

# Audiological screening in hearing health care for hospitalized elderly people

A triagem audiológica nos cuidados da saúde  
auditiva em idosos hospitalizados

Cribado audiológico en la atención de la salud  
auditiva en personas mayores hospitalizadas

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## Abstract

**Introduction:** Presbycusis, a hearing loss caused by aging, negatively affects the quality of life of the elderly. Hearing screening can identify hearing loss in this population, particularly in those with limited access to specialized services. **Objective:** To analyze the results of opportunistic hearing screening using the Hearing *Handicap* Inventory for the Elderly Screening Version (HHIE-S) questionnaire and the whisper test (WT) in hospitalized elderly. **Methods:** Hospitalized patients over 60 years of age, with and without hearing complaints, answered the HHIE-S questionnaire and underwent the WT. **Results:** Fifty elderly individuals, with a mean age of 69 years, 58% of whom were male, were evaluated. It was observed that 56% of the participants had a hearing *handicap*. There was a significant dependence between male gender and the perception of *handicap* ( $p=0.0077$ ). Regarding the WT, 36% failed in at least one ear. There was a dependence between the HHIE-S and the WT ( $p=0.042$ ). **Conclusion:** Both the HHIE-S questionnaire and the WT are useful in screening for hearing loss. The correlation between the two tests suggests that both can be complementary in assessing hearing loss in the elderly. This study found a dependence between sex and the perception of hearing *handicap*, and an association between the HHIE-S and the WT, as the correlation between the *handicap* condition (with or without) and the distribution between those who passed or failed the whisper test differed.

**Keywords:** Presbycusis; Screening; Aged; Hearing Loss.

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## Authors' contributions:

ICSPR: study design, methodology; data collection; article outline; critical review; guidance.

ARS: methodology; critical review.

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## Resumo

**Introdução:** A presbiacusia, perda auditiva decorrente do envelhecimento, promove efeito negativo na qualidade de vida do idoso. A triagem auditiva pode ser útil na identificação de perdas auditivas nessa população, principalmente, naqueles com acesso restrito aos serviços especializados para este fim. **Objetivo:** Analisar os resultados da triagem auditiva oportunista realizada por meio do questionário *Hearing Handicap Inventory for the Elderly Screening Version* (HHIE-S) e teste do sussurro (TS) em pacientes idosos hospitalizados. **Métodos:** Os pacientes internados com idade superior a 60 anos, com e sem queixa auditiva, responderam ao questionário HHIE-S e passaram pelo TS. **Resultados:** Cinquenta idosos com idade média de 69 anos, 58% destes do sexo masculino, foram avaliados. Observou-se que 56% dos participantes apresentaram *Handicap* auditivo. Verificou-se que existe uma dependência significativa entre o sexo masculino e a percepção de *handicap* ( $p=0,0077$ ). Quanto ao TS, 36% falharam em pelo menos uma das orelhas. Verificou-se que existe uma dependência entre o HHIE-S e o TS ( $p=0,042$ ). **Conclusão:** Tanto o questionário HHIE-S quanto o TS são úteis na triagem de perda auditiva. A correlação entre os dois testes sugere que ambos podem ser complementares na avaliação da perda auditiva em idosos. O presente estudo verificou que existiu uma dependência entre o sexo e a percepção de *handicap* auditivo, e ainda ocorreu associação entre o HHIE-S e o TS, uma vez que a correlação entre a condição do *handicap* (com ou sem) e a distribuição entre os que passaram ou não no teste de sussurro diferiu.

