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Original Research Article

Profile of hyperacusis and tinnitus among traffic police exposed to noise

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ABSTRACT

Background: Traffic police are in constant risk for developing noise induced hearing loss. Studies have reported prevalent permanent threshold shift resulting to varying degrees of hearing loss. The present study was carried out with an aim of investing the prevalent Hyperacusis and Tinnitus among traffic police personnel of Mangalore, Karnataka. To profile Audiological investigations and document the prevalent Hyperacusis and Tinnitus signs and symptoms among traffic police.
Methods: A total of 52 participants took part in the study in the age range of 24 to 45 years, with a mean value of 35.83±0.965 years. The study had 45 male ad 7 female participants. The Audiological evaluations were carried out. The pure tone audiometry was carried out using AC 40, two channel, diagnostic audiometer. Tympanometry was carried out using Middle ear Analyzer from Clarinet Inventis. To document the clinical signs and symptoms of Hyperacusis and Tinnitus, Modified Khalfa Hyperacusis questionnaire and Inventory of Hyperacusis Symptom (IHS) was used.
Results: In our study, mean pure tone average (PTA) on right side was 13.10±0.710 dB and on left side was 13.25±0.874 dB. Pure tone average on right side ranged from 5 to 30dB and left side 4 to 30dB. It was also observed that four of the participants had mild level of Hyperacusis and one had moderate Hyperacusis and another participant with severe level Hyperacusis.
Conclusions: There is a necessity to regularly monitor hearing skills and impact of noise on hearing health of traffic police personnel.

Keywords: Hyperacusis, Noise induced hearing loss, Tinnitus, Traffic police

INTRODUCTION

Sound is a part of daily life that aids in communication between living beings and brings pleasurable experiences such as listening to birds, music, and nature. Noise is an unpleasant pollutant in both the workplace and the home.[1] Tinnitus is the perception of ringing, buzzing, or whistling noises when no external auditory stimulus is present. Tinnitus is considered more or less chronic if it lasts longer than six months.[2] Noise-induced hearing loss is a noticeable disease, according to the Factory Act of 1948. No adult worker is required to work in a factory for more than 9 hours on any one day, according to the Act. The act also stipulates that all employees and job applicants must undergo periodic medical examinations and must be physically fit for the role. They must also be provided with personal protective equipment.[3] According to the guidelines by Government of India for control and regulation of nose levels which are mentioned in 'The Noise Pollution (Regulation and Control) Rules, 2000' which was amended in November 2000, October 2002 and September 2006, the ambient air quality standards with respect to noise in an industrial area is 75 decibels, 65 decibels in a commercial area, 55 decibels in a residential area, and 50 decibels in a silence zone during

6:00 am to 10:00pm. From 10:00pm to 6:00am it is 70 decibels in industrial area, 55 decibels in commercial area, and 45 decibels in residential area and 40 decibels in silence zone. Noise levels should never exceed 140 decibels in adults and 120 decibels in children to prevent hearing loss.[4]

Noise induced hearing loss (NIHL) is a type of sensorineural deafness caused by long-term noise exposure. According to the World Health Organization, around 466 million people worldwide suffer from disabling hearing loss in 2020, with that number anticipated to nearly double by 2050; approximately 34 million children suffer from hearing loss; and up to 60% of cases are avoidable. Excessive occupational noise (sound intensity more than 85 dB A) is a known cause of NIHL in adults, with prevalence rates ranging from 12 percent to 19 percent in the United States, 15 percent to 34 percent in Canada, and 10 percent in Japan. Military, forestry, agriculture, fisheries, and hunting have all been linked to an increased risk of NIHL.

