OCCUPATIONAL NOISE IN SELECTED TEA FACTORIES AND REPORTED HEALTH EFFECTS ON WORKERS IN KERICHO COUNTY

Gitau Patrick Martin.
Masters Student, Department of Environmental and Occupational Health, Kenyatta University, Kenya.
Dr. Rosebella Alungata Iseme.
Lecturer, Department of Environmental and Occupational Health, Kenyatta University, Kenya.
Dr. Jackim M. Nyamari.
Lecturer, Department of Environmental and Occupational Health, Kenyatta University, Kenya.

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ABSTRACT

Noise is one of the most common physical hazards experienced in workplaces. Occupational noise is generally the factory noise received by employees when they are working within an industry. Employees working in tea factories are exposed to the health risks resulting from industrial noise. This study was conducted in selected tea factories in Kericho County to assess the impact of occupational noise on employees' health. The study adopted a cross-sectional research design. The study targeted 259 employees in the production department working for a minimum of eight hours from the selected tea factories using a random sampling technique. The noise level was measured using an ND-9 Digital calibrated sound level meter. The generation of output in the study was achieved by using SPSS version 25. A univariate Chi-square test of independence was used to evaluate the association of noise levels and reported health effects among the workers in the production department of selected tea factories. The predictive ability of the study relied on the binary logistic regression to establish adjusted odds ratio (AOR) that reported a 95% confidence interval. Inferential statistics were presented using charts and tables of percentages, statistical means, and standard deviations. The study considered a P value of below 0.05 as significant. From the findings, most of the respondents were exposed to occupational noise for long hour sometimes for more than 4 hours due to lack of shifts or enough qualified personnel to relieve them at their duty stations. This led to increased risk to the effects of noise pollution on their health. A Chi-square test to determine the independence of health effects to occupational noise was significant at $p<0.05$ for noise levels ($r=0.108$, $p<0.05$), and days worked in the same place ($r=0.109$, $p<0.05$). Higher noise levels in a tea factory and more days an employee worked in the same work station were more likely to develop negative health effects. The correlation analysis was not significant between negative health effects produced from exposure to occupation noise and use of PPEs ($r=0.146$, $p<0.001$). Understanding the negative effects of occupational noise motivates the use of PPE, reducing the possibility of developing health effects from noise exposure. Therefore, the study concluded that exposure to occupational noise occurs in tea factories because of running machines with constant noise levels. The study recommends that tea factories administration and management should implement a proactive process that will provide guidelines for assessment and management of occupational noise risks, use of PPEs, and implementation of ergonomic solutions like conducive working conditions, initiate shifts in different working areas, always involve the workers in regular health check-ups, and reduce working hours.

Key words: Occupational noise, health effects, safety measures.

INTRODUCTION

Occupational noise (Industrial noise) is defined as the acoustic energy intensity received by the auditory system of employees when they are executing their duties within an industry. The World Health Organization (WHO) has documented that no physical difference exists between sound and noise. However, sound can be referred to as sensory perception, while noise, on the other hand, corresponds to undesired sound (Marisol et al., 2004). The definition of industrial Noise has been chastened further to the noise produced in the factories and is grating and intolerable. When sound is unwanted and more intense than required, it becomes noise, and it's finally referred to as "noise pollution" (Poushali, 2018). In determining the health impacts of noise on humans, usually, it's classified as occupational (workplace) or environmental (not generated from the workplace) (NIOSH, 1998).

One of the commonest physical hazards experienced in workplaces is noise (Hodder A. et al., 2010). According to Nadir et al., roughly 600 million employees across the globe are exposed to occupational noise. Worldwide, high intensities of occupational noise remain a problem. As documented by WHO (2001), in Germany, 4−5 million people (12−15% of the total workforce) are exposed to dangerous noise levels. Despite noise being linked with almost all work activities, some activities are associated with higher noise intensity, especially those involving impact processes, handling given types of materials, and flying commercial jets. Some occupations possess a greater risk of developing Noise-Induced Hearing Loss (NIHL) than others. They include manufacturing, transportation, mining, construction, agriculture and the military.

Conventionally, in line with Bruel & Kjaer (2013), occupational noise as a hazard has been linked with heavy industries; for instance, ship building industries are directly linked with noise-induced hearing loss (NIHL). According to Forni & Mackay (2018), noise is identified as a hazard to the safety and health of workers in many workplaces, by various means, in line with the nowadays idea concerning safety and health issues. Apart from hearing impairment (exposure to over 85 decibels (dBA) in the long run, which is also referred to as exposure action value), noise can also be a determining factor as far as stress is concerned; noise also raises hypertension. Noise and dangerous substances, for instance, some solvents, to be specific, do have some tendency towards ototoxicity that is capable of causing rapid ear damage. Psychological effects of noise pollution, on the other hand, are distractions and annoyances, which can be just as disruptive as physical and physiological effects on productivity. Studies have shown that worker productivity increases with decreased noise and depends on the exposure length. The higher the noise frequency, the more of a nuisance it causes compared to lower frequency noise (Arcardio & Gregoria, 2012).

In developed countries, the noise pollution situation has been improving. First, noise has been acknowledged as a hazard leading to protective measures. In addition, regulations about noise emission in the environment have been put in place in many workplaces. A good example is the US, whereby the Occupational Noise Exposure Regulation states that industrial employers must restrict noise exposure of their workers to 90 dBA for one 8-hour period (Davies &

Mazurek, 2014). In Kenya, maximum noise permissible levels at different times of the day within a given area are set by Environmental Management and Coordination (Noise and Excessive Vibration/Pollution) control regulations which states that noise must be limited to 90 dBA. Other acts include the Legal Notice No. 25: Factories and other Places of Work Act (2005), which sets limits of noise exposure to not more than 90 dBA for eight hour duration and the Occupational Safety and Health Act (2007) provide the guidelines for the conservation of noise control and hearing so that loss of hearing is prevented according to Basner et al. (2014).

