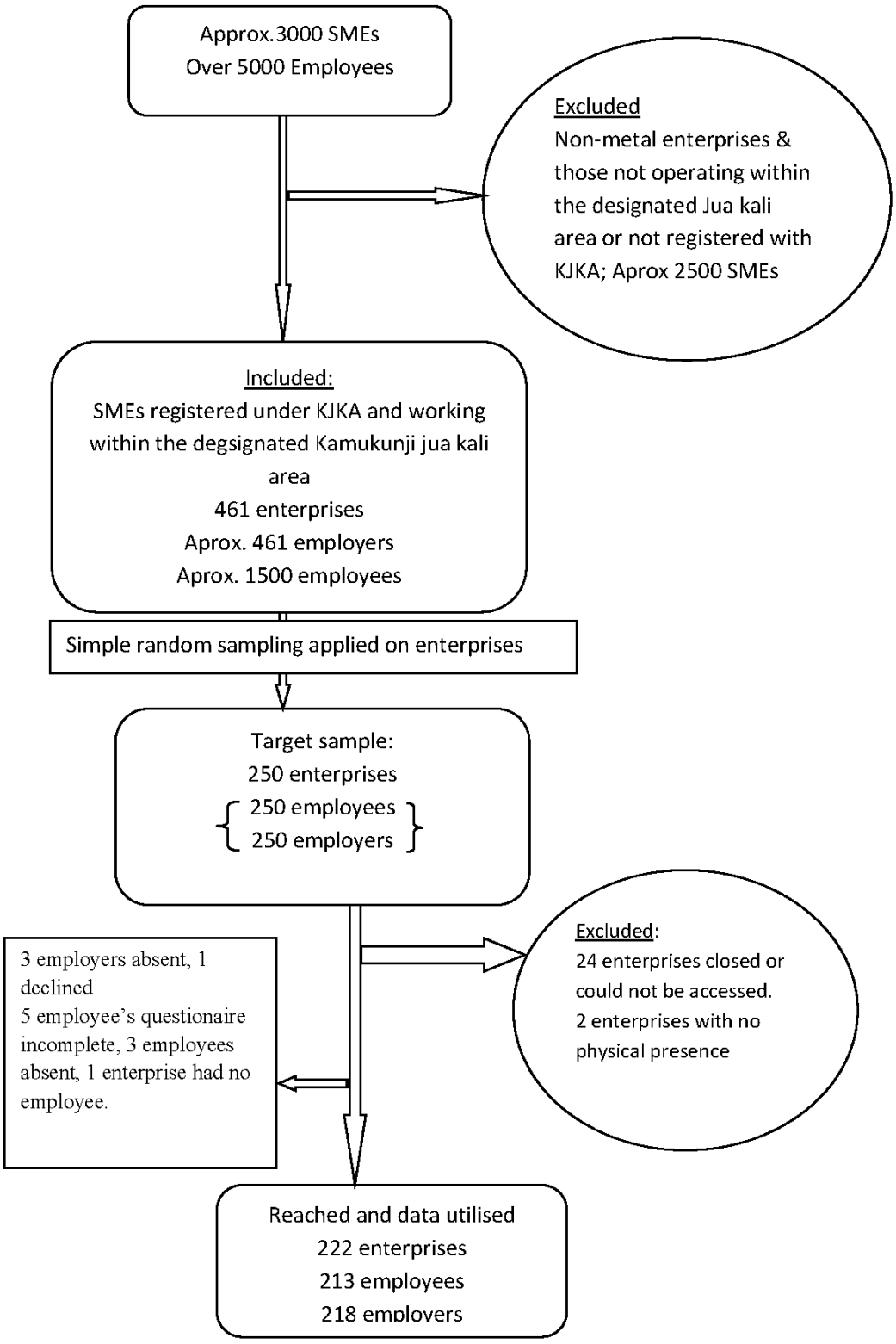
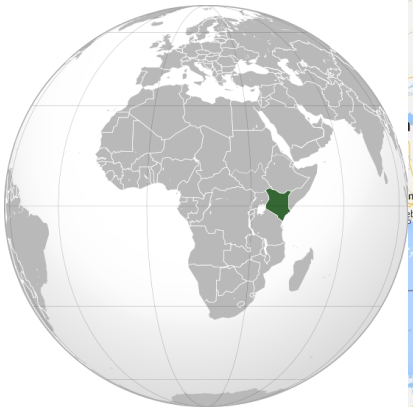


Figure 3.1 Flow Diagram: Data collection in Kamukunji *jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)



Location of Kenya in Africa and Kamukunji Jua Kali area in Nairobi.

4. RESULTS

Data was collected from 222 workplaces, 213 employees, and 218 employers within the Kamukunji *jua kali* small and medium sized metal enterprises. The response rate of 88.8% from a target sample size of 250 workplaces. Reflective sample was 208 workplaces of 461 KJKA enterprises. However, some of the questions were not fully answered and this will be noted in the differences among the sum totals in the analysis of various variables.

4.1. PART I: Workplace Assessment

Information on 222 workplaces was collected by the researcher through a brief walk-through survey.

Table 4.1.1. The type of workplace in Kamukunji jua kali micro and small metal enterprises (Kamukunji, Nairobi 2014)

Type of workplace	Frequency	%
Open	63	28.5
Closed	24	10.9
Partially enclosed	16	7.2
Mixed	118	53.4
Total	221	100.0

63 (28.5%) of the workplaces open (No roof, no walls/ no structure housing the workers), 24 (10.9%) closed (Enclosed in a structure with both roof and walls), 16 (7.2%) partially enclosed (structure present with only roof but no walls) and 118 (53.4%) mixed (some workers on the open while others under a building). (Table 4.1.1).

The size of work environment was adequate in 79 workplaces (36.2%) and inadequate in 139 workplaces (63.8%), (Table 4.1.2)

Table 4.1.2. Adequacy of work environment space in Kamukunji jua kali micro and small metal enterprises (Kamukunji, Nairobi 2014)

Size/space of work environment	Frequency	%
Adequate	79	36.2
Inadequate	139	63.8
Total	218	100.0

Table 4.1.3. Activities carried out in Kamukunji jua kali micro and small metal enterprises (Kamukunji, Nairobi 2014)

Type of activity	n	%*(N=222)
Soldering and welding	68	30.6
Folding and rolling metals	64	28.8
Painting	38	17.1
Cutting and grinding	103	46.4
Lifting and transporting materials	120	54.1
Marketing and sales	68	30.6
Others**	12	5.4

*Row percentage

**Other activities include cleaning of the final products, pickling, aluminium coating, metal heat treatment, cement-clay mixing and using to make inner lining of energy saving stoves, and riveting.

The activities carried out were soldering and/or welding (68 enterprises, 30.6%), folding and/or rolling of metals (in 64 enterprises, 28.8%), painting (38 enterprises, 17.1%), cutting and/or grinding of metals (103 enterprises, 46.6%), marketing and sales (68 enterprises, 30.6%), and other activities (12 enterprises, 5.4%). (Table 4.1.3).

Activities carried out in Kamukunji Jua Kali (from top left): cutting metal sheet; painting; cutting and folding of metal sheets; pickling of the final products; heat treatment, moulding, folding and cutting; aluminium coating; heat treatment, and folding metal rods.

The physical hazards observed included thermal hazards (heat in 78.6% workplaces, cold in 56% of workplaces), noise (98.2%), optical radiation (79.1%) of the workplaces, unsuitable lighting (86.4%), vibration (59.1%), electrical (71.4%), weather (85.9%), and other mechanical and sharp parts and objects (99.5%) that can cause injury.

Some of the chemical hazards noted in the workplaces were generalised into metals (93.7% of the workplaces), solvents in (82.7% workplaces), dust (88.2%), and gases (81.1%).

Ergonomic hazards were observed to present in forms of manual lifting and/or carrying materials (95.9% of the workplaces), working in awkward or uncomfortable postures (96.4% of the workplaces), and repetitive motions (93.6% of the workplaces). Biological hazards were thought to be possibly present in 85% of the workplaces (Table 4.1.4).

The noted hazards were subjectively characterised into ‘magnitudes’ based on their potential to cause injury or ill health and the possible extend of injury. Those of high magnitude had inherent capability to cause severe injuries within short durations of exposure. Those identified to be of high intensity were Noise, heat, metals, manual handling, and mechanical and sharp metal parts (Table 4.1.4, Figure 4.1.1)

Among the enterprises where hazardous agents were present, the exposure to the hazards were rated on a scale of 0-5 (0= Not exposed 1=very low, 2=low, 3=moderate, 4=high 5= very high) in reference to the workers. Later it was clustered into Low, moderate and high as shown in Table 4.1.6. Exposure to heat was low (78%), moderate (11%) and high in 11% of 173 enterprises where heat hazard was present. 83.2% had minimal control measures and 0.6% adequately controlled heat exposure. 87.5% of the 56 enterprises with cold hazard were of low exposure rate. Of all the exposures assessed, noise (50.9%), working in uncomfortable postures (42.5%), and mechanical and sharp parts (43.8%) were the leading with higher numbers of moderate or high exposure rates. Exposures rating for most of the hazards were low: heat (78.7%), cold (87.5%), unfavourable weather (94.7%), Radiation (68.4%), lighting (86.6%), vibration (88.5%), electrical (91.1%), chemicals (>85.5%), as well as ergonomic (>57.5%), and biological hazards (98.4%). There were inadequate or lack of hazard control measures in most of the enterprises for almost all the hazardous exposures assessed (Table 4.1.5, Figure 4.1.2).

Table 4.1.4. Hazard observation; Hazards identified and their estimate magnitudes in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

N=220 Physical hazards	Present		Low magnitude	Moderate	High magnitude
	n	%*	%*	%*	%*
Heat	173	78.6	31.8	7.3	39.5
Cold	56	25.5	12.7	9.5	3.2
Extreme weather conditions	189	85.9	58.6	24.1	3.2
Noise	216	98.2	11.8	31.4	55.0
Optical Radiation	174	79.1	65.5	7.7	5.9
Unsuitable lighting	190	86.4	75.9	8.2	2.3
Vibration	130	59.1	45.5	3.6	10.0
Electrical	157	71.4	47.3	10.0	14.1
Mechanical and sharp parts	199	99,5	12.7	50.9	35.9
Metals	214	97.3	22.7	3.6	70.9
Solvents	182	82.7	37.3	38.2	7.3
Dust	194	88.2	46.4	36.8	5.0
Gases	180	81.8	73.6	5.0	3.2
Manual Lifting and/or carrying	211	95.9	43.2	3.6	49.1
uncomfortable postures	212	96.4	22.7	58.6	15.0
Repetitive movements	206	93.6	25.5	54.5	13.6
Biological agents	187	85.0	50.5	34.1	0.5

*row percentage (N=220)

Table 4.1.5. Exposure to hazardous agents and use of control measures in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014).

Hazard	N	Exposure			Control measures	
		Low[a] n(%*)	Moderate n(%*)	High[b] n(%*)	Inadequate n(%*)	Adequate n(%*)
Heat	173	135(78.0)	19(11.0)	19(11.0)	144(83.2)	1(0.6)
Cold	56	49(87.5)	5(8.9)	2(3.6)	29(51.8)	-
Extreme weather conditions	189	179(94.7)	7(3.7)	3(1.6)	22(11.6)	-
Noise	216	106(49.1)	39(18.0)	79(32.9)	65(30.1)	2(0.9)
Optical Radiation	174	119(68.4)	32(18.4)	23(13.2)	87(50.0)	8(4.6)
Unsuitable lighting	190	165(86.8)	16(8.4)	5(4.7)	15(7.9)	-
Vibration	130	115(88.5)	11(8.5)	4(3.0)	25(19.2)	-
Electrical	157	143(91.1)	9(5.7)	5(3.2)	100(63.7)	2(1.3)
Metals	214	168(78.5)	32(15.0)	14(6.5)	198(78.5)	4(1.9)
Solvents	182	139(76.4)	23(12.6)	20(10.0)	198(78.5)	1(0.5)
Dust	194	172(89.2)	11(5.7)	10(5.1)	67(34.5)	5(2.6)
Gases	180	154(85.5)	16(8.8)	10(5.5)	8(4.4)	1(0.6)
Lifting and/or carrying	211	161(76.3)	29(13.7)	21(9.9)	77(36.5)	-
uncomfortable postures	212	122(57.5)	40(18.9)	50(23.6)	57(26.9)	-
Repetitive movements	206	128(62.1)	36(17.5)	42(20.4)	55(26.7)	1(0.5)
Biological agents	187	184(98.4)	2(1.1)	1(0.5)	166(88.8)	2(1.1)
mechanical and sharp parts	219	123(56.2)	27(12.3)	69(31.5)	165(53.5)	4(1.8)

[a] 'low' is a cluster of never exposed and almost never exposed; [b] 'High' is a cluster of almost always exposed and always exposed; *row percentages

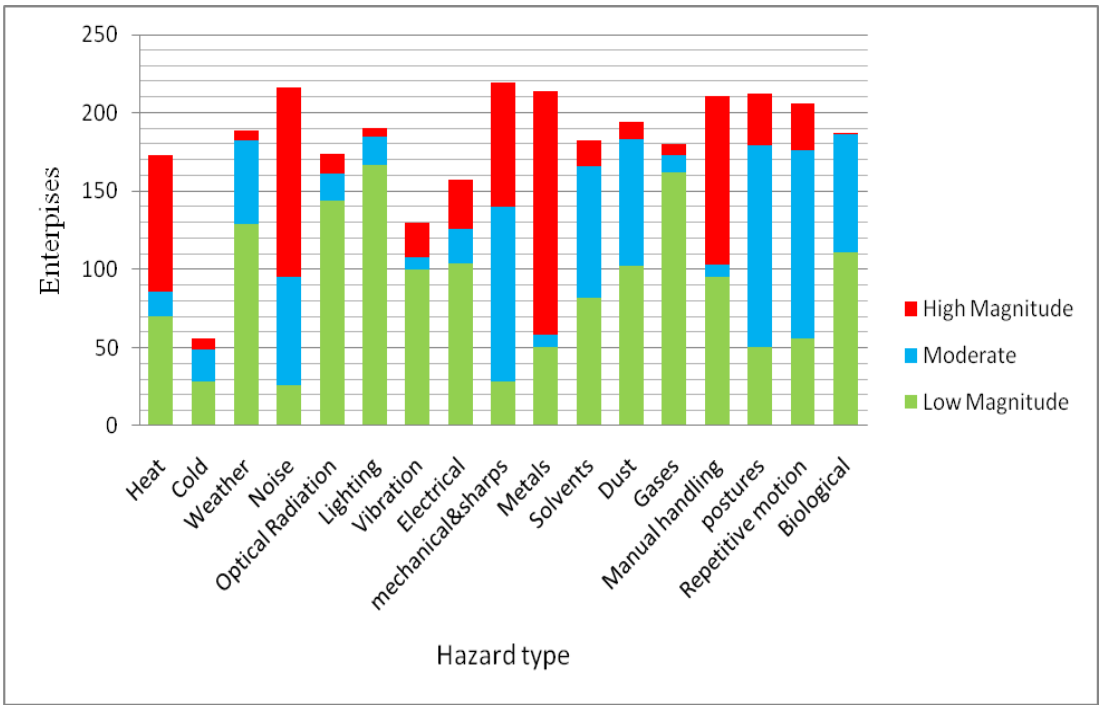


Figure 4.1.1. Hazard distributions and magnitude in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

