

FREQUENCY OF ASYMMETRICAL HEARING LOSS AMONG OLDER POPULATION

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ORIGINAL ARTICLE

ABSTRACT

Background: Asymmetrical hearing loss is hearing loss that is not similar in both ears. One ear has more hearing loss than other, which can be seen in older population aged 50 to 75 years.

Objective: To determine the frequency of asymmetrical hearing loss among the older population.

Methodology: A cross-sectional observational study was conducted to find out the frequency of asymmetrical hearing loss in the older population on a sample of 131 patients, both male and female, using a non-probability convenient sampling technique. This study was conducted in three hospitals (University of Lahore Teaching Hospital, Fatima Memorial Hospital Lahore, and Services Hospital Lahore). The duration of this study was 6 months, from October 2022 to March 2023. Patients with age of 50 to 75 years old population were included. Patients with conductive hearing loss, ear infections, and other co-morbid factors like smoking, cardiac disease, and hepatic disease were excluded. A structured questionnaire and PTA, tympanometry, and otoscopy were used to

accumulate the data. The data was analyzed through the SPSS version 24.0 package.

Results: Out of 131 patients, there were 76 (58.0%) male patients and 55 (42.0%) female patients. Most patients (59, or 45.0%) were in the age group of 61–70 years. There were mostly 88 (67.2%) lower-class patients. In the right ear, the majority of the patients 73 (55.7%) had sensorineural hearing loss, with most patients having moderate to moderately severe degree 50 (38.2%). In the left ear, most patients 88 (67.2%) had sensorineural hearing loss, with the majority having moderate to severe degree 59 (45.0%).

Conclusion: The result of this study concluded that the majority of the patients have moderate to severe sensorineural hearing loss in older male population.

INTRODUCTION

Hearing, also known as auditory perception, is the ability to hear sounds through an organ like the ear and to sense vibrations as regular changes in the pressure of an environment. Auditory science is the study of hearing. Sound may travel through any medium, whether it is solid, liquid, or gaseous. It is one of the traditional five senses.¹

Hearing loss is a common problem that can be triggered by noise, ageing, disease, and hereditary factors. Speaking with family and

close companions can be challenging for people who have hearing loss. Additionally, individuals could struggle to hear doorbells and sirens, comprehend medical advice, and react to warnings.²

The population is getting older, internationally and in the US. The prevalence of hearing loss and related morbidities may rise as a result. Previous epidemiologic investigations have looked at the evolution of hearing loss but have combined all individuals aged 80 or older into one group.³

According to estimates, 14.1% of persons aged 20 to 65 have a mild or severe speech-frequency hearing loss. This prevalence rises dramatically with age, reaching 39.3% of adults aged 60 to 69.⁴ Observational studies show a link between hearing loss and increased rates of incident disability, nursing care utilization, social isolation, symptoms of depression, and cognitive deterioration or dementia.⁴

AHL, also known as asymmetric hearing loss, is characterized by significant discrepancies in the unaided hearing thresholds between the ears. Asymmetrical hearing loss (AHL) sufferers have difficulty understanding speech and have decreased spatial sense of hearing (Firszt et al., 2017; Rothpletz et al., 2012), as well as a lower quality of life (Wie et al., 2010). The restricted or complete inability to utilise binaural signals that assist spatial hearing would likely result in lower performance and a lower quality of life.⁵

Participants 80 years of age and beyond had an average 7 decibels dB imbalance across their healthier and less healthy ear (98% of participants had an asymmetry of up to 23 dB). From 80 years of life to about 100 years of age, this asymmetry remained mostly unaltered. This supports a prior study in a practice providing tertiary audiology services that discovered an increased frequency of asymmetric auditory impairment among individuals 95 years of age and older.⁶

Both medical and audiologic consultations can reveal asymmetric hearing. Before considering audiologic rehabilitation with hearing aids or other techniques, patients with asymmetric hearing are frequently sent to otolaryngologists for evaluation for middle ear and retrocochlear diseases.⁷

