SUBCLINICAL DEAFNESS AMONG MEDICAL STUDENTS USING EAR PHONES

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ABSTRACT

Sensorineural hearing loss (SNHL) is due to defects either in the sensory end organ of the cochlea or in neural transmission to the central nervous system (CNS). A defect exists either in the conversion of acoustic energy by the sense organ of the inner ear or in the transmission of neural impulses centrally. Noise induced hearing loss is the second most common cause of SNHL after presbycusis. Both the intensity and the duration of noise exposure interact to influence potential damage to the hair cells of the inner ear for which no medical or surgical treatment is known. The aim of this study is to estimate the prevalence of subclinical noise induced hearing loss due to ear phone usage among medical students. Extensive usage of ear phones can cause damage to the outer hair cells and hence it can cause irreversible sensorineural hearing loss among people within few years. This adds to the hearing loss which is incurred by the increasing environmental sounds and such people are more prone for disabling deafness later on in life due to presbyacusis. A cross sectional study was conducted in a group of students of age 19-23years in which the participants were selected based on certain inclusion and exclusion criteria. Eligible participants were given a questionnaire about the usage of ear phones like duration of ear phone usage, number of hours /day, model of ear phone, volume level etc and were subjected to pure tone audiometry test for finding Bone conduction pure tone average. The data was analysed statistically. It showed that 28% showed minimal subclinical sensorineural hearing loss and with > 2yrs usage of ear phones the SNHL was found to be 40%.It was noticed that there is a marked increase in SNHL among ear phone users in noisy environment.

KEYWORDS: Devices, Ear phones, Irreversible Sensorineural Hearing loss, Noise Induced Hearing Loss, Medical Students, Pure tone audiogram, Bone conduction average

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INTRODUCTION

The advancement in the technology might also be hazardous to the normal functions of the human body. Extensive usage of ear phones can cause the irreversible sensorineural hearing loss among people within a decade. Usage of Personal Listening Devices (PLD) like iPods, mp3 Players have increased dramatically. Irrational use of ear phones would have an effect on hearing thresholds.

Aim

The aim of the study is to estimate the prevalence of subclinical noise induced sensorineural hearing loss among medical students using ear phones. Chronic noise exposure causes mechanic ultra structural visible damage at the level of the organ of Corti, initially causing a loss of outer hair cells, leading finally to neuronal degeneration. Typically, hearing loss initially occurs as a sensorineural high frequency notch, normally at 4kHz. The middle frequencies, e.g. the main speech frequencies, are affected considerably later. The extent and progress of the hearing loss depend on the intensity, duration of exposure and frequency composition of the sound and the individual noise susceptibility.

MATERIALS AND METHODS

300 students using ear phones to listen to music using iPods, mp3 players were recruited. The study was cleared by the institutional ethical committee. Written informed consent was obtained. Questionnaire was designed to survey students about No. of years of ear phone usage, No. of hours per day, model of ear phone used, usage during travel (train, bus). It was ascertained that none of the students were already suffering from any otological disease which may cause hearing loss.

Exclusion criteria

H/O of any ear symptoms
H/O of any otological surgeries

<table>
<thead>
<tr>
<th>Hearing threshold (dB)</th>
<th>Right ear</th>
<th>Chi ^2</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 2 yrs (n=180)</td>
<td>147 (78%)</td>
<td>42 (22%)</td>
<td>23 .006</td>
</tr>
<tr>
<td>&gt;2 yrs  (n=80)</td>
<td>33 (60%)</td>
<td>27 (40 %)</td>
<td>145 (76%)</td>
</tr>
</tbody>
</table>

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<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 2 yrs (n=180)</td>
<td>115 (63%)</td>
<td>44 (24%)</td>
<td>27 .007</td>
</tr>
<tr>
<td>&gt;2 yrs  (n=80)</td>
<td>113 (60%)</td>
<td>23 (38%)</td>
<td>145 (76%)</td>
</tr>
</tbody>
</table>