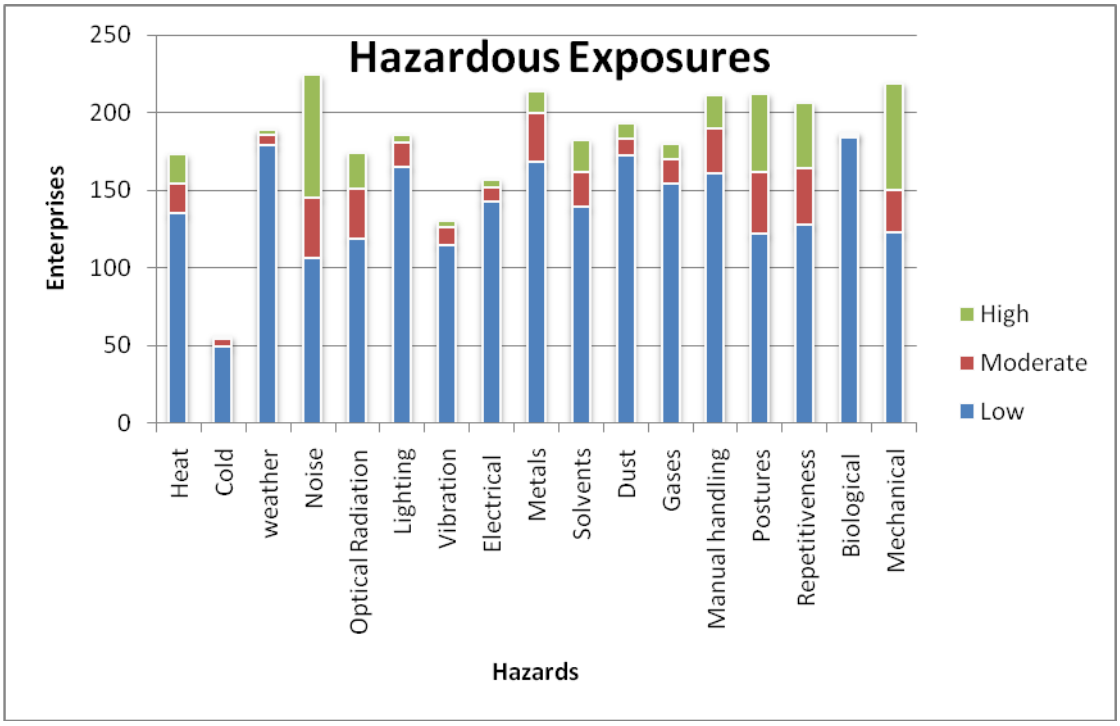


Figure 4.1.2. Exposure to hazards in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Table 4.1.6. First aid and fire safety equipment in Kamukunji jua kali micro and small sized metal enterprises as observed by the researcher (Kamukunji, Nairobi 2014).

		n	%
First aid equipment present	No	165	77.1
	Yes	49	22.9
	Total	214	100.0
Fire safety equipment present	No	188	87.9
	Yes	26	12.1
	Total	214	100.0

Basic first aid equipment was available in 49 enterprises (22.9%) and absent in 165 enterprises (77.1%). Basic fire safety equipment present in 26 enterprises (12.1%) but absent in 188 enterprises (87.9%) (Table 4.1.6).

4.2. PART II. Employer Findings

Data was obtained from 218 enterprise owners, an 87.2% response out of the total employers from the targeted 250 enterprises. Most of the owners were male (99.1%) and 0.9% were female (Table 4.2.1)

The enterprise owners' ages ranged from 26 years to 59 years with a mean of 44.7 years (std. deviation 5.2) (Table 4.2.1)

Majority (98.2%) were married, 2 (0.9%) single, 2 (0.9%) widowed, and none divorced.

The highest level of education attained by employers was primary (43 persons, 20.1%), secondary (70 persons, 32.7%), technical college (83 people, 38.8%), and 8.4% had university degree and above (18 people) (Table 4.2.1).

Table 4.2.1. Socio-demographic characteristics of the employers in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Characteristic		N	%
Sex	Male	216	99.1
	Female	2	0.9
	Total	218	100.0
Age	Equal to and above 34	6	2.8
	35-44	96	44
	Equal to and above 45	116	53.2
	Total	218	100.0
Education	Primary	43	20.1
	Secondary	70	32.7
	Technical college	83	38.8
	University	18	8.4
	Total	214	100.0
Marital status	Married	214	98.2
	Single	2	0.9
	Divorced	0	-
	Widowed	2	0.9
	Total	218	100.0

The number of persons working in the enterprises ranged from owner working alone (0.5% of workplaces) to maximum of 15 employees (mean of 3.48 persons per enterprise, Std. Deviation 1.9). 1 – 4 employees (196 workplaces, 91.2%), 5-10 (14 workplaces, 6.5%), and 4 (1.9%) workplaces had 11 or more employees. 38.1% of the workplaces had three employees (Table 4.2.2).

Table 4.2.2. Number of employees per enterprise in Kamukunji *jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014**)**

Number of Employees		n			%
	Self-employed	1			0.5
	1-2 employees	46			21.4
	3-4 employees	150			69.8
	5-6 employees	8			3.7
	7-8 employees	2			0.9
	9-10 employees	4			1.9
	11 and above	4			1.9
	Total	215			100.0
Minimum	Maximum	Mode	Median	Mean	± Std. Deviation
0	15	3(38.1%)	3	3.48	± 1.867

The employers had worked in the *Jua kali* sector for a minimum duration of 1.58 years and a maximum of 27.92 years and a mean of 11.03 years (Standard deviation, 4.56) (Table 4.3.1).

Those who had worked in the *Jua kali* sector for less than 5 years were 3.7%, 41.7% had worked in the sector for 5-10 years, 33.5% for 10-15 years, and 21.1% for more than 15 years (Table 4.3.1).

The minimum length of time at the current enterprise was 1.58 years, maximum being 20.08 years with a mean duration of 7.76 years (standard deviation 3.26 years) (Table 4.2.3).

Table 4.2.3. Work durations among employers in Kamukunji micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

	N	Min.	Max.	Mean	± Std. Deviation
Years in Jua Kali sector	218	1.58	27.92	11.03	± 4.56
Years in current enterprise	216	1.58	20.08	7.76	± 3.26
Hours of Work per Day	218	5	12	6.92	± 0.528
Work Days per Week	218	5	7	5.98	± 0.271

Table 4.2.4 Work life characteristics of employers in Kamukunji micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Durations		n	%
Total work Duration	< 5 years	8	3.7
	5-10 yrs	91	41.7
	10-15 yrs	73	33.5
	>15 yrs	46	21.1
		218	
Duration in current job	< 5 years	35	16.2
	5-10 Yrs	137	63.4
	>10 years	44	20.4
		216	
Work hours per week	40 and below	28	12.9
	41-45	188	86.2
	46 and above	3	0.9
	Total	218	100.0
Work hours per week			
Minimum	Maximum	Mode = 42.0	Mean± Std. Dev
(30 hours)	(56 hrs)	Median = 42.0	41.7±3.8

The number of work hours per day ranged of 5 to 12 hours a day with a mean of 6.9± 0.528hrs (Table 4.3.1). They worked for 6 hours or less in a day (11.9%), 86.7% for 7 hours per day, and 1.4% for 8 or more hours a day (Table 4.2.4).

The number of hours spent at work per week ranged between 30 and 56 hours. 86.2 % worked for 41-45 hours. (Table 4.2.4)

Those that had worked in the current job for less than 5 years were 16.2%, 63.4% for 5-10 years, and 20.4% for more than 10 years. Majority (86.2%) worked for between 41-45 hours, 12.9% for equal to and less than 40 hours, and 0.9% for 46 and above hours per week (Table 4.3.2)

Apart from managerial duties, 98.6% (n=214) of the employers in Kamukunji *Jua kali* enterprises also participated actively in other activities in the workplace.

Only 1.4% (3 employers) did not perform other chores apart from the managerial duties.

Duties performed included soldering and/or welding (6.2%), folding and/or rolling of metals (2.8%), painting (3.3%), cutting and/or grinding metals (10.9%), manual lifting and carrying (25.0%), and marketing and/or sales 94.8% (Table 4.2.5).

Table 4.2.5. Specific type of work done in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Current type of work*	N	n	%
Soldering & welding	210	13	6.2
Folding & rolling metals	210	6	2.8
Painting	210	7	3.3
Cutting & grinding	209	23	10.9
Lifting & carrying materials	211	53	25.0
Marketing & sales	213	202	94.8

*****more than one activity selected when individual employer performed different task.

Table 4.2.6. Workplace accidents in the past 1 year among employers in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014).

Involved in a workplace accident in past 1 year		n	%	Frequency	n	%
	No	199	93.9	1	11	84.6
	Yes	13	6.1	2	2	15.4
	Total	212	100.0		13	100.0

Among those who had been involved in workplace accident (6.1%) in the previous one year, 84.6% had one episode and 15.4% had it twice (Table 4.2.6).

Table 4.2.7. Occupational disease or a suspected work related illness in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Suffered Occupational disease or suspected work related disease	n	%*
No	17	7.9
Yes	199	92.1
Total	216	100.0

There were 92.1% (n=199) reports of having suffered occupational disease or work related disease, and only 7.9 % had not (Table 4.2.7).

Among the respondents, 95.9% had health insurance cover, and 4.1 % did not have. Those who did not have a health insurance cover cited: can't afford (22.2%), didn't know how to get (66.7%), and didn't need (11.1%) as the reason for not having insurance cover (Table 4.2.8).

Table 4.2.8. Employers' possession of a personal health insurance cover in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Possession of Health insurance			Reason for lack of health insurance cover		
	n	%	Reason	n	%
No	9	4.1	Can't afford	2	22.2
Yes	208	95.9	Don't know how to get	6	66.7
Total	217	100.0	Don't need	1	11.1

When there is need for healthcare services in the workplace 26.4% of employers seek the services from government health facility out of the workplace, 68.9% from private health facility, 7.1% from a health facility within the environs of the workplace, and 0.5% did not know where to get it (Table 4.2.9).

Table 4.2.9. Where employers seek healthcare services when needed in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Where to seek healthcare services when needed in workplace	(N=214)	
	n	%
Recommended Health facility within the work place	15	7.1
Government Health facility out of work place	56	26.4
Private health facility	146	68.9
Don't know	1	0.5

Table 4.2.10. Health and safety Education in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Had any Health and safety education		n	%*
	No	204	94.4
	Yes	12	5.6
	Total	216	100.0

Only 12 (5.6%) employers had received some form of health and safety training in KJK micro and small enterprises. Among those who had received any form of training on safety and health at the workplace, only 25.0% (n=3) of them had received while at the current workplace, and 9 (75.0%) did not receive the training at the current workplace (Table 4.1.10).

Pre-employment medical examination is a requirement in 166 workplaces, (76.5%), and not a requirement in 51 workplaces, (23.5%) as reported by the employers. Periodic medical examination however, was a requirement by 4.7%, not considered to be a requirement among 95.3% (employers of 204 workplaces) (Table 4.2.11).

Most (96.3%) had not had any medical exam to assess their fitness for the current work and only 3.7% had done some fitness assessment (Table 4.2.12).

Table 4.2.11. Pre-employment and periodic medical examinations as a requirement in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Pre-employment Medical Examination requirement		n	%
	No	51	23.5
	Yes	166	76.5
	Total	217	100.0
Periodic Medical Examination requirement	No	204	95.3
	Yes	10	4.7
	Total	214	100.0

Table 4.2.12. Fitness assessment for current job among employers in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Had any Medical Assessment of fitness for current work	n	%
No	210	96.3
Yes	8	3.7
Total	218	100.0

The respondents reported that there were no (2.8%), and that there were (97.2%) health and safety hazards in their workplaces. Majority (97.7%) considered that work posed a risk to their safety and health while only 2.3% did not think so. Those that thought that work had an effect their health were 98.1%, 1.4% did not consider, and 0.5% did not know whether work affected their health (Table 4.2.13).

Table 4.2.13. Information on health and safety hazards at the workplace and the effect work on safety and health in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Any Health and Safety Hazards at the workplace		n	%
	No	6	2.8
	Yes	212	97.2
	Total	218	100.0
Your health or safety at risk because of work	No	5	2.3
	Yes	210	97.7
	Total	215	100.0
Does work affect your health	No	3	1.4
	Yes	212	98.1
	Don't know	1	0.5
	Total	216	100.0

A self report was given on hazard presence and exposure status (0= Hazard absent, 1=never Exposed, 2= Almost never exposed, 3=around half the time, 4=Almost always, 5 = Always exposed) of the employer. Apart from heat and noise 70.7% were always or almost always exposed to noise while 37.6% were always or almost always exposed to heat hazards), over 50% of the employers reported never or almost never exposed rating of the other hazards (Table 4.2.14).

Employer rated self report on availability and use of control measures (0= none available 1=Never used, 2= almost never used, 3= around half the time, 4= almost always used, 5= used always), showed that over 90% of the workplaces almost never used or never used and hazard control measures for the hazards listed as seen on Table 4.2.15.

Table 4.2.14. Hazards present in the work place and exposure rating as reported by employers in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014).

		Never or almost never exposed		Around half the time		Almost always or always	
	N	n	%*	n	%*	n	%*
Heat	210	98	46.7	31	14.8	79	37.6
Cold	207	152	72.1	45	21.3	14	6.7
Extreme weather conditions	205	160	78.1	27	13.2	17	8.3
Noise	205	33	16.1	25	12.2	145	70.7
Optical Radiation	207	158	76.4	32	15.5	14	6.8
Unsuitable lighting (Inadequate or Excess)	206	156	75.7	35	17.0	13	6.3
Vibration	208	179	86.1	25	12.0	2	1.0
High voltage electrical Appliances	207	168	81.1	22	10.6	15	7.2
Metals	202	102	50.5	25	12.4	74	36.6
Solvents	209	169	80.8	31	14.8	8	3.8
Dust	207	145	70.1	31	15.0	27	12.0
Gases	210	162	77.1	36	17.1	9	4.3
Lifting, carrying heavy material	204	180	86.9	18	8.7	3	2.8
Uncomfortable postures	209	168	80.4	33	15.8	5	2.4
Repetitive movements	210	169	80.4	32	15.2	8	3.8
Biological agents	209	174	83.2	26	12.4	7	3.4
mechanical and sharp parts	210	178	84.8	21	10.0	9	4.3

*row percentage

Table 4.2.15 Availability and use of hazard control measures as reported by employers in Kamukunji Jua kali micro and small sized metal enterprises (Kamukunji, Nairobi 2014).