Workers in noisy professions must wear protective equipment, and employers may be compelled to limit workers' hours to avoid noise exposure, submit frequent noise monitoring reports, and even provide workers with health screenings. Noise levels surpassing 89 dB for more than five hours per week can cause permanent hearing loss. Smoking, diabetes, and a lack of exercise, as well as non-modifiable factors like ageing, genetics, and racial/ethnic influences, may all contribute to the acceleration of NIHL and accompanying tinnitus. Despite the fact that gender is not thought to be a key risk factor, males are more prone than females to engage in risky behaviour such as high-risk noise activities.[5] Although it is most common in the older age group (above 65 years of age), the number of children and young adults affected is increasing. Noise-induced hearing loss has become more common as a result of recreational noise exposure, particularly among teens and young adults. It's been reported that listening to sound at levels higher than 89dB for more than 5 hours per week can cause permanent hearing damage. Smoking, lack of exercise, poor diet, diabetes, tooth loss, and congestive heart disease are all known to be risk factors for noise-induced hearing loss.[6]

For two reasons, disorder-specific self-report assessments are becoming more valuable clinical tools in audiology and otology. For starters, they aid in the confirmation of patients' auditory and balance complaints that aren't clearly identifiable through audiometry and vestibular tests. Second, when utilised in a pre-treatment and post-treatment paradigm, self-perceived handicap scales serve as functional outcome measures, with a reduction in self-perceived handicap as the desired positive outcome.[7]

Another prevalent illness that produces pathological auditory hypersensitivity is hyperacusis. Hyperacusis, like tinnitus, differs from person to person, making it impossible to have a general agreement on the meaning, assessment, and interpretation of hyperacusis test findings. Khalfa et al. (2002) give the most recent definition of hyperacusis, which refers to discomfort for sounds that would be tolerable to most normally hearing people. Because hyperacusis appears to be subjective phenomena, objective measurements are difficult to define or quantify.[8]

Excessive noise is a global occupational health hazard with considerable social, physiological impacts, including noise induced hearing loss and hyperacusis. Traffic policemen are constantly exposed to motor vehicles and their noises. They are usually employed in heavy traffic junctions and majority of them remain unaware about the health issue related to the exposure to loud noise for a prolonged period because of adverse effect of noise pollution takes long time to become overt. Hence the present study focuses on identifying noise induced hyperacusis and tinnitus in traffic police personnel and treat them.

METHODS

Participants

The present study was a cross sectional study conducted among 52 traffic police personnel in the month of December 2020. Simple random sampling technique was used for selecting the participants. Traffic police were selected from different traffic zones of Mangalore, a coastal city in Sothern India. The Internal Ethical Review Board of our institution reviewed and approved the study protocol with the Yenepoya Ethical Committee number of YEC2/ 345. Permission from the Department of Traffic, Government of Karnataka and informed consent was taken from the study participants prior to the commencement of study. Demographic characteristics, information of occupation and hearing related symptoms of subjects by the face-to-face investigation, were collected. Subjects were selected according to the following criteria: (i) all traffic police with minimum 6 months of work experience and 8 hours duty per day and (ii) within an age of 20-45 years. Participants were excluded according to the following criteria: (i) with history of conductive hearing loss or congenital hearing loss, (ii) who uses Ear Protective Devices (EPDs) (iii) who have associated neurological deficits and conditions such as ototoxicity.

Detailed medical history was obtained from the subjects. Audiometric assessment of the subjects was carried out in acoustically treated room after ensuring the subjects were not exposed to traffic noise 8 hours before testing. This was to avoid temporary threshold shift. Pure tone audiometry was conducted after 6 hours of rest following the duty to establish the best possible audiological thresholds while excluding confounding factors. The pure tone audiometry was carried out using AC 40, two channel, diagnostic audiometer. Tympanometry was carried out using Middle ear Analyzer from Clarinet

