Journal of Social Research

P-ISSN: 2827-9832
E-ISSN: 2828-335x
Vol. 4, No. 11, October 2025
http://ijsr.internationaljournallabs.com/index.php/ijsr

The Relationship of Hearing Loss to Quality of Life in the Elderly in Nursing Homes

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ABSTRACT

Hearing loss is a common health concern among the elderly that significantly affects quality of life. This research investigated the link between the type and severity of hearing impairment and quality of life, utilizing the Hearing Handicap Inventory for the Elderly–Screening (HHIE-S). A cross-sectional approach was used with 58 participants aged 60 or older at the Binjai Elderly Social Service Unit of the North Sumatra Provincial Social Service. The study involved pure-tone audiometry to precisely measure each individual's hearing, along with the HHIE-S to assess the social and emotional impacts of hearing loss. Findings revealed a strong correlation between the severity of hearing loss and HHIE-S scores ($r = 0.641$; $p < 0.001$). The Kruskal–Wallis test showed significant differences in HHIE-S scores among various hearing loss groups ($p = 0.024$), with the mixed hearing loss group having the highest average score. Additional analysis using the Mann–Whitney test confirmed significant differences between the normal hearing and mixed-hearing-loss groups, as well as between the conductive-hearing-loss and mixed-hearing-loss groups.

Keywords: *Hearing impairment; HHIE-S; quality of life; elderly; pure tone audiometry.*

INTRODUCTION

Elderly is an aging process in which the functions of organs such as the brain, heart, liver, and kidneys gradually decrease, and active body tissues also decline. This decrease in various bodily functions results in the body becoming very susceptible to multiple diseases, which can lead to death. Under Law Number 13 of 1998 on Elderly Welfare, the elderly are defined as individuals aged 60 and above. According to the World Health Organization (WHO), older people are grouped into different categories as follows: a) age 45-54 years, called middle age; b) age 55-65 years, called elderly; c) age 66-74 years, called young old or young elderly; d) age 75-90 years, called old or older elderly; e) age over 90 years old, called very old or very elderly (World health organization, 2013). As stated by the Ministry of Health of the Republic of Indonesia (2016) the elderly are classified as: a) age 45-59, called pre-elderly; b) age 60-69 years, called elderly; c) >70 years old or ⩾60 years old with health problems, called high-risk elderly (Regulation of the Minister of Health of the Republic of Indonesia Number 25 of 2016 concerning the Action Plan for Elderly Health for the Year 2016-2019, 2016).

Along with rising life expectancy among Indonesians, more elderly people will face health issues. One of the common health issues older people face is hearing loss. Older people are more vulnerable and face various risks, usually because of worsening physical and mental health and changes in their development. There are three critical aspects of everyday functioning in the elderly group: cognitive processes (learning, thinking, and memory), mobility, and sensation (touch, smell, and taste). Failure to address any of these three aspects

will decrease a person's ability to function independently, thereby significantly impacting their quality of life. Hearing loss is the most common health problem in the elderly. This problem has a significant impact on activities because it disrupts communication, thereby affecting psychological and social functions and a person's quality of life (Silvanaputri et al., 2019)

The World Health Organization (WHO) predicts that by 2050, roughly 700 million people, approximately 1 in 10, will suffer from hearing loss. In low and middle-income countries, around 80% of individuals are expected to experience hearing loss. This condition becomes more common as people get older. Because it affects so many people, presbycusis, an age-related hearing loss, is considered the most significant social and economic problem caused by lifelong hearing loss. As the population ages, this issue is expected to get worse. Currently, over 42% of individuals with hearing loss are aged 60 or older. Worldwide, the rate of hearing loss, especially at moderate or severe levels, rises rapidly with age, from 15.4% in people over 60 to 58.2% in those over 90 (World Health Organization, 2021).

