



Depression among adult patients with hearing impairment: a cross-sectional study from Kohat, Pakistan

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ABSTRACT

Objective: To determine the frequency of depression among adults with hearing impairment attending the Divisional Headquarters Teaching Hospital (DHQTH) Kohat, Pakistan.

Methods: This descriptive cross-sectional study was conducted at DHQTH, Khyber Medical University Institute of Medical Sciences, Kohat, from January to July 2023. A total of 264 patients aged 18-60 years with hearing impairment of at least six-months' duration were enrolled through non-probability consecutive sampling. Patients with previous ear surgery, hearing aid use, psychiatric illness, substance abuse, or chronic neurological or medical disorders were excluded. Hearing impairment was confirmed by pure-tone audiometry. Depression was assessed using Patient Health Questionnaire-9 (PHQ-9). Data were analyzed using R version 4.3.1. Associations between depression and demographic variables were examined using Chi-square or Fisher's exact test.

Results: Mean age of the participants was 39.11 ± 16.00 years, and mean PHQ-9 score was 8.21 ± 5.84 . Of the 264 participants, 145 (54.92%) were male and 119 (45.08%) were female. Depression (PHQ-9 score ≥ 5) was identified in 185 (70.08%) participants, including 90 (34.09%) with mild, 67 (25.38%) with moderate, 15 (5.68%) with moderately severe and 13 (4.92%) with severe depression. Depression was significantly common among males than females (63.95% vs. 36.05%; $p=0.001$). A significant association was also observed between age group and depression ($p<0.001$), with the highest proportion occurring among participants aged 21-30 years.

Conclusion: Depression was highly prevalent among adults with hearing impairment, particularly among males and younger individuals. Routine depression screening should be integrated into ENT services to enable early diagnosis, timely intervention, and improved patient outcomes.

Keywords: Depression (MeSH); Mental Health (MeSH); Hearing Loss (MeSH); Patient Health Questionnaire PHQ-9 (MeSH); Otolaryngology (MeSH); Adult (MeSH); Hearing Tests (MeSH); Audiometry (MeSH).

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countries, where access to diagnostic and treatment services, hearing rehabilitation, and alternative communication methods may be limited.^{7,8} The prevalence of hearing loss increases with advancing age. Globally, more than 25-30% of adults aged 60 years and older are estimated to have hearing impairment, with the proportion rising substantially among the very old.⁹ Studies from Pakistan have reported variable prevalence estimates. A study conducted in Karachi found hearing loss in 22.5% of participants using the whisper test, 16.9% using the Rinne test, and 17.4% using the Weber test.¹⁰ Similarly, a study from Lahore among public transport drivers reported noise-induced hearing loss in 65% of participants, normal hearing thresholds in 25%, and disabling hearing loss in 10%.¹¹ Despite advances in management, including ear surgery, hearing aids, and cochlear implants, hearing loss remains an important and persistent public health concern.¹²

INTRODUCTION

Hearing impairment can affect individuals of all ages and is commonly encountered in clinical practice.¹ Even mild hearing loss may interfere with effective communication, resulting in difficulties in exchanging information at work, at home, and during social interactions.^{2,3} The World Health Organization recognizes hearing impairment as one of the major contributors to the global burden of disease.⁴ In recent years, hearing loss

has increasingly been observed among younger individuals, largely because of excessive noise exposure, in addition to established risk factors such as genetic predisposition, certain diseases, and exposure to ototoxic substances.⁵

Hearing impairment is associated with several adverse consequences, including reduced quality of life, communication difficulties, limitations in daily activities, cognitive dysfunction, and an increased risk of dementia.⁶ It poses particular challenges in developing

Depression is a common mental disorder characterized by persistent sadness, loss of interest or pleasure, feelings of guilt or low self-esteem, disturbed sleep and appetite, fatigue, and impaired concentration.¹³ Individuals with hearing impairment may be particularly vulnerable to depression because communication difficulties, social isolation, and reduced participation in daily activities can adversely affect psychological well-being. Studies have reported a higher prevalence of depression among people

with hearing loss; for example, a study conducted among adults aged over 65 years in France found depression in 22% of individuals with hearing impairment.¹⁴

Although hearing impairment is increasingly recognized as an important public health problem, its psychological consequences, particularly depression, remain insufficiently explored in Pakistan. Available local evidence has largely focused on the prevalence, causes, and clinical management of hearing loss, while data on associated mental health problems are scarce. This evidence gap is particularly relevant in Khyber Pakhtunkhwa, where limited access to hearing rehabilitation services, mental health care and alternative communication support may further increase the psychosocial burden among affected individuals.