Inventis. Modified Khalfa Hyperacusis questionnaire and Inventory of Hyperacusis Symptom (IHS) were used to assess the hyperacusis and Tinnitus Handicap Inventory Severity Scoring was used to assess the tinnitus. Modified Khalfa Hyperacusis Questionnaire had questions with functional, social and emotional subdivisions. Each question was given choice of 'yes, 'sometimes' and 'no' with score of 5, 3 and respectively. Modified Khalfa Hyperacusis Questionnaire was interpreted as 0-10 = normal, 12-40 = mild hyperacusis, 42-60= moderate hyperacusis and 62-100= severe hyperacusis. IHS uses questions with choices of not at all, a little, somewhat and very much so, which was scores as 1, 2, 3 and 4. IHS was interpreted as ≥69 as likelihood of hyperacusis, ≥80 as severe hyperacusis and ≥89 as very severe hyperacusis. Next questionnaire we used was Tinnitus Handicap Inventory Severity Scoring which had choices of 'yes', 'sometimes' and 'no' in each question, with a score of 4, 2 and 0. It was interpreted as 0-16 being slight or no handicap, 18-36 being mild handicap, 38-56 as moderate handicap, 58-76 as severe handicap and 78-100 as catastrophic handicap. They were also graded as grade I, grade II, grade III, grade IV and grade V respectively. We used Spearman's correlation formula for statistical data analysis.

RESULTS

History of exposure to vehicular and traffic noise was the independent variable of the study. The total years of work experience in traffic, number of hours exposed for noise per day while doing duty and total number of hours per week was considered as distinct groups. Accordingly, the Audiological profiles of the group were analyzed. Our research was conducted on 52 traffic police personnel in whom there were 45 males and 7 females who were in Mangalore city. The age of the participants ranged from 24 to 45 years, with a mean value of 35.83 ± 0.965 years. They had a work experience of minimum 2 years to maximum of 26 years. Mean of number of years of experience was 12.06 years. They had a mean value of 8.83 hours of noise exposure in a day and 52.96 hours of noise exposure in a week. Since the data was not normally distributed, we used Spearman's correlation formula for statistical data. The composition reveals that, the youngsters took part in the study relative to the senior cadre. The lesser representation in the higher category could be because of the nature of job and duties. Pure tone audiometry and tympanometry assessment was done on all participants. Mean pure tone average (PTA) on right and left side was 13.10±0.710 dB and 13.25±0.874 respectively (Table 1). Pure tone average on right side ranged from 5 to 30dB and left side 4 to 30dB. Four participants were found to have mild hearing loss, two of them had on right side and two of them on the left side. Tympanometry was done on all participants and the participants with B type tympanogram were excluded in the study. Inventory of Hyperacusis Symptom (IHS) showed one participant had severe hyperacusis (Table 3). This participant had mild hyperacusis according to Modified Khalfa Hyperacusis questionnaire. Tinnitus Handicap Inventory Severity Scoring showed 1 participant with grade 2 score who also had moderate hyperacusis according to Modified Khalfa Hyperacusis questionnaire (Table 4). Participants who were found to have mild hearing loss were not found to have hyperacusis or tinnitus. According to the Modified Khalfa Hyperacusis questionnaire it was seen that four of the participants with mild hyperacusis and one had moderate hyperacusis (Table 2).

Table 1: Mean and standard deviation of pure tone thresholds.

Group	PTA right ear		PTA left ear		SRT right ear		SRT left ear	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Traffic police	13.10	0.710	13.25	0.874	15.00	5.00	13.5	5.00

Table 2: Modified Khalifa hyperacusis questionnaire.

Score	Degree	Frequency	Percentage
0-10	Normal	47	90.38
12-14	Mild	4	7.69
42-60	Moderate	1	1.92
62-100	Severe	0	0
Total		52	100

Table 3: Inventory of hyperacusis symptoms scores.

Score	Degree	Frequency	Percentage
≥69	Likelihood of hyperacusis	51	98.07
≥80	Severe hyperacusis	1	1.92
≥89	Very severe hyperacusis	0	0
Total		52	100

Table 4: Tinnitus handicap inventory severity score.