This pattern is observed throughout the WHO region, encompassing Africa, the Eastern Mediterranean, Europe, the Americas, Southeast Asia, and the Western Pacific. In every area studied, the rate of hearing loss was between 10.9% and 17.6% among people aged 60 to 69, rose to between 41.9% and 51.2% for those aged 80 to 89, and went up to between 52.9% and 64.9% for those over 90 years old (World Health Organization, 2021). A national survey on hearing and vision health conducted in seven provinces between 1993 and 1996 found that 16.8% of people had hearing loss, with presbycusis accounting for 2.6% of that (Priasty et al., 2019). The 2018 Basic Health Research (Riskesdas) reported that hearing loss affects about 6.1% of Indonesia’s population, which is roughly 15 million people. (Litbangkes, 2018, in Sagala et al., n.d.). In 2019, the North Sumatra region reported hearing loss by 2.6% and deafness by 0.09% (Fiza Putri Rahmadillah et al., 2024).

Hearing loss is the partial or complete inability to perceive sounds in one or both ears. It can be categorized into mild, moderate, moderate-severe, and very severe levels (Safitri M, 2022). Deafness may arise from issues in the outer, middle, or inner ear, leading to conduction hearing loss, sensorineural hearing loss, or mixed hearing loss (Triola et al., 2023). Often considered an invisible disability, hearing loss's long-term effects and potential damage are not always matched by the attention and financial support provided to patients. It is more prevalent among adults, affecting about 25% of those over 45, with 27% of men and 24% of women impacted. Untreated hearing loss can lead to cognitive decline and a higher risk of dementia. The primary consequence is disrupted communication, which can severely affect health, psychosocial well-being, and economic stability, leading to social isolation and a lower quality of life (Fiza Putri Rahmadillah et al., 2024).

Age-related hearing loss, or presbycusis, is a form of sensorineural impairment caused by degeneration (aging) in the auditory organs. Progressive in presbycusis includes slow, gradually burdensome, and occurs on both sides of the ear. The causes of hearing loss in presbycusis are generally a combination of several factors, namely the stiffness of the eardrum, degeneration of the cochlear hair cells (aging), decreased elasticity of the basilar membrane, decreased numbers of auditory neurons, and changes in the auditory central system. There is a decrease in the speed of the auditory process in the central auditory cortex (Yudhanto D, 2020). The progression of presbycusis can be related to physical and environmental factors, genetics, and increased susceptibility to physiological stress and lifestyle behaviors. These factors

include exposure to loud noises, consumption of drugs, ototoxic chemicals, smoking habits and diet, and accompanying chronic medical conditions such as heart disease. Moderate to severe reductions in sensorineural hearing loss were observed in pure-tone audiometry examinations of presbycusis patients (Priasty et al., 2019).

The World Health Organization (WHO) describes quality of life as how people view their position in life, shaped by their cultural and value systems, along with their personal goals, expectations, standards, and concerns (World Health Organization, 2012). Physical health is a key factor impacting this perception, with presbycusis being a common health issue among the elderly. However, a poor quality of life cannot be linked to a single cause; it is influenced by various factors such as age, gender, marital status, income, and chronic illnesses. These elements can become future risk factors that diminish the elderly's quality of life, as disruptions in any of these areas can negatively influence their well-being (Priasty et al., 2019).

A previous study conducted by Maisara, Eva, and Mitra in 2019 at Sultan Syarif Mohamad Alkadrie Hospital in Pontianak found a strong connection between the severity of hearing loss and lower quality of life in individuals with presbycusis. This study used objective audiometric data to examine the distribution of sensorineural deafness severity in the elderly, with the majority of patients experiencing moderate (35.9%) and severe (30.8%) degrees, followed by mild (25.6%) and very severe (7.7%) degrees. The HHIE-S (Hearing Handicap Inventory for the Elderly-Screening) questionnaire was used to evaluate the subjective impact on quality of life. The questionnaire results clearly reflect the psychosocial burden experienced by patients: almost three-quarters of respondents reported quality-of-life impairments, with the highest proportion in the mild-moderate category (48.7%) and the rest (28.2%) experiencing severe impairments. These findings underscore that the treatment of presbycusis should not focus solely on medical interventions but also on interventions that improve patients' overall quality of life. Research by Maisara, Eva, and Mitra shows a strong association between hearing loss severity and patients' quality of life in presbycusis. As hearing loss increases, their quality of life generally declines more noticeably (Safitri M, 2022).