Figure 1
Association between duration of usage & hearing threshold

<table>
<thead>
<tr>
<th>Hearing threshold (dB)</th>
<th>Right ear</th>
<th>Noisy environment (n=53)</th>
<th>Normal environment (n=197)</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 (57%)</td>
<td>23 (43 %)</td>
<td>.045</td>
<td>.040</td>
</tr>
<tr>
<td>133 (67%)</td>
<td>64 (33%)</td>
<td>.45</td>
<td>.84</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hearing threshold (dB)</th>
<th>Left ear</th>
<th>Noisy environment (n=53)</th>
<th>Normal environment (n=197)</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 (59%)</td>
<td>21 (41%)</td>
<td>.33</td>
<td>.036</td>
</tr>
<tr>
<td>116 (58%)</td>
<td>81 (42%)</td>
<td>.33</td>
<td>.036</td>
</tr>
</tbody>
</table>

Figure 2
Association between Noisy environment & Hearing threshold

Study

Eligible participants were given a questionnaire, after obtaining the informed consent from the medical students were asked about the duration of ear phone usage, number of hours/day, model of ear phone& volume level. They were subjected to otoscopic examination to rule out the external and middle ear pathology, tuning fork tests is done to initially assess the type of hearing loss and pure tone audiometric examination was done for finding bone conduction pure tone average. This bone conduction pure tone average is an absolute measure of the inner ear ie cochlear function. The usual air conduction average is the working level of the ear or what we call serviceable hearing. So as we were specifically looking for a cochlear loss we took the bone conduction average as our standard. The data was analyzed statistically.
RESULTS

From PTA readings, average of 500 Hz, 1000 Hz & 4000 Hz was considered to evaluate the subject’s hearing threshold. PTA values - 69 subject out of 249 studied (i.e., 28%) showed minimal subclinical sensorineural hearing loss (SNHL). In subjects with usage of ear phones ≤ 2 yrs significant SNHL was observed among 23% of subjects. In subjects with > 2yrs usage of ear phones the SNHL was found to be 40%. It was noticed that there is a marked increase in SNHL among ear phone users in noisy environment, since they increase the volume of the ear phones in noisy surroundings.

Limitation of study
The intensity level (dB) of ear phone usage could not be determined because of individualized usage of sound source. Hearing Loss caused by usage of mobile phone could not be ruled out. PTA is a basic investigation. Oto Acoustic Emission (OAE) gives precise information about function of outer hair cells (peripheral auditory system). The future aspect of this kind of research would not be based on PTA but it will be based on OAE as it is more sensitive. We should be devising methods to quantify the outer hair cell damage and classify it as reversible and irreversible damage. As of now OAE is only a qualitative test with high accuracy and sensitivity.

DISCUSSION

Sensorineural hearing loss (SNHL) is rare in younger age. Sound stress caused by indiscriminate usage of earphones is the most likely cause of SNHL in this age group. This is an irreversible but preventable disability which can be avoided through safety measures. Informing people about the effects of ear phones on the hearing threshold may encourage them to proactively protect themselves. With the increasing technology regarding the usage of hearing devices and PLD [personal listening devices] more and more people are using it relentlessly. Though it causes hearing loss, most of it remains subclinical as our temporal or the auditory cortex self formats for the lost sensitivity. It is only when a certain threshold is lost that the person experiences deafness and that time irreversible losses occurs which has no treatment. Since the loss is sensory in nature the reversibility component is very less. They become deaf very sooner than others not using ear phones. This study throws light on this particular aspect discussed above and hence will be a useful guide to educate the youth about the ill effects of PLDs. We can also recommend that if a person uses ear phones for more than 2 years then the chance of getting deafness jumps from 28% to 40%. Significant loss is found when we hear through earphones in a noisy environment.

CONCLUSION

Prevalence of hearing loss was found to be 28%. It was higher among subjects with, prolonged duration of ear phones usage and listening in noisy environment. There was a 12% more risk in deafness when we use hearing devices for more than 2 years.

CONFLICT OF INTEREST

Conflict of interest declared none.

REFERENCES

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