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Predisposing Factors to Hearing Loss among the "Jua Kali" Workers: A Case Study of "Jua Kali" Workers in Mombasa County, Kenya

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Abstract

The "Jua Kali" sector which is an informal, unorganized small-scale enterprise employment in Kenya is a source of many livelihoods in most cities and towns. However the sector is inadequately supervised and lacks occupational health services with the workers characterized by little or no formal education, knowledge on occupational safety procedures, environmental safety requirements, and even the occupational health and safety laws and legislation making them vulnerable to many occupational health hazards. The aim of the study was to assess the predisposing factors to hearing loss among the "Jua Kali" workers in Mombasa County, Kenya. A well-structured questionnaire was used to collect social demographic and work related data while noise level measurements (noise mapping) were done randomly on elected subjects by using sound level meters. The audiometric test was done on the workers by use of clinical audiometer machine (measured at 4,000Hz) to determine the hearing levels. The data was analyzed using SPSS version 21.0. Out of 146 participants involved in the study, 47.9% had moderate hearing loss while 2.7% had severe hearing loss as per the disposing factors. There was a correlation ($p<0.05$) between disposing factor and hearing loss among the Jua Kali workers. Therefore, there is need to effectively regulate the informal sector, create awareness campaign on effects of noise exposure, establish hearing monitoring centers, and provide PPEs to arrest the otherwise forgotten irreversible disability causing hazard the Juakali workers are exposed to.

Key words: Predisposing factors, Hearing loss, Jua Kali, Informal sector, occupational health hazards

Introduction

The informal sector "Jua Kali" which is unorganized small-scale enterprise employment is a source of many livelihoods in most cities and towns in Kenya and the world over (Theuri, 2012). In Kenya, the sector accounts for nearly 18% of the GDP and comprises 90% of all businesses in the country (Theuri, 2012; ILO, 2005). Nevertheless in this sector which is inadequately supervised and lacks occupational health services, the workers are characterized by little or no

formal education, hence no knowledge on occupational safety procedures, environmental safety requirements, and even the occupational health and safety laws and legislation making them vulnerable to many occupational health hazards either directly or indirectly (African Newsletter, 2012). Among the experienced occupational health hazard is the noise-induced hearing loss that is caused by being exposed to uncontrolled noise in the cause of work. Noise is probably the most common occupational health problem in the world and especially in the manufacturing industries (African Newsletter, 2012) and Jua Kali sector in Kenya is not an exceptional. Like so many occupational health hazards, noise is insidious although traumatic noise exposure may cause an immediate hearing loss (American Hearing Research Foundation, 2009). In most cases individuals with noise-induced hearing loss may not become aware of the condition until it is of handicapping proportion; and by that time, it is permanent (United States Technical Service, 2000).

It has been estimated that as many as 500 million individuals worldwide might be at risk of developing noise-induced hearing loss (Alberti, 1998). The impact of hearing loss worldwide is manifestly under-appreciated, with studies suggesting that one in six adults are afflicted with some degree of physiologic hearing impairment (International Archives of Otorhinolaryngology, 2006). The Center for Disease Control (CDC) report states that 15% of Americans between the ages 20 to 69 years have hearing loss that could be caused by exposure to noise at work or leisure activities (CDC, 2010). According to Verbeek *et al*. (2012), 9 million workers in the USA are at risk of losing their hearing ability due to regular exposure to sound of 85 dB or greater. In the European Union, 28% of workers surveyed were reported to spend at least one-fourth of the time occupationally exposed to noise loud enough (corresponding to approximately 85 - 90 dBA), that they would have to raise their voices to hold a conversation (EASHW, 2000). In Germany, 4−5 million people (12−15% of the workforce) are exposed to noise levels defined as hazardous (WHO, 2001).

The predisposing factors such as the period of exposure to noise, age of the workers, their gender, level of education, and marital status have shown to have an impact on the extent of noise-induced hearing loss. For example, OSHA allows 8 hours of exposure to 90 dBA but only 2 hours of exposure to 100 dBA sound levels and NIOSH recommends limiting the 8 hour exposure to less than 85 dBA and 100 dBA, to less than 15 minutes of exposure per day (NIOSH, 1998). In Kenya, the Environmental Management and Control (EMCA) Act 1999, Occupational Safety and Health (OSH) Act 2007 and Noise and Excessive Vibration Pollution Control Regulation (NEBPCR) 2008, allows only 85dB in 8 working hours (Laws of Kenya,

2012). However, this has not been ascertained in the Jua Kali sector, despite increasing cases of hearing loss (Ear drop Kenya 2011). It is against this backdrop that this study was planned.