Without local data on the frequency of depression among patients with hearing impairment, clinicians may overlook an important and potentially treatable comorbidity during routine otorhinolaryngology care. Determining the frequency of depression in this population is therefore necessary to generate context-specific evidence that can support routine mental health screening, early identification, timely referral, and integrated management of patients with hearing impairment. Accordingly, this study was planned to determine the frequency of depression among patients with hearing impairment attending the Department of Ear, Nose, Throat (ENT) and Head and Neck Surgery, Khyber Medical University Institute of Medical Sciences, Kohat, Pakistan

METHODS

This descriptive cross-sectional study was conducted at the Department of ENT and Head and Neck Surgery, Khyber Medical University Institute of Medical Sciences (KMU-IMS), and District Headquarters Hospital, Kohat, from January to July 2023. Participants were recruited using a non-probability consecutive sampling technique.

The sample size was calculated as 264 patients using a presumed prevalence of hearing impairment of 22%, a 95%

confidence level, a 5% margin of error and 80% statistical power, using WHO sample-size calculation software.

Ethical approval was obtained from the Ethical Review Committee of Khyber Medical University Institute of Medical Sciences, Kohat (Reference No. KIMS-REC/ECC/23/06-R; dated: January 30, 2023).

Patients of either gender, aged 18-60 years, with hearing impairment persisting for at least six months were eligible for inclusion. Patients with a history of ear surgery, current use of hearing aids, comorbid psychiatric illness, substance abuse, or chronic neurological or medical disorders were excluded to minimize potential confounding factors affecting the assessment of hearing loss and depression.

All eligible patients with hearing impairment who attended the outpatient department or were admitted to the ENT and Head and Neck Surgery Unit at KMU-IMS, Kohat, were enrolled after obtaining informed consent. The purpose, procedures, potential benefits, and voluntary nature of participation were explained to all participants.

After enrollment, detailed demographic and clinical information was obtained. A comprehensive history was taken regarding the onset, duration, progression, and severity of hearing loss, as well as any history of ear discharge, trauma, radiation exposure, hearing aid use, or previous ear surgery. All participants underwent a thorough ENT and systemic examination. Clinical hearing assessment, including tuning fork tests, was performed, and the mucosal lining of the upper aerodigestive tract was examined. Pure-tone audiometry was conducted for all participants. Computed tomography (CT) and/or magnetic resonance imaging (MRI) were advised when clinically indicated. All clinical examinations and investigations were performed under the supervision of a senior otolaryngologist with more than ten years of post-fellowship experience.

Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9) a validated and widely used screening

tool that has been applied in Pakistani populations.^{14,15} The PHQ-9 assesses the frequency of depressive symptoms experienced during the preceding two weeks. Each of its nine items is scored from 0 to 3, yielding a total score ranging from 0 to 27. Depression severity was categorized as mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27). A PHQ-9 score of less than 5 was considered to indicate no clinically significant depressive symptoms.

Hearing impairment was defined as partial or complete loss of hearing within speech frequencies, confirmed by pure-tone audiometry. Pure-tone audiometry was used to determine the presence, degree, and type of hearing loss. Relevant demographic and clinical information was recorded on a predesigned proforma. Strict eligibility criteria were applied to minimize potential confounding and selection bias.

The questionnaire was distributed, and data was collected from the selected patients as per inclusion criteria. Strict exclusion and inclusion criteria were followed to control confounders and biases in the study and all relevant information was documented on a predesigned proforma.

Data were analyzed using R software version 4.3.1. Continuous variables, including age, were summarized as mean $\pm$ standard deviation. Categorical variables, including sex, presence of depression, and severity of depression, were presented as frequencies and percentages. Depression was stratified by age group and gender to assess potential effect modification. The chi-square test was used for post-stratification comparisons; Fisher's exact test was applied when the assumptions of the chi-square test were not met. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The mean age of the patients was 39.11 ± 16.00 years. The mean total PHQ score was 8.21 with a standard deviation of 5.84. The range of total PHQ scores was from 0 to 26. The interquartile range for the total PHQ

score was from 4 to 12.

