ORIGINAL RESEARCH PAPER

Audiology

SURVEY OF PREVALENCE OF NOISE INDUCED HEARING LOSS IN HAWKERS & SHOPKEEPERS IN NOISY AREAS OF INDORE, MADHYA PRADESH

KEY WORDS: Noise exposure, Hawkers, hearing loss, shopkeepers.

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ABSTRACT

Background-Noise is defined as unwanted sound. It is also defined as sound, generally of a random nature, the spectrum of which does not exhibit distinct frequency component (Harris, 1979). In the Indian perspective, like everywhere, road traffic noise is unique in comparison to the other pollutants, because unlike air or water pollution, noise has no residual evidence to serve as a continuing reminder of its unpleasantness. **Aim of the Study** is to measure the environmental noise levels and estimate the prevalence of noise induced hearing loss in road side hawkers & shopkeepers in Indore City. **Objectives** were to measure and to get prevalence of the noise exposure among the hawkers and the shopkeepers. **Method -** A total 100 subjects (94 males and 6 females) with noise exposure of 2 years and above was selected. This included the male subjects had age between 18 to 40 years with the mean age of 29 years and female subjects had age between 27 to 35 years. **Results -** The overall noise exposure level for this population is found to be 82.49 dB (A) with minimum noise level 77 dB (A) and maximum 90 dB (A). The Average year of noise exposures to these individuals are found to be 7.2 years. 63% population had primary education, 34% had not completed their secondary education and only 3% had matriculation and above. For prevalence there is no significant difference in % of Hearing Loss cases in Hawkers & Shopkeepers. **Conclusion -** Thus, the study infers that the measured environmental noise level is increasing significantly to the damaging level and remains at hazardous level for most of the time during the studied hours.

INTRODUCTION

Noise is defined as unwanted sound. It is also defined as sound, generally of a random nature, the spectrum of which does not exhibit distinct frequency component (Harris, 1979). By extension, noise is unwarranted disturbances in the useful frequency band (NIOSH, 1991). In 1983, the World Health Organization has recognized noise as one of the risk factors for hypertension (WHO, 1983). According to WHO 1994, "Adverse effect of noise is a change in morphology and physiology of an organism which results in impairment of capacity to compensate for additional stress or increase in susceptibility to the harmful effects of other environmental influences. Continuous exposure to unwanted sound causes many adverse effects both physiological and psychological. Adult-onset hearing loss has been described as the "fifteenth most serious health problem" in the world, with profound effects ranging from social isolation and stigmatization of individuals to serious national economic burdens (Smith, 2004). Excessive noise is a pervasive occupational hazard with many adverse effects, including elevated blood pressure, reduced performance, sleeping difficulties, annoyance and stress, tinnitus, noise-induced hearing loss (NIHL) and temporary threshold shift. Of these, the most serious health effect is NIHL resulting from irreversible damage to the delicate hearing mechanisms of the inner ear. NIHL typically involves the frequency range (pitch) of human voices, and thus interferes with spoken communications. A hearing loss caused by exposure to loud sounds of 85 dB or over through a prolonged period of time (Rabinowitz, 2006). NIHL is most likely to occur where sounds are either present in a continuous or impulsive manner (Axelsson, 1994). Occupational noise induced hearing loss refers to a hearing loss caused by loud sounds experienced in a work place (Mathur & Roland, 2014).

Noise Pollution on the Road Side

Indore is the capital city of state Madhya Pradesh in India. The population of Indore has grown much mainly because of the livelihood opportunities it offers and the possibility of residing in neighboring satellite cities and working in Indore. In India the transportation sector is growing rapidly and number of vehicles on Indian roads is increasing at a very fast rate. These have led to overcrowded roads and noise pollution. The major contribution of the traffic noise, towards overall noise pollution scenario, is a well-known established fact. Traffic noise from highways creates problem for surrounding areas, especially when there are high traffic volumes and high speeds. Vehicular traffic noise problem is contributed by various kinds of vehicles like heavy, medium trucks/ buses, automobiles and two wheelers, (Mukesh M.C 2010). With growth and urbanization of cities and towns, there has been a rapid increase in the traffic volume on the roadways. Although transportation is an indispensable part of the modern society, its benefits may be overshadowed by its negativities and is a cause for concern for the community.