Bilateral HAs are preferred for asymmetrical hearing loss because they are the most efficient and natural technique to recover hearing. Despite the advice for bilateral fitting,

patients frequently choose unilateral HA, according to audiologists' clinical experience.⁶ Different factors, including financial, aesthetic, and subjective discomfort connected to the occurrence of binaural interference, have been suggested as the causes of this.⁸

Additionally, there will be a greater need for competent specialists in the fields of hearing impairment diagnoses and therapy. Lack of effective auditory rehabilitation can have a negative impact on both people, who will become more and more socially isolated, as well as society at large. A few nations, like the Russian Federation, have acknowledged that both the avoidance and treatment of illnesses that cause hearing loss must be prioritized in light of the current dynamics.⁹

Very limited data is available regarding the focus on the prevalence of asymmetrical hearing loss among order population patients at national level.

MATERIAL AND METHODS

Study Design: It was a cross-sectional observational study.

Sampling Technique: Non-probability convenient sampling technique.

Settings: Data was collected from University of Lahore Teaching hospital, Fatima Memorial Hospital Lahore and Services Hospital Lahore.

Duration of Study: The Duration of this study was 6 Months from October 2022 to March 2023 after the approval from the Research Committee.

Sample Size: Sample size was 131 patients calculated on the basis of prevalence of hearing loss 55%, by using 95% confidence level and 5% confidence interval, through online sample size calculator.¹⁰

Data collection procedure

After taking the written consent from the patients, their hearing was assessed to check the type and degree of hearing loss.

Asymmetric hearing loss is normally defined as a difference of 15 dB between the right and left ears at three contiguous frequencies. When a person has a hearing loss, the hearing loss is almost never exactly the same in both ears. Their hearing was assessed through structured questionnaire, otoscopy, tympanometry and pure tone audiometry (PTA). Otoscope was used to examine the ears. The outer ear canal and ear drum were examined through otoscopy. Tympanometry was performed to check the middle ear status. The PTA assessed the type and degree of hearing loss. Before beginning the test, the researcher instructed the patients on how to carry out the process. Patients sat on a wooden seat with supra-aural headphones on both ears and a response button in their right hand, as instructed by the researcher. To eliminate guessing from the audiometer, the participant's angle was 90 degrees with the audiometer. The examiner instructed the patient to hit the button anytime he or she heard a sound through the headphones. This procedure was repeated until the precise thresholds were established.

Data analysis procedure

The data collected was first transferred to SPSS spreadsheet. It was then process and statistical analysis was done using SPSS version 24.0 package. Data was analyzed through frequencies and percentages

Sample selection criteria

Inclusion criteria

Patients with the age of 50 to 75 years old population were included.

Exclusion criteria

Patients with conductive hearing loss, ear infections, and other co- morbid factors like smoking, cardiac disease, hepatic disease were excluded.

RESULTS

Table 1 shows that, out of total 131 patients,

mostly patients are in age group 61 to 70 are 59 (45.0%). There are 76 (58.0%) male patients and 55 (42.0%) female patients. There are 88 (67.2%) patients with lower socioeconomic status, 33 (25.2%) patients with middle socioeconomic status, 10 (7.6%) patients with upper socioeconomic status.

Table 2 shows that, most patients have hearing loss in both ears 126 (96.2%), with duration of more than 5 years 76 (58.0%). 31 (23.7%) patients have history of ear infection and 100 (76.3%) have no history of ear infection. (52.7%) patients experiences tinnitus, 81 (61.8%) experiences tinnitus in both ears.

