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SURVEY OF NOISE LEVELS IN WOOD WORKSHOPS IN MOROGORO MUNICIPAL, TANZANIA

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ABSTRACT

This study was done in wood workshops in Morogoro municipal to survey noise exposure levels and woodworkers attitudes toward noise hazards. Five woodworking shops which constitute about 17% of the registered ones were randomly selected. Sound exposure level for workers was assessed using sound level meter. It was found that, more than 67% of the 80 measurements done exceeded noise exposure levels allowed by Tanzania Bureau of Standards (TBS) and World Health Organization (WHO) standards. The mean exposure level for all workshops was 86.8±2 dBA which WHO recommends exposure duration of not more than 45 minutes per day. Sixty percent of the workshops had more than 5% of the measurements exceeding 90dBA which WHO standard restricts workers exposure duration to less than 15 minutes. It was further observed that 62.3% of the workers in the surveyed workshops had positive attitudes toward safety and accepted that noise protective equipments were necessary. Surprisingly, only 14.1% wear protectors regularly while 48.2% complained that they reduce their working efficiency. The rest (37.7%) indicated that protectors were not available in their workshops. These results imply that most workers were exposed to noise levels which can cause hearing impairment. Additional study of this potential occupation health problem is recommended in order to fully characterize the risk and guide the development of the effective risk management strategies.

Keywords: sound exposure level, workers, hearing impairment

INTRODUCTION

Sound is a form of energy that is transmitted by pressure variations which the human ear can detect (EPD, 2007). Depending on the frequency and duration, sound can be perceived as noise. Noise is any unwanted sound, usually of high intensity and is perceived as the most disturbing factor in many workplaces (Berger 2003). In urban area, noise disturbance is a common phenomenon and in most cases it is unavoidable. In the European community it is estimated that 40% of the population is exposed to unavoidable industrial noise, while in Northern America more than 30 million workers are exposed to noise hazards (NIOSH, 1996). Unavoidable industrial noise is estimated to cause hearing loss to more than 250 million people, two thirds of whom living in developing countries (NIOSH, 1988).

In wood industries workers are exposed to hazardous noise levels throughout the entire production process. High noise levels are generated in the harvest of raw materials, transportation of materials, and manufacturing of wood products and maintenance of equipment used in the industry. Several tools used in the wood industry such as chain saws, large circular saws, chop saws, chippers and debarkers can generate continuous noise levels over 100 dBA which would expose unprotected workers to a 100% daily noise dose in a relatively short period of time. Additionally, these workers are often exposed to several noise sources within their work environment simultaneously which may serve to increase already high exposure levels.

A study of noise exposure levels in sawmills found only 10% of all personnel were below the 8-hour limit of 85 dBA while 27% of the workers were exposed to 8-hour levels above 95 dBA (Koehncke *et al*, 2003). Schneider and Susi (1993) obtained 8-hour time-weighted average (TWA) values on various trade workers at a construction site using noise-logging dosimeters and found an average TWA of 90.25 dBA. Kerr *et al* (2002) measured noise exposures for chop and circular saw operators and found routine exposure to sound levels of up to 115 dBA when the saw was in use. In Tanzania, Rongo *et al*. (2004) and Mbuligwe (2004) found that among 310 males workers assessed in small scales industries more than 90% had high level of exposure to noise. These authors also noted significant variability in sound exposures for laborers depending on specific task and duration of that task.

Rapid urbanization in many developing countries is resulting in industrial noise in cities at levels which are likely to cause hearing impairment. Some countries including Tanzania do not have effective programmes to deal with this problem. There is a serious shortage of accurate information on noise induced hearing loss to facilitate development of these programmes. Priorities to address the problem should include i) prevalence and longitudinal surveys of significant noise exposure and noise induced hearing loss, ii) the development of effective screening methods to enable early identification of and intervention against noise induced hearing loss, and iii) studies to determine the social and economic consequences of noise induced hearing loss.

By knowing the noise level and exposure duration we can determine exposure dose to each worker that will help them to know whether they are working within allowable limit or not. Again by knowing the exposure dose will help wood workshops workers to take appropriate preventive measures of wearing ear plugs or ear muffs in accordance with the noise intensity.

This study therefore, surveyed the level of exposure to noise of workers employed in wood working workshops in Morogoro municipality. Determination of exposure intensity and duration will assist in advising the workshop owners and workers on occupational hazards which may result from unsafe levels of exposure.