In the Indian perspective, like everywhere, road traffic noise is unique in comparison to the other pollutants, because unlike air or water pollution, noise has no residual evidence to serve as a continuing reminder of its unpleasantness. Even though its effects usually severe as any other pollutant, noise is often regarded with the lowest priority for control and management. Noise represents one of the most common occupational health hazards. The noise exposure is a typical city like Indore where noise exposure is two tires i.e. because of the commencement of flyovers and since commencement of flyovers noise exposure in many areas of Indore has not been mapped. Shopkeepers and venders constitute a sizable group and hawkers alone contribute about 410 billion rupees annually in the economic growth of country India. In Indore there are nearly 16 declared hawking zones exist in the city and currently, only 15,500 hawkers are hawkers and hold permits.

Aim of the Study

To measure the environmental noise levels and estimate the prevalence of noise induced hearing loss in road side hawkers & shopkeepers in Indore City.

The current study has been undertaken with following objectives:

- To measure the environmental noise levels at the various hawker's zone/sites/location during morning to evening and to analyze its exposure to hawkers and shopkeeper.
- To estimate and establish prevalence of Noise Induced hearing loss in Hawkers & shopkeepers.

METHODOLOGY

The study was conducted to find out the prevalence of noise induced hearing loss in Hawkers & shopkeepers. It also aimed at measuring the noise levels in noisy areas of the city.

Informed Consent: All the test procedures were explained to the participants (Hawkers & Shop keepers) and their written consents were obtained.

Subjects' Inclusion Criteria: A total 100 number of subjects were selected from the both genders. This included 94 males and 6 females. The male subjects had age between 18 to 40 years with the mean age of 29 years (S.D. =6.49) and female subjects had age between 27 to 35 years and duration of noise exposure. Subjects had noise exposure of minimum 2 years and above.

Subject Exclusion Criteria: Hawkers & Shop keepers with a history of ear discharge, neurogenic disorders and other significant medical history were excluded from the survey.

The Study Was Conducted In Three Phases:

Phase 1: Measurement Of Road Traffic Noise Level

To measure the overall traffic noise levels using sound level meter at different vehicular traffic sites of the city. Noise level was measured by using integrating SLM (Agronic 8928 B & K Type Digital Sound Level Meter) in dB(A). SLM has three measuring weighting network/ scales A, B & C with a push button to change the range of measurement quickly by 10 dB. SLM is attached to a 1/3rd octave band frequency analyzer. For noise measurement "A" scale is preferred than other two scales. SPL Meter along with microphone is usually calibrated before use. Location/site of noise measurement:

The hawker's zones were selected based on the information available with department of shop and establishment, Anti encroachment squad, dailies and Google search. Noise level measurements and analysis of the locations was based on the noise descriptors L_{Aeq}, based on the noise descriptor; noise map was developed to identify locations with high noise exposure. The noise map developed reveals high noise exposure at the nucleus of the metropolis where commercial activities and high traffic volume. Based on the information seven areas /sites /location were selected to measure and map the noise level.

Procedure of Noise Measurement

The investigation of environmental noise pollution of four sampling locations/zones of City was conducted. The SLM was positioned such that the microphone was at 0-degree azimuth with the flow of traffic. The meter was held 1.3 to 1.5 m above the ground surface and 3.0 to 3.5 m away from reflecting surface so that noise level reaching at the ear level can be best predicted for the selected sample. For each sampling location, noise measurements were carried out continuously for the period of 7 days with seven hours of monitoring per day with a gap of one hour after every hour of reading. The noise levels were recorded after every two minutes (i.e. 30 readings were recorded for every hour). The schedule for noise measurement during the day time was as follows: morning 09.00-10.00 hrs. 11.00-12.00 hrs, afternoon 13.00-14.00 hrs, 15.00-16.00 hrs, and evening 17.00-18.00hrs, 19.00-20.00 and 21.00-22.00hrs (Monday to Sunday) at various selected locations/ sites/ Noisy places of the city. The noise level was measured at two different places at each location i. e preferably at the hawkers and shopkeeper's place of operations.