In Kenya, tea is a major cash crop, and is ranked as the third highest foreign exchange earner after tourism and horticulture. The tea produced in Kenya is predominantly black tea, although green, pink, yellow and white tea is produced on order too by major tea producers (KTDA annual report, 2003). Production of black tea is a labor-intensive process involving several steps. From the farm, fresh-picked tea leaves are received then processing begins. Processing follows the following sequential steps: Withering, Cutting, Treating and Curing (CTC), Fermentation, Drying and Packaging.

In any working environment, communication is important as it allows people, tasks, processes and systems to interact purposefully and cooperatively to achieve health and safety objectives (Angelica & Vecchio, 2007). Like any food processing industry, tea factories have several safety and health issues associated with tea processing. They include machine guarding, physiological effects of vibration, noise and dynamic physical load, slips and falls and lifting-related injuries, which are common in the food industry (Kurulashvili and Fedorov 1991). Exposure to loud noise lowers employee morale and productivity (Liu, 1999). As stated by OSHA (2007), the employer must provide a safe working environment. In human beings, the adverse effects of noise are generally of a physiological and psychological nature. Hearing losses are the commonest effects; hence, an exposed person should be subjected to an audiometric test (Boateng & Amedofu, 2004).

Problem Analysis

All governments worldwide work towards economic development so as to improve household income. This has prompted the need for developing factories and industries as a basis for stimulating economic development. Productivity in factories and industries has become necessary for effective economic development, but this has compromised the suitability of working conditions when working hard to maximize profitability. This has resulted in health effects because employees in these factories are exposed to occupational hazards. According to Tsai et al. (1992), surveillance at the workplace is a vital strategy that can be used to identify health risks and form a basis for implementing strategies to mitigate its negative effects. Health hazards like occupational noise result in illnesses like deafness, stress, and headache that can complicate other underlying medical conditions of employees (Nurminen & Karjalainen, 2001).

Loewenson (2001) have noted that an individual's position at the workplace can influence their health. Particularly, the human body can develop medical complications if it is exposed to occupational risks at the workplace. According to WHO (2001), poor exposure to occupational hazards can result in asymptomatic variations, illness and death to an employee. For example, occupational noise is directly linked to health effects like deafness, stress, high blood pressure, and headache in a factory. Occupational noise is an extensive risk factor, strongly linked to hearing loss as an important health outcome. It's also different from environmental noise in that it is by definition bound to the place of work and is, therefore, the responsibility of employers and employees.

Several studies have been carried out about the topic but they lack strong empirical evidence in many areas. Additionally, there are many studies on occupational noise in tea factories that have been done in other countries, but a study in Kenya is lacking and thus this study will fill this research gap. Secondly, relating to occupational noise, the literature review is lacking on the impact on employee's health within a tea factory setting and this will be provided in this study. Lastly, no empirical evidence about airbone particles has been shown by prior studies about tea processing and this will be filled in this study. Kericho County is an idea study site for this study because it has a lot of KTDA managed factories which are equidistant and the effect of occupational noise is quite common. Secondly, since Kericho County has a lot of factories, the effect of occupational noise is great to many people and this makes selection of samples to the study easy and gives accurate findings.

According to Hammer et al. (2014), approximately 10–15 million people are affected by noise-induced hearing loss (NIHL) in the USA. Research carried out in the UK shows that young adults have severe hearing difficulties directly related to noise at the workplace (Prendergast et al., 2017). Lack of reliable data on disability situations (especially hearing disability) has been noted by the International Labor Organization (ILO, 2004:9). However, the 2009 national census sheds some light that out of the total 1.3 million Kenyans living with disabilities, 14% of these cases consist of hearing disabilities. Hearing disabilities in many developed and developing countries such as Kenya are attributed to noise pollution (KNBS, 2010). Most countries often lack effective legislation on noise pollution. Such legislation exists in Kenya, for instance (NEMA and EMCA), however there is a lack of adequate and strong enforcement to control noise pollution (Enda & Eoin, 2014). The study was therefore, done in Kericho to evaluate the noise levels in tea factories effectively.

In the context of occupational noise in previous studies, there are no specific occupational noise levels established in selected tea factories in relation to local permissible levels of 70dB. This study therefore sought to measure the levels of occupational noise within selected tea factories about permissible levels. Additionally, there are no specific reported health effects of occupational noise in a tea factory noted previously. Hence, this supports the objective to establish the reported health effects of occupational noise in selected tea factories in Kericho. Studies about knowledge of occupational noise have focused on manufacturing companies. No empirical evidence has been provided on tea processing and this prompted the need for the

third objective which was to assess knowledge of occupational noise in selected tea factories in Kericho county. Finally, empirical evidence from the literature review has shown that noise control strategy has focused on industrial settings, and not much evidence has been provided in a tea factory setting. Therefore, it is on this basis that this study sought to determine the noise control and prevention strategies in selected tea factories in Kericho.

RESEARCH METHODOLOGY

An analytical cross-sectional research design was used in the study. Quantitative methods were used to collect information. The target population for the study was the workers in the production department of selected tea factories in Kericho. Systematic random sampling was used to sample six factories to take sound pressure measurements from the total 16 factories using the register of factories from KTDA in Kericho County. Then, multistage sampling was used to proportionately establish the number of workers to be included in the study from each factory. A Purposive sampling was used to select the study population working in the production department. Data was collected using structured questionnaires and was then edited to check for completeness and consistency, coded and entered into statistical software for analysis. Both descriptive and inferential statistics were used to analyze the data using Statistical Package for Social Sciences (SPSS) software version 25. The results were presented through frequency tables and graphs.

FINDINGS

This section was organized based on the study objectives as follows.