Table 3 shows that, according to the right ear otoscopic findings 13 (9.9%) patients have wax in canal, 116 (88.9%) have clear canal, and 2 (1.5%) have other infections. Otoscopic findings of the left ear shows 11 (8.4%) patients have wax in canal, 118 (90.1%) have clear canal, and 2 (1.5%) have other infection. Tympanometric findings of the right ear shows that, 103 (78.9%) patients have Type A tympanogram, 11 (8.4%) have Type As tympanogram, and 17 (13.0%) have Type B tympanogram. Tympanometric findings of the left ear shows that, 112 (85.5%) patients have Type A tympanogram, 6 (4.6%) have Type As tympanogram, 3 (2.3%) have type Ad tympanogram and 10 (7.6%) have Type B tympanogram. In right ear, 21 (16.0%) patients have conductive hearing loss, 73 (55.7%) have sensorineural hearing loss, and 37 (28.2%) have mixed hearing loss. In left ear 5 (3.8%) patients have conductive hearing loss, 88 (67.2%) have sensorineural hearing loss and 38 (29.0%) have mixed hearing loss. Mostly patients 50 (38.2%) have moderate to moderately severe degree hearing loss in right ear and in left ear most patients 59 (45.0%) have moderately severe to severe degree hearing loss.

Table 1: Demographics analysis of participants

Variables	Sub-Variables	Frequency (Percentage %)
Age	50 - 60 years	49 (37.4%)
	61 - 70 years	59 (45.0%)
	71 - 80 years	23 (17.6%)
Gender	Male	76 (58.0%)
	Female	55 (42.0%)
Socioeconomic Status	Lower class	88 (67.2%)
	Middle class	33 (25.2%)
	Upper class	10 (7.6%)

Table 2: Frequency distribution Patient's assessment and clinical histories

Variables	Sub-Variables	Frequency (Percentage %)
In which ear do you feel hearing problems	Right	3 (2.3%)
	Left	2 (1.5%)
	Both	126 (96.2%)
Duration of hearing loss	1 - 2 years	2 (1.5%)
	3 - 5 years	53 (40.5%)
	More than 5 years	76 (58.0%)
History of ear infection	Yes	31 (23.7%)
	No	100 (76.3%)
History of tinnitus	Yes	69 (52.7%)
	No	62 (47.3%)
In which ear do feel tinnitus?	Right	20 (15.3%)
	Left	30 (22.9%)
	Both ears	81 (61.8%)

Table 3: Findings of Otoscopy, Tympanometry and Pure Tone Audiometry

Variables	Sub-Variables	Frequency (Percentage %)
Otosopic findings in right ear	Wax in canal	13 (9.9%)
	Clear canal	116 (88.9%)
	Other infections	2 (1.5%)
Otosopic findings in left ear	Wax in canal	11 (8.4%)
	Clear canal	118 (90.1%)
	Other infections	2 (1.5%)

Tympanometric findings in right ear	Type A	103 (78.9%)
	Type As	11(8.4%)
	Type B	17 (13.0%)
Tympanometric findings in left ear	Type A	112 (85.5%)
	Type As	6 (4.6%)
	Type Ad	3 (2.3%)
	Type B	10 (7.6%)
Type of hearing loss in right ear	Conductive	21 (16.0%)
	Sensorineural	73 (55.7%)
	Mixed	37 (28.2%)
Type of hearing loss in left ear	Conductive	5 (3.8%)
	Sensorineural	88 (67.2%)
	Mixed	38 (29.0%)
Degree of hearing loss in right ear	Mild to moderate	34 (26.0%)
	Moderate to moderately severe	50 (38.2%)
	Moderately severe to severe	24 (18.3%)
	Severe to profound	23 (17.6%)
Degree of hearing loss in left ear	Mild to moderate	11 (8.4%)
	Moderate to moderately severe	15 (11.5%)
	Moderately severe to severe	59 (45.0%)
	Severe to profound	46 (35.1%)

DISCUSSION

This study's focus is on the "50 to 75 years population," a previously understudied group of people aged 75 and beyond. The majority of earlier research on hearing loss have been mostly on patients over the age of 75. Hearing loss was pervasive in this population. The hearing loss ranged from moderate to severe, and it got worse at higher frequencies. Our findings, which show that individuals experience moderate to severe sensorineural hearing loss, are almost identical to those of other investigations.¹¹