A previous study by Dewi and Saputra (2024) in Sukawati Village, Gianyar, found A significant link between hearing impairment and HHIE-S scores in the elderly. This research relied on two main types of data to assess presbycusis: audiometry results determined the clinical degree of hearing loss, whereas the Hearing Handicap Inventory for the Elderly-Screening (HHIE-S) questionnaire evaluated the psychosocial effects and quality of life of the individuals affected. This method enables a connection between the level of deafness severity and the functional impairment that the patient perceives. The audiometry results showed that among patients with hearing loss, 36% had mild hearing loss, 22% moderate, 18% severe, and 12% very severe. Using the HHIE-S questionnaire to measure quality of life, 18% of presbycusis patients did not experience impairments, 64% experienced mild to moderate impairments, and 18% experienced severe impairments. Based on the research conducted by Dewi and Saputra, there is a strong link between the elderly's quality of life and the severity of their hearing loss. As individuals age, they become more prone to hearing loss, which further impacts their quality of life (Ni Luh Putu Yustina Dewi & Komang Andi Dwi Saputra, 2024).

Based on the description above, researchers aim to conduct a study to examine the relationship between hearing loss and quality of life among elderly nursing home residents. It

is hoped that this study will provide an overview of how hearing loss affects emotional, social, and daily activities in the elderly.

METHOD

This study used a cross-sectional design and collected primary data to examine how hearing loss affects the quality of life of elderly nursing home residents. Participants were selected through purposive sampling, requiring them to meet specific inclusion criteria. Hearing loss status and severity were assessed using standardized pure-tone audiometry. At the same time, the HHIE-S (Hearing Handicap Inventory for the Elderly - Screening) questionnaire was used to evaluate quality of life. Data was collected from the elderly at the Binjai Elderly Social Service Unit of the North Sumatra Provincial Social Service, during the period from May to December 2025, then analyzed using SPSS. The study population was 103 elderly individuals, and, using the Slovin formula with an error rate of 10%, a sample of 51 respondents was obtained.

The inclusion criteria include elderly respondents who are willing to participate, cooperative, without mental disorders, able to be mobilized, and with clean ear canals. Meanwhile, the exclusion criteria include the elderly who use hearing aids, do not understand the examination procedures, or fail in a series of studies. The independent variables included age, sex, degree of hearing loss, and type of hearing loss, while the dependent variable was quality of life. The research instruments included pure-tone audiometry, HHIE-S questionnaires, consent forms, and ear-microsuction tools for ear cleaning. The research procedure included providing explanations to the elderly, completing informed consent forms, cleaning the ears, completing questionnaires, and performing audiometric examinations in a soundproof room to determine the hearing threshold. The test results were then recorded and processed to serve as a basis for examining how hearing loss affects the quality of life of older adults.

RESULTS AND DISCUSSION

Univariate Analysis

Demographic characteristics of the research subjects

This study was attended by 58 respondents with an elderly age group of 60 ≥ 91 years who were at the Binjai Elderly Social Service UPTD, North Sumatra Provincial Social Service. All subjects included have met the inclusion criteria. The demographic characteristics of the research subjects are shown in full in the following table.

Table 1. Demographic characteristics of respondents

Characteristics	Frequency (n=58)	Percentage (%)
Age		
60-65 years old	26	44,8
65-70 years old	13	22,4
71-75 years old	12	20,7
76-80 years old	5	8,6
81-85 years old	2	3,4
86-90 years old	0	0
>91 years old	0	0

Gender		
Man	25	43,1
Woman	33	56,9

source: processed data

Based on the respondents' demographic characteristics, the largest age group was 60-65 years, with 26 people (44.8%). Meanwhile, by gender, the majority of respondents were women (33, 56.9%), followed by men (24, 43.1%).

Demographic characteristics of respondents based on degree of hearing loss and type of hearing loss

This study used pure-tone audiometry to evaluate hearing impairment in participants. The test measured both ears at 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, and 8000 Hz. The average air conduction threshold was derived from the four main frequencies: 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz.