Material and Methods

Research design

A descriptive research design which involves gathering data that describes events and then organizes, tabulates, depicts and describes the data collected was used in this study (Glass and Hopkins, 1994). The study aimed at collecting information from the respondents on personal information (age, sex, years of work) and medical background information (ear disease suffered) using a questionnaire. It also involved measurement of noise levels (noise mapping) and hearing ability of the respondents, classification, analysis, comparison and interpretation of data. Descriptive statistics for variations of those involved, and inferential statistics (correlation) for analysis of relationship between hearing loss, exposure time and the intensity of noise was done on the data collected.

Study population

The study was conducted among "Jua Kali" workers in Mombasa County which consists of four sub counties; Mombasa, Changamwe, Likoni, and Kisauni in Kenya which lies in the Coastal line of Kenya and Indian Ocean. The study was focused on the Jua Kali workers especially those in the Jua kali sheds where the main economic activity was metal fabrications which included making of chisels, hoes, crow bars, metal boxes, buckets, basins, rakes, frying pans, charcoal jikos and other blacksmith activities.

Sampling frame work

The study was conducted in Mombasa sub County, Mombasa County, Jua kali sheds during the month of January 2017 to July 2017. The focus was mainly on the Jua Kali workers at the Jua kali sheds who were directly dealing with metal works, blacksmiths and metal engineering. The workers with less than one year in the venture were not included since NIHL develops over a period of time.

Sample and Sampling technique

Sample Size and Determination

The number of persons involved in metal work only were determined from the local register available with the workers representative. The registered workers were; Buxton = 248, Changamwe = 72 and Kisauni= 97. The total number of registered "Jua Kali workers in the three stratum of Mombasa was 417.

The sample was determined using the formula

$$n = N/\ 1 + N\ (e)\ 2$$

Where;

n = sample size of the proportion of interest,

N= Total population

e = Level of precision sample error ± 0.05

Therefore the sample size was computed as follows:

$$n = {}^{417}/_{1+\ 417(0.05)^2}$$

= 204.1617

=204 workers

Sampling Technique

Workers in Mombasa Sub County Jua Kali sheds who had worked for a period of one year and above were included in the study because noise induced hearing loss develops over a period of time. Simple random sampling technique was used to select workers in each Jua Kali shade which ensured reduction of potential human biasness in selection of cases to be included in the sample (Fisher *et al*., 1991).

Data collection methods

The data was collected using a questionnaire that consisted three sections. Section I consisted of question on Socio-demographic characteristics. These are questions that gave information about the correspondent and included age, sex, level of education, and marital status. Section II consisted of NIHL related questions which lead to determining awareness of correspondents to noise hazards. Section III consisted of questions leading to knowledge on prevention of NIHL and illness of the ears, and general questions relating to occupational and other relevant areas. The questionnaire was administered to all identified participants who met the inclusion criteria.

Noise mapping measurements were done on the environment to determine the noise levels in the area of study. A sound level meter (SLM) (Figure 2.4) device used to make frequency-weighted sound pressure level measurements displayed in dB-SPL (Chris W., 2009). Audiometric tests (pure tone audiometry) were also done on the selected subjects to determine the hearing ability.

Results and Discussion

Social demographic observations

In this study as shown in table 1 below, it was observed that 49.3% of the respondents had normal hearing, 47.9% were evident to have moderate hearing loss while 2.7% had severe hearing loss. This is in agreement with previous studies from other informal sectors showing that noise is a known hazard that leads to hearing loss (Henderson *et al*., 2011; WHO, 1997).

Table 1: Levels of hearing loss among the respondents of Jua kali workers

Effect	Frequency	Percent	Cumulative %
Normal	70	49.3	49.3
Moderate	72	47.9	97.3
Severe	4	2,7	100

Among the Jua Kali workers as shown in table 2, it was observed that 51 out of 146 persons sampled aged 20-35 years had normal hearing while 25 had moderate hearing loss. The age bracket of 36-45 years had 17 persons with normal hearing and 33 with moderate hearing loss. The workers aged 46-60 years had 4 persons with normal hearing, 11 with moderate hearing loss and 3 persons with severe hearing loss. Among the sampled workers those with 60 and above years had 1 person with moderate and 1 severe hearing loss. Workers in this sector aged between 20 and 45 years were the most affected with induced hearing loss

In terms of level of education, the ones with primary and secondary education were the most affected, with 46 and 19 persons having moderate hearing loss. Only 4 persons with primary education had severe hearing loss.

