International Journal of Otorhinolaryngology and Head and Neck Surgery
Sheikh I et al. Int J Otorhinolaryngol Head Neck Surg. 2018 Jul;4(4):1023-1027
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20182706

Occupational noise induced hearing loss among local industrial population in Kashmir: a lifestyle study

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Received: 03 April 2018
Revised: 11 June 2018
Accepted: 12 June 2018

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ABSTRACT

Background: The purpose of this observational study was to evaluate the incidence of occupational noise induced hearing loss (ONIHL) among the local industrial population of Kashmir who are involved in occupations exposed to noise.
Methods: This prospective observational study was conducted in the department of ENT&HNS of government medical college Srinagar and SMHS Hospital. Total of 508 patients were screened and 158 patients were found have ONIHL patients were included in this study. The study population was evaluated for any significant history and were subjected thorough ENT assessment which included history, clinical examination, Otoscopic examination and then a pure tone audiometry. All these patients were further evaluated with a questionnaire in addition to clinical examination.
Results: Around 31% (158) participants were found to have occupational noise induced hearing loss. The highest incidence of hearing loss was found in 50-59 years age group, which was 0.61. The industrial distribution of occupational noise induced hearing loss (ONIHL) in the screened population in the community was found maximum among Bandsaws workers with ONIHL, contributing 30.37% to the total. ONIHL was found to be most common (64.28%) in individuals exposed to loud noise for maximum duration of time (>20 yrs), while it was least common (20.34%) in individuals exposed to loud noise for least duration of time (<5 yrs).
Conclusions: Our study concluded that people who are exposed to noise more than 90db for more than 8 hours day working in local industries of Kashmir have high frequency sensorineural hearing loss.

Keywords: Sensorineural hearing loss, Noise induced hearing loss, Pure tone audiometry

INTRODUCTION

Noise is defined as unpleasant or unwanted sound. The word noise comes from the Latin word nausea meaning sea sickness.[1] Noise is a common occupational hazard that leads to one of the most common complaints in the adult population seen by the otolaryngologist-noise induced hearing loss (NIHL).[2]

The World Health Organization estimates that approximately 15% of the workers in developed countries are exposed to noise levels which are harmful to hearing.[3] According to National Institute on Occupational Safety and Health (NIOSH), 14% of workers are exposed to noise >90 dB, and in some industries (e.g. textile, petroleum, food and transportation) this estimate reaches up to 25%.[2]

The outer hair cells (OHC) are more vulnerable to noise injury than the inner hair cells (IHC).[1] Plinius reported in 50 B.C. that people living near the rapids on the river Nile showed hearing impairment due to noise.[4] Although

NIHL is not amendable to medical or surgical therapy, it is entirely preventable.[1]

According to recently reviewed evidence, noise exposure drives mitochondrial activity and free radical production, which leads to the inner ear pathology seen in NIHL. And this explains the preventive role of agents that up-regulate endogenous antioxidants or exogenous antioxidants in NIHL.[5] Any workplace that exposes employees to noise levels ≥85 dBA for 8-hr risks harm to their hearing. While there are currently no such standards developed specifically for non-occupational noise exposure, criterion levels currently used in occupational settings can also be utilized for social noise exposure.[6] When engineering and administrative controls fail to reduce noise to an acceptable level, personal hearing protective devices (PHPD) are vital to prevent NIHL. Insert earplugs, earmuffs and canal caps are the three main types of PHPDs.[1,7,8] Simultaneous exposure to noise and ototoxic medications (aminoglycosides) may have an amplifying effect on hearing loss, producing more threshold elevation than with either factor alone.[1,9]

The purpose of this observational study was to evaluate the incidence of occupational noise induced hearing loss (ONIHL) among the local industrial population of Kashmir who are involved in occupations exposed to noise.

METHODS

This observational study was conducted in the department of ENT&HNS of government medical college Srinagar and SMHS hospital for a period of 2 years from Aug 2011 to Oct 2013. Total of 158 patients were included in this study who were exposed to audiometric analysis apart from clinical examinations.