METHODOLOGY

The study area

The study was conducted in Morogoro municipal which lies between latitude 60°51" south and longitude 31°41" east and is located about 194km inland (West) from Dar es Salaam. The municipal has an area of about 260 sq km with population of 287,000 inhabitants (2007 estimates) and is situated on the lower slopes of Uluguru Mountains, which rise above the town to about 1,600 feet above sea level.

Major economic activities in Morogoro Municipality include retail and whole sale trade, commercial and subsistence farming, transport and communications, education and other services and industry. Industries in the municipal can be classified into two groups; Medium sized and small scale industries employing about 15,000 people (Morogoro Region social-economic profile, 2002).

Data collection

Preliminary survey of the workshops was done to examine the range of sounds level produced when wood working machines were running. A walk through survey of the premises to collect an impression of the noise to be assessed, the type of noise generated (steady, intermittent, impulse), the range of level and to identify quite areas that can he eliminated from further consideration was done.

The formal survey involved interview and onsite field measurement. Measurement of noise level in the workshops using Bruel and Kjaer type 2230 precision sound level meter (Bruel and Kjaer, 1984). Measurements were taken at the corners and at the centre of the building housing the wood working machines. At each corner three measurements were recorded when machines were working. First the sound level meter was pointed to the centre of the workshop, then 45° away from the centre in clockwise direction and finally 45° from the centre to anticlockwise direction. For each direction the duration of measurements was ten minutes or more. At the centre of the workshop measurement were taken in four perpendicular directions. Eighty average sound exposure level measurements were made in five different workshops.

Data analysis

Data were analyzed by using Microsoft's Excel spread sheet software to derive means, average and other parameters needed to address the specific objectives of the study.

RESULTS AND DISCUSSION

Workers and customers exposure to noise hazards

All 80 measured noise levels were over 75dBA, the threshold level above which there is a duration dependent risk of induced hearing loss. Table 1 present the mean noise levels for each workshop, overall mean noise level for the five workshops and the fraction of measurements exceeding 85 and 90dBA.

Table 1: Noise levels and exceedence fractions in workshops

	Noise level (dBA)				
Workshop no.	n	Mean	Standard deviation	Percent (%) >85 dBA	Percent (%) >90 dBA
Overall	80	86.5	2.2	67.5	5
1	16	86.8	2.7	62.5	12.5
2	16	85.7	2.6	50	6.25
3	16	86.6	1.9	68.75	6.25
4	16	86.4	2.2	68.75	0
5	16	87	1.7	87.5	0

The observed mean noise level of 86.5 dBA was higher than 55 dBA which is the maximum permissible level recommended by Tanzania Bureau of Standards for mixed residential environment. At this mean exposure level, WHO standards insist that the exposure duration should not exceed 45 minutes. In contrast to WHO's recommendations, OSHA and NIOSH who suggests that workers can be exposed to such noise level for 16 hours and 8 hours respectively, without causing hearing impairment (Table 2).

About 67.5% of all measurements were above 85 dBA and more than 5% were above 90 dBA. According to OSHA (1983) and NIOSH (1998) the work place noise exposure limits restricts 8-hours work shift exposure to 90 and 85 dBA respectively, in order to protect most workers from compensable hearing loss after a 40 years working lifetime.

Table 2: Allowable daily exposure duration for various exposure levels

	Allowable exposure duration (minutes)					
Exposure level (dBA)	75	85	90	100	105	115
OSHA	>24h*	960	480	120	60	15
NIOSH	>24h*	480	151	15	4.5	0.5
EPA/WHO	480	47.5	15	1.5	0.5	0

* Indicates unlimited allowable exposure duration.

However, EPA (1998) and WHO (1999) recommended lower daily exposure (75 dBA for 8 hours, or 70 dBA for 24 hours) to prevent any hearing loss among exposed individuals. According to EPA (1998), a 30 minutes daily exposure to 90dBA of workshop machine noise (equivalent to a daily 8-hour exposure of 78 dBA) for 6 days per week over a 40 years period would be expected to produce a 4 kiloHertz (kHz) in the median individual and an 11 dBA hearing loss in the 90th percentile individual. Exposure to 100 dBA for 30 minutes per day would be expected to produce a 4 kHz hearing loss of 16 dB in the median individual and 24 dB in the 90th percentile individual. A loss of as little as 10 dB averaged across 2 and 4 kHz over both ears may affect speech comprehension (WHO, 1999).

These estimates assume no other exposure to noise during the day, which is clearly not the case since many workers are exposed to other sources of occupational and non-occupational noise. Individuals living in urban areas have been demonstrated to have greater hearing loss than those with similar occupational exposure to noise but living in rural areas. Additional monitoring which include non-occupational noise hazards is needed to quantify the risk of over exposure among this occupational group.