		None available or never used		Almost never used		Used half the time or more	
	N	n	%*	n	%*	n	%*
Heat	207	122	59	81	39.1	4	1.9
Cold	210	190	90.4	20	9.5	0	0.0
Extreme weather conditions	205	194	94.6	9	4.4	2	1.0
Noise	206	180	87.4	19	9.2	7	3.4
Optical Radiation	193	180	93.3	9	4.7	4	2.1
Unsuitable lighting	210	185	88.1	22	10.5	3	1.4
Vibration	206	190	92.2	10	4.9	6	3.0
High voltage electrical Appliances	206	191	92.7	11	5.3	4	2.0
Solvents	207	190	91.8	14	6.8	3	1.4
Dust	205	184	89.7	18	8.8	3	1.5
Gases	202	188	93.1	10	5	4	2.0
Lifting and/or carrying heavy material	211	200	94.8	6	2.8	5	2.4
working in uncomfortable postures	211	201	95.3	8	3.8	2	0.9
Biological agents	212	194	91.5	15	7.1	3	1.4
mechanical and sharp parts	207	195	94.2	8	3.9	4	2.0

*row percentages

The health problems listed as to be due to work were: headaches (82.2%), muscular pains in the shoulder and neck (57.2 employers), and hearing problems (73.6%). Other health problems were; visual problems (20.7%), respiratory problems, (14.9%), skin problems, (3.8%), backache (8.7%), stomach ache (10.1%), and muscular pains on the upper limbs (0.5%) (Table 4.2.16)

Table 4.2.16. Effects of work on health in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Health problem* (N=208)	n	%
Hearing problem	153	73.6
Problem with vision	43	20.7
Respiratory problems	31	14.9
skin problem	8	3.8
Backache	18	8.7
Headaches	171	82.2
Stomach ache	21	10.1
Muscular pains in shoulders and neck	119	57.2
Muscular pains on the upper limbs	1	0.5

*More than one option could be selected by the respondents by yes/no response

Person(s) assigned responsibility for safety and health in the workplace present in only 7 (3.2% of employers) and none assigned that duty in 96.8% (Table 4.2.17)

Risk assessment and management was carried out (7 workplaces, 3.2%), and not done (210 workplaces, 96.8%) in the previous one (1) year (Table 4.2.17).

Health and safety audit by health and safety advisor was not done (210 workplaces, 97.2%), and done (6 work places, 2.8%) in the previous one year (Table 4.2.17).

Only 2.8% of the workplaces did have an operational system for recording and reporting of both accidents and work related ill health information while majority (97.2%) of the did not have (Table 4.2.17).

Table 4.2.17. Employer report on responsibility for workplace safety, risk assessment, and health and safety audit in Kamukunji *Jua Kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

OHS activity	No		Yes	
	n	%	n	%
Any Person(s) responsible for safety and health at work (N=217)	210	96.8	7	3.2
Risk assessment and Management done in previous 1 year (N=217)	210	96.8	7	3.2
Workplace safety audit done in the past 1 year (N=216)	210	97.2	6	2.8
Recording of accidents and work related ill health (N=218)	212	97.2	6	2.8

Table 4.2.18. General health education among employers in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Had any General Health Education	n	%
No	204	96.2
Yes	8	3.8
Total	212	100.0

Most (96.2%) of the employers had not received any general health education and only a small proportion (3.8%) had had it (Table 4.2.18).

Those who had received general health education (n=6) reported the topics covered as: proper nutrition (75%), malaria (62.5%), HIV/AIDS (75%), fitness and exercise (75%), and on Tobacco, alcohol and other substances of potential abuse (62.5%).

First aid equipment were (18 workplaces, 8.5%), inadequate (33 workplaces, 15.6%), and absent (161 workplaces, 75.9%) (Table 4.2.19).

Fire control equipment were adequate (7 workplaces, 3.3%), inadequate (22 workplaces, 10.4%), and absent (182 workplaces, 86.3%) (Table 4.2.19).

Table 4.2.19. First Aid and fire control equipment as reported by employers in Kamukunji jua kali micro and small sized metal enterprises (Kamukunji, Nairobi 2014).

Equipment	N	Absent		Inadequate		Adequate	
		n	%*	n	%*	n	%*
First Aid Equipment	212	161	75.9	33	15.6	18	8.5
Fire Control Equipment	211	182	86.3	22	10.4	7	3.3

*Row percentage

Table 4.2.20. Welfare facilities/utilities as reported by employers in Kamukunji *jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Utility	N	Absent		Inadequate		Adequate	
		n	%*	n	%*	n	%*
Drinking Water	214	2	.9	3	1.4	209	97.7
Food Cafeteria	216	1	.5	2	.9	213	98.6
Resting Place	210	129	61.4	16	7.6	65	31.0
Place for sport and Exercise	212	194	91.5	13	6.1	5	2.4

*Row percentage

Drinking water was adequate in 209 (97.7%) workplaces, inadequate in 3 (1.4%) and not available in 2 (0.9%) workplaces. Food cafeteria were available and adequate in 213 (98.6%) workplaces, insufficient in 2 (0.9%), and absent in 1 (0.5%) workplaces. A place for resting was not available for 61.4% (129 enterprises), inadequate for 7.6% (16 enterprises), and adequate for 2.4% (5 enterprises) of the employers. Facilities for sport and exercise were adequate 5 (2.4%), inadequate 13 (6.1%) and not available to 194 (91.5%) (Table 4.2.20).

Table 4.2.21. Employer report on waste disposal and sanitation in Kamukunji jua kali micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

		Absent		Inadequate		Adequate	
Waste management	N	n	%*	n	%*	n	%*
Toilet/ Latrine	216	1	.5	3	1.4	212	98.1
Waste disposal	213	196	92.0	10	4.7	7	3.3
Drainage system	211	185	87.7	12	5.7	14	6.6

*Row percentage

Toilet/latrines were adequate for 212 workplaces (98.1%), inadequate for 3 (1.4%), and absent for 1 (0.5%) (Table 4.2.21).

The waste disposal avenues were adequate (7workplaces, 3.3%), inadequate (10 workplaces, 4.7%), and absent (213 workplaces, 92%) (Table 4.2.211).

Drainage system was adequate (14 workplaces, 6.6%), inadequate (12 workplaces, 5.7%) and absent (185 workplaces, 87.7%) (Table 4.2.21).

Table 4.2.22. Obstacles to health and safety as reported by employers in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Obstacles to OHS	N	Not a problem		Minor problem		Moderate barrier		Serious barrier		Very serious barrier	
		n	%*	n	%*	n	%*	n	%*	n	%*
Cost	211	9	4.3	1	.5	151	**71.6**	50	23.7	-	-
Lack of information on health and safety	209	6	2.9	3	1.4	156	**74.6**	44	21.1	-	-
Priority to productivity and profits	209	5	2.4	5	2.4	154	**73.7**	45	21.5	-	-
Planning difficulties	209	5	2.4	3	1.4	145	**69.4**	55	26.3	1	0.5
Lack of support and guidance from government	208	5	2.4	1	0.5	135	**64.9**	65	31.3	2	1.0

*Row percentage

The Bold represent the cluster with highest frequency

Most of the employers considered the obstacles to OSH as at least of moderate intensity. On a scale of 1-5 (1= Not a problem, 2=Minor problem, 3= Moderate barrier, 4= serious barrier 5=Very serious barrier) for the severity of the obstacles, the mode was 3 for all the barriers listed. The cost was considered a moderate barrier by 71.6%, and serious by 23.7%; Lack of information on health and safety considered moderate by 74.6% and serious by 21.1%; priority on productivity and profits was considered a moderate hindrance by 73.7% and serious by 21.5%; planning difficulties listed as a moderate barrier by 69.4% and as serious by 26.3%; and inadequate support and guidance from government was considered a moderate hindrance by 64.9% and serious by 31.3% (Table 4.2.22).

Table 4.2.23. Employers' Suggestions on Possible solutions to improving safety and health in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Possible solutions	N	Not a priority		Low priority		Medium priority		High priority		Essential	
		n	%*	n	%*	n	%*	n	%*	n	%*
Health and safety Training	213	4	1.9	2	.9	4	1.9	199	**93.4**	4	1.9
Provision of more personal protective equipment	211	1	.5	3	1.4	3	1.4	199	**94.3**	5	2.4
Collaboration with government agencies & other stakeholders	213	2	0.9	1	0.5	2	0.9	203	**95.3**	5	2.3
Upgrading equipment	213	1	0.5	3	1.4	3	1.4	200	**93.9**	6	2.8
Technical Training	211	1	0.5	1	.5	4	1.9	199	**94.3**	6	2.8

*Row percentage.
The bold indicate the highest frequencies

The employers, using a scale of 1-5 (1 = Not a priority, 2 = Low priority, 3 = Medium priority, 4 = High priority, 5 = Essential) highlighted health and safety training; provision of more personal protective equipment; Collaboration with government agencies and other stakeholders; Upgrading equipment; and technical training as a high priority(>90%) to improving safety and health . Health and safety training listed as high priority by 93.4%, and essential by 1.9%; provision of more personal protective equipment as high priority by 94.3%, and essential by 2.4%; Collaboration with government agencies and other stakeholders was listed as high priority by 95.3% and essential by 2.3%; Upgrading equipment high priority by 93.9% and essential by 2.8%; and technical training listed by 94.3% as high priority and 2.8% considered it essential. (Table 4.2.23).

4.3. PART III: Employee Findings

Data was collected from 213 employees, an 85.2% response rate. Majority (76.8%) were male and (23.2%) female. The minimum age was 18 years, maximum of 60 years with mean age of 29.8 ± 5.42 years.

Table 4.3.1. Socio-demographic characteristics of employees in Kamukunji *Jua Kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Characteristic		n	%
Sex	Male	162	76.8
	Female	49	23.2
	Total	211	
Age	Equal& below 34	187	88.2
	35-44	20	9.4
	Equal& and above 45	5	2.4
	Total	212	100.0
Education	Primary	64	30.2
	Secondary	133	62.7
	Technical college	13	6.1
	University	2	0.9
	Total	212	100.0
Marital status	Married	161	75.9
	Single	48	22.6
	Divorced	2	0.9
	Widowed	1	0.5
	Total	212	100.0

The highest level of education attained was primary (64 people, 30.2%), secondary (133 people, 62.7%), Technical college (13 people, 6.1%) and university degree (2 people, 0.9%). Most (75.9%) were married, 22.6% single, 0.5% widowed, and 0.9 % divorced (Table 4.3.1).

The minimum duration they had been in the sector was 0.67 years, a maximum of 21.08 years with a mean of 4.44±2.96 years. The minimum period of time at the current enterprise was 1.0 year, maximum of 16.33 years and a mean duration of 3.17±2.10 years. They worked for 6 to 8 hours per day with a mean duration of 7.02 hours±0.30hours).The number of days spent in work ranged between 6 days and 7days in a week with a mean of 6.03±0.18days (Table 4.3.2.).

Table 4.3.2. Work durations among employees in Kamukunji micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Durations	N	Min.	Max.	Mean	Std. Deviation
Years in Jua Kali sector	206	0.67	21.08	4.44	± 2.96
Years in current enterprise	202	1.00	16.33	3.17	± 2.10
Hours of Work per Day	209	6	8	7.02	± 0.30
Work Days per Week	209	6	7	6.03	± 0.18

Some (67%) had worked in the *Jua kali* sector for less than 5 years, 29.1% for 5-10 years, 2.9 % for 10-15 years, and 1.0% for more than 15 years; and 81.6% in the current enterprise for less than 5 years, 17.8% for 5-10 years, and 0.5 % for more than 10 years. Majority (92.8%) worked for between 41-45 hours, 1.4% for equal to and less than 40 hours, and 5.7% for 46 and above hours per week (Table 4.3.2)

Table 4.3.3. Work life characteristics of the Employees in Kamukunji micro and small sized metal enterprises (Kamukunji, Nairobi 2014**)**

Duration		n	%*
Total work Duration (N=206)	< 5 years	138	67.0
	5-10 yrs	60	29.1
	10-15 yrs	6	2.9
	>15 yrs	2	1.0
	Total	206	100.0
Duration in current job (N=202)	< 5 years	165	81.6
	5-10 Yrs	36	17.8
	>10 years	1	0.5
	Total	202	100.0
Work hours per week (N=209)	40 and below	3	1.4
	41-45	194	92.8
	46 and above	12	5.7
	Total	209	100.0
Work hours per week			
Minimum	Maximum	Mode = 42.0	Mean± Std. Dev
(30 hours)	(56 hrs)	Median = 42.0	42.4±2.2hours

The employees were engaged in soldering and/or welding (18.1%), folding and/or rolling of metals (21.0 %), painting (19.0%), cutting and/or grinding metals (25.2 %), manual lifting and carrying (7.6 %), and marketing and/or sales (14.3%) (Table 4.3.4).

Table 4.3.4. Specific type of work done by employees in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Current type of work	N	n	%
Soldering & welding	210	38	18.1
Folding & rolling metals	210	44	21.0
Painting	210	40	19.0
Cutting & grinding	210	53	25.2
Lifting & carrying materials	210	16	7.6
Marketing & sales	210	30	14.3

Table 4.3.5. Frequency of work place accident in the past 1 year among employees in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Number of times involved in workplace accident	n	%
1	58	37.9
2	58	37.9
3	23	15.0
4	13	8.5
5	1	.7
Total	153	100.0

Most (73.5%, 155 employees) were involved in a workplace accident in the previous one year and 26.5% (56) did not. They also had repeat accidents of up to five times; 37.9% once, 37.9% twice, 15.0% thrice, 8.5% for four times, and 0.7% for five times (Table 4.3.5).

The employees that had been afflicted by an occupational disease or work related disease were 79.5% (Table 4.3.6). However, amongst the group who reported YES to the question concerning work related disease, there were 19 employees (9.0% of all employees) who further reported that it was only suspected to be possible occupational disease by their own selves but not visited health clinic hence no confirmed diagnosis by a clinician.

Table 4.3.6. Occupational disease or a suspected work related illness among employees in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Suffered from occupational or work related disease	n	%
No	43	20.5
Yes	167	79.5
Total	210	100.0

Majority (91.9%) had health insurance cover whereas 8.1% were not under an insurance cover (Table 4.3.7).

Table 4.3.7. Employees' possession of a personal health insurance cover in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Health insurance	n	%
No	17	8.1
Yes	193	91.9
Total	210	100.0

When there is need for healthcare services in the workplace, 93.1% seek the services from government health facility out of the workplace, 24.0% from private health facility, and 0.5% from a health facility within the environs of the workplace (Table 4.3.8).

Table 4.4.8. Where employees seek healthcare services when needed in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Where to seek healthcare services* (N=204)	n	%
Recommended Health facility within the work place	1	0.5
Government Health facility out of work place	190	93.1
Private health facility	49	24.0

*More than one facility could be chosen

Those that had had any form of education on health and safety were 9.4%, whereas the majority (90.6%) had not received (Table 4.4.3). However, among those who had health and safety training, 10.0% (n=2) had it at the current workplace and 90.0% (n=18) did not receive in the current workplace.

