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# Participation restriction of adults and elderly users of an audiology clinic: association with auditory and social-environmental factors

## *Restrição à participação de adultos e idosos: associação com fatores auditivos e socioambientais*

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**Keywords**

Hearing
Quality of Life
Environment
Questionnaires
Disabled Persons

## ABSTRACT

**Purpose:** To verify the association between restrictions to auditory participation and quality of life, self-perceived health, auditory factors and sociodemographic aspects of adults and elderlies assisted in an audiology service. **Methods:** The study included 152 participants; restrictions to auditory participation were assessed using the instruments Hearing Handicap Inventory for Adults - HHIA and the Hearing Handicap Inventory for Elderly - HHIE. In order to assess the quality of life, participants answered the World Health Organization Quality of Life - abbreviated version (WHOQOL-bref). Sociodemographic characteristics were assessed using a questionnaire to characterize the participants; and by the Brazilian Criteria ABEP. The results of the hearing assessment were also collected. Descriptive, bivariate statistical analyzes ($p \leq 0.20$) and multiple logistic regression ($p \leq 0.05$) were performed. **Results:** Regarding social class, individuals belonging to classes B1 and C2 had, respectively, 4.75 and 7.73 times greater chances of presenting restrictions to auditory participation compared to individuals of class D. Regarding hearing factors, disabling hearing loss increased by 3.4 times the chance of presenting perception of restriction to auditory participation. In the environmental domain of the WHOQOL-bref instrument, each unit increased in the score was associated with a decrease of 0.96 times in the chance of perceived restriction in auditory participation. **Conclusion:** We found that the use of the amplifying hearing aid by itself, despite its benefits, did not eliminate the restrictions on auditory participation of most participants.

**Descritores**

Audição
Qualidade de Vida
Ambiente
Questionários
Pessoas com Deficiência

## RESUMO

**Objetivo:** Verificar a associação entre a restrição à participação auditiva com a qualidade de vida, a autopercepção de saúde, os fatores auditivos e os aspectos sociodemográficos de adultos e idosos atendidos em um serviço de audiologia. **Método:** Participaram do estudo 152 indivíduos e a restrição à participação auditiva foi avaliada por meio dos instrumentos Hearing Handicap Inventory for Adults – HHIA e o Hearing Handicap Inventory for Elderly – HHIE. Para a avaliação da qualidade de vida os participantes responderam o World Health Organization Quality of Life- versão abreviada (WHOQOL-bref). As características sociodemográficos foram avaliadas por meio de um questionário de caracterização dos participantes e pelo Critério Brasil ABEP, também foram coletados os resultados da avaliação auditiva. Foram realizadas análises estatísticas descritiva, bivariada ($p \leq 0,20$) e regressão logística múltipla ($p \leq 0,05$) **Resultados:** Em relação à classe social, indivíduos pertencentes às classes B1 e C2 possuíam respectivamente, 4,75 e 7,73 vezes chances maiores de apresentar restrição à participação auditiva quando comparados aos indivíduos da classe D. Em relação aos fatores auditivos, ter perda auditiva incapacitante aumentou em 3,4 vezes a chance de apresentar percepção de restrição à participação auditiva. No domínio ambiental do instrumento Whoqol-Bref, a cada unidade aumentada no escore, houve diminuição de 0,96 vezes a chance de percepção de restrição na participação auditiva. **Conclusão:** Verificou-se que apenas o uso do aparelho de amplificação sonora individual, apesar dos benefícios, não foi capaz de eliminar a presença da restrição à participação auditiva da maioria dos participantes.

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## INTRODUCTION

Hearing loss is a major public health problem and can have several negative impacts. In 2008, the World Health Organization (WHO) estimated that approximately 466 million people had disabling hearing loss, i.e., more than 6% of the world population; of these, 432 million were adults. Moreover, the WHO projections indicate that the number may increase to 630 million by 2030 and reach over 900 million by 2050[1]. The last demographic census of the Brazilian Institute of Geography and Statistics (IBGE) showed that approximately 9 million citizens had hearing loss, which represents 5.1% of the population. According to the same source, hearing was the third most reported disability[2].