The current study's findings indicate that males have a greater degree of asymmetric

hearing impairment than females. In contrast, a prior study by Cristina F. B. Murphy in 2018 examined the impact of working memory therefore, hearing loss due to ageing on a clinical assessment of older adults' and middle-aged adults' auditory processing. Results revealed that males are more likely than females to experience asymmetric hearing loss.¹² Another study conducted by Sanhueza IA. Klauk FJR will evaluate the quality of life and changes in hearing impairment in persons with asymmetric hearing loss in 2019. Similar to the current study, the findings indicated that men have asymmetric hearing loss more frequently than women do.¹³

The current study's findings indicate that patients with asymmetrical hearing loss experience higher sensorineural hearing loss in both ears. In contrast, Jeong-Hoon Oh, MD, did a research in 2007 to compare the clinical features and therapeutic outcomes of unilateral versus bilateral sudden sensorineural hearing loss (SSNHL). The findings indicated that patients with asymmetry and advanced age are more likely to develop Bi-SSNHL. Compared to patients with uni-SSNHL (56.5%), ten patients (62.5%) in the bi-SSNHL group demonstrated hearing recovery in one or both ears.—14 Another study conducted to compare sudden bilateral SHL with sudden unilateral SHL in a 2014 study by SA Sara. Results revealed that 52% of patients had unilateral SHL and 67% had bilateral SHL. Bilateral SHL was typically asymmetric. Both ears responded in patients with bilateral SHL who were making progress. Patients with bilateral SHL had a greater incidence of vascular disease and were older when their hearing loss first appeared.¹⁵

According to the findings of the current study, people with asymmetrical hearing loss experience hearing issues in both ears. SV Fernandes' 2010 study, in contrast, sought to control the medicolegal importance of asymmetrical hearing loss in the context of exposure to industrial noise. The patients (20%) and (22.6%) had binaural hearing threshold differences of at least 15 dB for at least one frequency, according to the results.¹⁶ Another study was carried out in 2016 by X Wang and N Li to assess audiometric asymmetry in Chinese industrial employees and to investigate the impact of sex, noise exposure, and binaural average thresholds. The findings revealed that 49.2% of the patients exhibited binaural hearing threshold differences for at least one frequency of at

least 15 dB.¹⁷

According to the current study's findings, the left ear of the patients had mild to severe SNHL. In contrast, a 2003 study by DS Dalton used standardized audiometric testing methods and measures of the excellence of life in terms of health examine the effects of range loss in a sizable cohort of older persons. The findings revealed that (42%) of the 69-year-old male participants had some degree of hearing loss in both ears. Of those, (28.8%) had moderate to severe SNHL in their left ear and (23.2%) had mild SNHL in their right ear.¹⁸ Another study conducted in 2011 by Frank R. to evaluate the frequency of hearing loss and risk factors among elderly Americans living in the US. According to the research, 63.1% of asymmetrical people experienced hearing loss in one or both ears. Patients with mild SNHL in the right ear (23%) and moderate to severe SNHL in the left ear (40%) were both impacted.¹⁹

CONCLUSION

The result of this study concluded that majority of the patient have moderate to severe sensorineural hearing loss in male older population.

RECOMMENDATIONS

More research is needed to access the asymmetrical hearing loss in population with age more than 75 years old. A follow up study should be under taken to evaluate the asymmetrical hearing loss in older population.