Table 4.3.9. Health and safety Education among employees in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Had any Health and safety education		n	%
	No	192	90.6
	Yes	20	9.4
	Total	212	100.0

All the employee respondents (212) did not undergo pre-employment medical examination for the current work.

Majority (94.8%) acknowledged the presence of health and safety hazards in their workplaces while 5.2% thought otherwise; and 7.7% did not consider that the work they did put their health or safety at risk, whereas 92.3% reported that work posed the risk. Most (94.2%) thought that work did affect their health, but 5.3% did not consider, and 0.5% did not know (Table 4.3.10).

Table 4.3.10. Information on health and safety hazards at the workplace and the effect work on safety and health in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Health and safety information		n	%
Any Health and Safety Hazards at the workplace	No	11	5.2
	Yes	201	94.8
	Total	212	100.0
Your health or safety at risk because of work	No	16	7.7
	Yes	192	92.3
	Total	208	100.0
Does work affect your health	No	11	5.3
	Yes	196	94.2
	Don't know	1	0.5
	Total	208	100.0

The employees reported high exposure ratings for most of the hazards (Table 4.3.11). They were always or almost always exposed to heat (97%), and mechanical and sharp parts (47.8%). Majority were also exposed on around half the work time to; cold (52.9%), unfavourable weather (47.9%), Noise (51.3%), lighting hazard (50.6%), uncomfortable postures (62.4%), repetitive movements (46.5%), and biological hazards (45.5%). The exposures were low for; radiation (68.4%), vibration (65.5%), electrical hazards (83.3%), dust (51.8%), and gases (76.0%).

Most of them lacked or never used and control measures against some hazards: unfavourable weather (68.6%), Noise (54.1%), radiation (80.4%), lighting (78.7%), vibration (85.2%), electrical (87.2%), gases (80.8%), sharp and mechanical parts (51.4%), and biological hazards (89.4%). There were almost no control measures for heat (73.4%), solvents (58.6%) and for manual handling and carrying of materials (62.0). There was however some minimal usage of control measures for all the hazards in at least half the work time or more (Table 4.3.12).

Table 4.3.11. Workplace hazards and exposure rating as reported by employees in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Hazard	N	Never or almost never exposed		Around half the time		Almost always or always	
		n	%*	n	%*	n	%*
Heat	206	2	1	4	1.9	200	97
Cold	204	60	29.4	108	52.9	36	17.7
Extreme weather conditions	194	75	38.6	93	47.9	26	13.4
Noise	197	42	21.3	101	51.3	54	27.4
Optical Radiation	184	126	68.4	45	24.5	13	7.1
Unsuitable lighting	180	84	46.7	91	50.6	5	2.8
Vibration	177	116	65.5	58	32.8	2	1.1
High voltage electrical Appliances	179	149	83.3	25	14.0	5	2.8
Solvents	205	95	46.4	70	34.1	40	19.5
Dust	199	103	51.8	61	30.7	35	17.6
Gases	192	146	76.0	31	16.1	15	7.8
Lifting, carrying heavy material	205	18	8.8	27	13.2	158	77
Working in uncomfortable postures	197	39	19.8	123	62.4	32	16.2
Repetitive movements	187	65	34.8	87	46.5	35	18.7
Biological agents(Insects, animals, bacteria, virus, fungi)	178	88	49.4	81	45.5	7	3.9
mechanical and sharp parts	203	41	20.2	63	31.0	97	47.8

*row percentages

Table 4.3.12. Availability and use of risk control measures as reported by employee in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

		None available or never used		Almost never used		Used half the time or more	
Hazard	N	n	%*	n	%*	n	%*
Heat	203	8	3.9	149	73.4	46	22.7
Cold	204	62	30.4	103	50.5	39	19.1
Extreme weather conditions	191	131	68.6	31	16.2	29	15.2
Noise	196	106	54.1	55	28.1	35	17.8
Optical Radiation	179	144	80.4	15	8.4	20	11.1
Unsuitable lighting(Inadequate or Excess)	178	140	78.7	28	15.7	10	5.6
Vibration	176	150	85.2	13	7.4	13	7.4
High voltage electrical Appliances	180	157	87.2	11	6.1	12	6.7
Solvents	203	44	21.7	119	58.6	40	19.7
Dust	195	129	66.2	39	20.0	27	13.8
Gases	192	155	80.8	15	7.8	22	11.4
Lifting and/or carrying heavy material	200	39	19.5	124	62.0	37	18.5
working in uncomfortable postures	197	99	50.3	74	37.6	24	12.2
Repetitive movements	187	143	76.5	20	10.7	24	12.9
Biological agents(Insects, animals, bacteria, virus, fungi)	179	160	89.4	11	6.1	8	4.5
mechanical and sharp parts	204	105	51.4	67	32.8	32	15.7

*row percentages

The health problems listed as to be due to the workplace exposures included: headaches (64.9%), muscular pains in the shoulder and neck (87.1%), hearing problems (8.2%), visual problems (3.1), respiratory problems (23.2%), skin problems (39.7%), backache (8.2), stomach ache (6.7%), and muscular pains on the upper limbs (8.2%). Among those who admitted that work have an effect on their health, only 0.2% reported not to know how work affected their health (Table 4.3.13).

Table 4.3.13. Effects of work exposures on health as reported by employees in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Health problem (N=194)	n	%*
Hearing problem	16	8.2
Problem with vision	6	3.1
Respiratory problems	45	23.2
skin problem	77	39.7
Backache	16	8.2
Headaches	126	64.9
Stomach ache	13	6.7
Muscular pains in shoulders and neck	169	87.1
Muscular pains on the upper limbs	16	8.2
Don't know	1	0.5

*Row percentage

All the employees that participated (in 208 workplaces, 100% of employees) reported that there was no one assigned responsibility on safety and health in the workplace. All were also in agreement that no risk assessment and management done, and no safety audit carried out in the previous one year. Majority (99.5% employees) of the work places do not have an operational system for recording and reporting of both accidents and work related ill health information, 0.5% indicated to have a system in place but only for work related ill health and not for workplace accidents (Table 4.3.14).

Table 4.2.14. Employee report on responsibility for workplace safety, Risk assessment, and health and safety audit in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Safety activity (N=212)	No		Yes
	n	%	n (%)
Any Person(s) Responsible for Safety and Health at work	208	100.0	-
Risk assessment and Management done in previous 1 year	208	100.0	-
Workplace safety audit done in the past one year	208	100.0	-
Recording of accidents and work related diseases	211	99.5	1(0.5)

Table 4.3.15. General Health Education among employees in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014**)**

Had any General Health Education	N	%
No	136	66.7
Yes	68	33.3
Total	204	100.0

Most (66.7%) had not gotten any form of general health education but 33.3 % had received some general health education (Table 4.3.15)

Among those who had received general health education, the topics covered were: proper nutrition (100%), malaria (94.1%), HIV/AIDS (97.1%), fitness and exercise (83.8%), and on tobacco, alcohol and other substances of abuse (83.8%) (Table 4.4.16).

Table 4.3.16. General health education topics received in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

Topic (N=68)	n	%
Proper Nutrition	68	100
Malaria	64	94.1
HIV/AIDS	66	97.1
Sport and Exercise	57	83.8
Tobacco, Alcohol, Other Substances of Abuse	57	83.8

*Row percentage

The first aid equipment were not available in majority (88.0%) and inadequate in 12% of the workplaces. Fire control equipment were inadequate (18.8%), and absent in 91.2% (176 workplaces) (Table 4.3.17).

Table 4.3.17. First Aid and fire control equipment as reported by employees in Kamukunji jua kali micro and small sized metal enterprises (Kamukunji, Nairobi 2014).

		Absent		Inadequate		Adequate	
Equipment	N	n	%*	n	%*	n	%*
First Aid Equipment	192	169	88.0	23	12.0	-	-
Fire Control Equipment	193	176	91.2	17	8.8	-	-

*Row percentage

Table 4.3.18. Employee report on welfare facilities/utilities in Kamukunji *jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

		Absent		Inadequate		Adequate	
Utility	N	n	%*	n	%*	n	%*
Drinking Water	193	-	-	-	-	193	100.0
Food Cafeteria	193	-	-	-	.-	193	100.0
Resting Place	193	190	98.4	3	1.6	-	-
Place for exercise and sport	193	191	99.0	2	1.0	-	-

*Row percentage

There was access to adequate drinking water and food cafeteria by all 193 (100%) employees. However, 98.4% (190 enterprises) did not have a place for resting, and was inadequate for 1.6% (3 enterprises) of the employees. Exercise facilities were not available to 99% and inadequate to 1% of the employees (Table 4.3.18).

Table 4.3.19. Waste disposal and sanitation as reported by employees in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

		Absent		Inadequate		Adequate	
Waste disposal avenue	N	n	%*	n	%*	n	%*
Toilet/ Latrine	193	-	-	-	-	193	100.0
Waste disposal	193	2	1.0	189	97.9	2	1.0
Drainage system	192	164	85.4	26	13.5	2	1.0

*Row percentage

All of the employees (193) reported adequate toilet/latrine facilities. Waste disposal avenues in the workplace were adequate (1%), inadequate (97.9%), and absent (1%). There were adequate (2 workplaces, 1.0%), inadequate (26 workplaces, 13.5%), and absent (164 workplaces, 85.4%) of functional drainage system (Table 4.3.19).

Most of the employees considered the obstacles to OSH to be at least of moderate intensity. On a scale of 1-5 (1= Not a problem, 2=Minor problem, 3= Moderate barrier, 4= serious barrier 5=Very serious barrier) for the severity of the obstacles, the mode was 4 for cost, lack of information on health and safety, and lack of support and guidance from government, and the 3 for all the other barriers listed. The cost was considered a moderate barrier by 39.5%, serious by 40% and very serious by 19%; Lack of information on health and safety considered moderate by 38.8%, serious by 42.2% and very serious by 17.5%; priority on productivity and profits was considered a moderate hindrance by 64.9%, serious by 26.7% and very serious by 8.4%; planning difficulties listed as a moderate barrier by 64.1%, serious by 26.7%, and very serious by 8.7%; and lack support and guidance from government was considered a moderate hindrance by 11.3%, serious by 82.3% and very serious by 6.4%, (Table 4.3.20).

Table 4.3.20. Obstacles to health and safety in Kamukunji *jua kali* metal enterprises as reported by employees (Kamukunji, Nairobi 2014)

		Not a problem		Minor problem		Moderate barrier		Serious barrier		Very serious barrier	
	N	n	%	n	%	n	%	n	%	n	%
Cost	205	-	-	3	1.5	81	39.5	82	40.0	39	19.0
Lack of information on health and safety	206	-	-	1	.5	80	38.8	89	43.2	36	17.5
Priority to productivity and profits	202	-	-	-	-	131	64.9	54	26.7	17	8.4
Planning difficulties	206	-	-	1	.5	132	64.1	55	26.7	18	8.7
Lack of support and guidance from government	203	-	-	-	-	23	11.3	167	82.3	13	6.4

*row percentage

Table 4.3.21. Employees' Suggestions on Possible solutions to improving safety and health in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

	N	Not a priority		Low priority		Medium priority		High priority		Essential	
		n	%*	n	%*	n	%*	n	%*	n	%*
Health and safety Training	205	-	-	1	.5	1	.5	163	**79.5**	40	19.5
Provision of more personal protective equipment	206	-	-	-	-	-	-	178	**86.4**	28	13.6
Collaboration with government agencies & other stakeholders	206	-	-	-	-	11	5.3	184	**89.3**	11	5.3
Upgrading equipment	206	-	-	-	-	2	1.0	178	**86.4**	26	12.6
Technical Training	206	-	-	-	-	7	3.4	189	**91.7**	10	4.9

*row percentage
The bold indicate the highest frequencies

Most of the employees using similar scale of 1-5 (1 = Not a priority, 2 = Low priority, 3 = Medium priority, 4 = High priority, 5 = Essential) listed health and safety training; provision of more personal protective equipment; Collaboration with government agencies and other stakeholders; Upgrading equipment; and technical training as a high priority towards improvement of safety and health . Health and safety training listed as high priority by 79.5%, and essential by 19.5%; provision of more personal protective equipment as high priority by 86.4%, and essential by 13.6%; Collaboration with government agencies and other stakeholders was listed as high priority by 89.3% and essential by 5.3%; Upgrading equipment high priority by 86.4% and essential by 12.6%; and technical training listed by 91.7% as high priority and 4.9% considered it essential (Table 4.3.21).

4.4. PART IV. Combined findings

The specific type of activities carried out in Kamukunji *Jua kali* differed between the position (employer or employee) in the enterprise. A larger proportion of employers did marketing and sales (94.8%), and manual lifting and carrying (25.0%). The employees on the other hand mainly engaged in soldering and/or welding (18.1%), folding and/or rolling of metals (21.0%), painting (19.0%), cutting and/or grinding metals (25.2%) ($p < 0.001$). (Table 4.4.1).

Table 4.4.1. Differences between work done by employers and employees in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

		Employer			**Employee**		
Current type of work	N	n	%*	N	n	%*	p<0.001**
Soldering & welding	210	13	6.2	210	38	18.1	χ^2= 14.080
Folding & rolling metals	210	6	2.8	210	44	21.0	χ^2= 32.783
Painting	210	7	3.3	210	40	19.0	χ^2= 26.090
Cutting & grinding	209	23	10.9	210	53	25.2	χ^2= 14.292
Lifting & carrying materials	211	53	25.0	210	16	7.6	χ^2= 23.520
Marketing & sales	213	202	94.8	210	30	14.3	χ^2= 277.044

*Row percentage in their own group distribution (each cells comes from 2x2)

** Pearson Chi-square test value for each row

The health problems commonly listed by the respondents (N=402) as to be due to their work included: headaches 73.8% (82.2% employers, 64.9% employees) ($p<0.001$); muscular pains in the shoulder and neck 71.6% (57.2 employers, 87.1 employees) ($p<0.001$); and hearing problems 42.0% (73.6% employers, 8.2% employees), ($p<0.001$). Other health problems reported as visual problems, 12.2%

(20.7% employers, 3.1% of employees) (p<0.001); respiratory problems, 18.9% (14.9% employers, 23.2% employees) (p<0.013); skin problems, 21.1% (3.8% employers, 39.7% employers) (p<0.001); backache, 8.5% (8.7% employers, 8.2% employees) (p=1.000); stomach ache, 8.5% (10.1% employers, 6.7% employees) (p<0.152) and muscular pains on the upper limbs, 4.2% (0.5% employers, 8.2% employees) (p<0.001). Among those who admitted that work have an effect on their health, only 0.2% reported not to know how work affected their health. (Table 4.4.2)

Table 4.4.2. Health problems thought to arise from workplace exposures in Kamukunji *Jua kali* micro and small sized metal enterprises (Kamukunji, Nairobi 2014)

	Employer (N=208)		Employee (N=194)		Total		
	n	%*	n	%*	n	%*	p-value**
Hearing problem	153	73.6	16	8.2	169	42.0	<0.001
Problem with vision	43	20.7	6	3.1	49	12.2	<0.001
Respiratory problems	31	14.9	45	23.2	76	18.9	0.013
skin problem	8	3.8	77	39.7	85	21.1	<0.001
Backache	18	8.7	16	8.2	34	8.5	1.000
Headaches	171	82.2	126	64.9	297	73.9	<0.001
Stomach ache	21	10.1	13	6.7	34	8.5	0.152
Muscular pains in shoulders and neck	119	57.2	169	87.1	288	71.6	<0.001
Muscular pains on the upper limbs	1	0.5	16	8.2	17	4.2	<0.001
Don't know	0	0.0	1	0.5	1	0.2	

*Row percentage, (2x2 crosstabs for McNemar test).