The World Health Organization uses a biosocial model to characterize the functional consequences of hearing loss (disability) that also considers adaptations to the environment and involvement of the individual in everyday situations (participation restriction)[3]. Thus, the hearing-related participation restriction is related to the individual's self-perception regarding their hearing limitations and the potential impacts on their relationships with family, friends, and strangers, on their lifestyle, social and emotional situations, and quality of life[4].

The consequences of hearing loss vary among individuals and are influenced by health conditions, level of sociability, ability to adapt to adverse situations, and experiences throughout life. Therefore, individuals with similar hearing characteristics may present different levels of participation restriction; in addition, there is no direct association of the restriction with the degree of hearing loss[4,5].

A Swedish study that aimed to translate and validate the Amsterdam Inventory for Auditory Disability and Handicap (AIADH) and describe the hearing difficulties and quality of life of 74 participants found that men presented worse results in the auditory evaluation at the frequencies of 2, 3, 4 and 6 kHZ, worse scores in the evaluation of the sound source location and used more non-verbal strategies to communicate, while presenting better quality of life compared to women. Thus, the researchers concluded that the hearing evaluation alone was not enough to determine the psychosocial effects and the impact on the quality of life of people with hearing loss. They also reported the importance of the development of training programs to raise insight in order to minimize the consequences of hearing loss[6].

The use of the Individual Sound Amplification Device (ISAD) is the primary intervention for adults with hearing loss. Among the benefits provided by this device are improved interpersonal relationships and reduced disability, participation restriction, and depression[7,8].

A study carried out in the United Kingdom aimed to verify the association between the use of ISAD and improvement in cognitive performance — evaluated by means of social isolation and the presence of depression — assessed 164,770 individuals aged between 40 and 69 years. The results showed that the use of ISAD improved cognitive performance and a positive association of ISAD use with social isolation or depression. In view of the results, the authors concluded that the impact of ISAD use on cognition is not related to social isolation or depression; the findings suggested that the benefit was related to the increased audibility of sounds related to the participants' daily activities[9].

Another study that investigated the level of satisfaction of 40 ISAD users by means of the Satisfaction Amplification in Daily Life (SADL), found that the study participants were satisfied with their ISADs during the performance of daily life activities regardless of the type and degree of hearing loss. The authors also concluded that adequate counselling and guidance influenced the positive evaluation of satisfaction[10].

The several impacts caused by hearing loss that are not related to altered anatomical functions and structures have led researchers and professionals to complement hearing evaluations with the use of questionnaires addressing the hearing-related participation restriction and quality of life[11-14]. These instruments help to measure the efficacy and effectiveness of treatments.

This study aimed to verify the association between hearing-related participation restriction with quality of life, auditory and sociodemographic factors of adult and elderly individuals seen at a Brazilian audiology clinic.

## METHODS

This is a cross-sectional analytical observational study with a probabilistic sample consisting of 152 adults and elderly individuals seen at the Audiology Department of a public hospital in the city of Belo Horizonte, state of Minas Gerais, Brazil.

The research was approved by the Research Ethics Committee of Universidade Federal de Minas Gerais, under protocol number CAAE 25014913.0.0000.5149. All research participants were informed about the voluntary nature of the study, its objectives, and methodological paths, and agreed to sign the Informed Consent Form (ICF).

### Study participants

We carried out a sample calculation considering the annual flow of 7,680 individuals seen in the outpatient clinics that make up the Audiology Department of the hospital: The Hearing Health Clinic and the Audiology Outpatient Clinic. A simple random sampling was considered with a confidence level of 99%. The sample was stratified per clinic: 114 individuals seen at the Hearing Health Clinic and 38 individuals seen at the Audiology Outpatient Clinic aged 18 years or older participated in the study. The participants underwent pure-tone threshold audiometry and immittance testing and signed the ICF on the day of data collection.

### Hearing-related participation restriction

The Hearing Handicap Inventory for Adults (HHIA)[15] and the Hearing Handicap Inventory for the Elderly (HHIE)[16] were used to assess self-perception of hearing-related participation restriction.