**Palavras-chave:** Presbiacusia; Triagem; Idoso; Perda auditiva.

## Resumen

**Introducción:** La presbiacusia, pérdida auditiva causada por el envejecimiento, afecta negativamente la calidad de vida de los adultos mayores. El cribado auditivo puede identificar la pérdida auditiva en esta población, particularmente en aquellos con acceso limitado a servicios especializados. **Objetivo:** Analizar los resultados del cribado auditivo oportunista mediante el cuestionario *Hearing Handicap Inventory for the Elderly Screening Version* (HHIE-S) y test del susurro (TS) en ancianos hospitalizados. **Métodos:** Pacientes hospitalizados mayores de 60 años, con y sin quejas auditivas, respondieron el cuestionario HHIE-S y se les realizó el TS. **Resultados:** Se evaluaron 50 adultos mayores, con una edad media de 69 años, de los cuales el 58% eran varones. Se observó que el 56% de los participantes tenía discapacidad auditiva. Hubo una dependencia significativa entre el género masculino y la percepción de discapacidad ( $p=0,0077$ ). Con respecto al TS, el 36% falló en al menos un oído. Se encontró una dependencia entre el HHIE-S y el TS ( $p=0,042$ ). **Conclusión:** Tanto el cuestionario HHIE-S como el TS son útiles en el cribado de la pérdida auditiva. La correlación entre ambas pruebas sugiere que ambas pueden ser complementarias en la evaluación de la pérdida auditiva en los ancianos. Este estudio encontró una dependencia entre el sexo y la percepción de la discapacidad auditiva, y una asociación entre el HHIE-S y el TS, ya que la correlación entre la condición de discapacidad (con o sin) y la distribución entre los que aprobaron o reprobaron la TS fue diferente.

**Palabras clave:** Presbiacusia; Cribado; Anciano; Pérdida auditiva.

## Introduction

The World Health Organization (WHO) predicts that by 2050, almost 2.5 million people worldwide will live with some degree of hearing loss, especially those who are older, due to the increase in life expectancy, which requires the adoption of preventive measures and early diagnosis<sup>1</sup>. Age-related hearing loss, known as presbycusis, is a multifactorial condition that affects more than a third of the elderly population<sup>2-4</sup>, and several studies have demonstrated its negative effect on quality of life and psychological well-being<sup>5</sup>. This condition may be accompanied by depression, anxiety, social isolation and accelerated cognitive decline over time<sup>6-7</sup>. Notably, presbycusis is one of the causes of reduced psychosocial interactions, and generates stress and dissatisfaction in the family environment<sup>5</sup>.

Despite its severity, hearing loss has been ranked as the greatest potentially modifiable risk factor for dementia among nine health and lifestyle factors, since when eliminated, the risk of dementia is reduced by up to 9%<sup>8</sup>.

In older adults, the onset of irreversible diseases is common, in addition to cognitive decline, which, when associated with hearing loss, can negatively affect the quality of life of this population<sup>9</sup>. Early identification, with hearing screening, is considered the first step in addressing this important public health problem<sup>1</sup>.

A basic audiological assessment, essential in the diagnostic process of hearing loss, requires appropriate equipment and locations, as well as the presence of specialized professionals, who are not always accessible to the entire population. Compounding this issue, a study revealed that the onset of hearing loss is not treated as a health disorder by the elderly, which implies a delay in finding a solution to the problem. This aggravates the domains of hearing disadvantage and disability<sup>5</sup>. Thus, many elderly individuals treated in primary care are underdiagnosed regarding presbycusis and suffer its consequences, such as social isolation, lack of understanding, depression, and cognitive decline, which could often be avoided if they had the opportunity for diagnosis and rehabilitation. In addition, elderly individuals are rarely assessed for the impact of hearing loss on their quality of life<sup>10</sup>, especially in hospital settings.

Studies indicate that simple hearing screening methods, performed by trained health professionals, can help identify individuals who need referral for diagnosis and are an alternative in the public health field<sup>11-12</sup>. This simple process should be incorporated into the clinical routine in primary care to identify hearing loss in adults and, subsequently, for regulation in tertiary audiological care centers<sup>5</sup>. However, there is a gap in the provision of this type of care in the initial stages, which results in the need to concentrate diagnostic and auditory rehabilitation services in tertiary care centers. In view of this, the importance of integrating this clinical practice into the scope of hospital speech therapy residency is highlighted as one of the ways to promote early identification, without excluding other care strategies, and highlights the importance of this training for therapeutic follow-up and professional training.

