Research Article

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Assessment of depressive symptoms and cognitive functions in older adults with hearing loss: a cross-sectional study

Abstract

Objective: To investigate the association between depressive symptoms and cognitive performance in older adults with hearing loss, evaluated at a hearing health reference center, with the aim of identifying patterns and mechanisms that may guide multiprofessional interventions.

Methods: This was a cross-sectional, observational, and quantitative study conducted with 47 older adults (≥60 years) with hearing loss confirmed by audiometry. Sociodemographic and clinical data were collected, along with the application of the 15-item Geriatric Depression Scale (GDS-15) and the Mini-Mental State Examination (MMSE). Statistical analyses included Pearson's and Spearman's correlation tests, chi-square, Student's t-test, Kruskal-Wallis, and multiple linear regression. A significance level of 5% was adopted.

Results: The sample was predominantly composed of women (51.1%), with a mean age of 74.1 years and mean schooling of 5.85 years. Most participants used hearing aids and had bilateral hearing loss. A significant negative correlation was found between GDS-15 and MMSE scores (Pearson $r = -0.315$; $p = 0.031$), indicating that higher levels of depressive symptoms were associated with poorer cognitive performance. Schooling significantly influenced MMSE scores ($p = 0.048$), while hearing aid use and duration of hearing loss showed no significant association. The regression model explained 33.9% of the variance in cognitive performance.

Conclusion: The findings highlight an inverse relationship between depressive symptoms and cognition in older adults with hearing loss, underscoring the importance of integrated strategies addressing auditory, mental, and cognitive health in aging.

Keywords: hearing loss, cognition, depression, older adults, mental health

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Introduction

Population aging has imposed significant challenges on healthcare systems, especially regarding the maintenance of autonomy and functionality in older adults. The coexistence of multiple morbidities not only compromises quality of life but also increases the demand for complex and integrated care.

Among prevalent conditions in this age group, age-related hearing loss stands out as a sensory impairment that can significantly affect communication, social interaction, and mental health. It is estimated that more than 42% of people with some degree of hearing loss are over 60 years old, and this prevalence grows exponentially with advancing age.

The literature has pointed to a relationship between hearing loss, depressive symptoms, and cognitive decline in older adults. Communication difficulties resulting from hearing impairment may lead to social isolation, frustration, and feelings of uselessness, constituting risk factors for the development of depressive disorders. Depression, in turn, is one of the most frequent comorbidities in old age, associated with negative outcomes such as functional decline, cognitive loss, and higher mortality.

Studies also indicate that hearing changes may precede cognitive impairment, suggesting the existence of a common neurobiological mechanism or the role of sensory loss as a factor of chronic cognitive overload.

Despite these evidences, few studies have explored these clinical dimensions in an integrated manner among Brazilian older adults assisted in specialized hearing health services. Understanding the association between depressive symptoms and cognitive performance in older adults with hearing loss is essential to support more effective multiprofessional evaluation and intervention strategies.

Therefore, the present study aimed to investigate the association between depressive symptoms and cognitive functions in older adults with hearing loss.

Methods

Design, study setting, and sample

This was a cross-sectional, observational, descriptive study with a quantitative approach. The project was approved by the Research Ethics Committee of the University of São Paulo (CAAE: 79061424.0.0000.5441; opinion no. 6.981.377), in accordance with Resolution 466/2012 of the Brazilian National Health Council.

The sample comprised 47 older adults with an audiometric diagnosis of hearing loss, of both sexes, assisted at the Division of Hearing Health of the Clinical Hospital, School of Medicine of Bauru, University of São Paulo, in Bauru-SP. Participants were recruited by convenience sampling and invited after outpatient consultation. The researcher explained the study and invited them to participate by signing the Informed Consent Form. After written consent, participants were evaluated in a private room.

Data were collected between August and October 2024.

Inclusion criteria: age 60 years or older, confirmed hearing loss, absence of severe neurological/psychiatric disorders, and no speech alterations preventing test administration. Exclusion criteria: individuals with cognitive deficits reported by themselves or relatives/caregivers.

Variables and instruments

Sociodemographic data (sex, age, schooling, marital status), clinical data (duration of hearing loss, laterality, use of hearing aids), and self-reported comorbidities were collected. Two standardized and validated instruments were used:

Geriatric depression scale (GDS-15): composed of 15 items, with scores ranging from 0 to 15. Classifications: 0–5 (normal), 6–10 (mild/moderate depression), 11–15 (severe depression).

Mini-mental state examination (MMSE): assesses multiple cognitive functions. Cut-off points are adjusted for schooling: illiterate (≥20), 1–4 years (≥25), 5–8 years (≥26.5), 9–11 years (≥28), >11 years (≥29).

Statistical analysis

Sample size was calculated considering an estimated Pearson correlation coefficient of 0.4, with a statistical power of 86%. Data analysis was performed using SPSS® version 20.0. Descriptive statistics (frequency, mean, standard deviation), chi-square test for categorical variables, Student's t-test for mean comparisons, Pearson's and Spearman's correlations, and the Kruskal-Wallis test for nonparametric variables were used. Multiple linear regression was also applied to estimate the impact of clinical and demographic factors on cognitive performance (MMSE). A significance level of 5% ($p < 0.05$) was adopted.