Both questionnaires are composed of 25 questions and assess the social and emotional consequences of hearing impairment. The

total score values range from 0 to 100 and the higher the score, the greater the self-perception of hearing-related participation restriction, i.e., the greater the difficulties in hearing and non-auditory factors.

### Quality of life

The quality of life of the participants in the present study was assessed by applying the version validated for Brazilian Portuguese of the World Health Organization Quality of Life – abbreviated (WHOQOL-BREF)[17]. This instrument is composed of 26 questions, two of which refer to self-perceived quality of life and satisfaction with health condition, while the other 24 questions are distributed across other domains. The instrument was applied in a single meeting and the researcher asked the participants to evoke the memories of their routine in the two weeks preceding the research to select the answer most appropriate to their situation. The answers to the questions varied in score from 1 to 5. The final score for each domain was calculated by a syntax considering the answers to each question, which resulted in final scores on a scale from 0 to 100, where the higher the score, the better the participant's evaluation[17].

### Sociodemographic and clinical characterization

To obtain the sociodemographic data, the participants answered a questionnaire characterizing the users of the outpatient clinics and the Criterio Brasil ABEP[18]. The questionnaire was prepared by the researchers and included questions about gender, age, place of residence, and education level. Information regarding the reason and the specialty of the healthcare professional who referred the participants for hearing evaluation was also collected. The research participants self-evaluated their hearing by means of a visual scale numbered from 0 to 10, where the higher the score, the better the evaluation.

To complement the sociodemographic data evaluation, we applied the Criterio Brasil ABEP, an instrument that verifies the characteristics of their residence (presence and quantity of given items in the residence) and the education level of the head of the family. The criteria proposed by the literature were followed in the analysis of this instrument.

### Auditory evaluation

For the results obtained in the pure-tone threshold audiometry and immittance testing, the values of the best ear were considered. The audiometric thresholds were classified according to type and degree. The hearing loss were also classified as disabling or non-disabling. The World Health Organization defines disabling hearing loss in adults as the permanent elevation of the hearing threshold in the best ear to levels above 40 dBHL[19].

### Statistical analysis

We carried out descriptive analysis of the variables by means of absolute and relative frequency distribution for categorical variables and numerical synthesis for continuous variables.

For the association analysis, we selected as response variable hearing-related participation restriction and as explanatory variables quality of life, sociodemographic and auditory factors. Pearson's chi-square test was used to assess the association between the response variable and the explanatory variables for the categorical variables, and the non-parametric Man-Whitney test for the continuous variables, since all of them had asymmetrical distribution, as assessed by the Kolmogorov-Sminorv test (p-values $\leq 0.05$). Variables with statistically significant associations at the 20% level ($p<0.20$) in the univariate analysis were considered for entry into the initial multiple logistic regression model. The manual backward method was adopted, and variables with associations at the 5% significance level were maintained. The magnitude of the associations was assessed by the odds ratios and their respective 95% confidence intervals. The adequacy of the models was evaluated by the Hosmer and Lemeshow test. The Statistical Package for the Social Sciences (SPSS), version 21.0, was used for all analyses.

## RESULTS

The study sample was composed of 152 individuals aged between 18 and 92 years; the mean age was 61.8 years. Ninety elderly individuals (59.2%) and 62 adults (40.8%) participated in the study, and most of the individuals were female (53.9%).

Most participants (63.2%) lived in the city of Belo Horizonte, capital of the state of Minas Gerais, and 27% of the sample reported living in the outskirts of the capital. Regarding economic class, according to the criteria proposed by Criterio Brasil ABEP, the following results were obtained: class A2 (0.7%), class B1 (14.5%), class B2 (12.5%), class C1 (29.6%), class C2 (26.3%), and class D (16.4%). The evaluation of education level showed that the mean number of years of schooling of the participants was 5.9 years (minimum 0 and maximum 16 years).

As to the clinic, 75% of the participants were seen at the Hearing Health Clinic and 25% at the Audiology Outpatient Clinic. Most of the referrals for hearing evaluation were made by ear, nose, and throat physicians (74.8%), followed by speech-language therapists (16.6%). Most participants (88.8%) have had a hearing evaluation before.