** McNemar test

5. DISCUSSION

In this descriptive study, data was collected from 222 workplaces (88.8% of the target sample reached), 213 employees, and 218 employers within the Kamukunji *Jua Kali* small and medium sized metal enterprises. However, some of the questions were not fully answered which is reflected on the differences among the sum totals in results after the analysis of various variables. The reason that can be attributed to the high response rate may be the involvement of Kamukunji Jua Kali Association officials from an early stage of the research planning and sustained communications throughout to the data collection period. The non-response allowance of 20% also came in handy towards reaching the target numbers for the study. The incomplete responses to all the questions might have been occasioned by the complexity of the questionnaires and need for details and concentration when attending to the questions. This reason might have also been confounded by the fact that most of the respondents' level of education was secondary or below (Tables 4.2.1 and 4.3.1), and therefore limited command on the English language (not mother tongue, used as a second language) which was used in the questionnaires. Standardization of the contribution of those trained to aid in data collection was not achieved owing to time, technical and other limitations in resources.

5.1. Workplace characteristics

Most of the enterprises (53.4%) carried out their operations in both open air and within an enclosure of a building i.e. some workers performed their tasks out in the open while others worked under a building structure. When the 28.5% that operated completely on an open area is added, the result is that 81.9% of the enterprises had at least some or all of the workers in the open without the protection of a shelter. Only 10.9% of the enterprises had closed workplaces (enclosed in a structure with both roof and walls), (Table 4.1.1). It is not uncommon for operatives in this sector to carry out their activities without the protection of proper building structure (19, 20, 56). This is reflected by the name *jua kali* (hot sun), an indication that workers have to endure working without shelter from the sun's rays. This may also be due to the weak economic power of these enterprises hence not affording to construct shelter or even secure ownership of the land they operate in, limiting their

capacity to invest fully in the enterprises. As noted from the suggestions for improving health and safety standards among these enterprises, there is need for increased involvement and support from government agencies and other interested parties to aid in setting up of safe structures that can be utilised by the *Jua kali* workers.

Despite most of the enterprises having open space to carry out their work, majority (63.8%) of them had inadequate working space for their activities. On the contrary, it is the lack of adequate space inside the building structures, and on their designated area that might have pushed the workers to carry out their duties on the open and crowded place. The limited financial power of the SMEs is a challenge that prevents these enterprises from acquiring their own spacious place and putting up befitting structures for their businesses. The size of space in the work environment was noted to be adequate in 36.2% of the enterprises (Table 4.1.2). A working space was considered adequate based on the standards set by the health and safety act which stipulates that it should be sufficient in size for work to be carried out with ease and with necessary free space, and having regard to the nature of the work, an adequate amount of air for each employee. The minimum permissible as stipulated being ten cubic metres per person (space more than four point five metres from the floor not taken into account, and, galleries not part of this space). Workroom are also expected to be not less than three metres in height, measured from the floor to the lowest point of the ceiling or, where there is no ceiling, to the lowest point of the roofing material (29). Crowding in workplaces especially where there is use of machines and sharp equipment and in the presence of other health hazards e.g. heat, air contaminants increase the risks of both accidents and work related ill health. overcrowding, has also been one of the reasons for high spread of communicable diseases common in developing countries and especially among the low income population, which affect the workers' health directly, and through interactions with other workplace exposures resulting in more worse health states; and therefore the need for comprehensive approach to workers' health.

The activities carried out were soldering and/or welding (68 enterprises, 30.6%), folding and/or rolling of metals (in 64 enterprises, 28.8%), painting (38 enterprises, 17.1%), cutting and/or grinding of metals (103 enterprises, 46.6%),

marketing and sales (68 workplaces, 30.6%), and other activities which included cleaning of the final products, aluminium coating, metal heat treatment, cement-clay mixing and using to make inner lining of energy saving stoves, and riveting as noted in Table 4.1.3. Most of these activities have been noted by various guidelines and studies to be constituent processes in metal works and metal fabrications (40,41,48,49,50). These enterprises in spite of being small, each enterprise was not specialized in performing a single activity but instead performed more than one task. They were involved in production, service and marketing as well (21). When workers perform various activities, some of which they may not have had any training on, there are more exposures and with less specialisation and experience, and increase in accident risk. Such a situation also calls for extended scope of health and safety education to cover all the possible risks in the various activities the workers can be called upon to perform.

Majority of the business entities had between 1 and 4 employees (91.2%). The number of persons working in the enterprises ranged from owner working alone (0.5% of enterprises) to maximum of 15 employees with a median of 3 employees per enterprise (Table 4.2.2). The businesses, based on the employee numbers qualify to be classified under the category of Micro and Small Enterprises. Based on the number of employees, these enterprises are too small and are left out of some of the important health and safety legislations; for example need for health and safety committee which applies to businesses with 20 and more employees, and provision of healthcare services in the workplace. They also have low possibilities of attracting and affording to source for private health and safety services. The owner is often the sole person deciding on safety matters, and employees simply comply, especially bearing in mind the existence of close relationships and friendships among them. The lack of union representation among small enterprises further complicate the situation as they lack united common voice to air their grievances. Provision of occupational health services via the primary healthcare delivery model may help reach these groups. Training and guiding the enterprises to form coalitions can be beneficial in increasing their access to OHS services as well as raising their bargaining power and to enjoy other benefits of higher scale of production.

The Kamukunji enterprises were burdened with a wide variety of hazards which were related to activities done, belonging to micro and small informal sector, and the location in a tropical developing country. The physical hazards observed included thermal hazards (heat in 78.6% workplaces, cold in 56% of workplaces), noise (98.2%), optical radiation (79.1%) of the workplaces, unsuitable lighting (86.4%), vibration (59.1%), electrical (71.4%), weather (85.9%), and other mechanical and sharp objects (99.5%) that can cause injury. A study done in Canada showed that 43 welders (N=44) were exposure to noise levels in excess of the 80-dB action level standard for an eight-hour day. Other sources of noise were metal fabrication (grinding, shearing, and forming of metal) and plasma arc cutting (58). Other studies in Germany and Finland have shown that metal fabrication and welding result in high background noise exposures of 103 dB and 80-85dB respectively with peak impulse noise of 150 dB (59, 60). Some of the chemical hazards noted in the workplaces were generalised to overlap each other as metals (93.7% of the workplaces), solvents in (82.7% workplaces), dust (88.2%), and gases (81.1%). Ergonomic hazards were observed in manual lifting and/or carrying materials (95.9% of the workplaces), working in awkward or uncomfortable postures (96.4% of the workplaces), and repetitive motions (93.6% of the workplaces) Biological hazards were thought to be possibly present in 85% of the workplaces (Table 4.1.4 and Figure 4.1.1). Those operating in these enterprises were exposed to a wide variety of the hazards (Table 4.1.5 and Figure 4.1.2). Other literature has depicted such kind of hazards in working with metals or SMEs in the tropics (19, 20, 40, 41, 48-50, 54-56). This understanding of the presence of a wide range of hazards is useful in formulating intervention plans including, control measures, and education and training on safety. However, considering the scope of this study, being observational and quantitative with subjective assessment of hazards, there is need for detailed more comprehensive research to be carried out with objective measurements to get the specific levels and exposures of these hazardous agents.

Majority, 98.4% of respondents (97.2% employers, 99.5% employees) showed that the work places did not have an operational system in place for recording and reporting of both accidents and work related ill health information. Only 1.4% (2.8% of the employers) reported to have system in place for both

accidents and work related ill health, and 0.2% (0.5% of employees) indicated to have a system in place but only for work related ill health.(Table 4.2.17 and Table 4.3.14). This finding has been replicated in some studies in Sri Lanka and Canada (34, 37). It is considered to be more prevalent in businesses with less than 5 employees which is the case in this study, 92.1% of the enterprises had 4 or less employees. The deficiencies in record keeping among these SMEs may be attributed to lack of knowledge on the importance of this task as well as ignorance on how such records are kept and inadequate supervisions from the responsible government safety agency. It also creates difficulties when attempting to evaluate the impact of interventional measures, assessment of correlation between exposures and outcome as well as long term follow up and health surveillance. There is need to focus on training of both employees and employers in the SMEs on the very important role of proper recording and intensify supervisory duties by relevant government institutions.

Most of the enterprises (77.1%) lacked basic first aid equipment (first aid box) (Tables 4.1.6, 4.2.19 and 4.3.17). This observation was similar with the self-report from the employers (75.9%) and employees (88.0%) who pointed out the absence of first aid equipment. Among the enterprises that had the equipment, both employers (15.6%), and employees (12%) considered it inadequate. Basic fire control equipment (mainly fire extinguishers) were noted to be present in 26 enterprises (12.1%) but absent in 188 enterprises (87.9%). The respondents' feedback corroborated this finding that the equipment was deficient; 13.4% of employers and 8.8% of employees showed that though their enterprises possessed the equipment, it was also inadequate. Among the enterprises with fire extinguishers, 10.4% of employers and 8.8% of the employers expressed inadequacy of the available equipment. This left majority of the enterprises with no basic fire control equipment (86.3%) as reported by the employers and (91.2%) as reported by employees. The enterprise, considering the wide array and magnitude of the hazards present, ought not only to have basic fire fighting and first aid equipment but also trained personnel to use the equipment. The lack of important equipment might have been brought about poor perception of the risks in the enterprises, economic

challenges, and lack of know-how on how to use them as well as deficient knowledge on both legislative demands and workplace safety.

The welfare utilities/facilities considered in the study were availability and adequacy of drinking water, eating cafeteria, resting places and amenities for exercise and sport. Majority of the enterprises had adequate drinking water reported by 100% (n=193) of the employees, and 97.7% (209) of employers. It was inadequate in only a few enterprises. All the employees (193) and 98.6% of employers affirmed the availability and adequacy of food cafeterias, while a very small proportion of employers reported the inadequacy and unavailability of the amenity. Most enterprises had facilities for supply of food and water because they are basic needs and considering the long duration of time spent on the enterprises, access to these needs is important. A study done among SMEs in Thailand reported similar findings where 98.6% had access to clean drinking water 72.5% to hygienic cafeteria and eating places (39). The multiplicity of tasks performed and inadequacy of work spaces, allocation of space for resting and exercise could just be a luxury with extra costs for the enterprises. For this reason facilities for exercise and resting were not available to most of the enterprises' employees and employers. A place for resting was not available in most of the enterprises. 61.4% of the employers and 98.4% of the employees, and inadequate for 7.6% of employers and 1.6% of the employees, and was only reported to be adequate by 2.4% of the employers. A place for exercise and sport was not available for those working in Kamukunji *jua kali* enterprises as expressed by 99% of employees and 91.5% of the employers. These amenities are useful for the wellbeing of the workers and efforts be made to promote and improve on the already existing ones while at the same time consider building awareness on the role and benefits of exercise on health, and promotion healthy lifestyle. Focus on unmasking the reasons for the low availability of some of the amenities is also necessary since the mandate of this study was only to describe the situation.

The information on waste disposal and sanitation was acquired by inquiring on the availability and adequacy of sanitary conveniences, avenues for disposing workplace waste products and drainage systems among the employees and employers. Most of the enterprises had adequate sanitary conveniences (98.1% and

100% according to employers and employees respectively) (Table 4.2.21 and Table 4.3.19). However, most of the enterprises lacked disposal avenues for the workplace waste (92%) according to the employers or inadequate (97.9%), as reported by the majority of the employees. Only a small percentage lacked waste disposal avenues. The availability of good drainage system was absent in majority (87.7% and 85.4%) according to both employers and employees respectively. A few of the respondents considered drainage system to be adequate. The lack of proper adequate drainage system may be associated with the informality of the structures of these enterprises which do not have proper planning, and so the need to incorporate other sectors e.g. public health and sanitation and city planning in efforts to provide a safer working environment

Self-reporting by the employers affirmed that Pre-employment medical examination was a requirement in most (76.5%) of the enterprises but not mandatory in some (23.5%) of the enterprises. Periodic medical examinations on the other hand, were not a requirement in most (95.3%) of the workplace but in only a few (4.7%) (Table 4.2.11). This points out that there may be some an appreciation of the need fitness to carry out the tasks well in these enterprises, but low knowledge on the real importance of the medical surveillance.

The low understanding of the legislative requirements concerning the health and safety, as well poor practices, possibly confounded by inadequate supervisory and law enforcement efforts by responsible authorities was reflected in how the SMEs handled safety issues administratively. According to 96.8% of employers and 100% of the employees, there was no one assigned responsibility for safety and health in the workplace, but 3.2% of the employers reported the presence of a person responsible for safety and health in the workplace. Risk assessment and management was not carried out in most of the enterprises (96.8%) in the previous one (1) year as reported by the employers as well as employees (100%). Health and safety audit by health and safety advisor was not done in majority of the work place as reported by both employer (97.2%), and employees (100%) (Tables 4.2.17 and 4.3.14). Similar challenges have also been highlighted in other studies on SMEs which revealed that only a small number of these enterprises have health and safety committees, and have low practice of risk assessment (61). Lack of adequate trained personnel in

concerned government ministry, high number of and widely dispersed workplaces, and high number of unregistered informal establishments present a big challenge to safety audit and inspection especially among the developing countries. Training of more personnel as well as outsourcing and collaborations among various interested parties in both public and private sector can help lessen this adversity.

5.2. Socio-demographic characterisitcs

Majority of employers/enterprise owners (99.1%) and employees (76.8%) were male (Tables 4.2.1 and 4.3.1). Most of the activities carried out in metal work which include metal fabrication and other processes are high risk and physically demanding. The industry along with mining and construction, fire-fighting are dominated male. Study done in Canada among welders showed all participants to be male. (59).

The enterprise owners' ages ranged from 26 years to 59 years with a mean of 44.68± 5.22 years. The employees' minimum age was 18 years, maximum of 60 years with mean age of 29.79± 5.41years. The employees are generally younger than the employers in many occupations. None of the respondents was below the age of 18 since the sector is considered high risk and therefore the young are to be protected from the hazardous exposures in the sector as stipulated by health and safety act (29).

The employers had attained a higher level of education relative to the employees. Among the employers, 20.1% had primary as their highest level of education attained, 32.7% secondary, 38.8% technical college, and 8.4% had university degree or higher whereas the highest level of education attained by the employees was 30.2% primary, 62.7% secondary, 6.1% Technical college and 0.9% had university degree or higher. The general level of education was low especially among the employees. This reduce their ability for choice of specialised work but are willing to perform any task in spite their limitations in knowledge and skill in both technical and safety areas, and therefore need for continuous regular training and supervision.