Table 2. Demographic characteristics of respondents based on the degree of hearing loss

Characteristics	Frequency (n=58)	Percentage (%)
Degree of Hearing Loss of the Right Ear		
<20 dB	5	8,6
20 - <35 dB	23	39,7
36 - <50 dB	12	20,7
50 - <65 dB	15	25,9
65 - <80 dB	2	3,4
80 - <95 dB	1	1,7
≥95 dB	0	0
Degree of Hearing Loss of the Left Ear		
<20 dB	4	6,9
20 - <35 dB	25	43,1
36 - <50 dB	9	15,5
50 - <65 dB	16	27,6
65 - <80 dB	2	3,4
80 - <95 dB	1	1,7
≥95 dB	1	1,7
Types of Right Ear Hearing Loss		
Normal	5	8,6
Conductive Hearing Loss	11	19
Sensorineural Hearing Loss	33	56,9
Mixed Hearing Loss	9	15,5
Types of Left Ear Hearing Loss		
Normal	5	8,6
Conductive Hearing Loss	9	15,5
Sensorineural Hearing Loss	36	62,1
Mixed Hearing Loss	8	13,8

The degree of right ear hearing loss was highest in the 20–35 dB range, with 23 people (39.7%). In the left ear, the highest degree of interference was also in the 20–35 dB range, with 25 people (43.1%). For the type of hearing loss, the majority of respondents experienced sensorineural deafness in the right ear (33 people, 56.9%) and in the left ear (36 people, 62.1%).

Demographic characteristics of the respondents' quality of life based on the HHIE-S questionnaire

Table 3. Demographic characteristics of the respondents' quality of life based on the HHIE-S questionnaire

Characteristics	Frequency (n = 58)	Percentage (%)
HHIE-S Questionnaire Score		
No Handicap	41	70,7
Mild-Moderate Handicap	16	27,6
Severe Handicap	1	1,7

According to the results of the Hearing Handicap Inventory for the Elderly – Screening (HHIE-S) questionnaire, 41 respondents (70.7%) did not experience quality-of-life impairments (score 0–8). A total of 16 respondents (27.6%) experienced mild to moderate quality-of-life impairment (score 10–22), and only one respondent (1.7%) experienced severe quality-of-life impairment (score 24–40).

Data normality test

Table 4. Normality test of HHIE-S score data based on the type of hearing loss

Types of hearing loss	Shapiro-Wilk
	p-value
Normal	<0.001
Conductive Hearing Loss	<0.001
Sensorineural Hearing Loss	<0.001
Mixed Hearing Loss	0.658

Based on the Shapiro-Wilk normality test, most HHIE-S scores for each type of hearing loss were abnormally distributed ($p < 0.05$), except for the mixed hearing loss, which showed normal distribution ($p = 0.658$). Therefore, further analysis uses non-parametric tests.

Bivariate Analysis

The relationship between the degree of hearing loss and quality of life

Table 4. The relationship between the degree of hearing loss and quality of life

Degree of hearing loss	Quality of Life, *n (%)*			Total	r	p
	No handicap (0-8)	Mild-Moderate Handicap (10-22)	Severe Handicap (24-40)			
Normal	5 (8,6)	0 (0)	0 (0)	5 (8,6)	0,641	<0.001
Mild	24 (41,4)	0 (0)	0 (0)	24 (41,4)		
Moderate	8 (13,8)	5 (8,6)	0 (0)	13 (22,4)		
Moderately severe	4 (6,9)	11 (19)	0 (0)	15 (25,9)		
Severe	0 (0)	0 (0)	0 (0)	0 (0)		
Profound	0 (0)	0 (0)	1 (1,7)	1 (1,7)		
Complete	0 (0)	0 (0)	0 (0)	0 (0)		
Total	41 (70,7)	16 (27,6)	1 (1,7)	58 (100)		

Of the 58 respondents, 41 people (70.7%) did not experience quality-of-life impairments, 16 people (27.6%) experienced mild to moderate impairments, and 1 person (1.7%) experienced severe impairments. In the group with normal hearing, which comprised 5 people (8.6%), all experienced a good quality of life without impairment. Similarly, in the group with mild hearing loss, as many as 24 people (41.4%). Among respondents with moderate hearing loss, 8 people (13.8%) did not experience quality-of-life impairments, while 5 people (8.6%) experienced mild-to-moderate impairments. In the moderate-to-severe hearing loss group, 4 people (6.9%) did not experience quality-of-life impairments, while 11 people (19%) reported mild-to-moderate impairments. The group with very severe hearing loss consisted of 1 person (1.7%), who was experiencing severe quality-of-life impairments. The Kendall's Tau_b correlation test revealed a strong relationship between hearing loss severity and HHIE-S scores ($r = 0.641$). All correlations were statistically significant ($p < 0.001$), suggesting that more severe hearing loss is associated with higher HHIE-S scores and reduced quality of life.