Inclusion criteria

- Patients of all age groups attending ENT OPD with complaints of hearing loss and history of noise exposure.
- Individuals in local industrial population, between age 10 and 59 yrs
- Individuals exposed to noise levels >90 db for a minimum of 8 hrs a day

Exclusion criteria

- Local industrial population <10 yrs and >59 yrs
- Individuals with history of acoustic trauma.
- Patients diagnosed with other causes of SNHL, having history of noise exposure.

The data was entered in Microsoft excel 2010 and analysed using SPSS v 20. The data was summarized by mean, frequencies and percentages.

RESULTS

Total of 508 patients were screened and 158 were found to have occupational noise induced hearing loss. Table 1 shows distribution of occupational noise induced hearing loss (ONIHL) in different age groups in the community and the percentage of each age group

Table 1: Age distribution of ONIHL in community (n=158).

Age (yrs)	No. of individuals screened	No. of individuals with ONIHL	Percentage of ONIHL (%)
10-19	34	9	5.96
20-29	93	14	8.86
30-39	195	53	33.54
40-49	127	46	29.1
50-59	59	36	22.78
Total	508	158	100

Table 2: Incidence of ONIHL in community.

No. of individuals screened	No. of individuals with ONIHL	Calculated incidence
508	158	0.31

Table 2 shows the incidence of occupational noise induced hearing loss (ONIHL) which was calculated after screening the high risk groups exposed to loud noise in the community. After screening a total of 508 individuals in different local industries in Kashmir, the study group was finally reduced to only 158 individuals who were found to have occupational noise induced hearing loss. The calculated incidence was 0.31.

Table 3 shows the age wise distribution of incidence of occupational noise induced hearing loss (ONIHL) in the screened population in the community.

The highest incidence of hearing loss was found in 50-59 years age group, which was 0.61. While as the age group with least incidence was 20-29 years group.

Table 3: Age wise incidence of ONIHL in community (n=158).

Age (yrs)	No. of individuals screened	No. of individuals with ONIHL	Calculated incidence
10-19	34	9	0.26
20-29	93	14	0.15
30-39	195	53	0.27
40-49	127	46	0.36
50-59	59	36	0.61

Table 4: Industrial distribution in community (n=158).

Industry	Total population screened	No. of individuals with ONIHL	Percentage (%) of individuals with ONIHL
Bandsaw	138	48	30.37
Stone crushers	61	26	16.54
Cricket bat manufacturing plants	29	12	7.59
Coppersmiths	62	29	18.35
Blacksmiths	40	16	10.13
Automobile workers	78	27	17.08
Total	408	158	100

Table 5: Duration of noise exposure at work place in community (n=158).

Time (in yrs)	No. of screened individuals	No. of individuals with ONIHL	Percentage (%) of HL in a group
<5	231	47	20.34
5-10	132	46	34.8
10-15	82	32	39.02
15-20	35	15	42.85
>20	28	18	64.28

Table 4 shows the industrial distribution of occupational noise induced hearing loss (ONIHL) in the screened population in the community. Maximum contribution was from Bandsaws were 48 individuals were diagnosed with ONIHL, contributing 30.37% to the total.

Table 5 shows the distribution of individuals with occupational noise induced hearing loss (ONIHL) in terms of duration of noise exposure (in yrs). ONIHL was found to be most common (64.28%) in individuals exposed to loud noise for maximum duration of time (>20 yrs), while it was least common (20.34%) in individuals exposed to loud noise for least duration of time (<5 yrs).

DISCUSSION

In this study 508 individuals, exposed to loud noise levels, were screened by pure tone audiometry for hearing loss at their respective work places. Only 165 out of the 181 individuals with suspected occupational noise induced hearing loss, followed up in OPD and were subjected to clinical audiometry in soundproof chamber. 7 of these individuals were found to have normal hearing levels, which confined the study group to only 158.

The incidence of ONIHL in the community was found to be 0.31, while as that in hospital attending population was 0.54/1000 in the 2 yr study. The most common age group with ONIHL were people in their 3rd decade and least common were in age group of 10-19 yrs, mainly working in automobile workshops or as coppersmiths, etc.

Female workers in the industries are less common in this part of the world, no female worker was present in our study.

Individuals with ONIHL have mainly high frequency hearing loss, mainly in 3-6 khz range. Max recorded noise level was measured at stone crushers (119.3 db) while min at Bandsaws (105.6 db). Most common local industry with loud noise exposure and most people with ONIHL in this state was found in bandsaws.

