

Effect of Everyday Noise on Hearing in Rural and Urban Population; A comparative Study

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ABSTRACT

Noise pollution is one of the common types of environmental pollution and is due to exposure to high levels of noise. It is harmful to our health especially on our hearing perception and causes hearing loss. We had undertaken a study based on effect of everyday noise on hearing in rural and urban population. Participants were selected from clients attending to out-patient department of Otorhinolaryngology, N M C. Though ENT examination and audiological investigations were performed on selected patients. Results of our study showed, the hearing loss in urban population is comparatively higher than in rural population. The hearing loss was also noted maximum in higher frequencies.

Key words: Noise pollution, hearing loss, rural, urban, PTA

Introduction:

Any unwanted or undesirable acoustic signal is called noise. Noise became a part of modern mechanized lifestyle. Intensities of this noise range from low to high in our day to day life. Noise pollution is the excessive noise (high intensity noise of long or short periods of time) which is harmful to our health. It is mainly caused by machines, motor vehicles, trains, aircraft etc. Noise pollution is one kind of environmental pollutions. Noise can be divided as outdoor noise and indoor noise [1]. Outdoor noise generators: road traffic noise, explosives, factories, machinery etc. Indoor noise generators: mixer / grinders, vacume cleaners, water pumps, television etc.

Effect of noise pollution on health:

Noise pollution causes many health problems related to ear (hearing), blood pressure, psychological, giddiness, fatigue etc. It is well established fact that exposure to high intensity noise damages auditory system of humans. When sound is produced, its waves reach tympanic membrane (TM) through external auditory canal and set in vibration. This TM vibration causes to and fro movement of ossicular chain in middle ear and sets the basilar membrane into vibration in the cochlea of inner ear. This basilar membrane has sensory cells (i.e. inner and outer hiliar cells on its surface. When basilar membrane is set in



vibration, a travelling wave will generate. During this process the hair cells come in contact with tectorial membrane. Travelling wave and contact with tectorial membrane set hair cells in polarization and depolarization phases. During these phases vibration of sound converted into electrical signals and neural fibers collect these electrical impulses and send to brain, where information is analyzed. Exposure to noise, of high intensities & for longer hours causes damage to these sensory cells and this result in hearing threshold shift (in otherwise less hearing loss). Along with hearing loss, there could be tinnitus, ear ache, tympanic membrane rupture, ossicular chain discontinuity, giddiness etc. The hearing loss caused due to noise exposure is initially temporary and repeated exposure causes permanent hearing loss. Hearing loss due to noise exposure is called noise induced hearing loss (NIHL) and it is common in adults. There are several factors that make sound potentially damaging to cochlea; intensity of sound, frequency composition of sound, duration of exposure of sound [2].

Materials & Methods:

It is a prospective study of one year duration. People from rural and urban areas, who visited the department of ENT, Narayana Medical College Hospital with & without complaint of hard of hearing were taken as subjects. Subjects within age range of 30–45 years and residing in either rural area or urban area for past 15years were taken for the study. Subjects having systemic diseases like diabetes, hypertension, chronic illness conditions, chronic middle ear diseases with conductive pathology and ototoxic drug exposure were excluded from study. Patients beyond 30–45 years age range, and industrial workers were also excluded from study. A total of 100 subjects were taken; 50 members in rural population group and 50 members in urban population group. Gender distribution was not considered. All the selected candidates had undergone routine ENT examination, puretone audiometry for checking the hearing thresholds from 250Hz to 8000Hz, and impedance audiometry to rule out middle ear pathology. A detailed history about kinds of noise and duration of noise exposed was taken. The

Table I: Mean thresholds with minimum and maximum for rural and urban groups:

Frequency in Hz	Mean threshold with min & max in dBHL		Difference between mean thresholds of R & U groups	'p' value
	Rural (n=50)	Urban (n=50)		
250	5.2 (0-10)	10.2 (5-15)	5	0.001
500	8.6 (0-15)	12.2 (5-20)	3.6	0.003
1000	9.4 (5-25)	18.7 (10-30)	9.3	0.003
2000	15.3 (10-20)	26.5 (20-35)	11.2	0.001
4000	17.6 (10-25)	31.3 (25-35)	13.7	0.003
8000	19.8 (15-25)	37.1 (30-40)	17.3	0.002

P value anything less than 0.05 considered as significant.

hearing thresholds at each frequency were compared between two groups: rural and urban populations and relevant statistical analysis was carried out.