RESULTS

Demographic Data of Subjects

A total number of 100 subjects including 6 females and 94 males in age range from 18 years to 40 years with the mean age of 29 years (S.D. =6.49) were selected for the study. The overall noise exposure level for this population is found to be 82.49 dB (A) with minimum noise level 77 dB (A) and maximum 90 dB (A). The Average year of noise exposures to these individuals are found to be 7.2 years. 63% population had primary education, 34% had not completed their secondary education and only 3% had matriculation and above. 65% of respondent could fill the questionnaire by themselves and rests of the respondents were provided assistance. The care was taken to avoid the influence of assistant on response data.

Objective 1 - To Estimate Noise Levels At The Various Hawkers Zone/sites/location During Morning To Evening.

The details of measured environmental noise levels at different hawkers & shopkeepers' locations have been shown in Table 1. it can be observed that maximum noise level 100.0 dB (A) has been recorded during 8 p.m.- 9 p.m. while the 54.0 dB (A) minimum noise level was obtained during 8 a.m.- 9 a.m. The average measured environmental noise levels recorded between 8a.m. to 10p.m. have been shown in Figure1. There are certain locations in city where most of the working / day time noise levels are exceeding above the safe noise levels for human health recommended and permitted by the regulating and controlling agencies of air quality (Ambient Air Quality Standards in respect of Noise: The Noise Pollution [Regulation and Control] Rules, 2000).

Table1: Hawker's Populations And Overall Noise Levels At These Four Locations

Hawking Zones/Location	Estimated no. of Hawkers	Average Noise Levels
Vijayanagar chowk	28,624	86.72 dB (A)
MR-9 chowk	33,010	83.54 dB (A)
LIG square	30,134	86.18 dB (A)
Palasiya square	38,835	89.77 dB (A)

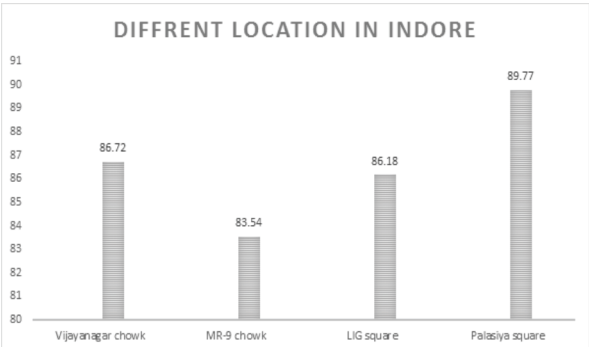

Figure 1: Recorded Environmental Noise Level At Hawkers And Shopkeeper's Place At Various Locations In Indore.

Objective 2 - To Establish The Prevalence Of Noise Induced Hearing Loss In Hawkers And Shopkeepers

The obtained test scores from 0 to 22 with the mean score in hawkers is 1.93 (S.D. = 4.097), and mean score in shopkeeper is 2.19 (S.D. = 2.007). From Table 2 the results of questionnaire analysis reveals that out of 100 subjects, 64 Hawkers and 30 Shopkeepers have Normal Hearing, 29 Hawkers and 17 Shopkeepers are having tinnitus problem and the 3 Hawkers and 2 Shopkeepers may be having hearing problem and

remaining 1 hawker have Hearing loss as per hearing screening tool. 94.1% out of 64 Hawkers obtained less than 5 score, which suggest that the subjects have normal hearing. 4.4% scored 6-9 suggestive of hearing loss and 1.5% subjects scored 1.5% which suggests hearing loss in them. 93% out of 30 shopkeepers scored less than 5 which indicate no hearing loss and 6.3% out of 30 scored 6-9 which is suggestive of hearing loss, none of the shopkeeper scored the value 10 or above on Hearing screening test. The obtained scores were subjected to evaluate the correlation between the groups. Chi square test was applied to study the relation between 2 groups. The results of the same are displayed in Table 2. The p value obtained on chi-square analysis at the level of significance of $p \leq 0.05$. Since obtained chi-square value is 0.734 which is greater than p-value. It means that there is no significant difference in % of Hearing Loss cases in Hawkers & Shopkeepers. In order to evaluate the percentage of hearing loss in between the groups t- test was applied. Since the obtained 2 tailed t- value is .734 which is greater than p value at significance level of 0.05. Hence there is no significant difference in mean score of percentage of hearing loss cases in Hawkers & Shopkeepers.