It was observed that among the male workers 66 persons had moderate hearing loss while 4 persons had severe hearing loss. Among the female, only 4 persons had moderate hearing loss.

Table 2: The effect of social demographics on hearing loss of Jua kali workers

		Hearing Loss		
Predisposing Factors	**Characteristic**	**Normal**	**Moderate**	**Severe**
Age(yrs)	20-35	51	25	0
	36-45	17	33	0
	46-60	4	11	3
	60 and above	0	1	1
Education Level	None	4	2	0
	Primary	38	46	4
	Secondary	27	19	0
	Tertiary(College)	3	3	0
Gender	Male	49	66	4
	Female	23	4	0

The table below presents the social demographic observation (age, gender and the level of education) from the study. It was observed that according to age, the distribution of the Jua kali workers was 20-35 years (52.1%), 36-45 years (34.2%), 46-60 years (12.3%) and those above 60 years 1.4%. The youth and the middle aged persons were the most prevalent group among the Jua Kali workers.

According to gender, the male were more among the respondents with 81.5%, and female 18.5% of the population in the Jua kali sector, hence this sector is considered a male dominated workplace.

The observation showed that 4.1% of the respondents never went to school, 60.3% had primary education, and 31.5% had secondary education while 4.1% had tertiary education. Workers with some level of education is mandated to train on workplace safety in Kenya, this implies that most of the workers had negligible safety information concerning their work.

Table 3: Social demographic results

Predisposing factors	Characteristic	Frequency	Percentage
Age (years)	20-35		52.1
	36-45		34.2
	46-60		12.3
	60 and above		1.4
Gender	Male	119	81.5
	Female	27	18.5
Education level	None	6	4.1
	Primary	88	60.3
	Secondary	46	31.5
	Tertiary (college)	6	4.1

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Work related observations

The observations presented below (daily assignments, no. of working hours per day, use of personal protective equipment, information on workplace noise, and knowledge if one can protect himself against noise) were work related.

The observations in table 4 showed that in daily assignments, hammering resulted in 39 persons having moderate hearing loss and 4 persons severe hearing loss. Riveting, welding and food vendoring work had 21, 4 and 6 persons respectively with moderate hearing loss.

The period spent on the job indicated that persons who had worked in the sector for 0-5 years, 11 persons had moderate hearing loss and 1 person had severe hearing loss. Those with 6-10 years on the job reported 44 persons with hearing loss and 1 person with hearing loss.

Table 4: The effect of work related factors on hearing loss of Jua kali workers

		Hearing Loss		
Predisposing factor	**Work**	**Normal**	**Moderate**	**Severe**
Daily assignment	Hammering	36	39	4
	Riveting	15	21	0
	Welding	11	4	0
	Food vendoring	10	6	0
Duration on current job (yrs)	0-5	44	11	1
	6-10	23	44	1
	11-15	4	10	0
	16-20	0	2	1
	21 and above	1	3	1
Work per day (Hrs)	1-5	1	3	0
	5-8	23	15	4
	Above 8	48	52	0
Hearing protective equipment use	Yes	16	11	2
	No	56	59	2

Daily assignments

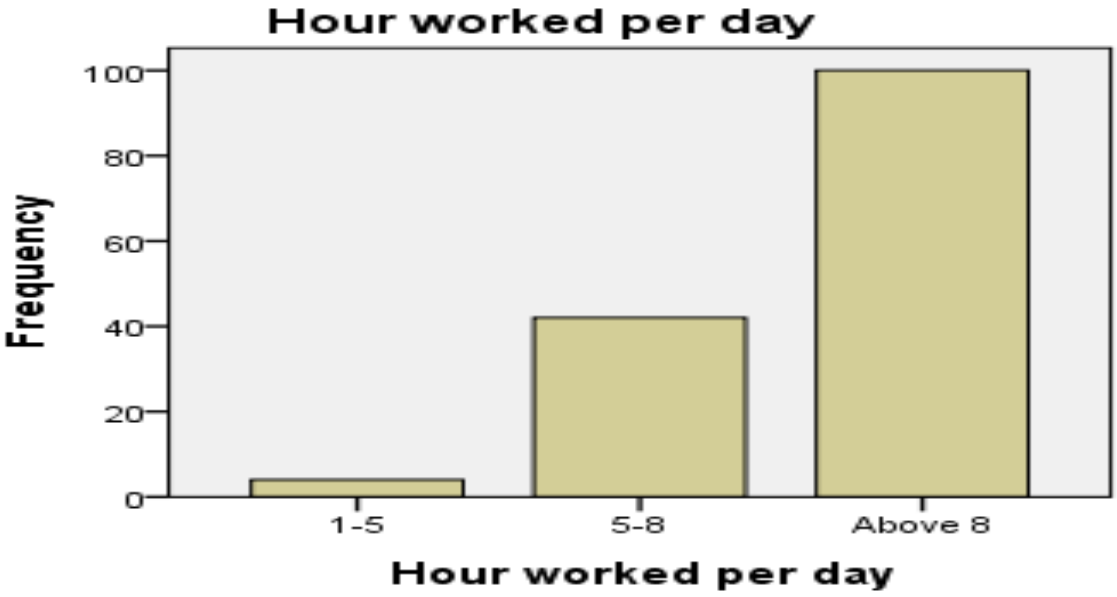
The table below showed that the high percentage (54.1%) of the respondents worked in hammering, 24.7% riveting, 10.3% welding and food vendoring 11.0%. Hammering was the most popular work in the Jua kali sector. Some work places are noisier than others, hence work may predispose one to NIHL (WHO, 1997).