The need for early identification of presbycusis is reinforced as an important strategy to avoid its deleterious effects, such as increased risk of falls, cognitive decline, depression, anxiety, and social isolation. The premise of understanding the subject as a “whole” present in academic training should be extensive and ostensive in *latu sensu* training programs, which applies to the Speech Therapy residency.

In view of the above, this study aimed to analyze the outcomes of opportunistic hearing screening performed using the Hearing Handicap Inventory for the Elderly Screening Version (HHIE-S) questionnaire and the whisper test (WT) in hospitalized elderly individuals.

## Material and Method

This is a cohort, cross-sectional, observational/epidemiological study that was submitted to the Research Ethics Committee of the Federal University of Sergipe, in accordance with Resolution No. 466/2012 of the National Health Council, and approved according to CAAE: 68727823.5.0000.5546.

The sample was a convenience sample and included 50 elderly patients over 60 years of age, with and without hearing complaints, with preserved level of consciousness, admitted to the university hospital and who agreed to participate in the study. All signed the Free and Informed Consent Form. Individuals under 60 years of age, those admitted to intensive care units, in contact and/or respiratory

isolation, with movement restrictions or restrained in bed, with reduced level of consciousness and elderly users of hearing aids were excluded.

The Hearing Handicap Inventory for the Elderly Screening Version (HHIE-S) questionnaire was used to list hearing complaints. This is a shortened version of the Hearing Handicap Inventory for the Elderly (HHIE) questionnaire, which is quicker and more objective to apply for screening elderly individuals. This questionnaire was adopted due to its high sensitivity and specificity, especially with elderly individuals who do not have previous hearing complaints<sup>13-15</sup>, in addition to its high accuracy and easy applicability<sup>16-17</sup>. Users were asked to answer “yes” (4 points), “sometimes” (2 points) or “no” (zero) for each question. The possible scores ranged from zero (no perception of handicap) to 40 (maximum handicap restrictions). The subjects were grouped into three categories: 0-8 points (no perception of handicap); 10-23 points (mild to moderate perception) and 24-40 points (significant perception of handicap)<sup>14-15</sup>.

The WT was carried out in the various wards of the hospital. The testing time was considered the quietest period, avoiding mealtimes, medication administration and hygiene routines. The noise in the room was controlled, and when necessary, the companions and technical staff were asked to leave the room. The testing followed the recommendation of the Ministry of Health, in which the examiner should remain at a minimum distance of 33 centimeters from the person being assessed and out of their field of vision. In this position, the evaluator asked a brief and simple question addressed to each ear in a low tone of voice (whisper). The phrases “What is your name?” and “How old are you?” were used and it was verified whether the elderly person heard and understood what was said. The “failure” in the screening occurred due to unsatisfactory performance in one of the ears<sup>18</sup>.

The tests were administered by speech therapists and speech therapy students who were trained and calibrated before data collection. There was

prior training, and a data collection script was followed from the patient’s approach to the application of the tests. Data collection activities were supervised during the first month of the research, with guidance and adjustments made by all those involved. These measures were adopted to minimize interference in the results.

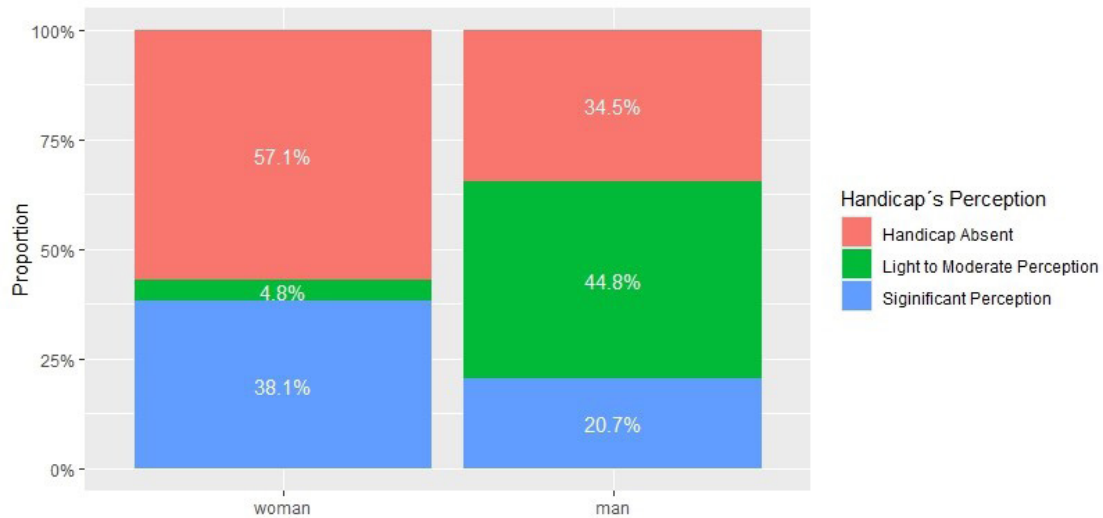
The Chi-Square statistical test was used to verify the association between the variables. Patients with a HHIE-S score above 10 or failure in the WT were referred for formal audiological diagnosis.