The study population consisted of 264 participants, with 119 (45.08%) females and 145 (54.92%) males. Most of the participants (35.98%) were in the age group of 21-30 years, while the least represented age group was 31-40 years (5.30%). Regarding marital status, 185 (70.08%) participants were married

and 79 (29.92%) were unmarried (Table I).

Among the 264 participants, 90 (34.09%) had mild depression, 67 (25.38%) had moderate depression, 15 (5.68%) had moderately severe depression, and 13 (4.92%) had severe depression, while 79 (29.92%) exhibited no depressive symptoms.

Table I: Frequency of gender, age group and marital status

Variable	Characteristic	Frequency (Percentage)
Gender	Female	119 (45.08)
	Male	145 (54.92)
Age group (years)	10-20	24 (9.09)
	21-30	95 (35.98)
	31-40	14 (5.30)
	41-50	55 (20.83)
	51-60	45 (17.05)
	61-70	31 (11.74)
Marital status	Unmarried	79 (29.92)
	Married	185 (70.08)

Table II: Association between depression status and gender and age group

Variable	Characteristic	No depression (n = 117)	Depression (n = 147)	p-value
Gender	Female	66 (56.41)	53 (36.05)	0.001*
	Male	51 (43.59)	94 (63.95)	
Age (years)	10-20	11 (9.40)	13 (8.84)	<0.001**
	21-30	14 (11.97)	81 (55.10)	
	31-40	14 (11.97)	0 (0.00)	
	41-50	42 (35.90)	13 (8.84)	
	51-60	32 (27.35)	13 (8.84)	
	61-70	4 (3.42)	27 (18.37)	

Note: * Chi-square test; ** Fisher exact test.

Table II presents the distribution of two variables, gender and age group, among two groups based on their depression status: those without depression (n=117) and those with depression (n=147). The p-values indicate the statistical significance of the differences between the two groups for each variable. For gender, the results show that a significantly higher proportion of males reported depression (63.95%) compared to females (36.05%), with a p-value of 0.001. For age group, the results indicate a significant association between age group and depression status, with a p-value of <0.001. Specifically, individuals in the age group of 21-30 had the highest proportion of depression (55.10%), followed by those in the age group of 61-70 (18.37%), while those in the age group of 31-40 did not report any depression in this sample.

Table III presents the distribution of depression types among a sample population by gender and age group. For gender, the results show that a significantly higher proportion of males reported moderate (77.61%) and severe (100.00%) depression, while a significantly higher proportion of females reported mild (43.33%) and moderately severe (80.00%) depression. The overall association between gender and depression type was statistically significant (p<0.001). For age group, the results indicate a significant association between age group and depression type (p<0.001). Specifically, individuals in the age group

Table III: Association between depression types and gender and age group

Variable	Characteristic	Depression type					p-value
		Mild (n=90)	Moderate (n=67)	Moderately severe (n=15)	Not applicable (n=79)	Severe (n=13)	
Gender	Female	39 (43.33)	15 (22.39)	12 (80.00)	40 (50.63)	13 (100)	<0.001
	Male	51 (56.67)	52 (77.61)	3 (20.00)	39 (49.37)	0 (0.00)	
Age group (years)	10-20	12 (13.33)	0 (0.00)	0 (0.00)	12 (15.19)	0 (0.00)	<0.001
	21-30	39 (43.33)	27 (40.30)	15 (100.00)	14 (17.72)	0 (0.00)	
	31-40	0 (0.00)	0 (0.00)	0 (0.00)	14 (17.72)	0 (0.00)	
	41-50	14 (15.56)	1 (1.49)	0 (0.00)	27 (34.18)	13 (100)	
	51-60	12 (13.33)	21 (31.34)	0 (0.00)	12 (15.19)	0 (0.00)	
	61-70	13 (14.44)	18 (26.87)	0 (0.00)	0 (0.00)	0 (0.00)	

Note: * Fisher exact test

of 21-30 had the highest proportion of moderate (40.30%) and moderately severe (100.00%) depression, while those in the age group of 41-50 had the highest proportion of severe depression (100.00%). Individuals in the age group of 31-40 did not report any depression.