Results:

PTA thresholds from 250Hz to 8000Hz were noted for each subject. It was observed that most of the subjects had minimal to mild hearing loss at high frequencies.

It was noted that, at higher frequencies, i.e 4000Hz and 8000Hz mean threshold was high in both groups. When compared the mean thresholds at each frequency, the mean threshold value was significantly high for urban group than rural group.

Discussion:

Noise causes hearing loss and also affects well being of humans. Duration, frequency composition and intensity are key factors in causing damage. High intensity noise for a short period of time is enough to cause damage like mine explosion sound / crackers' explosion sound, gun firing etc.

As the intensity of noise increases for even, shorter durations are also enough to cause damage ear occur. Safe listening level depends on the intensity and duration of noise. Individual susceptibility is also another important factor in getting noise induced hearing loss (NIHL) [3]. Personal listening devices like, ipods, CD / MP3 players also known to cause NIHL when used at high intensity levels for long time and it is noted that teenagers and young adults often play music on personal listening devices at higher intensity levels [3]. In a study by Atmaca, Peker & Altin (2005) it was observed that high levels of noise at workplace

affect individual's work performance by causing hearing loss, nervousness, dizziness and insomnia. In another study done in Karachi showed exposure to noise for 12 hours in a day for 6 months caused hearing loss in nearly 82.4% individuals (mainly exposed to road traffic noise)[5].

It's known that every day, we are exposed to lot of noise, especially in utilizing vehicles, entertainment, machinery etc. this noise at high intensity levels and for prolonged periods cause damage to human health in terms of; hearing ability, blood pressure, sleep, concentration etc. effect of noise on hearing in industrial workers was well studied in earlier literature. Due to this noise exposure 4kHz notch is seen often in individuals who are exposed to constantly high levels of sound (>90dB). This finding was supported by Siddiqui et.al (2005) where they mentioned hearing loss in people in residential area for maximum time. In this study we tried to show the effect of everyday noise on hearing in two different kinds of population; rural and urban. It was seen that rural population were exposed to sounds of agriculture machinery (ex: noise of tractor, water pump sets, and rice mill), two wheeler vehicles and public address systems at religious gatherings. Repeated exposure to these noises showed little effect on rural population's hearing (mostly at high frequencies). In urban area persons were exposed to lot of road traffic noise every day, loud speakers, and various machinery noises (flour mills, drilling & cutting machinery, welding, concrete mixers etc). In the present study we found two findings. The first finding is high frequency hearing losing both groups; rural and urban. Participants in both groups got minimal to mild high frequency deafness in agreement with earlier similar studies. This HF hearing loss can

be attributed noise exposure. Noise being a complex sound signal, affects mostly high frequency hearing in humans initially [6].

The second finding of the study is urban population were more affected to when compared to rural population in all hearing frequencies (P Values is < 0.005 for 250Hz to 8000Hz). This could be due to the variation is the amount of noise exposure between groups. It is known fact that people in rural area live in a quiet environment compared to urban population [5]. People who live in urban area were exposed to lot of road traffic noise every day, loud speaker, and various machinery noises (flour mills, drills & cutting machinery, welding, concrete mixers etc). Though the rural population exposed to agricultural noise, it is for brief periods only unlike urban people every day.

This study indicates noise pollution is a definite cause for deafness in public. The study also recommends the measurement of noise pollution by using sound level meters at public places in urban as well as rural areas.

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