Occupational noise levels

0ccupational noise subjected the employees to harmful noise levels while at work this is likely to have significant health consequences on them. Noise level at the six selected tea factories was measures at different times of the day for a period of time (one week). From the results, noise levels varied from one factory to the other at different time of the day. For instance, in the morning hours (8-9am) tea factory D recorded the lowest noise levels at 88.6 decibels while tea factory E recorded the highest noise levels (109.3 decibels). The average noise levels for all the factories during this time period was 95.3 decibels. An independent T-test was conducted and results indicated that there was a significant difference between the lowest and highest noise levels ($t_{(137)} = 2.208$, $p<0.001$). Similarly, noise levels at the six factories were recorded at midday where tea factory A recorded the lowest noise (92.2 db) whereas tea factory C had the highest noise (103.5 db). Results of an independent T-test revealed that there was a significant difference between the lowest and highest noise levels ($t_{(134)} = 2.032$, $p<0.001$). Whereas in the evening hours (between 3-4 pm), tea factory E had the lowest noise levels of 90.8 decibels while tea factory B recorded the highest noise levels (106.8 decibels). On average, tea factory A had the lowest noise levels (94.5 db) while tea factory B had the highest noise levels (105.8 db) (***see Table 1***).

Table 1: Noise levels in the factory

Name of factory	8-9am (db)	12-1pm (db)	3-4pm (db)	Average (db)
Factory A	90.7	92.2	100.5	94.5
Factory B	109.3	101.3	106.8	105.8
Factory C	98.7	103.5	104.1	102.1
Factory D	88.6	92.7	103.3	94.9
Factory E	93.4	101.2	90.8	95.1
Factory F	89.1	94.4	100.5	94.7
Total	**95.3**	**97.8**	**101.3**	**98.1**

Employees also reported that they were exposed to noise for longer periods. This ranged from four hours to sometimes more than eight hours in a day. From the results, half of the respondents reported that they worked at the same duty post for more than 8 hours in a day, while 44.8% spent between 4 to 8 hours per day (***see Table 2***). This shows that respondents have been exposed to occupational noise for long hours thus making them vulnerable to effects of this noise on their health.

Table 2: Hours in day respondents are exposed to noise

	Frequency	Percent
1 to 4 hours	6	2.4
4 to 8 hours	116	44.8
8 hours and above	130	50
No response	8	2.9
Total	259	**100**

Level of knowledge on the effects of noise by workers in tea factories

For a better understanding of the effects of noise, the study was designed to establish the level of knowledge on the effects of noise by workers in tea factories. The majority of the respondents (84.2%) indicated that they were aware what occupational noise was. Most of them (84.3%) indicated that it was noise produced by machines in a workplace, while 15.7% reported that it is any noise causing discomfort (see Figure 1).

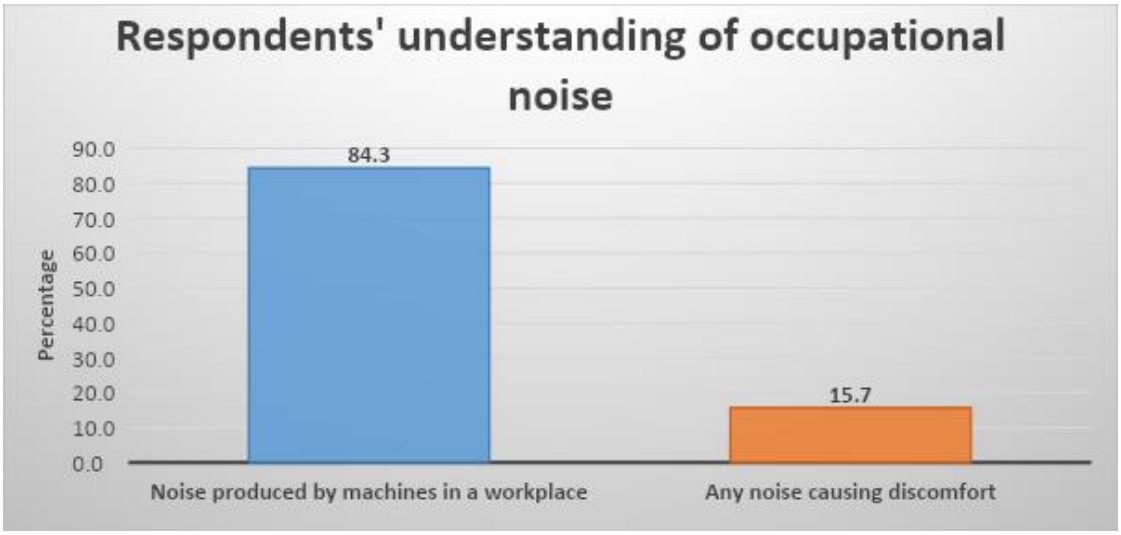

Figure 1: Respondents' understanding of occupational noise

Despite having knowledge on occupational noise and its health effects, most of the respondents reported that they still worked in the tea factories because it was their only source of income. In addition, other gave reasons such as management of the factories had put in place noise reduction measures and that they were used to the noise (19.2%).

The study sought to establish whether respondents were aware of the effects exposure to occupational noise had on human health. Most of the respondents (82.5%) ascertained that they were aware of the negative effects caused by exposure to noise. In addition, one way of ascertaining the effects of occupational noise was to undergo an audiometry test. Further, those who had gone for the test were asked for the importance of going for an audiometry test, as shown in figure 2 below.