DISCUSSION

The present study demonstrated a high frequency of depression among patients with hearing impairment attending a tertiary care ENT clinic. More than half of the participants experienced depression, with mild and moderate depression being the predominant categories. The mean age of the study population was 39.11 ± 16.0 years, and the mean PHQ-9 score was 8.21 ± 5.84 , indicating an overall mild level of depressive symptoms. Depression was significantly more common among males than females and was most prevalent among younger adults, particularly those aged 21-30 years. These findings highlight the considerable psychological burden associated with hearing impairment and underscore the importance of routine screening for depression as an integral component of comprehensive hearing care.

Hearing loss has been consistently associated with depression and cognitive decline, particularly among older adults. Two main hypotheses have been proposed to explain this relationship. The common cause hypothesis suggests that hearing loss and cognitive decline share underlying age-related neurodegenerative processes, whereas the cascade hypothesis proposes that chronic auditory deprivation contributes to cognitive impairment directly or indirectly through social isolation, reduced communication and depression. Additionally, the increased cognitive effort required to compensate for hearing impairment may further contribute to cognitive decline.^{16,17}

The present study demonstrated significant associations between both gender and age with the severity of depression among patients with hearing impairment. Males were more likely to experience moderate and severe depression, whereas females more

frequently reported mild and moderately severe depression. Depression was most common among younger adults, particularly those aged 21-30 years, while severe depression was relatively more frequent in the 41-50-year age group. These findings suggest that demographic factors may influence the pattern and severity of depression in individuals with hearing impairment and should be considered during psychological assessment and management. However, as this was a single-center study, the findings should be interpreted with caution and require confirmation in larger, multicenter studies.

Previous studies have consistently demonstrated an association between hearing loss and depression; however, evidence regarding long-term psychological adjustment remains limited.¹⁸⁻²⁰ While some studies have reported increasing depressive symptoms with advancing age, others suggest that these symptoms may diminish over time as individuals adapt to hearing impairment.¹⁸⁻²⁰ Bilateral hearing loss has been associated with greater depressive symptoms, possibly due to increased dependence on caregivers, social isolation, loneliness, and reduced quality of life.²¹ Although women, particularly those younger than 70 years, have been reported to experience more depressive symptoms than men,²¹ our study found a higher frequency of depression among males. This discrepancy may reflect differences in study populations, sociocultural factors, or healthcare-seeking behaviors. Previous longitudinal research has also suggested that older adults may gradually adapt to hearing impairment through modified communication strategies, thereby reducing the psychological impact over time.²² However, the influence of depression treatment and other confounding factors has not been adequately explored, leaving the long-term trajectory of depression in individuals with hearing impairment uncertain. Further longitudinal studies are needed to clarify the natural course of depression and identify factors that facilitate psychological adaptation in this population.

Depression in the present study was assessed using the PHQ-9, a validated and widely used instrument for screening and grading the severity of depressive symptoms in both clinical practice and research. Variations in the reported prevalence of depression across studies may partly reflect differences in the assessment instruments employed. Previous studies have shown that estimates of depression vary according to the screening tool used, which may contribute to inconsistencies in the published literature.^{19,23}

Limitations of the study

This study has several limitations. The duration and severity of hearing loss, detailed audiological findings, and participants' socioeconomic and occupational characteristics were not assessed, which may have influenced the observed associations. In addition, the cross-sectional design precludes establishing a causal relationship between hearing impairment and depression. Furthermore, this was a single-center study with a relatively modest sample size, which may limit the generalizability of the findings.

CONCLUSION

Depression was highly prevalent among individuals with hearing impairment, with more than half of the participants experiencing depressive symptoms, predominantly of mild to moderate severity. Depression was significantly associated with both gender and age, being more common among males and younger adults, particularly those aged 21-30 years. These findings underscore the importance of integrating routine mental health screening into the comprehensive care of patients with hearing impairment to facilitate early identification and timely intervention. Further multicenter longitudinal studies incorporating detailed audiological, socioeconomic, and clinical variables are needed to validate these findings, clarify the temporal relationship between hearing impairment and depression, and identify modifiable risk factors.

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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

MSaK & AF: Conception and study design, acquisition, analysis and interpretation of data, drafting the manuscript, approval of the final version to be published

MAI, WS, SM & MSiK: Acquisition, analysis and interpretation of data, drafting the manuscript, approval of the final version to be published

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

Authors declared no conflict of interest, whether financial or otherwise, that could influence the integrity, objectivity, or validity of their research work.

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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.



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