MERIT RESEARCH JOURNALS
www.meritresearchjournals.org

Merit Research Journal of Medicine and Medical Sciences (ISSN: 2354-323X) Vol. 8(7) pp. 337-341, July, 2020
Available online http://www.meritresearchjournals.org/mms/index.htm

Original Research Article

Prevalence and Factors Associated with Noise Induced Hearing Loss in Young Adults

Salma Farrukh Memon[1], Shakil Ahmed Shaikh[2*], Nimra Masood Baig[3], Iqra Sahibdad[4]

[1]Chairperson Department of Physiology Lumhs Jamshoro Sindh Pakistan

[2]Assistant Professor Department of Physiology Suleman Roshan Medical College Tando Adam

[3]PhD Student, University of Sindh Jamshoro

[4]BS student University of Sindh jamshoro

***Corresponding Author's E-mail: sshakilonly@hotmail.com**

Abstract

Ear is the sense organ of hearing and any damage or defect in hearing can lead to communication disturbances and personal isolation. Noise pollution affects hearing and prolonged exposure to loud noises induces. Noise Induce Hearing Loss (NIHL), which is preventable if precautionary, measures taken. NIHL is irreversible and is mostly symmetrical as in case of occupational exposure but through environmental exposure NIHL may be asymmetrical. The purpose of this study is to assess the prevalence of NIHL in university students due to environmental exposure and leisure time activities. Sample of 204 students participated in study. Structured questionnaire containing social demographic factors and noise exposure were administrated in participants. Weber test and Rinne's test were performed to study NIHL. Crosstab analysis of both test's result and tinnitus with different factors was done. Out of a sample, 204 students 75 participants were suffering from NIHL. Forty-one participants had asymmetrical NIHL while 34 participants had symmetrical NIHL. These results based on Weber and Rinne's test. Our study conclude that NIHL is symmetrical and asymmetrical in case of environmental and leisure time activities.

Keywords: Factors, Noise Induced Hearing Loss, Prevalence, Tinnitus, Tuning Fork

INTRODUCTION

Hearing plays a major role in communication between the people and societal activities. Hearing loss is the third most common pathophysiological condition after diabetes and cancer. However, untreated hearing impairment is associated with depression, cognitive disorder, causing loneliness and linked with decrease job employments (Shaikh et al., 2018).

Noise induced hearing loss (NIHL) is one the major environmental cause of hearing loss that can be prevented in young and middle aged population, and it is the self reported cause among men (Carroll et al., 2017). NIHL considered as the second most common factors which contributes to sensorineural hearing deficit after Presbycusis (hearing loss related to aging) (Nelson et al., 2005) and is irreversible. Hearing loss during the adulthood has been described as serious health concern (Smith et al., 2004).

Environmental and occupational noises are the two major noises to which a person is generally exposed. Road traffic, rail traffic and air traffic are considered to be contributors to the environmental noise while industrial machinery, ventilation system, construction equipments and work place noise along with industrial noise (Siddiqui et al., 2015) considered as factors mainly contribute to occupational noise (Siddiqui et al., 2015). Occupational noise has been the main concern related to NIHL as people are generally exposed to high level noise for long durations at work places. Globally, 16% of disabling hearing difficulties are associated with increased exposure to noise at industrial units and other noisy work places (Nelson et al., 2005). In America out of 28 million (having hearing impairment), 10 million people have hearing loss due to excessive noise in work place or during recreational activities (Rabinowitz, 2000). Many studies suggested that exposure of >90 dB(A) during 8 hours or , 8h>90 dB induces NIHL. NIHL

occurs predominantly at higher frequencies i.e 3000Hz-6000Hz with largest effects observed at 4000Hz (Passchier-Vermeer and Passchier, 2000).

The National Institute for Occupational Safety and Health (NIOSH) recommended Noise Exposure Limit (REL) is 85 dB (A) weighted as an 8 hour time. This recommendation is based on 3 dB exchange rate (increase or decrease in 3db corresponds to doubling or half the noise exposure dosage, respectively) (Daniel, E. 2007; NOISH, 1998), as in logarithmic scale a 3 dB rise in sound pressure level (SPL) represents a doubling of sound intensity. For example, 4 hours of noise exposure at 88 dB(A) is considered to provide the same noise "dose" as 8 hours at 85 dB (A).