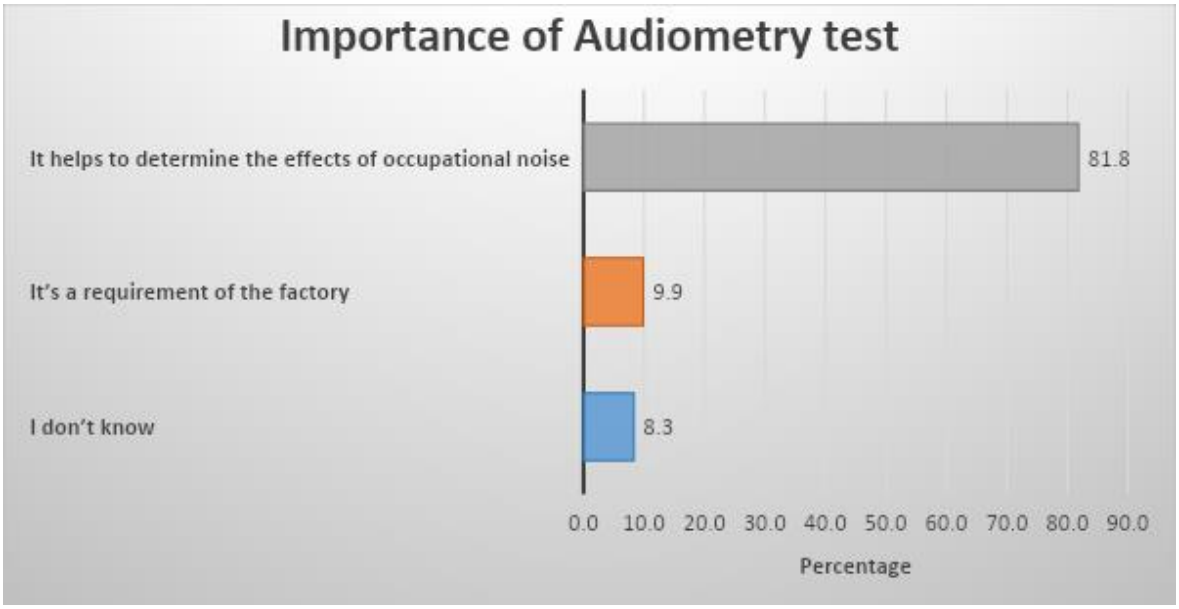

Figure 2: Importance of audiometry test

Based on figure 2, most of the respondents (81.8%) indicated that audiometry test helps to determine the effects of noise. An additional 9.9% reported that the test is important because it is a requirement for the factory while 8.3% were not aware of the importance of the test.

Health effects of occupational noise in tea factories

The second objective of the study sought to assess the reported health effects of occupational noise in tea factories. The health effects resulting from excessive exposure to occupational noise were categorized into two; acute and long term health effects.

Acute health effects

These were the short-term effects to excessive exposure to noise especially at the workplace. These included headache (46.4%), sleeplessness (27.2%), irritability and hearing loss (each 21.6%), stress (19.2%) as well as pain in the ear (17.6%) (see Figure 3).

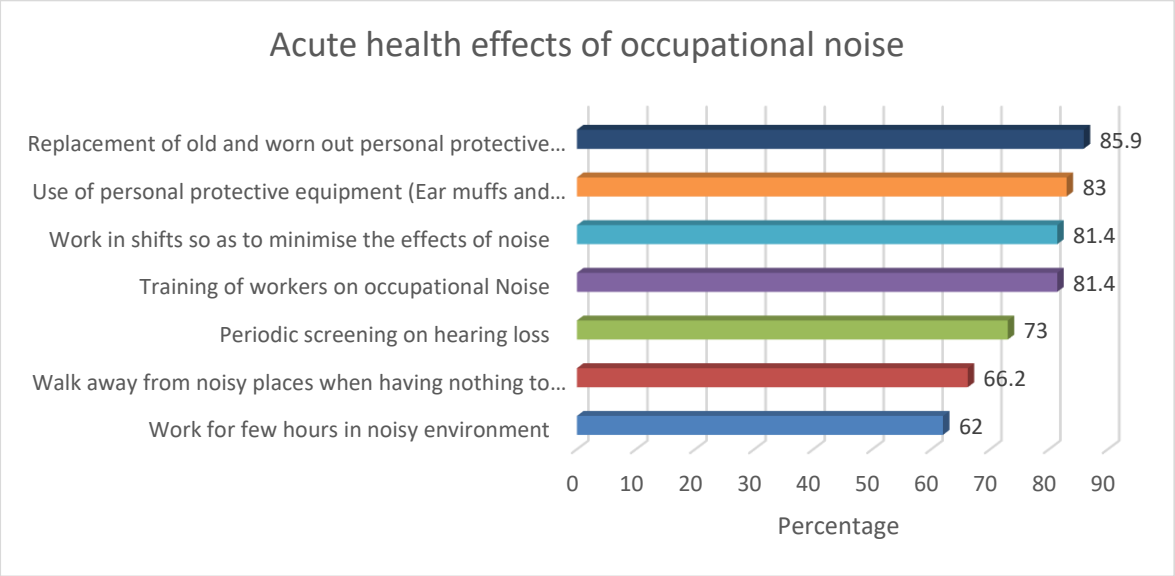

Figure 3: Perceived health effects of occupational noise

These health effects were caused by various other factors such as the safety The results of binary logistic regression were as presented in Table 3. the response variable was acute health effects of exposure to occupational noise.

Table 3: Regression analysis for reported acute health effects

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Average noise levels	0.069	0.026	6.931	1	0.008**	1.071	1.018	1.128
Maintenance of machines	0.618	0.376	2.701	1	0.100	1.854	0.888	3.873
Adoption of new/ advanced machines	-0.315	0.407	0.599	1	0.439	0.730	0.329	1.620
Use of PPEs	-1.100	0.384	8.194	1	0.004**	0.333	0.157	0.707
Training of workers	0.162	0.352	0.213	1	0.644	1.176	0.590	2.344
Periodic screening on hearing loss	0.160	0.299	0.287	1	0.592	1.174	0.653	2.109
Negative health effects	0.665	0.293	5.167	1	0.023*	1.945	1.096	3.451
4 to 8 hours	-0.386	0.781	0.244	1	0.621	0.680	0.147	3.143
8 hours and above	0.184	0.235	0.614	1	0.433	1.202	0.759	1.905
1 – 3 days	1.622	2.318	0.000	1	0.999	5.064	0.000	
3 – 5 days	1.177	0.618	3.631	1	0.057	3.244	0.967	10.882
Over 5 days	0.440	0.328	1.798	1	0.180	1.552	0.816	2.952
Constant	-6.929	2.625	6.967	1	0.008**	0.001		

a. Variable(s) entered on step 1: Average noise levels, Maintenance of machines, Adoption of new/ advanced machines, Use of PPEs, Training of workers, Periodic screening on hearing loss, Negative health effects, Hours exposed to noise in a day (1-3 hours used as base category), Days working in the same place (less than a day used as base category).