The results of the evaluation of the hearing-related participation restriction showed that 63 participants (41.4%) had no restriction, 21 (13.8%) had mild restriction, 20 (12.5%) had moderate restriction, and 49 (32.2%) individuals had significant hearing-related participation restriction.

The results presented below refer to the univariate analysis of the association between hearing-related participation restriction with sociodemographic and auditory factors, and quality of life. For the entry in the initial logistic regression model, associations were considered at a significance level of 20% ($p\leq0.20$).

Among the variables analyzed, an association was observed at the 20% level between the presence of hearing-related participation restriction and female gender ($p= 0.188$) and economic class ($p= 0.036$), as shown in Table 1.

**Table 1.** Analysis of the association of the presence of hearing-related participation restriction with sociodemographic variables

| Characteristics | Hearing-related participation restriction | | p-value* |
|---|---|---|---|
| | No | Yes | |
| **Gender** | | | |
| Female | 30 (47.6) | 52 (58.4) | **0.188** |
| Male | 33 (52.4) | 37 (41.6) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **Life cycle** | | | |
| Adult | 25 (39.7) | 37 (41.6) | 0.815 |
| Elderly | 38 (60.3) | 52 (58.4) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **Education level** | | | |
| ≤ 8 years | 43 (68.3) | 63 (72.4) | 0.581 |
| > 8 years | 20 (31.7) | 24 (27.6) | |
| Total | 63 (100.0) | 87 (100.0) | |
| **Critério Brasil ABEP** | | | |
| Class B1 | 7 (11.3) | 15 (16.9) | **0.036** |
| Class B2 | 7 (11.3) | 12 (13.5) | |
| Class C1 | 24 (38.7) | 21 (23.6) | |
| Class C2 | 10 (16.1) | 30 (33.7) | |
| Class D | 14 (22.6) | 11 (12.4) | |
| Total | 62 (100.0) | 89 (100.0) | |
| **Place of residence** | | | |
| Belo Horizonte | 43 (68.3) | 53 (59.6) | 0.502 |
| Outskirts of Belo Horizonte | 15 (23.8) | 26 (29.2) | |
| Other | 5 (7.9) | 10 (11.2) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **Age**[##] | | | |
| Median | 67.00 | 68.00 | 0.679** |
| Mean | 62.24 | 64.00 | |
| Standard deviation | 18.21 | 17.26 | |

*Pearson's chi-square; **Mann Whitney test; [#]1 individual excluded, Class A1; [##]In years

**Table 2.** Analysis of the association of presence of hearing-related participation restriction with auditory factors (n=152)

| Characteristics | Hearing-related participation | | p-value* |
|---|---|---|---|
| | No | Yes | |
| **Outpatient clinic** | | | |
| Hearing Health | 40 (63.5) | 74 (83.1) | **0.006** |
| Audiology | 23 (36.5) | 15 (16.9) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **First evaluation** | | | |
| Yes | 13 (20.6) | 4 (4.5) | **0.002** |
| No | 50 (79.4) | 85 (95.5) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **Disabling Hearing Loss** | | | |
| Yes | 31 (49.2) | 65 (73.0) | **0.003** |
| No | 32 (50.8) | 24 (27.0) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **Degree of Loss in Best Ear** | | | |
| Normal | 21 (33.3) | 13 (14.6) | **0.009** |
| Mild/Moderate | 33 (52.4) | 50 (56.2) | |
| Moderately severe/Severe/ Profound | 9 (14.3) | 26 (29.2) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **Type of Hearing Loss in Best Ear**** | | | |
| No hearing loss | 20 (31.7) | 13 (14.6) | **0.023** |
| Neurosensorial | 36 (57.1) | 57 (64.0) | |
| Conductive/Mixed | 7 (11.1) | 19 (21.3) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **Hearing grade** | | | |
| Mean | 7.2 | 5.5 | **<0.001** |
| Standard deviation | 1.9 | 2.7 | |
| Median | 7.0 | 5.0 | |

*Pearson's chi-square; **Variable not considered in logical regression analysis

The analysis of association between the presence of hearing-related participation restriction and auditory factors found that all variables showed statistical significance (Table 2). It is worth noting the positive association between the presence of participation restriction and the following variables: presence of disabling hearing loss (p= 0.003) and hearing self-evaluation (p= <0.001).