Score	Degree	Frequency	Percentage
0-16	Slight or no handicap (Grade 1)	51	98.07
18-36	Mild handicap (Grade 2)	1	1.92
38-56	Moderate handicap (Grade 3)	0	0
58-76	Severe handicap (Grade 4)	0	0
78-100	Catastrophic handicap (Grade 5)	0	0
Total		52	100

DISCUSSION

Our pilot study comprised of 52 traffic police personnel from Mangalore city in which 45 males and 7 females. According to some research, there is no difference in the level of discomfort caused by tinnitus for both males and females.[9] A study conducted in a tinnitus clinic in Seoul, Korea, it was found that patients over the age of 40 were the most likely to suffer from severe tinnitus.[10] But studies conducted in countries like Australia and UK showed an association between advancing age and tinnitus.[11,12] According to the studies from the recent past, there appears to be a link between hyperacusis and tinnitus. In a research by Anari et al, it was found that 86% of subjects with hyperacusis also have tinnitus.[13] Another research by Jastreboff found that 40% of patients who have tinnitus as their primary complaint also have hyperacusis.[14]

In our study, mean pure tone average (PTA) on right side was 13.10±0.710 dB and on left side was 13.25±0.874 dB. Pure tone average on right side ranged from 5 to 30dB and left side 4 to 30dB. Workplace NIHL is a well-known problem among law enforcement officers, particularly among traffic police.[15,16,17,18]

According to our research, participants with mild hearing loss did not experience hyperacusis or tinnitus. In a study conducted among Indian Railway Travelling Ticket Examiners, showed hearing loss increasing in 4 KHz. Another research was conducted on Indian Air Force Personnel and it was found 22.9% had hearing loss and among them only 5.67% had tinnitus.[19] Speech frequencies are less affected in the early stages of NIHL, and patients have few symptoms, therefore they are frequently unaware of the deleterious consequences of sound. No personnel in our study reported hearing loss to the medical attendant, although 4 participants were found to have hearing loss during the audiometric survey.

When the World Health Organization proclaimed COVID 19 a pandemic on March 25, 2020, India went into lockdown. During the lockdown time, the amount of noise was predicted to have decreased by up to 35–68 percent globally. According to a research conducted in northern India, lockdowns dramatically reduced ambient noise levels compared to the pre-pandemic period.[20] This research was conducted during the Covid lockdown.

In our study, it was found that four of the participants with mild hyperacusis and one had moderate hyperacusis according to Modified Khalfa Hyperacusis Questionnaire and according to Inventory of Hyperacusis Symptom (IHS) we had 1 participant with severe hyperacusis. In research done in Turkey, hyperacusis was seen in 5.78% of participants, in which majority were females.[21]

In our study we had 7 female participants only and none of them had hyperacusis or tinnitus. This lower number of female traffic police personnel could be one of the reasons for low incidence of hyperacusis in our study.

Employers are expected to comply with 'noise at work' legislation in industries where occupational noise-induced hearing loss is common. The Control of Noise at Work Regulations 2005 provide legal restrictions that require action to be taken if daily noise levels exceed 80dB, including providing noise-reduction equipment and minimising exposure to the noise with enough rest. In March 2015, the World Health Organization established the 'Make Listening Safe' campaign, which includes offering advocacy materials for youth, advocating safe listening devices, developing software for safer listening, and promoting research in this domain.[6]

The strength of our study is that we have focused our study on a specific group of people who are exposed to constant exposure to loud traffic noise, dust and smokes from vehicles. There are a number of limitations to our study that should be taken into account. To begin with, the number of participants was lower, as was the overall number of people in the target population. Further, there may be bias because the individuals are presently serving and may not be fully disclosing their medical conditions.

CONCLUSION

To summarise, Noise Induced Hearing Loss is an incurable but preventable occupational disease condition. General awareness of noise induced hearing loss was very less and none of them were using hearing protective devices. Measures such as adequate supply of a hearing protective device, regular education and training for the employer and employees, execution of a workplace hearing conservation programme, and regular health surveillance (audiometry) for police officers

exposed to excessive noise can indeed help to address the issue.

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