Results

A total of 47 older adults with hearing loss were evaluated, of whom 24 (51.1%) were female. The mean age was 74.13 years (SD = 8.87) and mean schooling was 5.85 years (SD = 4.61). Most participants were married (57.4%), used hearing aids (76.6%), and had bilateral hearing loss (80.9%). The mean duration of hearing loss was 12.21 years (SD = 12.13).

Regarding the instruments applied, the mean GDS-15 score was 3.85 (SD = 2.86), and the mean MMSE score was 22.45 (SD = 4.40), considering the respective cut-off points adjusted for schooling.

Correlation analyses indicated a significant negative association between GDS-15 and MMSE scores:
Pearson correlation: $r = -0.315$; $p = 0.031$
Spearman correlation: $r = -0.309$; $p = 0.034$
These findings suggest that higher levels of depressive symptoms are associated with lower cognitive performance.

In the comparison between groups with and without hearing aid use, the mean MMSE score was:
Users: 22.03 ± 4.75
Non-users: 23.82 ± 2.71
However, the difference was not statistically significant (Student's t-test, $p = 0.126$).

No significant correlations were found between duration of hearing loss and MMSE score ($r = -0.043$; $p = 0.765$), or between duration of hearing loss and GDS-15 ($r = 0.064$; $p = 0.663$).

Schooling, grouped into ranges, showed a significant influence on MMSE scores (Kruskal-Wallis test, $H = 7.899$; $p = 0.048$).

The association between GDS-15 classification (normal, mild/moderate, severe) and MMSE classification showed a trend toward statistical significance (chi-square, $\chi^2 = 10.428$; $p = 0.064$).

Finally, multiple linear regression, considering MMSE score as the dependent variable, showed that age, schooling, sex, duration of hearing loss, and GDS-15 score explained 33.9% of the variance in cognitive performance ($R^2 = 0.339$) (Table 1).

Table 1 Sample characteristics, Bauru - São Paulo, 2024

Variable	Mean ± SD / n (%)
Age (years)	74.13 ± 8.87
Female sex	24 (51.1%)
Schooling (years)	5.85 ± 4.61
Married	27 (57.4%)
Use of hearing aid	36 (76.6%)
Bilateral hearing loss	38 (80.9%)
Duration of hearing loss (years)	12.21 ± 12.13

Discussion

The results of this study demonstrated a statistically significant negative association between depressive symptoms and cognitive performance in older adults with hearing loss. These findings reinforce the growing body of evidence pointing to an interrelationship between sensory deficits, mental health, and cognition in aging. The presence of depressive symptoms, even at subclinical levels, may negatively impact cognitive functions such as attention, memory, and processing speed, compromising functionality and quality of life in older adults.

The correlation identified between higher GDS-15 scores and poorer MMSE performance suggests that emotional health should be considered a central dimension in the comprehensive assessment of older adults with hearing loss. Depression may represent both a risk factor and a secondary symptom of functional, auditory, and cognitive decline, reinforcing the bidirectional nature of these associations.

Schooling proved to be significantly associated with cognitive performance, as widely described in the literature. The concept of cognitive reserve helps explain why individuals with higher educational levels tend to experience less clinical impact in the face of structural or functional brain changes associated with aging. This finding highlights the importance of preventive strategies throughout life, including literacy, social participation, and intellectual engagement from early stages of life.

Despite the high prevalence of hearing aid use among participants, this variable was not significantly associated with cognitive performance. This absence of association may reflect methodological limitations, such as the lack of control over effective duration of use, perceived benefit, or the presence of continuous rehabilitative support. Nonetheless, the literature suggests that early and systematic use of hearing devices may mitigate the risk of social isolation and its impacts on cognition.

Multiple linear regression revealed that a set of sociodemographic and clinical variables explained a significant proportion of the variance observed in MMSE scores ($R^2 = 0.339$), with emphasis on depressive symptoms and schooling. These results highlight the multifactorial nature of cognitive aging and the importance of comprehensive and interdisciplinary assessment approaches.

By focusing on a population of older adults treated at a hearing health reference center, this study provides relevant data for geriatric clinical practice. The findings support the routine incorporation of screening tools for depressive symptoms and cognitive assessment in hearing rehabilitation services, expanding the possibilities of early and integrated intervention.[1–26]

Conclusion

The results of this study demonstrated that depressive symptoms are significantly associated with poorer cognitive performance in older adults with hearing loss, reinforcing the importance of an integrated approach to mental and cognitive health in this group. Schooling also emerged as a relevant factor, evidencing the role of cognitive reserve in aging.

These findings underscore the need for systematic screening of depressive symptoms and cognitive functions in services assisting older adults with hearing impairment, contributing to the development of more comprehensive and effective care strategies.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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