5.3. Work life characteristics

The employers had worked in the *Jua kali* sector for a minimum duration of 1.58 years and a maximum of 27.92 years and a mean of 11.03±4.56years. The minimum duration the employees have been in the sector was 0.67 years, a maximum duration of 21.08 years with a mean of 4.44±2.96years (Table 4.2.3 and Table 4.3.4). Like the age and level of education differences, the employers had worked in the sector for longer period as compared to the employees. The enterprise owners had also worked for longer periods in their current enterprises as compared to the employees. This difference may also be a pointer to a bigger concern of high employee turnover among the SMEs. Rapid changes to other jobs mean an increase in situations where one is new to the work environment, exposure to new hazards, and increase in unfamiliarity with reduced advantage of experience; which provide a recipe for increased risk of accidents and workplace injuries. This therefore, puts undue pressure on already minimal overstretched resources at the disposal of these SMEs to put more into training of new personnel on both safety and technical skill acquisition which is often not feasible. Focus on understanding the factors for the rapid transitions and controlling them may be of more significance and beneficial in the long term to these enterprises.

The employees (98.2%) and employers (86.2%) spent fairly similar durations of time in the workplaces (41-45 hours per week). Keeping in mind the small nature of work environments and low number of employees, this may play to enhance their social ties, and at the same time, shared common exposures to general workplace hazards irrespective of tasks done and therefore the importance of holistic focus on hazard control measures and more importantly to OHS education and medical surveillance.

Apart from managerial duties, 98.6% of the employers participated actively in other activities in the workplace. Managers and owners in SMEs are thought to play an integral part of their businesses not only in performing managerial duties but also by participating actively in the various activities that are done in the enterprise. This puts managers in a good position to not only advice the employees on safe practices but also lead by example, provided the employer is well informed on the crucial role of OHS in his/her workplace

The activities carried out by both employers and employees were analysed individually to see whether there was a significant difference in the proportions participating on these tasks relative to each other. The employers performed soldering and/or welding (6.2%), folding and/or rolling of metals (2.8%), painting (3.3%), cutting and/or grinding metals (10.9%), manual lifting and carrying (25.0%), and marketing and/or sales 94.8%; while the employees engaged in soldering and/or welding (18.1%), folding and/or rolling of metals (21.0 %), painting (19.0%), cutting and/or grinding metals (25.2%), manual lifting and carrying (7.6%), and marketing and/or sales 14.3%), (Table 4.4.1). The employees performed energy intense and relatively more hazard prone tasks (metal fabrication activities) compared to the employers who were involved more on manual carrying of materials and mostly in marketing and sales. Employers were also more likely to be performing more than one task in the enterprise than the employees. The owners are involved in tasks that is associated with money handling as the sell the products to clients hence maintaining the control of the enterprises. The labour intense activities done by employees may be associated with relatively increased risk of accidents and occupational related diseases. This points to a need for focused technical and safety and health training.

5.4. General Health and Safety

The availability and enrolment into a personal health insurance cover is important in enhancing access to healthcare services. Majority of both employers (95.9%) and employees (91.9%) had health insurance cover (Table 4.2.8 and Table 4.3.7). The high enrolment rate into health insurance may be due to the efforts put in the government in setting targets and directives towards ensuring all workers had access and can afford the health insurance premiums by supporting the informal and small enterprises. Other interested partners had contributed towards this goal through projects that subsidizes the health insurance costs for individuals, families and enterprises with low financial power in order to promote their access to healthcare. There were however, those who did not have a health insurance cover. Among the minority who did not have, 50% of the employers didn’t know how to get 88.9% of the employees 88.9% of the employees couldn’t afford. There is still need to put

effort towards universal coverage and more essential sustainability of the wide coverage.

Majority of employers (94.4%) and employees (90.6%) had not received any form of education on workplace health and safety (Table 4.2.10 and Table 4.3.9). Among those who had received only 25% of employers and 10% of the employees did receive while at the current job. (Table 4.4.4). This could be one of the reasons for poor performance in risk assessment, low usage of risk control measures, and lack of safety audit among other limitations note in the results. There is therefore need to address this important and essential component of health and safety, and as mentioned earlier, inadequate well trained staff in the DOHS among other obstacles when well addressed, will subsequently lead to increased dissemination of knowledge up to the SMEs.

The use of pre-employment examinations as well as periodic medical surveillance was very low. 96.3% of the employers had not had any medical exam to assess their fitness for the current work. All the employee respondents (212) did not undergo pre-employment medical examination for the current work. This was in contrary to the report by the 76.5% employers who stated that pre-employment medical examination was a requirement in their workplaces. This might be attributed to poor risk perception which is common among the small enterprises, and inadequate access to occupational health services (1, 2, 6, 36, 65). Focusing on increasing not only the awareness of the risks but also an emphasis on the consequences of the uncontrolled exposure to hazards, long term effects of occupational diseases and the benefits preventive measures as well of early diagnosis is essential. Policies and guidelines on pre-employment examinations for small enterprises and the self-employed persons is also essential to help those running their own businesses to understand more about health determinants and enhance control over their own health.

Information on health and safety hazards at the workplace, and the effect work on safety and health among both the employers and employees were also sought. Majority of both employers (97.2%) and employees (94.8%) acknowledged that there were health and safety hazards in their workplaces. 97.7% of employers and 92.3% of the employees reported that work pose a risk to their safety and health.

This knowledge reflects that those working in Kamukunji jua kali have an insight of the plights posed by the hazardous exposures in their work environment as noted when this is compared with hazard observation findings and self-reports.

According to the finding from hazard observation by the researcher, noise (50.9%), working in uncomfortable postures (42.5%), and mechanical and sharp parts (43.8%) had moderate or high exposure rating in most enterprises. Exposures rating for most of the other hazards were low: heat (78.7%), cold (87.5%), unfavourable weather (94.7%), Radiation (68.4%), lighting (86.6%), vibration (88.5%), electrical (91.1%), chemicals (>85.5%), as well as ergonomic (>57.5%), and biological hazards (98.4%). There were inadequate or lack of hazard control measures in most of the enterprises for almost all the hazardous exposures assessed (Table 4.1.6). The self-report by the employers reflected almost similar findings whereby apart from heat and noise, over 50% of them reported never or almost never exposed rating of the other hazards (Table 4.4.11). 70.7% were always or almost always exposed to noise while 37.6% were always or almost always exposed to heat hazards. Similar to researcher observations, the employers also reported low utilization of control measures: Over 90% of the workplaces almost never used or never used any hazard control measures for all the hazards listed (Table 4.4.13). The employees, however, reported high exposure ratings for most of the hazards (Table 4.4.14). They were always or almost always exposed to heat (97%), and mechanical and sharp parts (47.8%). Majority were exposed on around half the work time to; cold (52.9%), unfavourable weather (47.9%), Noise (51.3%), lighting hazard (50.6%), uncomfortable postures (62.4%), repetitive movements (46.5%), and biological hazards (45.5%). The exposures were low for; radiation (68.4%), vibration (65.5%), electrical hazards (83.3%), dust (51.8%), and gases (76.0%). Although the relatively more employees reported that hazard control measures were utilized at least half the time, the figures were generally low. Most of them lacked or never used any control measures against some hazards: unfavourable weather (68.6%), Noise (54.1%), radiation (80.4%), lighting (78.7%), vibration (85.2%), electrical (87.2%), gases (80.8%), sharp and mechanical parts (51.4%), and biological hazards (89.4%). There were almost no control measures for heat (73.4%), solvents (58.6%) and for manual handling and carrying of materials (62.0). There was however some minimal

usage of control measures for all the hazards in at least half the work time or more (Tables 4.1.5, 4.2.15 and 4.3.12). These differences can be due to over reporting of hazard exposures among employees as seen in a similar study of workers in scrap metal industry in the United States of America (54). It could also be a genuine difference considering that the workers performed more hazard prone tasks of metal forging while most employers were involved in less hazardous duties like marketing and sales. Observations made by the researcher represented a momentary assessment while the feedback from employees and employers was more about their day to day work experience and therefore a long term assessment of the exposures and use of protective measures. This might also have brought in the differences noted from hazardous exposure ratings as well as the use of hazard control measures.

There were inadequate or lack of hazard control measures in most of the enterprises for almost all the hazardous exposures assessed.

98.1% of the employers and 94.2% of the employees reported that work did affect their health. (Table 4.2.13 and Table 4.3.10). These figures are high as compared to findings in European survey on working condition (55). This could be due to the from personal experience as 81.4% of all respondents reported to have suffered an occupational disease or work related ill health; and 36.9% to have been involved in a workplace accident in the previous 1 year. The difference may also be due to the fact that the working conditions in Europe are much better and hence lesser negative feedback. From the list of the hazards observed in the workplaces, the respondents can be said to be well aware that their health and safety are at risk. However, there was a limited transfer of information from knowledge to practices and therefore, further investigations are essential to understand the reasons for and bridge this gap.

Among those who reported that work and workplace exposures affect their health (N=402), the health problems commonly listed by the respondents that can be due to their work included headaches (73.8%), muscular pains in the shoulder and neck (71.6%), and hearing problems (42%). Other health problems reported as visual problems (12.2%), respiratory problems (18.9%), skin problems (21.1%), backache (8.5%), stomach ache (8.5%), and muscular pains on the upper limbs. Among those who admitted that work affect their health, only 0.2% reported not to know how

work affected their health. (Table 4.4.2). The listed health problems could indeed be associated with the exposures found in such workplaces (40-47, 50, 62). The employer and employee having been matched based on workplace, McNemar test was used to test the agreement on health problems that can be attributed to work. Most of the problems highlighted were different between the two groups except for respiratory, back and stomach problems. More employers than employees listed headaches, hearing problems, and visual problems. On the other hand the problems reported to be due to work relatively highly by employees than employers were: Muscular pains in the shoulder and neck, skin problems, and muscular pains on the upper limbs. Those prominently listed among the employers seem to be more from long term effects of exposure (employers had spent longer duration on the sector) while those listed more by the employees were immediate consequences mainly due to awkward postures and repetitive movements reflective of the activities they perform (62). It appears that the information is based on experiential knowledge with deficiencies in propositional knowledge on potential effects of hazardous exposures at work. The noted gap puts high priority the need for provision of health promotion and preventive health services, opens up avenues for further investigations, setting up of interventional measures and continuous evaluation of systems.

When in need of healthcare services in the workplace, those working in Kamukunji *Jua kali* sought it from different places. 93.1% of employees sought the services from government health facility out of the workplace, 68.9% of employers, from private health facility, and only7.1% of employers and 0.5% of employees would seek health services from a health facility within the environs of the workplace (Tables 4.2.9 and 4.3.8). This kind of service delivery makes it difficult to reconcile information given by both employees and employers in terms of occupational diseases and other work related ill health with clinical data and diagnoses from health institutions. Setting up of a central registry and dedicating a specific health facility to serve the health needs of these SMEs with similar work process, and a shared physical location can offer better service and focused training of the health workers on the occupational health, as well providing a good follow up as long as records are well managed.

Majority of the respondents (92.1% of employers and 70.5% of employees) reported to have suffered an occupational disease or work related ill health which was diagnosed by a clinician; 19% of employees, suspected to have suffered from possible occupational ill health but not visited clinic (Table 4.4.8). This might be explained by the age and duration of operation in the sector both of which were higher among the employers. It therefore amounts to longer periods of exposure to hazards and increased possibility of occupational ill health. Only 6.1% of the employers and overwhelming 73.5% of the employees were involved in workplace accident in the previous one year while 93.9% of employers and 26.5% of employees stayed free of workplace accidents. Among those who had been involved in a workplace accident in the previous year, the employers were involved only twice or less (90.9% once and 9.1% twice). The employees however, had repeat accidents of up to five times; 37.9% once, 37.9% twice, 15.0% thrice, 8.5% for four times, and 0.7% for five times. (Table 4.3.5). The significantly high number of accidents among the employees may attributed to the relatively shorter duration of work experience in both the sector and current task, as well as the involvement in more hazardous activities compared to the employers.

Despite their knowledge on the wide range of health problems associated with the kind of work, the high frequencies of workplace accidence and work related diseases; they continue to operate in the sector. This could be due to lack of alternative opportunities. The problem is made worse by the general low level of education, lack of skills training and widespread poverty among most of those working in the informal *Jua kali* sector (3).

Majority of Kamukunji jua kali workers had not had any general health education though those who had received it were of higher proportion than those who had received health and safety training. 96.2% of the employers and 66.7% of the employees had not received any general health education, (Table 4.2.18 and Table 4.3.15). There is need to look further into the reason for the low coverage. Incorporation of health and safety education to go hand in hand with general health education and putting effort in dissemination of this comprehensive health education is recommendable. Among those who had received general health education, the topics covered were: proper nutrition (75% employers, 100% employees), malaria

(62.5% employers, 94.1 employees), HIV/AIDS (75% employers, 97.1% employees), fitness and exercise (75% employers, 83.8% employees), and on Tobacco, alcohol and other substances of potential abuse (62.5% employers, 83.8% employees), (Table 4.3.16). The topics, however minimal the number of workers who have had the privilege of learning about them, are relevant and very important in strive towards overall person's wellbeing.

The employers and employees gave their opinion with on what they considered obstacles to safe decent work. When well looked into, may offer guidance on priority areas to improve on the prevailing health and safety conditions. Most of the employers considered the severity of the listed obstacles to OSH as at least of moderate intensity. The top three challenges considered by majority of the employers as serious or very serious barrier were; lack support and guidance from government (31.3%), planning difficulties (26.3%), and cost (23.7%) (Table 4.2.22). The employers (>93%) considered the suggested solutions as high priority. The top three rated by most as of high priority or essential for improvements of OHS were: Collaboration with government agencies and other stakeholders (97.6%), upgrading equipment (97.1%), and technical training (96.7%) (Table 4.2.23).

The top three challenges considered by majority of the employees to be serious or very serious barrier were; lack of support and guidance from government (88.7%), lack of information on health and safety (60.7%), and cost (59%) (Table 4.3.21). The top three suggestions rated by employees as high priority or essential for improvement in OHS were: provision of more personal protective equipment (100%), Upgrading equipment (99%), and health and safety training (99%) (Table 4.4.21.).

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusions

Kamukunji *jua kali* micro and small sized metal enterprises;

Had high number and variety of health hazards, low health and safety practices, both employers and employees were well aware of the presence of health hazards and the negative effects on health but disconnect exists between knowledge and practice.

