Original Research Article

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Effects of occupational noise on quality of life

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ABSTRACT

Background: Noise is an unwanted sound which could possibly adversely impact an individual's quality of life. The issue of occupational noise is of public health importance. Excessive noise can potentially affect the quality of life. The objective of the study was to evaluate the effects of occupational noise exposure on quality of life.

Methods: This was a prospective community based study involving sawmill workers in Ile-Ife. Library and administrative staff of Obafemi Awolowo University, Ile-Ife were used as control. The quality of life of all participants was evaluated with World Health Organization Quality of Life bref questionnaire and a designed noise exposure evaluation questionnaire.

Results: A total of 420 subjects were recruited for the study and similar number for control. There was a negative correlation between occupational noise and the physical and psychological domains of quality of life.

Conclusions: Occupational noise level is associated with a reduction in the overall, physical and psychological components of the quality of life.

Keywords: Occupational, Noise, Quality of life, Sawmill workers, Ile-fe

INTRODUCTION

Noise is defined as an unwanted sound. Exposure to occupational noise for a prolonged period of time has been shown to be potentially hazardous.^{2,3} Noise becomes hazardous when the sound exceeds 85 dB over a typical eight hour work day.4 Noise could be present both at home and at work. The work place is an important part of man's environment as that is where a significant part of the day is spent. Therefore, the noise at work plays a role as a source of risk factors for a hearing impairment. Worldwide, noise-induced hearing impairment is the most prevalent irreversible occupational hazard.⁵ Hence, this preventable condition is of public health significance. It has also been reported that 16% of disabling hearing loss in adult is due to occupational noise.⁶ Excessive noise could cause hearing impairment, tinnitus, social, behavioural effects and some physiological effects which could potentially result to reduction in the quality of life.

Characteristics of occupational noise induced hearing loss are that it is sensorineural, affecting hair cells in the inner ear, typically bilateral, "notching" of the audiogram at 3000, 4000, or 6000 Hz, with recovery at 8000 Hertz (Hz). Noise could be an important cause of hearing loss among sawmill workers, artillery men, ironsmiths, workers in the power houses and highly mechanized industries, operators of grinding machines. In Ife East which is in the Southwestern Nigeria, there are over 500 sawmills and these sawmill workers constitute a significant part of the population. Many studies have been done on occupational noise but little has been done on how it affects the quality of life especially among sawmill workers in this location, hence this study.

Objectives

The aim of this study was to find the effects of occupational noise on the quality of life among sawmill

workers. The specific objectives were to evaluate the correlation between hearing threshold and quality of life among sawmill workers, the correlation between occupational noise and quality of life scores.

METHODS

Study design

This was a prospective community based study on sawmill workers in Ile-Ife.

Study duration

This study was done from February, 2014 to May, 2015.

Study setting

Study was done in Ile-Ife, Osun state in southwestern Nigeria

Study protocol

The minimum sample size was determined using the Leslie and Kish formula for sample size determination.⁸

$$N = Z^2 pq/d^2$$

Where:

N= minimum required sample size

Z= the standard normal deviation, usually set at 1.95 which correspond to 95% confidence level

P= proportion in the target population estimated to have particular characteristics. A proportion of 50% (p=0.5) was used as no comparable study on quality of life among sawmill workers was found.

$$q = 1.0 - p = 1 - 0.5 = 0.5$$

d= absolute deviation or amount of difference allowed between the target and the study population.

Hence, N=
$$1.95 \times 1.95 \times 0.5 \times 0.5/0.05 \times 0.05$$

$$= 0.950625/0.0025 = 380$$

The minimum acceptable sample size is 380. Therefore taking into consideration a 10% addition to account for attrition, 420 sawmill workers were selected for the study using multistage sampling technique. In the first stage, 3 wards out of the total of 7 wards in Ife East Local Government were selected using a ballot. In the second stage, 14 alternate sawmills were selected in each ward and then in the third stage 10 sawmill workers were selected from each sawmill using a ballot. The control consisted of 420 library and administrative staff of Obafemi Awolowo University, Ile-Ife. The first 420 library and administrative staff who met the criteria and

of similar age and sex were recruited for the study as control.

The quality of life of all participants was evaluated with World Health Organization Quality of Life (WHO-QoL) brief questionnaire and a designed noise exposure evaluation questionnaire. The sound level at each sawmill was measured with a sound level meter (Pulsar model 14 class 2, meets the requirements of IEC 61672) when the machines were in operation. A pure tone audiometry was done with a screening audiometer (Ambco Model 1000) and hearing threshold was determined using the pure tone average of the better ear.

Ethical approval

Ethical approval was obtained from Ethical Committee of Obafemi Awolowo University Teaching Hospital, Ile-Ife. Informed consent was obtained from all the participants.

Data management

The data obtained was analyzed using the Statistical Package for Social Sciences (SPSS) version 20 software and was presented in a descriptive format using tables. The prevalence of hearing loss was determined and the correlation between hearing threshold, occupational noise and quality of life scores were determined. A 'p' value less than 0.05 was accepted as statistically significant.

RESULTS

The study consisted of 410 males and 10 females (both saw mill subjects and control). Table 1 shows the demographic data of the participants. Majority (79.3%) of the workers were 21-40 years. Ninety three (22.1%) sawmill workers had bilateral hearing threshold \geq 41 dB. None of the subjects used any noise protective device.

Table 1: Summary of demographic data of participants.

