

## Hearing Loss - Continuous Noise Exposure among Street Hawkers & Shop Keepers



### Audiology

**KEYWORDS :** Traffic noise, hair cells, high frequency hearing loss.

**Mrs. Sreevidya.Sherla**

Helen Keller's Institute of Research & Rehabilitation for the disabled children, Sri Colony, Opp.G.K. colony busstop, Ramakrishnapuram, Secunderabad-500 056

**Mrs. Lubna Eram**

Helen Keller's Institute of Research & Rehabilitation for the disabled children, Sri Colony, Opp.G.K. colony busstop, Ramakrishnapuram, Secunderabad-500 056

### ABSTRACT

*Exposure to loud sound source results in damage to the structures of cochlea such as hair cells and associated nerve causing hearing loss. Hair cells are tonotopically organized and the damage to the same occurs in correspondence to the frequency of sound being exposed to. Exposure to noise in occupational setting majorly occurs in the high frequency region; therefore, the characteristic feature of noise induced hearing loss ranges from 3 kHz – 6 kHz (Dobie,2001). The current study focused on investigating the effect of traffic noise on shopkeepers and street hawkers. A total of 60 subjects were selected and divided into groups on base of their years of experience. Hearing thresholds were obtained. Results revealed that a significant difference exists in hearing threshold of the two groups. It was also noted that long duration exposure resulted in high frequency loss.*

### Introduction:

Hyderabad being the largest city in southern India has a population of 6.8 million and a metropolitan population of 7.75 million, making it the fourth most populous city and sixth most populous urban agglomeration in India. Along with the increasing degree of air, water and industrial pollution, another kind of pollution is now worrying the inhabitant is noise pollution. Noise pollution in the city of Hyderabad is increasing along with the increase of numbers of motor vehicles plying on its road.

Noise had several effects on health. Noise induced hearing loss (NIHL) is one major of all. The symptoms of NIHL increase gradually over a period of continuous exposure or may occur due to one-time exposure at various loudness levels. The sounds that are produced may become distorted or muffled and may cause difficulty in understanding speech. The individual may not be aware of the loss, but it can be detected with a hearing test. This is characterized by alteration in hearing threshold in high frequency region, i.e., between 3-4 kHz. This is also known as cochlear alteration threshold which is irreversible and capable of hampering speech intelligibility.

The National Institute for Occupational Safety and Health (NIOSH) 2003, a branch of U.S Centers for disease control and prevention, reports that ear injury can develop in workers if exposed to sound at 85dB or greater for more than 8 hours. Therefore, exposure to loudness level of 85dB for eight hours per day has become a standard in the mining, construction & agriculture industries, as well as in the U.S Air Force & Army.

Roy and Rahman (2006) studied the effect of various noise levels on hearing thresholds in Dhaka City. Results reported that 3 out of 29 sample (10.34% Hawker + 3.45% Shopkeeper) were identified to have NIHL. It was also clear from the earlier results that Hawkers are more vulnerable than shop keepers since Hawkers remain on footpath without any barrier, which can reduce the intensity of noise but the shop keepers do not face such intensive noise due to glass doors or glass windows.

A similar study carried out at "National Center for Hearing and Speech for Children" (NCHSC) (Chakraborty, Samad & Amin, 2005), on several professional groups revealed that a definite noise notch (>25dB) at 4 KHz observed in 10.58% of audiograms. On the whole it was concluded that automobile drivers, traffic polices were at high risk of developing NIHL compared to road side hawkers and shop keepers.

Ashraf et al. (2009) investigated the frequency of hearing loss

among textile industry workers of weaving department. Results have shown that noise level was in range of 88.4 – 104 dB (A). It was also noted that hearing loss was significantly associated with working experience of more than 10 years and overtime.

Charminar being one of the busy areas in the city of Hyderabad, more than 1000 heavy and light vehicles cross the area every hour. Presence of sound horns in such areas is major cause of noise leading to fluctuations in hearing thresholds and permanent deafness at times. Therefore causing noise pollution and effecting Hawkers and shop keepers severely. In addition to decrement in their hearing status, alterations in behaviours are observed as well.