Table: Daily assignments at the workplace

Activity	**Frequency**	**Percentage**	**Valid %**	**Cumulative%**
Hammering	79	54.1	54.1	54.1
Riveting	36	24.7	24.7	78.9
Welding	15	10.3	10.3	89.0
Food vendoring	16	11.0	11.0	100

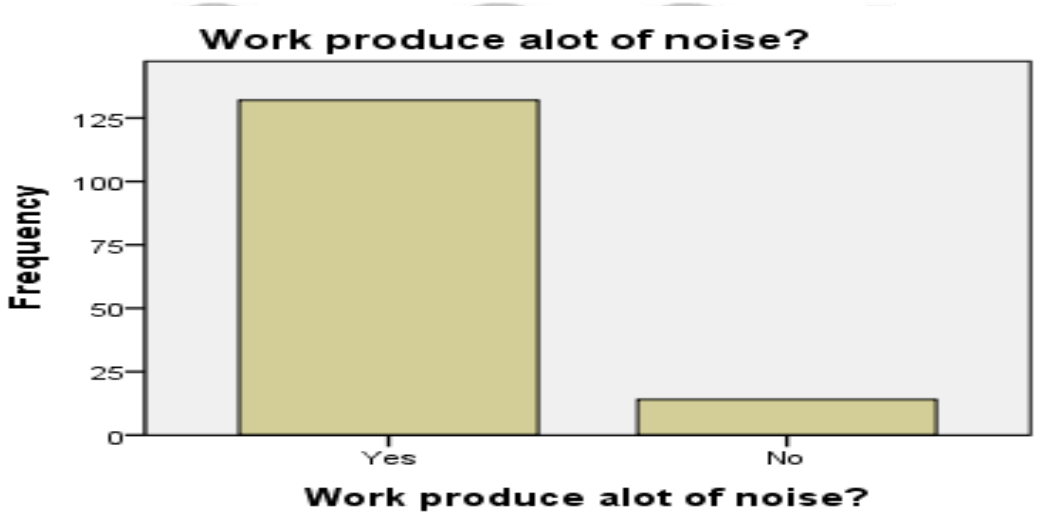
Working hours

In the Jua kali sheds of Mombasa County, 68.5% of the respondents worked for over 8 hours, 28.8% worked for 5-8 hours while 2.7% worked for 1-5 hours in a day as presented in the bar graphs below. In Kenya, the Environmental Management and Control (EMCA) Act 1999, Occupational Safety and Health (OSH) Act 2007 and Noise and Excessive Vibration Pollution Control Regulation (NEBPCR) 2008, allow only 85dB in 8 working hours (Laws of Kenya, 2012).