Industrial and workplace noise in Pakistan is the greatest emerging concern from sugar industry, from weaving looms of textile industry, steel mills, boilers and steam engines of industrial and airports in the largest cities (Siddiqui et al., 2015). Besides industrial and environmental exposure, many leisure time activities like use of personal listening device, attending concerts, listening to amplified music may play role in inducing NIHL. College students using personal listening devices are reaching at hazardous sound levels. In Pakistan, number of studies carried out on dental colleges related to their environmental risk of inducing NIHL. The objective of this study is estimating the prevalence of NIHL in university students other than dental colleges and exploring the hidden risks or factors inducing NIHL, other than occupational.

METHODOLOGY

Sampling and Study Setting

This study cross sectional study was conducted in young adults of University of Sindh located in Jamshoro during the time of March to May 2019. Young adults aged from 18 to 26 years were included in this study. Participants were randomly selected from different departments. After obtaining the informed consent from the participants, questionnaires were administrated to them. The data that was collected through the interview based questionnaire, comprised of demographic profile, socio economic status, history of illness and education. The participants having any hearing disease or damage, under treatment such as ototoxic drugs, erythromycin, anti-malarial, macrolide antibiotics, congenital disease, suffering from repeated ear infections and discharge were excluded from the data analysis. Total 213 participants recruited in this study and the response rate was 100%. Tuning fork was used for Rinnie's test and Webber test performed on all participants to asses hearing loss. These tests were performed to determine that hearing loss is either conductive or sensorineural.

Ethical Approval

Institutional Review Board of Department of Physiology, University of Sindh, Jamshoro approved the study.

RESULTS

Hearing impairment is the problem of concern particularly in the highly urbanized society, where threshold for noise level is high, number of studies have attributed noise as the major factor for hearing impairment. No extensive study has been carried out in Pakistan regarding noise induced heating loss. In order to find out the prevalence of noise induced hearing loss in students, we randomly selected student living in various areas. The mean age of the students was 21±1.64, the mean age of male students was 21±1.60, and for female was 21±1.74. Table 1 showed that out of 213 students 58.2% (n=124) were in age group of 18-21 years and 41.8% (n=89) were in age group of 22-26 years. While female were 24.4% (n=52) and male were 75.6% (n=161). In addition, the students which were under weight were 23.5% (n=50), Normal were 64.8% (n=138), over weight were 8% (n=17) and obese were 3.8% (n=8). After taking frequencies, participants having any hearing disease or damage are excluded and the sample remained of 204 study participants. Table 2 showed that in age group (18-21) years 59.32% (n=17) were normal while 21.18% (n=25) had ASSNHL while 19.49% (n=23) had SSNHL. In age group (22-26) years 68.60% (n=59) were normal and 8.60% (n=16) had ASSNHL while 12.79% (n=11) had SSNHL. Former age group is showing more prevalence of NIHL. According to gender 56% (n=28) females were normal and 28% (n=14) females had ASSNHL and 16% (n=8) females had SSNHL. In Males 65.58% (n=70) were normal 21.18% (n=25) had ASSNHL while 19.49% (n=23) had SSNHL. Females are showing more prevalence of NIHL in males. In relation to noise exposure in person's on area, in study participants who were exposed to in range of 40s dB 57.32% (n=4) were normal and 28.57% (n=2) had ASSNHL while 14.28% (n=1) had SSNHL. Those participants who were exposed to in range of 50s dB 65.57% (n=40) were normal 13.11% (n=8) had ASSNHL while 21.31% (n=13) had SSNHL. Moreover, who were exposed to in range of 60s dB 62% (n=20) were normal and 25% (n=8) had ASSNHL while 12.5% (n=4) had SSNHL and who were exposed to in range of 70s dB 64.10% (n=50) were normal and 20.51% (n=16) had ASSNHL while 15.38% (n=2) had SSNHL. Moreover, who were exposed to in range of 80s dB 57.69% (n=15) were normal 26.92% (n=7) had ASSNHL while 15.38% (n=4) had SSNHL. Prevalence of NIHL was increasing with noise exposure according to results. In relation with BMI of participants those who were under weighted showed 40.42% (n=19) had NIHL (ASSNHL + SSNHL) and who were normal BMI had 33.32(n=44) had NIHL and who were over weighted 47.01% (n=8) had NIHL and who were obese 50% (n=4) had NIHL. Results showed that prevalence of NIHL is more in all groups than that group having normal BMI. Participants who did smoking 29.62% (n=8) had NIHL and out of those who didn't smoke 37.84% (n=67) had NIHL. Prevalence of NIHL in relation to use of mobile phone in sense of calling was increasing in last two groups of hours. In relation with use of headphones in listening music, occurrence of NIHL was increasing with hours.