## Results

The study included 50 subjects who met the inclusion criteria. The age range of the participants ranged from 60 to 81, with an average age of 69.4 ( $\pm 7.1$ ) years. The sample composition by gender was 58% male and 42% female. Regarding the reasons for hospitalization, the most frequent were neoplasms (34%) and alterations in the respiratory system (20%). Of the participants, 30% ( $n=15$ ) reported having undergone a previous audiological evaluation, while the majority, 70% ( $n=35$ ), had not.

Regarding the Handicap assessed by the HHIE-S, 56% of the participants reported it positively and 44% negatively. Among those with a handicap, 28% had a mild to moderate hearing handicap (10-23 points) and 28% had a significant hearing handicap (24-40 points).

The statistical analysis found no relationship between age and the handicap assessed by the HHIE-S. Regarding the perception of Handicap and gender, the Chi-square test indicated a significant association ( $p=0.0077$ ) for males who presented a greater handicap. This indicates that the way people perceive handicap varies according to gender. Specifically, women tend to perceive the handicap significantly or not at all, while males have a higher proportion of mild to moderate perception or do not perceive any disability, as shown in Figure 1.



Source: Developed by the author (2024)

**Figure 1.** Handicap's perception degree assessed by HHIE-S

Regarding the screening performed with the WT, 36% (n=18) of the sample failed in at least one of the ears. The Chi-Square test showed an association (p-value=0.042) between the HHIE-S and the

WT, in which among those who had a handicap, 50% passed the WT, while those who did not have a handicap, the majority (81.8%), passed the WT, as shown in Figure 2.



Source: Developed by the author (2024)

**Figure 2.** Distribution of the pass/fail results between patients with and without hearing handicap

According to the research protocol, 64% of the sample that failed at least one of the tests was referred for a complete audiological evaluation.

## Discussion

This study aimed to investigate the hearing complaints of elderly individuals admitted to a university hospital through screening using the WT and the hearing handicap questionnaire. Additionally, it sought to verify the correlation between these instruments. The relationship between HHIE-S and the WT is a topic of interest in the assessment of hearing loss, especially in the elderly<sup>18</sup>.

Studies on hearing screening in the elderly are still scarce. One study identified that only six educational centers in Brazil have recently dedicated themselves to studying the subject<sup>12</sup>, and revealed that there was no consensus on which screening method is best for the elderly population.

Most participants (70%) had not undergone an audiological evaluation before, which highlights the need for greater awareness of the importance of hearing health in the elderly and the eventual inclusion of hearing health monitoring, even in a hospital setting. This is more evident since 64% of the patients screened were referred for a complete hearing evaluation. This finding was consistent with a study that showed that opportunistic screening of hospitalized elderly patients resulted in the referral of 73% of the screened patients<sup>19</sup>.

As presented, this study revealed that 56% of the patients had a handicap, 28% with a degree ranging from mild to moderate, and 28% with a significant handicap. A recent study showed that 59% of the participants had a hearing handicap: 36% with a degree ranging from mild to moderate and 23% with a significant handicap, and another study<sup>20</sup>, also using the HHIE-S, found that 58.9% had a hearing handicap.