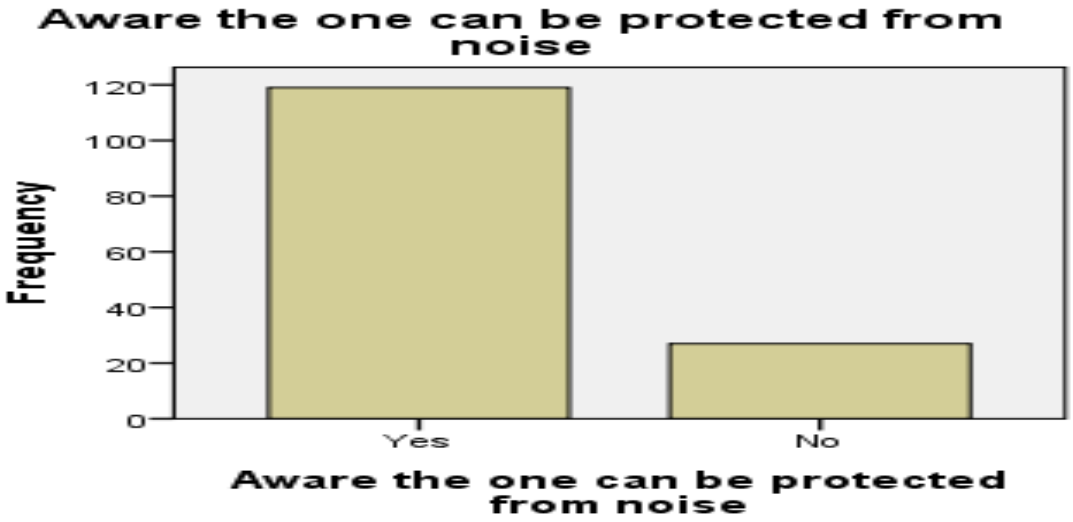
Information on workplace noise

The bar graph below shows that most of respondents (90.4%), interviewed knew that their workplace was noisy while 9.6% were ignorant of the workplace noise.



Knowledge if one can protect himself against noise

As presented in the bar graph below, 81.5% of the respondent were aware that they can protect themselves against noise and only 18.5% were not. Jua kali sector is greatly an informal sector with a big number of Kenyans having little or no technical education and ignorant of noise hazard since NIHL is not perceived as lethal (ILO, 2005; United States Technical Service, 2000). In summary, it is evident from the above observation that a large number of Jua kali sector workers (90.4%) had information that their workplace is noisey, 81.5% had information that one can protect themselves against noise but only 19.9% used noise protective equipment.



Correlation results

In the table below a correlation between hearing loss and the predisposing factors such as age, gender, level of education, years spent on the job, daily assignments, working hours per day and the use of hearing protective equipment is presented. The correlation between the hearing loss and age (0.445), and duration on current job (0.421) was positive and there was a statistically significant linear relationship (P≤0.05). The relationship between hearing loss and the use of hearing protective equipment was positive (0.015) but insignificant (P≤0.05). The relationship between hearing loss and gender (-0.334), and daily assignments (-0.170) was significantly (P≤0.05) negative, while the level of education (-0.095) and hours worked per day (-0.054) was insignificantly (P≤0.05) negative.

Table: Correlation between hearing loss and predisposing factors

Predisposing factors	N	Coeff	Sig.
Age	146	0.445	0.000
Gender	146	-0.334	0.000
Education	146	-0.095	0.255
Duration on current job	146	0.421	0.000
Daily assignments	146	-0.170	0.040
Hours worked per day	146	-0.054	0.519
Hearing protective equipment use	146	0.015	0.854

Significance = $P \leq 0.05$

Conclusion and recommendation

Conclusion

In conclusion to this study, the predisposing factors to hearing loss among the Jua Kali workers was found to be in effect. From the noise mapping results, there was loud enough noise in the Jua Kali sheds to warrant hearing loss among the workers. The social demographic characteristics such as age, level of education and gender among the Jua Kali workers contributed to hearing loss.

In terms of work related observations, hammering was the most popular (54.1%) assignment in the Jua kali sector with 55.7% having moderate hearing loss and 5.06% had severe hearing loss

It was evident that most of the Jua kali workers (68.5%) engaged in their duties for over 8 hours with 52% of them having moderate hearing loss

Only 19.9% of the respondent used protective equipment with 80.1% did not us PPE although 81.5% of the workers had knowledge that one can protect themselves against noise.

Recommendation

As indicated by observations, the Jua kali sector is a workplace for most of the Kenyan youthful population with basic education,

1. drastic initiatives must be taken to safeguard Jua Kali sector workplace
2. TVET institutions in Kenya to should consider tailor made program to fit the Jua Kali workers so as to equip them with latest/timely technical and safety skill and encourage equal opportunity to all genders.

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3. The county DOSH to carry out safety inspections in Jua kali sector regularly, encourage the workers to practice Job rotation to ensure that workers do not carry out a particular assignment for a long period of time
4. County DOSH to organize for a continuous periodic creation of awareness on OSHA act of 2007, safety training and safety responsibility of every Jua kali worker which will enable the workers to know that it is their right to safe workplace free from recognized hazard, right to information of safety and health hazards associated with their workplace.
5. To petition the county government of Mombasa to provide subsidized hearing protection equipment, and install warning signs indicating noisy work place and use of PPE to every worker.

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