From the table above, it was evident that average noise levels, use of PPEs and awareness on the negative health effects of noise had significant associations with acute health effects as a result of exposure to occupational noise. Adjusting for other factors, a unit increase in the amount of noise would significantly lead to increased risk of getting acute health effects by 7.1%. Moreover, those who used PPEs were 66.7% less likely to get acute health effects of exposure to noise compared to those who did not use PPEs while adjusting for other factors.

Long-term effects of excessive noise exposure

The respondents were asked if they were aware of the long-term effects of exposure to excessive noise. The results in figure 4.6 below shows the long-term effects of exposure to noise as identified by the respondents.

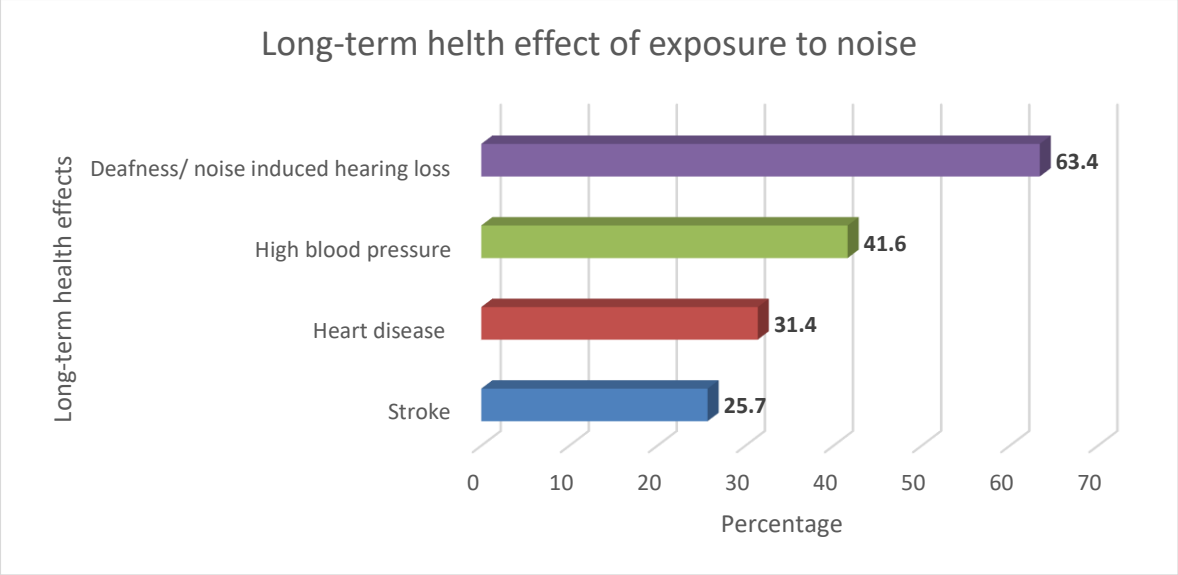

Figure 4: Long-term effects of occupational noise

The results indicated that 63.4% of the respondents indicated that prolonged exposure to noise causes deafness/ noise induced hearing loss. Less than half of the respondents knew that excessive exposure to noise causes high blood pressure (41.6%), heart disease (31.4%) as well as stroke (25.7%). Further, results of binary logistic regression on long term health effects of exposure to occupational noise.

Table 4: Regression analysis for reported long-term health effects

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Average noise levels	0.001	0.029	0.001	1	0.971	1.001	0.946	1.059
Maintenance of machines	0.297	0.422	0.495	1	0.482	1.345	0.589	3.075
Adoption of new/ advanced machines	0.078	0.442	0.031	1	0.860	1.081	0.455	2.570
Use of PPEs	-1.213	0.404	9.001	1	0.003**	0.297	0.135	0.657
Training of workers	-0.291	0.387	0.565	1	0.452	0.748	0.350	1.596
Periodic screening on hearing loss	0.799	0.363	4.850	1	0.028*	2.223	1.092	4.526
Negative health effects	-0.221	0.318	0.482	1	0.488	0.802	0.430	1.495
4 to 8 hours	-1.850	1.312	1.989	1	0.158	0.157	0.012	2.057
8 hours and above	0.141	0.263	0.287	1	0.592	1.151	0.688	1.926
1 – 3 days	3.050	1.402	4.731	1	0.030*	21.111	1.352	329.649
3 – 5 days	0.524	0.593	0.781	1	0.377	1.689	0.528	5.403
Over 5 days	0.022	0.362	0.004	1	0.951	1.022	0.503	2.078
Constant	-0.722	2.883	0.063	1	0.802	0.486		

a. Variable(s) entered on step 1: Average noise levels, Maintenance of machines, Adoption of new/ advanced machines, Use of PPEs, Training of workers, Periodic screening on hearing loss, Negative health effects, Hours exposed to noise in a day (1-3 hours used as base category), Days working in the same place (less than a day used as base category).