A significant percentage (36%) failed the WT, a result that agreed with the findings of a study<sup>20</sup> that found a similar percentage, with 39.2% of failures. However, this value is inconsistent with another study that found a higher percentage of failures in this test, reaching 73%<sup>21</sup>. The authors attributed the high failure rate to the participants' level of education, which affected the level of understanding of the sample in the Whisper Test.

The present study found that there was a dependence between sex and the perception of auditory

handicap ( $p=0.0077$ ), since females presented significant perception or did not present perception of handicap, while males showed a higher proportion of mild to moderate perception or did not present perception of handicap. The investigation into sex differences in the perception and manifestation of disabilities revealed distinct patterns in the way they engage in and evaluate self-debilitating behaviors and disabilities, since females are less likely to use behavioral handicaps and are more critical in their evaluations<sup>22</sup>. In addition, they are less likely to engage in self-limitations and are more critical of such behaviors. Males, on the other hand, are more likely to self-debilitate<sup>23</sup>. It is noteworthy that the results presented here converge with a study<sup>24</sup> that investigated the prevalence of hearing handicap and found that male participants had higher HHIE-S scores than female participants. On the other hand, it was discordant with another study<sup>25</sup> that analyzed the hearing handicap of adults and elderly individuals treated at an audiology outpatient clinic and identified that there was a positive association between the female gender and perception of handicap. These discordant findings allow us to infer that, despite being important and necessary, the test should be adopted to contribute to the construction of more evidence that helps prove that speech therapy care in the hospital environment is more comprehensive than recommended in academic training.

Regarding the assessment with the WT, it was found that 36% of those evaluated failed. Through statistical analysis, we observed an association between the results of the HHIE-S questionnaire and the results of the TS ( $p=0.042$ ), such that among the elderly individuals who indicated hearing handicap, half of them passed the WT. It was possible to observe that the majority of participants in this study (81.8%) did not have a hearing handicap and passed the WT. The difference found between the two tests can be justified by the methodology of application of the WT, which may present variables of vocal intensity, environmental noise and size of the study sample, which may possibly have compromised the performance of the subjects in the test, even when the applicators were calibrated for the standardized execution of the test.

Although it was not the objective of this study, it was found that the hearing handicap was associated with the global burden of symptoms of mild cognitive impairment and, more specifically, with



the domains of affective dysregulation and apathy and highlighted by a study<sup>26</sup> that showed that elderly people with hearing handicap had worse cognitive function<sup>27</sup>.

This study showed that there was an association between the HHIE-S and the whisper test, since the distribution between those who passed or failed the whisper test differed depending on the condition of the handicap (presence/absence). Among the patients who did not present a handicap, the vast majority (81.8%) passed the WT. This situation can be explained by the better cognitive pattern, related to auditory perception and attention paid during the test. Cognition and attention are important factors that influence the results of auditory tests. A recent study<sup>28</sup> identified, in elderly individuals, that the worse the auditory self-perception, the greater the association with cognitive impairment.

The HHIE-S and WT tools are inexpensive and easy to apply assessments. When applied correctly, such as in long-term care facilities for the elderly, primary care centers, hospitals, and places that do not have access to conventional hearing tests, they provide important indicators of auditory function and enhance early intervention, as emphasized in other studies<sup>29</sup>.

## Conclusions

This study revealed that a significant percentage of screened patients were referred for a complete audiological diagnosis. A relationship was found between gender and the perception of hearing handicap. An association was observed between the HHIE-S and the whisper test, since, depending on the condition of the handicap (presence/absence), the distribution among the elderly who passed or failed the whisper test differed. The variation in results between genders suggests that personalized approaches may be necessary to more accurately capture the perception of hearing handicap among different demographic groups.

The screening proved to be fast and pertinent, which allows us to infer its feasibility of implementation in health services. The correlation between the two tests suggested that they may be complementary in the assessment of hearing loss in the elderly. Routine implementation of hearing screenings is recommended to ensure early detection and appropriate intervention, and to promote

better hearing health and quality of life for hospitalized elderly people.

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