Table 3 showed that study participants who cleaned their

Table 1. Baseline characteristics of study participants

Factor	Group	Frequency	Percentage
Age	18-21	124	58.20%
	22-26	89	41.80%
	TOTAL	213	100%
Gender	FEMALE	52	24.40%
	MALE	161	75.60%
	TOTAL	213	100%
BMI	<18.5	50	23.50%
	18.5-25	138	64.80%
	26-27	17	8.00%
	>27	8	3.80%
	TOTAL	213	100%

Table 2. Cross tabulation of Rinne's and Weber tests's results with different factors.

Variable	Normal	ASSNHL	SSNHL	%	Total
Age (18-21)	70(59.32%)	25(21.18%)	23(19.49%)	100%	118
Age (22-26)	59(68.60%)	16(18.60%)	11(12.79%)	100%	86
Gender (Male)	101(65.58%)	27(17.53%)	26(16.88%)	100%	154
(Female)	28(56%)	14(28%)	8(16%)		50
ANE(IN L.A)	4(57.14%)	2(28.57%)	1(14.28%)	100%	7
40s dB	40(65.57%)	8(13.11%)	13(21.31%)		61
50s dB	20(62%)	8(25%)	4(12.5%)		32
60s dB	50(64.10%)	16(20.51%)	12(15.38%)		78
70s dB	15(57.69%)	7(26.92%)	4(15.38%)		26
80s dB					
BMI(<18.5)	28(59.57%)	11(23.40%)	8(17.02%)	100%	47
(18.5-25)	88(66.66%)	27(20.45%)	17(12.87%)		132
26-27	9(52.94%)	3(17.6%)	5(29.41%)		17
>27	4(50%)	0(0%)	4(50%)		8
Smoking	19(70.37)	6(22.22)	2(7.40)	100%	27
YES	110(62.14)	35(19.77)	32(18.07)		177
NO					
Use of Mobile Phone(Isoc)	57(61.95%)	21(22.82%)	14(15.21%)	100%	92
<1 HOUR	62(65.26%)	17(17.89%)	16(16.84%)		95
1-3 HOUR	7(70%)	1(50%)	1(50%)		10
4-6 HOUR	0(0%)	1(20%)	1(20%)		2
7-9 HOUR	3(60%)				5
>9					
Use of Head Phone(Ilm)	55(71.42%)	11(14.28%)	11(14.28%)	100%	77
<1 hour	71(60.16%)	25(21.18%)	22(18.64%)		118
1-3 hour	3(33.33%)	5(55.55%)	1(11.11%)		9
4-6 hour					

ASSNHL (Asymmetrical Sensorineural Hearing Loss), **SSNHL** (Symmetrical Sensorineural Hearing Loss), **ANE** (Average Noise Exposure), **L.A** (Living Area), **ISOC** (In Sense Of Calling), **ILM** (In Listening Music).