Based on the results, use of PPEs, periodic screening on hearing loss, and days working in the same place (1 – 3 days) had a significant association with the long-term health effects due to exposure to occupational noise at 95% confidence level. The findings further indicated that presence of machines within tea factories contributed to dangerous noise levels and mitigation strategies should be emphasized at the factory level. Adjusting for other variables, those who used PPEs at work were 70.3% less likely to have long term health effects of exposure to noise compared to those who did not use PPEs.

Besides, while adjusting for other factors, it was established that those who went for Periodic screening on hearing loss were two times more likely to suffer from long term health effects of exposure to noise compared to those who did not have the periodic screening. This may be explained by the notion that those who go for the screening might have already suffered from hearing loss and may be seeking for treatment. Similarly, adjusting for other factors, those who worked in the same duty station for 1 – 3 days were 21 times more likely to get long term effects of exposure to noise than those who worked at the same station for less than a day.

Level of compliance to safety practices on noise pollution put in place in tea factories

The study sought to determine the level of compliance to safety practices on noise pollution put in place in tea factories. This focused on respondents' opinions on provision and use of PPEs, training on noise pollution, hearing loss screening, maintenance of machines, and age as well as wear and tear of machines. From the results, the majority (61.5%) informed that they were aware of such measures, as shown in figure 5.

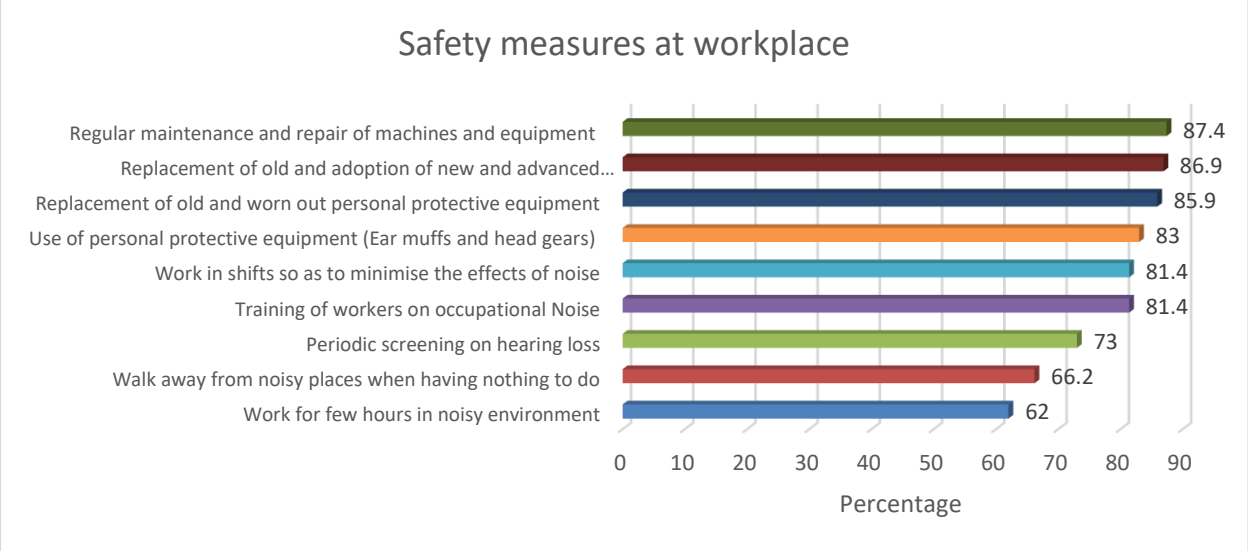

Figure 5: Safety measures at workplace

In order to minimize noise at the workplace, the tea factories put in place various safety measures. Most of these measures focused on machines/equipment where the factories put more emphasis on regular maintenance and repair of machines and equipment (87.4%),

replacement of old and adoption of new and advanced machines/ equipment (86.9%), replacement of old and worn out personal protective equipment (85.9%), and use of personal protective equipment (Ear muffs and head gears) (83.0%). Some of the reasons for not using PPEs were reported to be unavailability of the protective gears (65.7%), feeling that PPEs were not comfortable to wear (17.1%), lack of knowledge on the importance of using PPEs (2.9%) while 14.3% did not have reasons for not using the protective equipment. In addition, training of employees on occupational noise as well as working in shifts so as to minimize the effects of noise (81.4%) were practiced. Moreover, 73% of the respondents reported that the factories offered opportunities for periodic hearing loss screening. In spite of these efforts by the factories to safeguard workers from occupational noise, one third of the respondents felt that the factories are not doing enough to ensure safety of workers.

Discussion

Different factories experience different levels of noise at different times of the day. In the morning hours, factory D had the lowest noise levels while highest levels were experienced in midday in factory C and B. In addition, tea factory E had the lowest noise levels of 90.8 decibels, while tea factory B recorded the highest noise levels (106.8 decibels) during the evening hours which exceeds the recommended limit. The results above indicate that the levels of noise occur differently (independently) across the different factories. The results support those of Otieno et al., (2015), who stated that within PSVs, Kenyans are exposed to dangerously strong noise. A mean noise level of 86.3±9.5 dB(A) was reported within the PSVs in Nairobi City's CBD. These levels are much higher than the overall allowable limit of 60 dB (A). Besides, research conducted in Kenya to determine the level of noise pollution in three non-formal sectors in Kenya, showed high values of 93.8 dB, 90.0 dB, and 90.0 dB, and 92.5 dB(A) (Gongi et al., 2016), which exceeds the overall allowable limit of 75 dB(A) across all sectors (WHO, 1999). The results support those of Ali (2010), who carried out studies in Egypt on industrial noise and found that the average continuous amount of noise levels ranged from 70 to 100 dBA and had varying outcomes; most of the respondents faced industrial noise levels that ranged from 85 to 100 dBA. The results contrasted with those of Kimani (2011), whose study was done at Kamukunji Jua Kali sheds, Nairobi, Kenya, and the results showed the noise levels are way above the recommended limits.