### Need for the study:

In Indian scenario many studies have been undertaken on noise induced hearing loss in large industries, traffic police, and mill weavers, military and in mining industrial workers, construction workers were studied with not much focus on the hearing ability of shopkeepers and street hawkers. However, no much investigation was conducted to find out the effects of traffic noise on hearing among shopkeepers and street hawkers. These workers work for more than 8 hours a day and are exposed to noise. Hence there exists a need to identify noise levels in this area and their effect on the hearing among shopkeepers and street hawkers.

### Aim of the study:

The aim of the current study is to evaluate the presence of hearing loss as a result of noise exposure among street hawkers and shop keepers.

### Objectives:

- To measure the noise levels during day time and night time inside the shop and outside the shop.
- To determine hearing thresholds of shopkeepers (Group 1) and street hawkers (Group 2).
- To compare between hearing thresholds of Exposure 1 and Exposure 2.

### Methodology:

The study was carried out by measuring noise levels at both premises (inside and outside) of the shop. All the participants were subjected to conventional pure tone audiometry in a sound treated room with Otoscopic examination and Tympanometry being formed in prior to the same. A total number of 60 participants were selected and divided into two groups (30 shop

keepers and 30 street hawkers). Considering the age of experience the participants were further divided into groups Exposure 1, and 2 for both the groups respectively. E1, included participants with an experience of 5-10 years while E2, included participants with 10-15 years of experience. Information regarding the type of noise and duration of exposure to sound source was collected.

Procedure: Noise levels were measured using sound level meter (SLM) (American Recorder IEC 651 TYPE II). Due to the varying levels of noise during a day, effort was taken to measure noise level at regular interval with a gap of three hours. Otoloscopic examination was done to rule out the presence of impacted cerumen in the ear canal and tympanic membrane perforation. Tympanometry was performed to rule out the middle ear pathology which gave the accurate results of the functioning of middle ear. Individuals exhibiting middle ear pathology were excluded from the subject group. Pure tone audiometry was carried out following Hughson-Westlake method. The test was done for frequencies ranging from 250 Hz to 8 KHz i.e. (250 Hz,500 Hz,1 KHz,2 KHz,3 KHz,4 KHz,6 KHz and 8 KHz.) for air conduction and 250Hz to 4000Hz for bone conduction.COSMIC 103 Clinical Audiometer was used.

**Statistical Analysis:** Statistical Package for Social Sciences (SPSS 17.0), t-test was used to find the significant difference between the two groups.

**Results and discussion:**

**Objective 1:** To measure the noise levels during day time and night time inside the shop and outside the shop.

A digital SLM, was used to measure the noise levels during day and night time at regular intervals of time. The noise levels that were measured varied from 60 to 85 dB (A). It was noted that the subjects were exposed to noise for a period of 8-10 hours with no ear protection devices.

**Table 1 - The results of the noise levels measured.**

A' weighting				
Time	INDOOR		OUTDOOR	
	SLOW	FAST	SLOW	FAST
11:00 AM	66.6	76.6	68.3	78.9
02:00 PM	68.3	75.6	70.9	81.0
05:00 PM	70.3	79.0	73.3	82.3
08:00PM	71.3	81.8	75.4	84.3

**Objective 2: To determine hearing threshold levels of shopkeepers (Group 1) and street hawkers (Group 2) who are exposed to traffic noise.**

Conventional pure audiometry was obtained for all subjects and the mean values are as follows.

GROUP 1: Pure tone audiometry results for the subjects of Group 1 (shop keepers) ranged from 15 dB to 25 dB for a frequency range of 250 Hz to 8 kHz.

GROUP 2: Similarly results for the participants of Group 2(Street hawkers ) ranged from 13 dB to 21 dB for a frequency range of 250 Hz to 8 kHz.