Amedofu et al in his study of occupational noise induced hearing loss in different industries also found most individuals with ONIHL in the 3rd decade. They screened 116 individuals in this age group and found 25 individuals with ONIHL.[10] In his study however Amedofu et al kept the lower limit of age as 20 years and it was in this youngest age group (20-29 years) were he

found minimum number of individuals(n=4) with ONIHL among the screened (n=70). In our study also, the youngest group (10-19 years) had least number of individuals with ONIHL.

Sulkowski et al found the incidence of occupational noise induced hearing loss in coal miners, steel and iron industries to be 0.3/1000, which is close to that observed in our study.[11] The difference in the values however can be attributed to the difference in the nature of industries and hence the difference in the type and duration of noise exposure. The age wise distribution of incidence of ONIHL in the screened population showed the maximum value (0.59) in the individuals between 50-59 age group. 59 individuals were screened for hearing loss in this age group and 36 were diagnosed with ONIHL. The maximum incidence of hearing loss in this age group was due the fact that these individuals being the eldest among all in other age groups, they were exposed to loud noise levels for longer periods. But the least incidence was not in the youngest age group (10-19 years) as expected but in the 20-29 years age group and was 0.15. A total of 93 individuals were screened between 20-29 years and only 14 were diagnosed with ONIHL. The reason for this discrepancy was that most of the individuals between 10-19 years were blacksmiths, coppersmiths, and automobile workers, usually employed in childhood; and were exposed to intermittent impact type of noise. Intermittent noise being much more harmful than continuous noise lesser duration of noise exposure.

Solanki et al in their study also observed most of the individuals with noise induced hearing loss having moderate and moderate-severe hearing loss and only few with severe hearing loss.[12] This was a finding similar to that of our study.

Caldart in their study among textile workers found most common symptom to be hipoacusis (30.8%), followeds by difficulty of understanding the words (25.0%) and tinnitus (9.6%).[13] Since the study group was formed after screening of the individuals at risk of developing noise induced hearing loss, many of them were not aware of the status of their hearing. Only 57 % of the individuals with ONIHL were found to be aware of their hearing status, either they had no symptoms at all or they were told by friend, relative about the same, without realising it themselves.

Danish et al in their study found 57% of individuals were not aware of hearing loss.[14]

CONCLUSION

In this observational study screening for ONIHL was done in different local industries from were 158 individuals with hearing loss formed the study group. In case of OPD attending population 58 individuals were diagnosed with ONIHL. The following conclusions were drawn:

The incidence of ONIHL in the community was found to be 0.31. While as that in the hospital attending population was 0.54/1000 in the 2 year study period. The most common age group working in these local industries were individuals in their 3rd decade, hence the most common age group with ONIHL was also the same. Least common age group was 10-19 years, many of which were minors also, mainly working in automobile workshops, as coppersmiths, etc. Since female workers in industries are less common in this part of the world, no female worker was present in our study. Most common local industry with loud noise exposure and hence with most individuals with ONIHL in this state was found to be the Bandsaws. Noise induced hearing loss is directly related to the duration of noise exposure.

In our study ONIHL was most common in individuals exposed to loud noise >20 years. Audiometric notch (3-6 kHz) is not a diagnostic for ONIHL but its presence in individuals with significant history of noise exposure is a positive finding. The characteristic notch in our study was present in only 34% of individuals with ONIHL. Intermittent (impact) noise was found to be more damaging to hearing than continuous noise. Most of the individuals exposed to impact noise had moderate and moderate-severe hearing loss, while as most to continuous noise had only mild and moderate hearing loss. Conductive otologic pathologies found in association with ONIHL were found to have no protective or additive effect ($p>0.05$).

Noise induced hearing loss is one of the few preventable causes of permanent sensorineural hearing loss. Awareness among the high risk population about the potential threat to their hearing and encouraging the use of personnel hearing protective devices can significantly reduce the burden of occupational noise induced hearing loss.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Sheikh I, Ali I, Makhdoomi O, Wani RT. Occupational noise induced hearing loss among local industrial population in Kashmir: a lifestyle study. Int J Otorhinolaryngol Head Neck Surg 2018;4:1023-7.