For the analysis of the association between the presence of hearing-related participation restriction and quality of life, we chose to regroup the categories of the questions referring to self-perceived quality of life and health condition (Table 3). We observed that all variables related to quality of life were associated with the presence of hearing-related participation restriction at a 20% level. The mean score of all domains assessed by the WHOQOL-BREF was lower for the individuals who presented hearing-related participation restriction.

The odds ratio analyses show that, regarding social class, individuals belonging to classes B1 and C2 had respectively 4.75- and 7.73-times greater chances of presenting hearing-related participation restriction when compared to individuals from class D (Table 4). Regarding auditory factors, having a disabling hearing loss increased by 3.4 times the chance of presenting perceived hearing-related participation restriction. We also found that the higher the score of the hearing self-evaluation, the lower the chance of perceived hearing-related participation restriction. As to the environmental domain of the WHOQOL-BREF instrument, each unit increment in its score decreases by 0.96 times the chance of perceived hearing-related participation restriction.

**Table 3.** Analysis of association of the presence of hearing-related participation restriction with quality of life (n=152)

| Characteristics | Hearing-related participation restriction | | p-value* |
|---|---|---|---|
| | No | Yes | |
| **Quality of life** | | | |
| Low/Very low/Medium | 13 (20.6) | 27 (30.3) | **0.181** |
| Good/Very good | 50 (79.4) | 62 (69.7) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **Satisfaction with health condition** | | | |
| Unsatisfied | 14 (22.2) | 31 (34.8) | **0.093** |
| Satisfied | 49 (77.8) | 58 (65.2) | |
| Total | 63 (100.0) | 89 (100.0) | |
| **Physical domain** | | | |
| Mean | 71.2 | 66.2 | **0.143** |
| Standard deviation | 17.9 | 20.5 | |
| Median | 75.0 | 67.9 | |
| **Psychological domain** | | | |
| Mean | 77.9 | 71.9 | **0.032** |
| Standard deviation | 19.7 | 20.6 | |
| Median | 79.2 | 75.0 | |
| **Social relations domain** | | | |
| Mean | 77.6 | 71.8 | **0.118** |
| Standard deviation | 18.3 | 23.5 | |
| Median | 75.0 | 75.0 | |
| **Environmental domain** | | | |
| Mean | 67.7 | 60.8 | **0.002** |
| Standard deviation | 12.9 | 14.7 | |
| Median | 68.8 | 62.5 | |

*Pearson's chi-square test or Mann Whitney test

**Table 4.** Results of the multiple logistical regression analysis between the presence of hearing-related participation restriction and selected variables

| Characteristics | Initial model | | Final model | |
|---|---|---|---|---|
| | OR (IC 95%) | p-value* | OR (IC 95%) | p-value* |
| **Sex** | 1.68 (0.72-3.90) | 0.230 | 1.64 (0.74-3.64) | 0.221 |
| **Critério Brasil ABEP** | | | | |
| Class B1 | 4.93 (1.13-21.47) | **0.034** | 4.75 (1.19-18.97) | **0.027** |
| Class B2 | 3.05 (0.71-13.14) | 0.134 | 3.24 (0.82-12.79) | 0.093 |
| Class C1 | 1.24 (037.-4.18) | 0.724 | 1.25 (0.40-3.88) | 0.703 |
| Class C2 | 9.21 (2.20-38.53) | **0.002** | 7.73 (2.07-28.90) | **0.002** |
| **Outpatient clinic** | 1.84 (0.57-5.97) | 0.308 | – | – |
| **First evaluation** | 2.69 (0.62-11.74) | 0.188 | – | – |
| **Disabling hearing loss** | 2.96 (0.84-10.43) | 0.092 | 3.40 (1.44-8.04) | **0.005** |
| **Degree of hearing loss** | | | | |
| Mild/Moderate | 0.84 (0.19-3.72) | 0.819 | – | – |
| Moderately severe/Severe/Profound | 1.11 (0.17-7.13) | 0.912 | – | – |
| **Hearing grade** | 0.76 (0.62-0.93) | **0.007** | 0.74 (0.616-0.90) | **0.002** |
| **Quality of life** | 0.94 (0.32-2.82) | 0.917 | – | – |
| **Satisfaction with health condition** | 2.07 (0.71-6.06) | 0.184 | – | – |
| **Physical domain** | 1.01 (0.98-1.04) | 0.580 | – | – |
| **Psychological domain** | 1.02 (0.98-1.05) | 0.355 | – | – |
| **Social relations domain** | 1.03 (0.98-1.03) | 0.800 | – | – |
| **Environmental domain** | 0.95 (0.91-0.99) | **0.014** | 0.96 (0.93-0.99) | **0.008** |
| **Constant** | 1.30 | 0.897 | 22.16 | 0.011 |