Workers attitudes and knowledge of using noise protectors

Workers' interviews indicated that most of the respondents (90.5%) were aged between 20 and 34 years of age. Eighty nine percent had primary education, 4% adult education while 2% had secondary education. Those who had formal carpentry training were 15 % while the rest (85%) received on job training. About 50.9% of the respondents had between 3 and 5 years of working experiences, 28.3% had less than three years of experience

while those with more than 5 years in the industry were 20.8%.

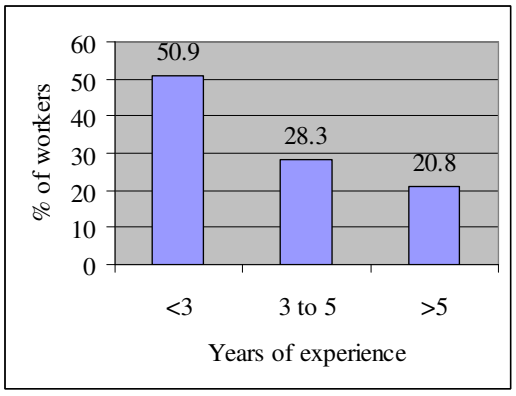

Figure1: Respondents' experience in wood working

Workers training on proper operations and handling of protectors are very important in reducing health hazards and accidents. The survey found that 66% of all workers in the surveyed workshops had the necessary training in safety measures including, how such equipment provide protection, what hazards they protect against and the procedures to follow if they notice guards that are damaged, missing or inadequate.

Assessment of use of protectors for reducing the impact of noise pollution indicated that about 62.3% of the respondents had positive attitudes and accepted that protective equipments were necessary. Surprisingly, only 14.1% were wearing them regularly (Figure 2). 48.2% of workers reported that although protective were available and were appropriate for the job, they were not willing to wear them because they reduce their working efficiency. Contrary to this opinion, Nagi *et al*. (1999) demonstrated that the noise from various sources does not only interrupt conversation or create stress and annoyance in the general population, but it also reduces the efficiency and output of workers. The rest of the respondents (37.7%) indicated that protectors were unavailable in their workshops.

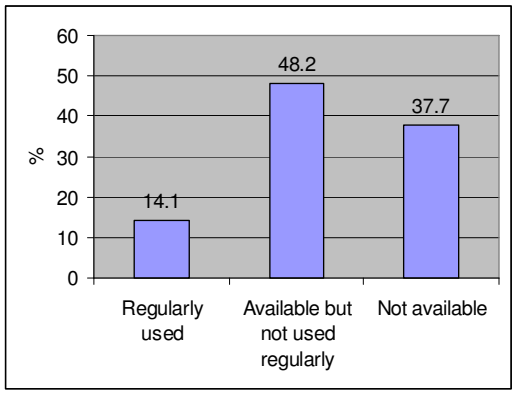

Figure 2: Availability and frequency of use of noise protectors

These results are similar to those of other studies done in small scale industries (SSI) in Tanzania. Rongo *et al*. (2004) revealed that there is high level (>90%) of self reported exposure to dust, fumes, noise or sunlight in certain occupational groups and low reported use of personal protective equipment in SSI. Similar result were observed in textile mill, wood and metal works industries in Dar es Salaam as reported by Yhdego, (1991) and Mbuligwe (2004) who observed that workers were exposed to high levels of noise and heat.

In Tanzania, small and medium enterprises (SMEs) operating in the formal and informal sector contribute about 30% of GDP and consist of more than 1.7 million businesses engaging about 3 million people, or about 20% of the Tanzania labor force . As was observed in this study, most of workers in these industries perceive themselves to be exposed to many occupational and environmental health hazards. Additional study of this potential public health problem is therefore warranted in order to fully characterize the risk and to guide the development of effective risk management strategies.

CONLUSION AND RECOMMENDATIONS

This study demonstrated that, workers in woodworking workshops were exposed to excessive noise levels and were likely to get hearing impairments. Workers do not use hearing protectors and the workshops do not have hearing conservation programs. Although most workers are aware of occupational hazard associated with noise, they do not use appropriate protectors. The government and the concerned authorities have not satisfactorily intervened in this situation. The study recommends that detection and monitoring of occupational noise should be enforced especially in the informal industrial sector where most of the youths are employed. The noise sources should be reduced and hearing conservation programmes including audiometry and workers education and protection introduced.

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