As was also observed by Suter (2012), the results of this study showed that noise has continually caused negative effects on human beings. The current study determined whether the workers were affected by noise, and the majority (two thirds) indicated that noise had not affected their health. The results contrast with Kujawa & Liberman (2009), who stated that the implication of NIHL is that noise can produce subclinical adverse effects that go undetected, progress unnoticed, and finally manifest itself long after the effect. In addition, the finding showed that exposure to occupational noise led to headache, sleeplessness, irritability and hearing loss, stress as well as pain in the ear. The results concur with those of Forni & Mackay (2018), who stated that apart from noise being reduced or eliminated, the exposure to too much noise may result in harmful effects as far as health is concerned. These effects include loss of

hearing, speech interference, and physiological effects such as sleep disturbance and annoyance. Furthermore, according to Gaganija et al. (2012), the major impacts of exposure to excessive noise were headache, hearing issues, sleeplessness, trouble focusing, and conversation disturbance in a study of Morogoro Tanzania research. In addition, Münzel, Gori, Babisch, and Basner (2014) found that long-term exposure to ambient noise, leading to hypertension, ischemic heart disease, or even stroke, can adversely affect the cardiovascular system.

When assessing the respondents' knowledge of the occupational noise and the resulting health effects, the results showed the majority of the respondents were aware that excessive exposure to noise causes hearing impairment, headache, Tinnitus/ wheezing sounds in the ear, Speech interference, and accidents, especially at the workplace. However, there was low awareness of whether exposure to excessive noise causes anger, unfriendliness, and withdrawal. The results support those conducted by Hetú et al. (Williams et al. (2015) and Basner et al. (2014), who stated that the stigma of NIHL was affirmed by the workers failing to acknowledge difficulties in the surrounding of social and family life; there were psychosocial shortcomings and the effect of hearing loss on close relationships. The results were supported by the findings of Minja et al. (2003), who found that 81.1 percent of the cases and 85 percent of the workers were having the knowledge of noise as the cause of hearing loss and that this can be prevented by wearing ear protectors. Furthermore, Masaka (2003) did establish the NIHL knowledge to be at 85% at a Zimbabwean mine workstation. In contrast to France, according to Lie et al., (2016), a survey conducted by the Ministry of Jobs found that about 7 percent of workers are exposed for at least 20 hours per week to excessive noise levels that are above 85 dB(A). About 25 percent are exposed to hazardous noise greater than 85 dB(A), working 20 hours per week. Nevertheless, the findings showed participants were aware of the negative effects caused by exposure to noise. The results contrasted with those of Eziyi et al. (2015), whose results showed that the participants did not believe their own occupation was noisy because that was where they were earning their income majority of workers would endure exposure to noise without doing anything about it because, in their own words "We are used to it." Others never thought that noise could cause damage to their hearing though they agreed that it was likely that noise could cause hearing damage.

Regarding the level of compliance with safety practices on noise pollution, the findings showed that the majority of the workers in the Tea factories were aware of the safety measures that can be put in place to reduce excessive noise at the workplace. The results also showed that most of the measures focused on machines/equipment, and the factories emphasized regular maintenance and repair of machines and equipment. Furthermore, the results showed employees' training on occupational noise and working in shifts to minimize noise effects were practiced. The results support those of Environment Management and Coordination Act 1999 (EMCA) as a policy framework law on environmental management and conservation in 2002; subsidiary legislation to EMCA; (Noise and Excessive Vibration Pollution) control regulations, 2009, legal notice number 61 was enacted, and it gives provisions relating to noise from certain activities.

Conclusion

The study concludes that occupational noise is high in the selected tea factories because of running machines and it remained the same over time. Respondents were asked about their exposure to noise at their factories, changes in noise levels in the factories as well as the duration of exposure to occupational noise in their current work stations. This implies that the majority of the respondents got exposed to noise at the factories. Moreover, the results indicated that respondents had not suffered from any noise-related problem prior to employment. Exposure to noise only occurs majorly in factories which have running machines.

In addition, when workers are engaged in the workplace for more than 8 hours a day, they may suffer from headaches, sleeplessness, irritability and hearing loss, stress as well as pain in the ear. The study, further, concludes that a majority of respondents were knowledgeable about occupational noise at the workplace. For instance, headache is a result of excessive noise and Tinnitus/ wheezing sounds in the ear, speech interference, and accidents are associated with noise at the workplace.

Lastly, the study concludes that occupational noise and prevention strategies at selected tea factories can be achieved through regular maintenance and repair of machines and equipment, replacement of old and adoption of new and advanced machines/ equipment, replacement of old and worn out personal protective equipment, and use of personal protective equipment (Earmuffs and headgears).

RECOMMENDATIONS

1. The study recommends that opportunities for periodic hearing loss screening measurements to be put in place that could benefit the workers who work in the production department for more than 8 hours. This is important because it will ensure implementation of proper strategies to employees with the highest risks.
2. Training of employees on occupational noise as well as working in shifts was a common strategy used by selected tea factories to minimize the health effects by focusing on identification of signs.
3. The study also recommends factories to use provide personal protective equipment such as earmuffs, earplugs as well as headgears because majority of workers were knowledgeable about their role in mitigating occupational noise effects and would not have a problem using them.
4. Lastly, the study recommends that tea factories should implement ergonomic solutions like: conducive working conditions, initiate shifts in different working areas, always involve the workers in regular health check-ups, and reduce working hours.

Suggestion for Future Research

The current study focuses on assessing occupational noise in tea factories and its effects on workers in Kericho, County, Kenya. Hence researchers can conduct the same study in other major tea growing counties in Kenya, e.g., Nyeri, Kirinyaga, and compare their results with current results and see if the findings concur or differ.

REFERENCES

Acardio, P.S. & Gregoria, A.S. (2002). A Design Approach. London: Routledge.