*Adjustment of initial/final models (Hosmer e Lemeshow): p= 0.728/p=0.741
**Reference categories:** Sex - male; Critério Brasil ABEP- Class D; Clinic - Audiology; first evaluation - no; Disabling hearing loss - no; Degree of hearing loss - normal; Quality of life - low; Satisfaction with health condition: unsatisfied

## DISCUSSION

The characterization of the research participants showed the predominance of elderly individuals, women, and users seen at the Hearing Health Clinic. These aspects can be explained by the improvement in health conditions and consequently the increase in life expectancy of the Brazilian population. According to information from the Brazilian Institute of Geography and Statistics (IBGE)[2], in the year 2000 the elderly represented 7.1% of the population, whereas in 2013 this representation had increased to 13%. Women also represent more than 50% of the Brazilian population[2].

The process of hearing loss due to ageing causes cognitive changes, reduced speech understanding in noisy environments, and psychosocial impacts[20]. Brazilian[21,22], European[13,23], and North American[24] literature have shown the benefits of the use of hearing aids in reducing the negative impacts on hearing-impaired individuals. In view of the importance of health promotion for people with hearing loss, in 2004 the Brazilian government implemented the National Policy for Auditory Health Care, which offers hearing aids free of charge and performs complete follow-up from fitting to hearing rehabilitation[25]. The teaching hospital where the study was carried out is one of the references of care of people with hearing loss, a situation that justifies the fact that most of the sample was composed of users of the Hearing Health Clinic. This information reinforces the importance of public policies for the promotion of well-being and the attempt to reduce potential restrictions caused by hearing loss.

In the association between the presence of hearing-related participation restriction and sociodemographic factors, both in the univariate analysis and in the logistic regression, only the socioeconomic classification presented a result with statistical significance. It was observed that having a low socioeconomic status increased the chances of the individual presenting hearing-related participation restriction. This finding corroborates a study[9] that estimated the prevalence of hearing impairment in individuals aged 40 to 69 years in the United Kingdom. Information was collected on the use of Individual Sound Amplification Device (ISAD), buzzing, noise exposure, and sociodemographic data. The findings showed that 10% of the 164,770 participants had hearing loss and statistically significant results between the presence of hearing loss and lower socioeconomic status, advanced age, and exposure to noise at work or listening to loud music.

Among the characteristics of the sample, we also found that most of the participants had low education levels, with less than eight years of study, but no association was found between the education level and the presence of hearing-related participation restriction. Low education levels make it difficult for individuals to get qualified job opportunities with higher salaries; these situations are reflected in the socioeconomic status evaluation. However, there was an association between low socioeconomic status and the presence of hearing-related participation restriction. It is worth pointing out that education is one of the items of Criterio Brasil ABEP[18] used in the present study to analyze socioeconomic status. Thus, it is possible to infer that participants with low education levels also presented worse socioeconomic conditions.