- Had inadequate working space (63.8%) for work to be carried out with ease with 81.9% having to perform some of their tasks in open air without shelter from environmental exposures.
- Were involved in manufacture and sale of metal products; most of the employees performing the metal fabrication while sales services were done mainly by the employers.
- Persons working per enterprise ranged from owner working alone to a maximum of 15 employees with a mean of 3.48±1.9 employees.
- Hazardous agents were very common; Noise (98.2%), mechanical and sharp objects (99.5%) and ergonomic hazards (>93%) were the most prevalent. The employees reported higher exposure rating to most hazards as compared to employers and researcher report; but there were generally inadequate or lack of hazard control measures in most of the enterprises for almost all the hazardous exposures assessed.
- 98.4% of respondents (97.2% employers, 99.5% employees) showed that the work places did not have an operational system in place for recording and reporting of both accidents and work related ill health information
- Possession of First aid (22.1%) and fire control equipment (12.1%) was low
- Basic welfare facilities were available: over 90% had adequate drinking water and eating cafeteria; but over 61.4% did not have resting places and more than 91.5% lacked exercise and sport amenities.
- Sanitary conveniences available in most (91.8%), but majority lacked adequate avenues for disposal of workplace waste (92%) and no good drainage system (>85.4%)

- Pre-employment medical examination was a requirement in most (76.5%) of the enterprises but Periodic medical examinations were not mandatory (95.3%). However, 96.3% of the employers had not had any medical exam to assess their fitness for the current work and all the employees (100%) did not undergo pre-employment medical examination.
- Risk assessment and management was not carried out in most of the enterprises (96.8%) in the previous one year and no Health and safety audit by health and safety advisor done as well (97.2%). Over 96.8% had no one assigned responsibility for safety and health in the workplace.
- Majority of employers (99.1%) and employees (76.8%) were male. High proportion of both employers (98.2%) and employees were married (75.9%).
- Employers' ages ranged from 26 years to 59 years with a mean of 44.68± 5.2 years, and employees' minimum age was 18 years, maximum of 60 years with mean age of 29.79± 5.4 years.
- Employers had attained higher level of education with 47.2% above secondary (Technical college or university degree) and only 7% of employee in the same category.
- Employers had worked in the *Jua kali* sector for a minimum duration of 1.58 years, a maximum of 27.92 years and a mean of 11.03±4.6 years while the minimum duration the employees had been in the sector was 0.67 years, a maximum duration of 21.08 years with a mean of 4.44±2.96 years.
- Apart from managerial duties, 98.6% of the employers participated actively in other activities in the workplace.
- Majority of both employers (95.9%) and employees (91.9%) had health insurance cover
- Training on workplace health and safety was generally low whereby most of employers (94.4%) and employees (90.6%) had not received any.
- Employers (97.2%) and employees (94.8%) acknowledged that there were health and safety hazards in their workplaces; and 97.7% of employers and 92.3% of the employees reported that work posed a risk to their safety and health.

- Commonly listed problems associated with workplace exposures were headaches (73.8%), muscular pains in the shoulder and neck (71.6%), and hearing problems (42%).
- Healthcare services were sought from government health facility out of the workplace (93.1% of employees), and from private health facilities (68.9% of employers).
- Occupational disease or work related illness had afflicted 92.1% of employers and 70.5% of employees, and only 6.1% of the employers and overwhelming 73.5% of the employees were involved in workplace accident in the previous one year.
- General health education topics received were on nutrition, malaria and HIV/AIDS; but 96.2% of the employers and 66.7% of the employees had not received any.
- Lack of support and guidance from government (31.3%), planning difficulties (26.3%), and cost (23.7%), were considered as serious or very serious barriers to OHS by employers and over 95% suggested; Collaboration with government agencies and other stakeholders, Upgrading equipment, and technical training as high priority solutions.
- The employees listed lack of support and guidance from government (88.7%), lack of information on health and safety (60.7%), and cost (59%) as serious or very serious barriers to OHS; and over 99% suggested provision of more personal protective equipment, Upgrading work equipment, and health and safety training as possible solutions to improving workplace health and safety.

6.2. Recommendations

Kamukunji Jua Kali Association:

- To encourage members to put more effort in safe practices and compliance with legislative requirements, seek avenues for provision of OHS training

Government;

- Accelerate the process of disseminating the provision of BOHS
- Guide SMEs to establish and maintain proper record keeping

- With involvement of SMES, establishment specific health facilities to serve similar industries recommended.
- Train more OHS personnel, promote worker education, and improve on inspection of workplaces

General- To all stakeholders and interested parties

- There is need for proactive participation of all interested parties in approach to controlling hazardous exposures in order to promote the well-being of the group as it can be noted that the exposures to hazards were high but with minimal use of control measures.
- Considering that most of the personnel in the MSEs were under a personal health insurance cover, insurance agencies can be utilised to aid in dissemination of safety information by integrating workplace health and safety education into their programs.
- Measures to be put in place to reduce the gap between knowledge and practice. Majority acknowledged the importance of health and safety, the need for medical surveillance, and that hazardous exposures were not only present in the workplace but also affected their health; but few health and safety practices were in place- pre-employment examination, risk assessment, responsibility for OHS, safety audit, health and safety education, hazard control measures, recording and reporting of accidents and work related ill health.
- The high possession of health insurance among both employers and employees commendable and should be sustained. However, a system should be put in place to identify and equip a common health facility where services can be sought by all those working in the sector when there is need for medical attention in the workplace. This could help in improving health service delivery as well as recording of work related ill health and occupational accidents.
- The obstacles to occupational health and safety raised, and the suggestions made by the respondents be looked into and utilised as preliminary guidance to the intervention towards improvement of health and safety of those working in the sector.

- Based on the descriptive nature of the study, which is limited to offers a basic outlook, there is need for more focused preferably analytical studies to elucidate the relationship between the exposures and health outcomes; and interventional research to help in improving the working conditions as well as evaluating the success of control measures and other interventions.

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Appendix 1. Questionnaires

OCCUPATIONAL HEALTH AND SAFETY STATUS IN KAMUKUJI JUA KALI SMALL AND MEDIUM-SIZED METAL ENTERPRISES

Workplace assessment form **Workplace number_____**

1. Date of onset (month and year) _____
2. Type of work environment :
    1. Open
    2. Closed
    3. Partially enclosed
    4. Mixed- some part open other closed
3. Working environment size/space
    1. Adequate
    2. Inadequate
4. Technology in use
    1. Old
    2. Modern
    3. Mixed(modern and old)
5. Type of activities(can choose more than one)

Type of work	No(0)	Yes(1)
Soldering and welding		
Folding and rolling metals		
Painting		
Cutting and grinding		
Lifting and transporting materials		
Marketing and sales		
Others (Specify_____		

6. Workplace factors(indicate by circling appropriate number as given on the scale below)

Health Hazard	**Presence*(0-5)**	**Present**		
		Exposure status(0-5)**	**Control measures**	
			Available, Usage*(0-2)**	**None**
Physical				
Heat	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2	
Cold	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2	
Extreme weather conditions	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2	
Noise	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2	
Optical Radiation	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2	
Unsuitable lighting(Inadequate or	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2	

excess)			
Vibration	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
High voltage electrical Appliances	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
Chemical			
Metals	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
Solvents	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
Dust	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
Gases	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
Ergonomic hazards			
Lifting and/or carrying heavy materials	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
working in uncomfortable postures	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
Repetitive movements	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
Biological agents(Insects, animals, bacteria, virus, fungi)	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
mechanical and sharp parts	0-1-2-3-4-5	0-1-2-3-4-5	0- 1- 2
Others_____			

***Presence and injury risk: 0=not present, 1=present, very low risk 2=low risk, 3=moderate risk, 4=high risk, 5= very high risk**

****Exposure: 0= Not exposed 1=very low, 2=low, 3=moderate, 4=high 5= very high**

*****Hazard control measures' Usage: 0= none used, 1= minimal usage 2= Well Used**

7. Health and safety Precautions- Use of Personal protective equipment66

PPE		**None(0)**	**Present**			
			Unsuitable for the risk		**Appropriate for the risk**	
			Not Used(1)	**Used(2)**	**Not Used(3)**	**Used(4)**
	Work clothes/Overalls					
	Gloves					
	Safety boots					
	Protective eye glasses					
	Ear plugs, Ear muffs					
	Mask					
	Others_____					
		Absent(0)		**Present(1)**		
Fire safety equipment						
First aid equipment						

OCCUPATIONAL HEALTH AND SAFETY STATUS IN KAMUKUJI SMALL AND MEDIUM-SIZED METAL ENTERPRISES

Employer/manager questionnaire No_____ Workplace number_____

Dear participant.
The aim of this survey is to get information on the status of occupational health and safety practice in Kamukunji *Jua Kali* Small and medium scale enterprises. The data collected will be used only for scientific purposes.
In order to get the real situation of health and safety, please answer the questions fully and correctly as possible.
Please do not write your name on this form.
Participation is voluntary and can withdraw from the study at any stage.
If you agree to participate in the study please mark appropriately on the box below.

☐ I agree ☐ I do not agree

Thank you for your Participation.

1. Please indicate your age_____
2. Indicate your Sex
   (1) Male
   (2) Female
3. Indicate you marital status
   (1) Married
   (2) Single
   (3) Divorced
   (4) Widowed
   (5) Other (specify) _____
4. What is the highest level of education you've attained?
   (1) Primary
   (2) Secondary
   (3) technical college
   (4) University degree and above
5. How many employees do you have_____?
6. How long have you been working in *jua kali* sector (Total duration)? _____years ___ months
7. How long have you worked in the current enterprise? _____years ___ months?
8. How many hours do you work in a day? _____

9. How many days do you work in a week? _____
10. Apart from management are you also involved in active work?
    - **0.** No(If not, proceed to question **12**)
    - **1.** yes

11. What kind of work do you do currently (You can select more than one)?

Type of work	Indicate by marking on this column
welding	
Folding /rolling metals	
Painting	
Cutting Metals	
Manual carrying of materials	
Marketing and sales	
Others (Specify_____	

12. In the last one year have you been involved in a workplace accident?
    - **0.** No
    - **1.** Yes, approximately how many times____
13. Have you suffered an occupational disease or from a suspected work related illness?
    - **0.** No
    - **1.** Yes, diagnosed by a clinician
    - **2.** Possible(I suspected but haven't gone to clinic/ hospital)
14. Do you have a personal Medical insurance cover?
    - **0**. No
    - **1.** Yes (If yes go to question 16)
15. What is the reason for lack of personal health insurance?
    - **1.** I can't afford
    - **2.** I don't know how to get
    - **3.** I don't need
    - **4.** Other(Specify)_____
16. Have you had any workplace health and safety education/Training?
    - **0.** No
    - **1.** Yes, while at the current job/workplace
    - **2.** Yes, but not at the current workplace
17. Are your employees required to have a pre-employment medical examination?
    - **0.** No
    - **1.** Yes
18. Are periodic medical examinations done in your work place?
    - **0.** No
    - **1.** Yes

19. Have you had any medical examination to assess your fitness for your current work?
    - **0.** No
    - **1.** Yes
20. Do you have an operational system in place for recording and reporting occupational accidents, occupational related ill health?
    - **0.** No
    - **1.** Yes, only accidents
    - **2.** Yes, only work related ill health
    - **3.** Yes, for both accidents and work related ill heath
21. Are there any safety and health hazards (things that can injure/harm you) in your enterprise?
    - **0.** No(If no proceed to question 23)
    - **1.** Yes
22. What are the hazards in your workplace? (You can select more than one: Indicate by circling the appropriate number based on the scale provided below.)

Health Hazard	**Presence and Exposure status*(0-5)**	**Use of Risk Control and protective measures**
		Availability, and Usage **(0-5)
physical		
Heat	0 1 2 3 4 5	0 1 2 3 4 5
cold	0 1 2 3 4 5	0 1 2 3 4 5
Extreme weather conditions	0 1 2 3 4 5	0 1 2 3 4 5
Noise	0 1 2 3 4 5	0 1 2 3 4 5
Optical Radiation	0 1 2 3 4 5	0 1 2 3 4 5
Unsuitable lighting(Inadequate or excess)	0 1 2 3 4 5	0 1 2 3 4 5
Vibration	0 1 2 3 4 5	0 1 2 3 4 5
High voltage electrical Appliances	0 1 2 3 4 5	0 1 2 3 4 5
Chemical		
Metals	0 1 2 3 4 5	0 1 2 3 4 5
Solvents	0 1 2 3 4 5	0 1 2 3 4 5
Dust	0 1 2 3 4 5	0 1 2 3 4 5
Gases	0 1 2 3 4 5	0 1 2 3 4 5
Ergonomic hazards		
Lifting and/or carrying heavy materials	0 1 2 3 4 5	0 1 2 3 4 5
working in	0 1 2 3 4 5	0 1 2 3 4 5

uncomfortable postures													
Repetitive movements	0	1	2	3	4	5		0	1	2	3	4	5
Biological agents(Insects, animals, bacteria, virus, fungi)	0	1	2	3	4	5		0	1	2	3	4	5
Mechanical and sharp object edges	0	1	2	3	4	5		0	1	2	3	4	5

***Exposure status: 0= Hazard absent, 1=never Exposed, 2= Almost never exposed, 3=around half the time, 4=Almost always, 5 = Always exposed**

****Use of control measures: 0= none available 1=Never used, 2= almost never used, 3= around half the time, 4= almost always used, 5= used always**

23. Is there person(s) appointed to be responsible for safety and health in your workplace?
    - **0.** No
    - **1.** Yes
24. Have you carried out risk assessment and management on your work place?
    - **0.** No
    - **1.** Yes
25. In the last one year, has a Health and safety advisor visited to audit your workplace?
    - **0.** No
    - **1.** Yes
26. Do you think your health or safety is at risk because of your work, or not?
    - **0.** No
    - **1.** Yes
    - **2.** I don't know
27. Does your work affect your health?
    - **0.** No, it does not affect my health(IF No proceed to question 29)
    - **1.** Yes, it affects my health
    - **2.** I don't know

28. How does your work affect your health (You can choose more than one)?
    - **(1)** Hearing problems
    - **(2)** Problems with my vision
    - **(3)** Respiratory problems
    - **(4)** Skin problems
    - **(5)** Backache
    - **(6)** Headaches
    - **(7)** Stomach ache
    - **(8)** Muscular pains in shoulders and neck
    - **(9)** Muscular pains on the upper limbs

(10) I don't know

(11) Other (specify)_____

29. Where do you go to seek for healthcare services when need be in your workplace?
    (1) Recommended Health facility within the workplace
    (2) Government health facility out of workplace
    (3) Private health facility
    (4) I don't know
    (5) Other(specify)_____
30. Have you had a general health education?
    0. No(proceed to question 32)
    1. Yes, while at the current
    2. Yes, but not at the current workplace
31. What were the topic(s) of the health education(indicate by marking appropriately on the table- You can choose more than one where applicable)

Topic	**Yes**	**No**
Proper Nutrition		
Malaria		
HIV/AIDS		
Sport and exercise		
Tobacco, alcohol and other substances of abuse		
Other(s)_____		

32. Indicate the whether the following other welfare facilities/utilities are present

Facilities/Utilities	**present**		**Absent(0)**
	Adequate(2)	**Inadequate(1)**	
Drinking water			
Toilet/Latrine			
Food cafeteria			
Resting place			
First aid Equipment			
Fire prevention/control equipment			
Place for sport and exercise			
Waste disposal			
Drainage			

33. What are the obstacles to health and safety in your work place (rate on a scale of 1-4 by circling appropriate number based on the scale provided below the table)*?