AUTHORS CONTRIBUTION

MA: Main Idea conception,
SAB: Data Collection,
MS: Data Collection,
TT: Review and corrections,
AK: Data Interpretation

REFERENCES

1. Johnson JC, Marshall CR, Weil RS, Bamiou D-E, Hardy CJ, Warren JD. Hearing and dementia: from ears to brain. *Brain*. 2021;144(2):391-401
2. Kuo P-L, Di J, Ferrucci L, Lin FR. Analysis of hearing loss and physical activity among US adults aged 60-69 years. *JAMA network open*. 2021;4(4):e215484-e
3. Goman AM, Lin FR. Prevalence of hearing loss by severity in the United States. *Am J Public Health*. 2016;106(10):1820-2
4. Feltner C, Wallace IF, Kistler CE, Coker-Schwimmer M, Jonas DE. Screening for hearing loss in older adults: updated evidence report and systematic review for the US Preventive Services Task Force. *JAMA*. 2021;325(12):1202-15
5. Dillon MT, Buss E, Rooth MA, King ER, McCarthy SA, Bucker AL, et al. Cochlear implantation in cases of asymmetric hearing loss: subjective benefit, word recognition, and spatial hearing. *Trends in hearing*. 2020;24:2331216520945524
6. Sharma RK, Lalwani AK, Golub JS. Modeling Hearing Loss Progression and Asymmetry in the Older Old: A National Population Based Study. *The Laryngoscope*. 2021;131(4):879-84
7. Suen JJ, Betz J, Reed NS, Deal JA, Lin FR, Goman AM. Prevalence of asymmetric hearing among adults in the United States. *Otology & neurotology: official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*. 2021;42(2):e111
8. Frosolini A, Cinquemani P, de Filippis C, Lovato A. Age at Fitting Affected Unilateral Versus Bilateral Hearing Aids Choice in Asymmetric Hearing Loss. *The Journal of International Advanced Otolaryngology*. 2023;19(2):116
9. Golovanova L, Boboshko MY, Kvasov E, Lapteva E. Hearing loss in adults in older age groups. *Advances in Gerontology*. 2019;9(4):459-65
10. sample size calculator 2022 [updated 01.09.2022; cited 2022 1 September]. Available from: https://journals.lww.com/otology-neurotology/Fulltext/2008/06000/Asymmetric_Hearing_Loss__Definition,_Validation,.00003.as.
11. Leskowitz MJ, Caruana FF, Siedlecki B, Qian ZJ, Spitzer JB, Lalwani AK. Asymmetric hearing loss is common and benign in patients aged 95 years and older. *The Laryngoscope*. 2016;126(7):1630-2
12. Murphy CF, Rabelo CM, Silagi ML, Mansur LL, Bamiou DE, Schochat E. Auditory processing performance of the middle-aged and elderly: auditory or cognitive decline? *J Am Acad Audiol*. 2018;29(01):005-14
13. Sanhueza I, Manrique-Huarte R, Calavia D, Huarte A, Manrique M. Hearing impairment and quality of life in adults with asymmetric hearing loss: benefits of bimodal stimulation. *The journal of international advanced otology*. 2019;15(1):62

14. Oh J-H, Park K, Lee SJ, Shin YR, Choung Y-H. Bilateral versus unilateral sudden sensorineural hearing loss. *Otolaryngology–Head and Neck Surgery*. 2007;136(1):87-91
15. Sara S, Teh B, Friedland P. Bilateral sudden sensorineural hearing loss. *The Journal of Laryngology & Otology*. 2014;128(S1): S8S15
16. Fernandes S, Fernandes C. Medicolegal significance of asymmetrical hearing loss in cases of industrial noise exposure. *The Journal of Laryngology & Otology*. 2010;124(10):1051-5
17. Wang X, Li N, Zeng L, Tao L, Zhang H, Yang Q, et al. Asymmetric hearing loss in Chinese workers exposed to complex noise. *Ear Hear*. 2016;37(2):189
18. Dalton DS, Cruickshanks KJ, Klein BE, Klein R, Wiley TL, Nondahl DM. The impact of hearing loss on quality of life in older adults. *The gerontologist*. 2003;43(5):661-8
19. Lin FR, Thorpe R, Gordon-Salant S, Ferrucci L. Hearing loss prevalence and risk factors among older adults in the United States. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences*. 2011;66(5):582-90