Table 3. Cross tabulation of Rinne's and Weber test's results with different factors

	Normal	ASSNHL	SSNHL	%	Total
Clean Ear	48(67.60%)	14(19.71%)	9(12.67%)	100%	71
Daily	68(61.81%)	22(20%)	20(18.18%)		110
Weekly	13(56.52%)	5(21.73%)	5(21.73%)		23
Monthly					
Tinnitus					
Yes	14(56%)	8(32%)	3(12%)	100%	25
No	81(70.43%)	18(15.65%)	16(13.91%)		115

Table 3. Continue

Head Injury				100%	41`
Yes					163
No	23(56.09%)	10(24.39%)	8(19.51%)		
	106(65.03%)	31(19.01%)	26(15.95%)		
Diabetes				100%	55
Yes	32(58.18%)	11(20%)	12(21.81%)		149
No	97(65.10%)	30(20.13%)	22(14.76%)		
Other Disease				100%	36
Yes	20(55.55%)	9(25%)	7(19.44%)		168
No	109(64.88%)	32(19.04%)	27(16.09%)		

ASSNHL (Asymmetrical Sensorineural Hearing Loss), **SSNHL** (Symmetrical Sensorineural Hearing Loss).

Table 4. Cross tabulation of Tinnitus with Average noise exposure

Tinnitus * Average Noise Exposure Cross tabulation						
		Avearge Noise Exposure				**Total**
Count		40s dB	50s dB	60s dB	70s dB	
TINNITUS	NO	6(35.29%)	3(17.64%)	5(29.41%)	3(17.64%)	17
	YES	3(60%)	1(20%)	1(20%)	0	5
Total		9	4	6	3	22

ear daily showed 32.38% (n=23) had NIHL (ASSNHL + SSNHL) and out of those who cleaned weekly 38.18% (n=42) had NIHL and out of those who cleaned monthly 3.46% (n=10) had NIHL, this result showed that prevalence of NIHL is less in those who cleaned their ear daily, in relation with tinnitus out of person's who had tinnitus 44%(n=11) had NIHL, and out of those who don't had 29.56% (n=34) had NIHL, In study participants who had head injury 43.9% (n=18) had NIHL while who don't had any head injury 34.96% (n=57) had NIHL. Prevalence of NIHL is more in those participants who had any head injury. The participants who had history of diabetes mellitus 41.81% (n=23) had NIHL while out of those participants who did not have any history of diabetes mellitus 34.89% (n=52) had NIHL, so prevalence of NIHL was more in those who had any diabetic history. Out of study participants who had any other disease 44.44% (n=16) had NIHL while out of those who did not have any disease 35.13% (n=59) had NIHL. The frequency of NIHL was also more in those who had any other disease.

Table 4 showed that out of students who were exposed to in range of 40s dB 33.33% (n=3) had tinnitus and who were exposed to in range of 50s dB 25% (n=1) had tinnitus while in those who were exposed to in range of 60s dB 16.66% (n=1) had tinnitus and out of those who were exposed to 70s dB no one had tinnitus. Results showed that among study participants who were exposed to 40s dB and 50s dB had more prevalence of NIHL.

DISCUSSION

Noise pollution is increasing day by day due to advancement and industrialization, Noise pollution has several harmful effects on human health and as well on environment and it is modifiable environmental cause of hearing loss. Reduction/ avoidance of exposure to loud noise can prevent or cause slow progression of hearing loss. NIHL mainly caused by occupational noises but also occurs through environmental exposure and through leisure time activities or recreational activities.

In this study, we recruited participants that were exposed to environmental noise and leisure time activities. We took the age range of 18-26 years to exclude the secondary causes of hearing loss. Similarly previous studies (Lin et al., 2011; Sliwinska-Kowalska and Davis, 2012) showing that age after 40 years is involved in hearing loss. Therefore, result of our study suggests that participants suffer from sensory neural hearing loss entirely because of noise exposure and not because of age.

Our results showed that 36.76% of participants showed Sensorineural Hearing Loss in which 20.09% had Asymmetrical Sensory Neural Hearing Loss (ASSNHL) while 16.66% had Symmetrical Sensorineural Hearing Loss (SSNHL). Most of the studies (Rabinowitz, 2000; Khan et al., 2012) demonstrated that NIHL is symmetrical and they conducted their study on participants who were occupationally exposed while other study (Rabinowitz, 2000) suggested that it may be asymmetrical if participant is exposed to noises coming from the sources such as sirens, firearms etc. Hence, our study is in line of later study.