Variables	Subjects	Controls
Age (in years)		
≤20	2.1	1.9
21-30	37.6	37.9
31-40	41.7	42.1
41-50	17.6	17.1
51-60	1.0	1.0
Sex		
Male	410	410
Female	10	10

There was a significant difference in the physical, psychological, social, environmental and overall components of quality of life between sawmill subjects and the control subjects as shown in Table 2 below. Table 3 shows that an inverse relationship was seen between all the domains of the quality of life scores and hearing

threshold among both sawmill subjects and controls. There was a significant reduction of all domains of quality of life with increase in hearing threshold among the subjects. However, among the controls, there was a significant reduction only in the physical, psychological and social components of quality of life scores with increase in hearing threshold. Table 4 shows that there

was a significant reduction in the overall, physical and psychological domains of the quality of life scores with increase in occupational noise level among sawmill subjects and no significant change was seen in the social and environmental components of the quality of life scores with change in occupational noise levels.

Table 2: Comparison of quality of life and its domain between sawmill and control subjects

General scores/domains	Cases	N	Mean score (QoL score±SD)	t-test	P value
Comonal (arranall)	Subject	420	65.10±10.84	10.72	0.001
General (overall)	Control	420	73.97±6.53	10.72	
Dhygiaal	Subject	420	64.50±8.95	4.35	0.001
Physical	Control	420	73.00±11.34	4.33	
Psychological	Subject	420	65.61±8.80	1.25	0.001
	Control	420	69.22±11.58	4.35	
Social	Subject	420	65.21±8.42	4.48	0.001
Social	Control	420	69.01±10.61	4.40	0.001
Environmental	Subject	420	59.71±10.72	4 20	0.001
	Control	420	63.60±10.79	4.28	

Table 3: Correlation between Quality of life scores and hearing threshold

Variables	Subjects		controls			
variables		r	P value	N	r	P value
Overall quality of life and hearing threshold	420	-0.10	0.039	420	-0.014	0.842
Physical quality of life and hearing threshold	420	-0.23	0.001	420	-0.19	0.007
Psychological quality of life and hearing threshold	420	-0.17	0.001	420	-0.26	0.001
Social quality of life and hearing threshold	420	-0.19	0.001	420	-0.18	0.011
Environmental quality of life and hearing threshold	420	-0.10	0.041	420	-0.08	0.267

Key: r means coefficient of correlation.

Table 4: Correlation between occupational noise level and quality of life scores.

Variables	N	r	P value
Overall quality of life and occupational noise	420	-0.180	0.011
Physical quality of life and occupational noise	420	-0.109	0.026
Psychological quality of life and occupational noise	420	-0.109	0.026
Social quality of life and occupational noise	420	-0.004	0.940
Environmental quality of life and occupational noise	420	-0.004	0.940

Key: r means coefficient of correlation.

DISCUSSION

Occupational noise causes auditory and non auditory effects which could possibly affect quality of life. This study found 22.1% (93) of the sawmill workers have hearing loss in the disabling range (≥41 dB). Nelson et al however found that 16% of disabling hearing loss in adult is attributable to occupational noise though in the general population.⁶ The effect of hearing threshold on the physical and psychological components of quality of life has also been observed by Prestes et al who found greater impairment in the physical and psychological domains among those with higher thresholds on audiometry.¹⁰ This could explain why hearing impaired individuals may

not hear instructions correctly and are more likely to have poor performance at work. They are more likely prone to injuries due to inappropriate response to danger as a result of their hearing impairment. Hearing threshold has a bearing on the social domain of the quality of life as observed in this study. Inability to understand speech is one of the main effects of hearing impairment. This consequently leads to difficulty in communication and eventually a situation of being socially handicapped. It has been shown that the handicap resulting from hearing loss could result to difficulty in communication. This study found that increase in hearing threshold is associated with the reduction in the overall quality of life. This corroborates the findings of Scherer and Frisina.

Increase in occupational noise leads to reduction in the physical and psychological components of the quality of life as shown in Table 4. Thus, occupational noise affects physical activities such as sleep, performance. 15-17 Sleep disturbance is a serious consequence of noise which affect daytime alertness, performance and quality of life.¹⁸ Noise exposure has been found to be related to reports of accidents, minor injuries and cognitive failures.¹¹ Occupational noise has a bearing on the psychological component of the quality of life. Studies have shown that noise is associated with aggressive behaviour, depression and anxiety. 19,20 This study found no significant correlation between occupational noise and the social and environmental components of the quality of life. The result of this study however could be due to the fact that the sawmill workers are exposed to occupational noise for up to 8 hours daily and majority of them have worked in this environment for more than a year, so they have probably adapted to the noisy environment. Hence, no demonstrable significant effect of occupational noise on their social and environmental components of quality of life in this study. A relationship between transportation noise exposure and annoyance which is a social aspect of life has been demonstated.²¹ This is at variance with the findings from this study although that study was on transportation noise and not on sawmill. There is paucity of comparative data on effects of noise on the social and environmental aspects of quality of life among sawmill workers. This study also found a reduction in the overall quality of life scores with increase in occupational noise as other previous studies have shown.²² Hence from this study, noise variously affects quality of life.

It is however essential to note that the effects of other confounding factors such as presbyacusis, job satisfaction which could also affect quality of life could not be excluded in this study.

CONCLUSION

Hearing loss was found to be associated with a significant reduction in physical, psychological, environmental and social domains of the quality of life. Occupational noise level was associated with a significant reduction in the overall, physical and psychological components of the quality of life. We recommend that hearing conservation programme and compulsory use of noise protective devices among sawmill workers should be enforced.

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