Table 2: Prevalence Of Noise Induced Hearing Loss In Hawkers And Shopkeepers Obtained By Hearing Screening Tool.

			Group		Total
			Hawkers	Shop Keepers	Subjects
Level of Hearing Loss	Score 0-5 No Loss	Count	64	30	94
		% within Group	94.1%	93.8%	94.0%
	6-9 May be	Count	3	2	5
		% within Group	4.4%	6.3%	5.0%
	10-22 HL	Count	1	0	1
		% within Group	1.5%	.0%	1.0%
	Total		68	32	100
		% within Group	100	100	100

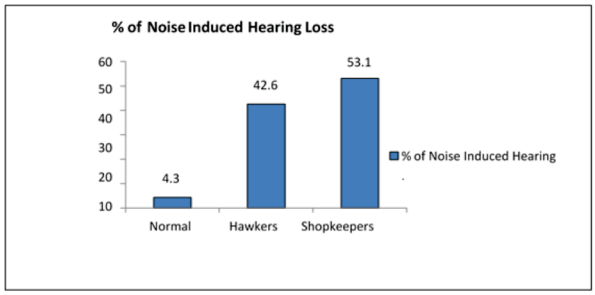

Figure 2: Prevalence Of Noise Induced Hearing Loss Among Hawkers And Shopkeepers

DISCUSSION

The study conducted by Abdulali S. et al (2006), measured the noise levels at different traffic junctions in city. They found that the noise levels at selected locations range from 75-95 dB (A). From above study it can be concluded that within the span of 7 years (2006- 13), the noise levels has been increased significantly up to 100 dB (A). Moreover, the present study found maximum noise level of 100.0 dB (A) during evening hours with overall noise exposure of 79.0 dB (A) with minimum noise level in this area was 72.6 dB (A) at any given point of time. Further, the current study also reports 54.6 dB (A) as minimum noise level during 8-9 am (Ref. Table 5.1). Hence it is clearly visible that the noise level has increased by 8-17 dB (A) during day time from 11 am to till night 10 pm in comparisons with noise levels at traffic junctions reported by Singh (1999), Abdulali S. et al (2006) & Adhav P. et al (2012).

Thus, the study finds that there is alarmingly increased in the noise pollution in city. The increase in noise levels could be due to the uncontrolled rise in city populations and habitats that resulted in shrinking the overall open spaces for the noise to escape in the environment. Further, commencement of flyovers with 2-tier traffic, sky walks, increasing number of vehicular traffic at road, high rise buildings and other commercial & urbanization activities in city most probably have resulted in increasing the overall environmental noise levels. In spite the study reports lower noise level but this level is also not within the permitted limits of the designated area of the air quality controlling and regulating agencies in our country. Thus, the study infers that the measured environmental noise level is increasing significantly to the damaging level and remains at hazardous level for most of the time during the studied hours. Further no location in the current is found to be in adherence with Noise control pollution act of Air Quality (Ref. Table 1.2) at any given point of time. Karimi, Nasiri, Kazerooni and Oliaei (2010) studied Noise Induced Hearing Loss risk assessment in truck drivers. The results revealed that about 9-12.6% of truck drivers suffer from hearing impairment in mid frequencies and the percentage of truck drivers with hearing impairment increased to about 45% at high frequencies for both ears.

However, the current study has some disagreement with prevalence of noise induced hearing losses in other occupational set-ups. These study reports higher prevalence rate than the present study. The obtained differences in prevalence of noise induced hearing loss in hawkers & shopkeepers may be due the differences in the selection criteria's of the subjects in the respective studies. As majority of subjects in the current study were adults in the age range of 18-40 years with average working experience 7.2 years whereas studies that are not in line of current had selected older subjects with more years of noise exposures at work place and there were interactions of other causative factors as well. Thus, it can be concluded that obtained prevalence rate of noise induced hearing loss in hawkers & shopkeeper in the city in the current study is as frequent as in other occupational set-ups. Thus, it suggests that the tinnitus is a strong indicator for hearing loss cases in hawkers & shop keepers and again 4/6KHz notch turns out to be strong marker for road/traffic/ environmental noise as an occupational hazard for hawkers & shopkeepers.

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