Ali, S.A. (2010). Industrial Noise Levels and Annoyance in Egypt. Applied Acoustics. (2010), doi: 10.1016/j.apacoust.2010.11.001

Angelica M. and Vecchio sadus (2007). Enhancing safety culture through effective communication. CISRO Minerals clayton Australa. Safety science monitor article II.

Basner, M., Babisch, W., Davis, A., Brink, M., Clark, C., Janssen, S., & Stansfeld, S. (2014). Auditory and non-auditory effects of noise on health. The Lancet, 383(9925), 1325-1332. doi: 10.1016/s0140-6736(13)61613-x.

Boateng C.A and Amedofu G.K (2004). Industrial Noise pollution and its effects on the hearing capabilities of workers: A study from saw mills, printing presses and corn mills. Afri J Health Sci; 11: pp.5-60.

Bruel, F. & Kjaer, B. (1992). Sound and Vibration Measurement. http://www.cav.psu.edu/workshops/2014/B&K%20Intro.pdf

CDC - Engineering Noise Control - NIOSH Workplace Safety and Health Topic. (2018). https://www.cdc.gov/niosh/topics/noisecontrol/default.html

Enda Murphy & Eoin A. King (2014). Environmental Noise Pollution.

Environmental Management and Coordination Act, EMCA, (1999). Environmental Management and Coordination Act. Nairobi: Government of Kenya.

Eziyi J, Akinwumi I O, Olabanji I O, Ashaolu O O, Amusa Y B. Noise Pollution: Knowledge, Attitudes and practice of sawmill workers in Osun State, Nigeria. Niger J Health Sci 2015; 15:36-9

Forni, M., & Mackay, D. (2018). Environmental Noise Pollution. Awe International Magazine. https://www.aweimagazine.com/article/environmental-noise-pollution-148

Gaganija, M.S., Mkoma, S.L. & Lema, E.S (2012). Attitudes of community to urban traffic noise in Morogoro, Tanzania. Ethiopian Journal of Environmental Studies and Management EJESM Vol. 5(3):280.

GoK, (2005). Legal notice No. 25 the Factories and Other Places of Work Act (Cap.514). Nairobi: GoK

Gongi, S. P., Kaluyi, J., & Kanali C. L. (2016). Industrial Noise Pollution and its Health Effects on Wokers in Nairoby City. International Journal of Engineering and research and Technology, 181 (5), 426 -435

Hammer, M.S., Swinburn, T.K. & Neitzel, R.L., (2014). Environmental noise pollution in the United States: developing an effective public health response. Environmental health perspectives, 122(2), p.115.

Hodder Arnold, Concha-Barrientos M, Campbell-Lendrum D, Steenland K (2010). Occupational noise: Assessing the burden of disease from work-related hearing impairment at national and local levels.

Kimani, M.J. (2011). Evaluation of Occupational Noise Exposure among Workers in Metal fabricating sector in Kamukunji Nairobi. Unpublished PhD MSc thesis, Juja:Jomo Kenyatta University of Agriculture and Technology.

Kurulashvili MD, Fedorov AV (1991). Physiological and hygienic evaluation of combined effects of vibration, noise and dynamic physical load in tea-picking machine operators. Gig Tru i Prof Zabol; 6: pp.9-11

Lie, A., Skogstad, M., Johannessen, H. A., Tynes, T., Mehlum, I. S., Nordby, K. C. ... & Tambs, K. (2016). Occupational noise exposure and hearing: a systematic review. International archives of occupational and environmental health, 89(3), 351-372.

Loewenson, R. (2001), Globalization and occupational health: a perspective from southern Africa. *Bulletin of the World Health Organization*, 79(1): 863-8.

Marisol Concha-Barrientos, Kyle Steenland, Annette Prüss-Üstün, Diarmid Campbell-Lendrum & Carlos Corvalán, (2004). Assessing the burden of disease from work-related hearing impairment at national and local levels World Health Organization Protection of the Human Environment Geneva.

Masaka E. The Prevalence of Noise Induced Hearing Loss at a Nickel Mine in Zimbabwe. Master of Public Health (Occupational Hygiene) African Health Sciences Vol 13 Issue 4 December 2013

Minja B.M, Moshi N.H, RIWA P. Noise induced hearing loss among industrial workers in Dar es salaam. East African Medical Journal 2003; 80(6):238-42.

Münzel, T., Gori, T., Babisch, W., & Basner, M. (2014). Cardiovascular effects of environmental noise exposure. European heart journal, 35(13), 829-836.

.

Nurminen, M. and Karjalainen, A (2001). Epidemiologic estimate of the proportion of fatalities related to occupational factors in Finland. *Scandinavian Journal of Work, Environment & Health*, 27(3): 161-213.

Occupational Safety and Health Act, (2007). Occupational Safety and Health Act, Nairobi: Government Printer.

Otieno, D., Onyango, C. L., Kanali, J., & Kaluli, W. (2015). Evaluation of the Extent and Potential Impacts of Noise Pollution inside Public Service Vehicles (PSVs) in Nairobi City, Kenya. American Journal of Enviro

Poushali, G., (2018). Effects of industrial noise pollution.

Suter, A. (2012). Engineering Controls for Occupational Noise Exposure. The Best Way to Save Hearing.

Tsai, S.P, Gilstrap, E.L., Cowles, S.R., Waddell, L.C and Ross, C.E (1992). Personal and job characteristics of musculoskeletal injuries in an industrial population. *Journal of Occupational Medicine,* 34(1): 606–612.

WHO. (1999). Guidelines values for community noise in specific Environment, Geneva: World Health Organization.

WHO. (2001). Occupational and community noise, (Fact Sheet No. 258), Geneva: World Health Organization.

Williams, K. C., Falkum, E., & Martinsen, E. W. (2015). Fear of negative evaluation, avoidance and mental distress among hearing-impaired employees. Rehabilitation psychology, 60(1), 51.