***1=not a problem, 2=Minor problem, 3= Moderate barrier, 4= serious barrier 5=Very serious barrier**

Cost	1	2	3	4	5
Lack of information on health and safety	1	2	3	4	5
Priority to productivity and profits	1	2	3	4	5
Planning difficulties	1	2	3	4	5
Lack of support and guidance from government	1	2	3	4	5
Others(Specify)_____	1	2	3	4	5

34. What can you suggest as possible solutions to improving safety and health in the workplace? (Indicate its priority by circling the appropriate number based on a scale of 1-5* provided below)

*** 1 = Not a priority, 2 = Low priority, 3 = Medium priority, 4 = High priority, 5 = Essential**

Health and safety Training	1	2	3	4	5
Provision of more personal protective equipment	1	2	3	4	5
Collaboration with responsible government agencies and other stake holders	1	2	3	4	5
Upgrading equipment	1	2	3	4	5
Technical Training	1	2	3	4	5
Other (specify)_____	1	2	3	4	5

OCCUPATIONAL HEALTH AND SAFETY STATUS IN KAMUKUJI SMALL AND MEDIUM-SIZED METAL ENTERPRISES

Employee questionnaire No____ Workplace number/ Employee

Dear participant.

The aim of this survey is to get information on the status of occupational health and safety practice in Kamukunji *Jua Kali* Small and medium scale enterprises. The data collected will be used only for scientific purposes.

In order to get the real situation of health and safety, please answer the questions fully and correctly as possible.

Please do not write your name on this form.

Participation is voluntary and can withdraw from the study at any stage.

If you agree to participate in the study please mark appropriately on the box below.

☐ I agree ☐ I do not agree

Thank you for your Participation.

1. Please indicate your age_____
2. Indicate your Sex
   (1) Male
   (2) Female
3. Indicate you marital status
   (1) Married
   (2) Single
   (3) Divorced
   (**4)** Widowed
   (5) Other (specify)_____
4. What is the highest level of education you've attained?
   (1) Primary
   (2) Secondary
   (3) technical college
   (4) University degree and above
5. How long have you been working in *jua kali* sector (Total duration)? _____years_____Months
6. How long have you worked in the current enterprise_____years_____ Months?
7. How many hours do you work in a day? _____hours
8. How many days do you work in a week? _____
9. What kind of work do you do currently (You can select more than one as applicable)?

Type of work	Indicate by marking on this column
Welding, Soldering	
Folding /rolling metals	
Painting	
Cutting Metals	
Manual carrying of materials	
Marketing and sales	
Others (Specify_____	

10. In the last one year have you been involved in a workplace accident (that requires medical attention and/or not being able to attend to your work)?
    - **0.** No
    - **1.** Yes, approximately how many times____
11. Have you suffered an occupational disease or from a suspected work related illness?
    - **0.** No
    - **1.** Yes, diagnosed by a clinician
    - **2.** Possible(I suspected but haven't gone to clinic/ hospital)
12. Do you have a personal Medical insurance cover?
    - **0.** No
    - **1.** Yes (If yes go to question 14)
13. What is the reason for lack of personal health insurance?
    - **0.** I can't afford
    - **1.** I don't know how to get
    - **2.** I don't need
    - **3.** Other(Specify)_____
14. Have you had any training/education on safety and health in work place?
    - **0.** No
    - **1.** Yes, while at the current
    - **2.** Yes, but not at the current workplace
15. Did you undergo pre-employment medical examination?
    - **0.** No
    - **1.** Yes
16. Have you had periodic medical examinations done in your work place?
    - **0.** No
    - **1.** Yes
17. Do you have an operational system in place for recording and reporting occupational accidents, occupational related ill health?
    - **0.** No
    - **1.** Yes, only accidents
    - **2.** Yes, only work related ill health
    - **3.** Yes, for both accidents and work related ill heath

18. Are there any safety and health hazards (things that can injure/harm you) in your work environment?
    - **0.** No (If no proceed to question 20)
    - **1.** Yes
    - **2.** I don't know

19. What are the common hazards in your workplace? (you can select more than one)

Health Hazard	**Presence and Exposure status*(0-5)**	**Present Risk Control measures Availability, and Usage **(0-5)**
physical		
Heat	0 1 2 3 4 5	0 1 2 3 4 5
cold	0 1 2 3 4 5	0 1 2 3 4 5
Extreme weather conditions	0 1 2 3 4 5	0 1 2 3 4 5
Noise	0 1 2 3 4 5	0 1 2 3 4 5
Optical Radiation	0 1 2 3 4 5	0 1 2 3 4 5
Unsuitable lighting(Inadequate or excess)	0 1 2 3 4 5	0 1 2 3 4 5
Vibration	0 1 2 3 4 5	0 1 2 3 4 5
High voltage electrical Appliances	0 1 2 3 4 5	0 1 2 3 4 5
Chemical		
Metals	0 1 2 3 4 5	0 1 2 3 4 5
Solvents	0 1 2 3 4 5	0 1 2 3 4 5
Dust	0 1 2 3 4 5	0 1 2 3 4 5
Gases	0 1 2 3 4 5	0 1 2 3 4 5
Ergonomic hazards		
Lifting and/or carrying heavy materials	0 1 2 3 4 5	0 1 2 3 4 5
working in uncomfortable postures	0 1 2 3 4 5	0 1 2 3 4 5
Repetitive movements	0 1 2 3 4 5	0 1 2 3 4 5
Biological agents(Insects, animals, bacteria, virus, fungi)	0 1 2 3 4 5	0 1 2 3 4 5
Mechanical and sharp object edges	0 1 2 3 4 5	0 1 2 3 4 5

***Exposure status: 0= Hazard absent, 1=never Exposed, 2= Almost never exposed, 3=around half the time, 4=Almost always, 5 = Always exposed**

****Use of control measures: 0= none available 1=Never used, 2= almost never used, 3= around half the time, 4= almost always used, 5= used always**

20. Is there person(s) appointed to be responsible for safety and health in your workplace?
    - **0.** No
    - **1.** Yes
21. Has risk assessment and management been carried out on your work place?
    - **0.** No
    - **1.** Yes
    - **2.** I don't know
22. In the last one year, was a Health and safety advisor invited to audit your workplace?
    - **0.** No
    - **1.** Yes
    - **2.** I don't know

23. Do you think your health or safety is at risk because of your work, or not?
    - **0.** No
    - **1.** Yes
    - **2.** I don't know
24. Does your work affect your health, or not?
    - **0.** No, it does not affect my health(IF No proceed to question 26)
    - **1.** Yes, it affects my health
    - **2.** I don't know
25. How does your work affect your health?
    - **(1)** Hearing problems
    - **(2)** Problems with my vision
    - **(3)** Respiratory problems
    - **(4)** Skin problems
    - **(5)** Backache
    - **(6)** Headaches
    - **(7)** Stomach ache
    - **(8)** Muscular on shoulders and neck pains
    - **(9)** Muscular pains in the limbs
    - **(10)** I don't know
    - **(11)** Other (specify)_____
26. Where do you go to seek for healthcare services when need be in your workplace?
    - **(1)** Recommended Health facility within the workplace
    - **(2)** Government health facility out of workplace

(3) Private health facility
(4) I don't know
(5) Other(specify)_____

27. Have you had a general health education?
    0. No(If No, proceed to question 30)
    1. Yes
28. What were the topic(s) of the health education(You can choose more than one- indicate by marking with an **[√]** appropriately on the table)

Topic	**yes**	**No**
Proper Nutrition		
Malaria		
HIV/AIDS		
Sport and exercise		
Tobacco, alcohol and other substances of abuse		
Other(s)_____		

29. Indicate the whether the following other welfare facilities/utilities are present at your workplace.

Facilities/Utilities	**Absent(0)**	**Present**	
		Inadequate(1)	**Adequate(2)**
Drinking water			
Toilet/Latrine			
Food cafeteria			
Resting place			
First aid Equipment			
Fire prevention/control equipment			
Place for sport and exercise			
Waste disposal			
Drainage			

30. What are the obstacles to health and safety in your work place (rate on a scale of 1-4* by circling appropriate number based on the scale provided below the table)?

***1=not a problem, 2=Minor problem, 3= Moderate barrier, 4= serious barrier**

Cost	1	2	3	4	5
Lack of information on health and safety	1	2	3	4	5
Priority to productivity and profits	1	2	3	4	5
Planning difficulties	1	2	3	4	5
Lack of support and guidance from government	1	2	3	4	5
Others_____	1	2	3	4	5

31. What can you suggest as possible solutions to improving safety and health in the workplace? (Indicate its priority by circling the appropriate number based on a scale of 1-5* provided below)?

***1=not a priority, 2=low priority, 3=Medium priority, 4=High priority, 5=Essential**

Health and safety Training	1	2	3	4	5
Provision of more personal protective equipment	1	2	3	4	5
Collaboration with responsible government agencies and other stake holders	1	2	3	4	5
Upgrading equipment	1	2	3	4	5
Technical Training	1	2	3	4	5
Other	1	2	3	4	5

Appendix 2 (a). Application for permission to carry out study, document 1.

EMBASSY OF THE REPUBLIC OF KENYA * ANKARA *

forwarded
20/02/2014

20/02/ 2014

TO: SECRETARY GENERAL,
KAMUKUNJI JUA KALI ASSOCIATION

THRU'
KENYA EMBASSY IN ANKARA – TURKEY

RE: PERMISSION TO CARRY OUT RESEARCH

My name is **Kibor Kipkemoi KEITANY**. I am graduate student at Hacettepe University, Institute of Public Health, Department of Occupational Health and Occupational Diseases pursuing a Master of Sciences- Occupational Health. I plan and seek your permission to collect data for thesis research project ***'Occupational health and safety Status in Kamukunji small and medium sized metal enterprises'*** within your enterprises. The research will involve use of work place assessment form and questionnaires to collect data from both the employers and the employees.
For purposes of good research practice I request that you indicate the acceptance by writing and signing on this letter.

Attached is a copy of a letter addressed to you from my university, though written in Turkish, it is expressing the same on my behalf.

Yours Faithfully

Kibor Kipkemoi KEITANY

KAMUKUNJI JUA KALI ASSOCIATION
DATE 24/2/14
P.O BOX 78553 NAIROBI

Fredrick Dewa
Secretary General

Appendix 2 (b). Application for permission document

T.C.
HACETTEPE ÜNİVERSİTESİ
Genel Sekreterlik

Yazı İşleri Müdürlüğü

Sayı : 88600825/180-643
Konu :

20 Şubat 2014

KAMUKUNJI JUA KALI ASSOCIATION GENEL SEKRETERLİĞİNE

Üniversitemiz Halk Sağlığı Enstitüsü İş Sağlığı ve Meslek Hastalıkları Anabilim Dalı İş Sağlığı Yüksek Lisans öğrencilerinden **Kibor KİPEMOİ KEİTANY, "Kamukunji Jua Kali Bölgesinde Metal İşkolunda Faaliyet Gösteren İşyerlerinde İş Sağlığı ve Güvenliği Durumu"** konulu tezinin verilerini Kenya'da toplamak istemektedir.

Adı geçen öğrencimizin söz konusu çalışmayı yapabilmesi için gerekli izinlerin verilmesi hususunda gereğini saygılarımla rica ederim.

Prof. Dr. A.Murat TUNCER
Rektör

KAMUKUNJI JUA KALI ASSOCIATION
DATE 24/2/14
P. O. BOX 78553 NAIROBI

Fredrick Sauw
Secretary General

Eki:
1-Dilekçe
2-Danışman Onayı
3-Tez Öneri Formu

Hacettepe Üniversitesi Genel Sekreterlik, Yazı İşleri Müdürlüğü, 06100 Sıhhiye-Ankara
Telefon: 0 (312) 305 1008 - 1039 • Faks: 0 (312) 310 5552
E-posta: yazimd@hacettepe.edu.tr

Ayrıntılı Bilgi için:

Appendix 2 (c). Written permission from KJKA officials.

KAMUKUNJI JUA KALI ASSOCIATION

P.O BOX 78558-00507

Date:.....

3/4/2014

RE: PERMISSION TO CARRY OUT RESEARCH

Following application of permission to carry out study "occupational, Health and Safety status in Kamukunji Jua Kali small and medium sized metal enterprises" the application has been accepted and permission to carry out the study is hereby granted.

KAMUKUNJI JUA KALI ASSOCIATION
P.O BOX 78558 NAIROBI

Fredrick Dawa
SECRETARY GENERAL
TEL: 0724 709 887

Appendix 3. Ethical approval and permission from Hacettepe university Ethical committee.

T.C.
HACETTEPE ÜNİVERSİTESİ
Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu

Sayı : 16969557 – 373 26 Mart 2014

ARAŞTIRMA PROJESİ DEĞERLENDİRME RAPORU

Toplantı Tarihi : 19.03.2014 ÇARŞAMBA
Toplantı No : 2014/05
Proje No : GO 14/182 (Değerlendirme Tarihi 19.03.2014)
Karar No : GO 14/182 - 24

Üniversitemiz Halk Sağlığı Enstitüsü İş ve Meslek Hastalıkları Anabilim Dalı öğretim üyelerinden Doç.Dr. Sibel KIRAN'ın sorumlu araştırmacı olduğu Dr. Kibor Kipkemoi KEITANY'ın tezi olan GO 14/182 kayıt numaralı ve ***"Kamukunji Jua Kali Bölgesinde Metal İşkolunda Faaliyet Gösteren İş Yerlerinde İş Sağlığı ve Güvenliği Durumu"*** başlıklı proje önerisi araştırmanın gerekçe, amaç, yaklaşım ve yöntemleri dikkate alınarak incelenmiş olup, idari izinlerin tamamlanması kaydı ile etik açıdan uygun bulunmuştur.

1.Prof. Dr. Nurten Akarsu (Başkan)
GÖREVLİ
2. Prof. Dr. Nüket Örnek Buken (Üye)
3. Prof. Dr. M. Yıldırım Sara (Üye)
4. Prof. Dr. Sevda F. Müftüoğlu (Üye)
5. Prof. Dr. Cenk Sökmensüer (Üye)
6. Prof. Dr. Volga Bayrakçı Tunay (Üye)
7. Prof. Dr. Songül Vaizoğlu (Üye)
8. Prof. Dr. Yılmaz Selim Erdal (Üye)
9 Prof. Dr. Melahat Görduysus (Üye)
GÖREVLİ
10. Prof. Dr. Cansın Saçkesen (Üye)
11. Prof. Dr. R. Köksal Özgül (Üye)
12. Prof. Dr. Ayşe Lale Doğan (Üye)
13 Doç. Dr. S. Kutay Demirkan (Üye)
14. Prof. Dr Leyla Dinç (Üye)
15. Yrd. Doç. Dr. H. Hüsrev Turnagöl (Üye)
16. Av. Meltem Onurlu (Üye)

Hacettepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu
06100 Sıhhiye-Ankara
Telefon: 0 (312) 305 1082 • Faks: 0 (312) 310 0580 • E-posta: goetik@hacettepe.edu.tr
Ayrıntılı Bilgi için:

Appendix 4. Pictures