According to our results, 14% of participants having NIHL also had Tinnitus. While previous studies (Passchier-Vermeer and Passchier, 2000; Ayatollahi et al., 2012; Chung et al., 2005) suggested that half the persons having NIHL also had Tinnitus. Many studies also showed relation of smoking with NIHL and in our results, we found 29.66% of participants who were smokers have NIHL while 37.85% of those who did not smoke had NIHL. Our results, suggest that duration of use of

mobile phone whether talking on the phone or listening to music, has a direct
and detrimental relation with NIHL. Our results also show that students who have history of diabetes had more prevalence of NIHL than those who do not have. In addition, those having other diseases showed more prevalence of NIHL.

Results are in concurrence with BMI showing that occurrence of NIHL is increasing in persons who are overweight, obese and under weight.

In summary, our results show that environmental and leisure time's activities may induce NIHL, so one should consider noise pollution as major concern and pay attention towards its adverse effects. Authorities should provide education related to this issue at public level and should take some actions to reduce the traffic noise, as it is the main contributor of environmental noise. Then every person has to consider loud noises as hazardous especially youngsters who usually attend music concerts and listen to loud music and should wear ear protectors. In our society public also uses mobile phone in sense of calling for long hours, so people should try to reduce the usage of mobile phone in sense of calling.

CONCLUSION

Our results are showing symmetrical and asymmetrical NIHL and as student are not exposed to loud noises for long time as in case of workers that are exposed occupationally but still our results showing 36.7% students presenting NIHL. Therefore, it may be concluded environmental, leisure time noise exposures are inducing NIHL in considerable numbers, and precautions must be taken to avoid NIHL. We found that only 14% of students having NIHL also have Tinnitus. We performed Weber and Rinne's test on students but the authentic test for NIHL is audiometry

REFERENCES

Ayatollahi J, Ayatollahi F, Ardekani AM, Bahrololoomi R, Ayatollahi J, Ayatollahi A, et al. (2012). Occupational hazards to dental staff. Dental research journal. 9(1):2-7.

Carroll YI, Eichwald J, Scinicariello F, Hoffman HJ, Deitchman S, Radke MS, et al. (2017).Vital signs: noise-induced hearing loss among adults—United States 2011–2012. MMWR Morbidity and mortality weekly report. 66(5):139.

Chung JH, Des Roches CM, Meunier J, Eavey RD (2005). Evaluation of noise-induced hearing loss in young people using a web-based survey technique. Pediatrics. 115(4):861-7.

Khan N, Khan AR, Khan A, Khan S (2012). Frequency of hearing l frequency of hearing loss in noisy occup s in noisy occup s in noisy occupational settings.

Lin FR, Thorpe R, Gordon-Salant S, Ferrucci L (2011). Hearing loss prevalence and risk factors among older adults in the United States. J. Gerontol. Series A: Biomedical Sciences and Medical Sciences. 66(5):582-90.

Nelson DI, Nelson RY, Concha-Barrientos M, Fingerhut M (2005). The global burden of occupational noise-induced hearing loss. Ame. J. Ind. Med. 48(6):446-58.

Passchier-Vermeer W, Passchier WF (2000). Noise exposure and public health. Environmental health perspectives. 108 (suppl 1):123-31.

Rabinowitz PM (2000). Noise-induced hearing loss. American family physician. 61(9):2759-60.

Shaikh SA, Laghari ZA, Memon SF, Bhatti MA (2018). Association of Cigarette Smoking with Hearing Loss in Young Male Adults of Hyderabad, Pakistan. Journal of Liaquat University of Medical & Health Sciences. 17(04):230-4.

Siddiqui IA, Nizami S, Chandio RR, Nizami S, Sikander N, Ashraf S (2015). Consequences of traffic noise in residents of Karachi, Pakistan. Pak. J. Med. Sci. 31(2):448.

Sliwinska-Kowalska M, Davis A (2012). Noise-induced hearing loss. Noise and Health. 14(61):274.

Smith ME, Kane AS, Popper AN (2004). Noise-induced stress response and hearing loss in goldfish (Carassius auratus). J. Exp. Biol. 207(3):427-35.