Regarding education level, the findings of the present research do not corroborate the results of the prospective study carried out in Norway with the objective of verifying the association between hearing loss and the socioeconomic conditions of 17,593 participants. Its results showed that men with less than 10 years of education and with a professional occupation requiring fewer years of study are at higher risk of hearing loss[5]. Another population-based study conducted in Sweden investigated the association between self-reported hearing impairment and sociodemographic characteristics in 19,045 individuals aged 20 to 64 years. The results indicated that the participants who obtained income by means of manual labor, with a lower level of education, reported greater hearing impairment when compared to the individuals who did not perform manual labor[26]. Since the present study was carried out with a cross-sectional design, we did not verify the causalities of the results obtained, and the sample size, smaller when compared to the abovementioned studies, may also have influenced the findings.

In view of the aforementioned, it can be inferred that the participants of the Brazilian research, for having a lower education level and being of low income have been more vulnerable to occupations that required less academic qualification and to work environments more exposed to noise throughout their lives, a situation that over the years increased their risk of developing hearing difficulties causing activity and participation restrictions.

According to the literature, an individual with hearing loss when seeking help may go through stages that involve the acknowledging the hearing loss, personal experiences, interaction with society and, finally, a decision[27]. In the present research, we found a statistically significant association of presence of hearing-related participation restriction with the variable disabling hearing loss and hearing self-evaluation. The odds ratio logistic regression model showed that having disabling hearing loss and low scores in the hearing evaluation increases the chances of the individual presenting hearing-related participation restriction. The findings of the present research corroborate a study[27] whose objective was to investigate the acceptance of hearing loss and showed that the non-acceptance of hearing loss was related to an increase in emotional discomfort, a situation that can cause participation restriction.

As to the association of the presence of hearing-related participation restriction with quality of life, we also observed from the global evaluation that most of the research participants reported having a good or very good quality of life and were satisfied with their general health condition. Quality of life evaluation is subjective and is related to multiple factors, among them the interpersonal relationships stability and good health[28]. Quality of life is also influenced by the individual's ability to adapt to the environment in which he/she lives. Elderly people with a better ability to adapt tend to suffer lower emotional impacts when facing daily life adversities[29]. Given the results presented, it is inferred that the research participants associated the positive evaluation of quality of life with good health status. We may also consider that when assessing quality of life, the participants, mostly elderly people, were aware of the potential limitations caused by ageing and adapted to this condition of life.

As for the four domains assessed by the WHOQOL-BREF, both in the univariate analysis and in the logistic regression model, a statistically significant relationship was found between the presence of hearing-related participation restriction and the environmental domain. This domain includes questions about safety, the physical environment, financial resources, opportunities to acquire information, leisure, and transportation. These findings corroborate a Brazilian study that evaluated the quality of life of elderly people with normal hearing and with presbycusis users of ISADs[28]. In this research, which also used the WHOQOL-BREF, we noticed a positive association between presbycusis and the worst perception of quality of life in the environmental domain; thus, the results indicated that hearing loss, regardless of the use of ISADs, limits access to the environment.

The other domains assessed by the WHOQOL-BREF, which did not show a statistically significant association with the presence of participation restriction, assessed the physical, psychological, and social relations factors. The findings of the present research partly corroborate an American study[30]. In assessing quality of life, no statistically significant differences were found between the use of ISAD and the optimization of cognitive aspects and social behavior, but a statistically significant relationship was found between the use of ISAD and the improvement of physical aspects. Unlike the findings of the present study, another Brazilian study[29] whose goal was to assess the quality of life of elderly individuals before and after ISAD fitting showed a significant improvement in the physical, psychological, and social relations domains following ISAD fitting. These data show the importance of referral to ISAD fitting services and to auditory rehabilitation as a support to improve emotional and social aspects in individuals with hearing loss.

## CONCLUSION

The results of the present study show that individuals with disabling hearing loss and lower socioeconomic conditions are more likely to present hearing-related participation restriction. The findings also show the importance of considering the influence of environmental factors on the impact caused by the restriction. We found that the use of ISADs alone, despite its benefits, did not eliminate the hearing-related participation restriction for most participants. These findings reinforce the importance of clinical interventions that consider the results of the hearing evaluation in addition to the life context of each patient.

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## Author contributions

*VCS participated in the study design, data collection and analysis, writing of the manuscript, and approval of the final version; SMAL participated, as a supervisor, in the study design, data analysis and interpretation, writing of the manuscript, and approval of the final version.*