**Table 2 - The mean and standard deviation between PTA of Group 1(shopkeepers) and Group 2(street hawkers)**

Frequency	Group	N	Mean	S.D	t-value
250 Hz	1	30	15.83	4.371	1.15
	2	30	13.50	3.972	
500 Hz	1	30	16.50	5.111	0.13
	2	30	16.33	4.722	
1 KHz	1	30	19.00	4.983	1.11
	2	30	17.67	4.302	
2 KHz	1	30	19.50	5.625	0.39
	2	30	19.00	4.235	
3 KHz	1	30	21.50	6.585	0.94
	2	30	20.00	5.724	
4 KHz	1	30	24.67	6.585	1.91
	2	30	20.67	5.724	
6 KHz	1	30	24.33	9.535	0.90
	2	30	22.17	6.661	
8 KHz	1	30	25.83	12.253	1.59
	2	30	21.83	6.363	

\*P - value < 0.05 significant, \*\* P - value <0.01 highly significant

The results tabulated above reveals that there exists no significant difference between the two groups in the overall range of frequencies.

**Objective 3: To compare between hearing thresholds of Exposure 1 and Exposure 2**

**Table 3 - The mean and standard deviation of PTA of Exposure 1(5-10 years) and Exposure 2(10-15 years).**

Frequency	Exposure	N	Mean	S.D	t-value
250 Hz	1	30	14.00	3.806	1.2
	2	30	15.33	4.722	
500 Hz	1	30	15.33	4.138	1.75
	2	30	17.50	5.374	
1 KHz	1	30	16.83	3.592	2.61
	2	30	19.83	5.167	
2 KHz	1	30	17.83	3.869	2.30
	2	30	20.67	5.529	
3 KHz	1	30	18.83	3.640	2.52
	2	30	22.67	7.512	
4 KHz	1	30	19.33	3.651	3.37
	2	30	26.00	10.205	
6 KHz	1	30	20.17	4.044	2.92
	2	30	26.33	10.822	
8 KHz	1	30	20.67	4.302	2.60
	2	30	27.00	12.635	

\*P - value < 0.05 significant, \*\* P - value <0.01 highly significant

The above tabular column reveals that no significant difference exists at the frequency region of 250 Hz and 500 Hz. However, there exists a significant difference at 2 kHz and 3 kHz, and highly significant score observed at 1 kHz, 4 kHz, 6 kHz and 8 kHz.

Discussion: The study aimed at comparing the hearing thresholds among street hawkers and shop keepers. The results have shown that there exists a significant impact of noise exposure on hearing thresholds (predominantly at 1 kHz, 4 kHz, 6 kHz, and 8 kHz) in correspondence to the years of experience. This was in par with the study done by Ashraf et al. (2009), where it was reported that any occupation with direct sound exposure and increased years of experience could significantly impact the hearing thresholds.

In addition, a significant difference was also noted among street hawkers compared to the shopkeepers due to the direct exposure to noise source. These results are noted to be in par with the study done by Roy and Rahman (2006), where it was stated that street hawkers were the group of people who were often affected by noise pollution.

**Conclusion:**

With a view that street hawkers and those individuals with a

greater experience are at a risk of developing NIHL, recommendations concerning preventive measures were listed.

- On analysing the sound level in experiment area it was observed that the noise level remained between 75-80 dB (A) all over the day which is according to the norms of NIOSH.
- Noise predominantly affected the hearing of shopkeepers and street hawkers at higher frequencies starting from 3 KHz, 4 KHz, 6 KHz and 8 KHz.
- More the number of years they are exposed to traffic noise, greater the hearing loss. Thus it can be concluded that prolonged exposure to noise results in high frequency hearing loss.

#### Limitations and future research focus:

To obtain more valid results, measures can be implemented in future to study in a larger population, including conventional pure tone audiometry to test extended high frequencies in addition to speech audiometry and oto-acoustic emission test protocol.

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