The relationship between hearing loss types and quality of life

Table 5. Kruskal-Wallis test results of the relationship between hearing loss type and quality of life (HHIE-S)

Types of hearing loss	Frequency (n = 58)	Median	Minimum	Maximum	p
Normal	5	0	0	8	0,024
Conductive Hearing Loss	13	0	0	10	
Sensorineural Hearing Loss	34	6	0	18	
Mixed Hearing Loss	6	14	0	24	

The Kruskal-Wallis test yielded a p-value of 0.024 ($p < 0.05$), indicating a significant difference in HHIE-S scores among hearing loss groups. Based on the table above, the highest median HHIE-S score was observed in the group with mixed hearing loss (median = 14; range 0–24), indicating that this group experienced greater quality-of-life barriers than the other groups. In the sensorineural hearing loss group, the median score was 6 (range 0–18), indicating a considerable effect on the quality of life for some respondents. Meanwhile, the group with conductive hearing loss had a median score of 0 with a range of 0–10, suggesting that most respondents in this group did not experience significant barriers. Similar things were seen in the group with normal hearing, who showed a median of 0 with a range of 0–8. A follow-up analysis was performed using the Mann-Whitney test to identify significant differences between groups.

Table 6. Results of the Mann-Whitney (Post-hoc) test of the relationship between hearing loss type and quality of life (HHIE-S)

Group 1	Group 2	p
Normal	Conductive hearing loss	0,597
Normal	Sensorineural hearing loss	0,134
Normal	Mixed hearing loss	0,035
Conductive hearing loss	Sensorineural hearing loss	0.080
Conductive hearing loss	Mixed hearing loss	0,014
Sensorineural hearing loss	Mixed hearing loss	0,068

Post hoc Mann-Whitney test results indicated significant differences in HHIES scores across several hearing loss groups. The comparison between the normal and mixed hearing loss groups showed a significant difference ($p = 0.035$), as did the comparison between the conductive hearing loss and mixed hearing loss ($p = 0.014$). These results show that patients with mixed hearing loss experience a greater hearing barrier than those in the normal and conductive groups. Meanwhile, comparisons among other groups revealed no significant difference ($p > 0.05$).

Discussion

Univariate analysis

a. Demographic characteristics of respondents

A total of 58 individuals participated in the study conducted at the Binjai Elderly Social Service Unit of the North Sumatra Provincial Social Service.. The age range of research subjects included in the inclusion criteria was 60 ≥ 91 years, with the largest age group falling between 60-65 years of 26 people (44.8%). Meanwhile, by gender, the majority of respondents were women (33, 56.9%). When viewed by age range, the study by Ni Luh Putu Yustina and Komang found that the majority of the sample was 60-64 years old (15 people, 30%) and 65-69 years old (15 people, 30%). Similarly, Lauren et al.'s study found that the most significant portion of the sample, aged 60-69 years, comprised 57 individuals (38.1%). However, it was found that different results were found in the study conducted by (Ni Luh Putu Yustina Dewi & Komang Andi Dwi Saputra, 2024; Dillard et al., 2024). Maisara et al. reported that the most common age range was 70-79 years, with 15 people (38.5%) (Safitri M, 2022).

Based on Lauren's research, there is a relationship between increasing age and a rise in hearing threshold, with increases of 0.42-1.44 dB annually at 60-69 years. (Dillard et al., 2024). Wu et al. reported that although the loss of deep hair cells was relatively minimal (less than 15% on average), significant loss of peripheral nerve fibers occurred, especially in individuals over 60, with more than 60% of axons disappearing. The resulting nerve damage is much more severe and cannot be identified through a standard audiogram. These findings suggest that many auditory neurons in the elderly ear are disconnected from their hair cell targets. This condition is considered a significant cause of hearing loss among older adults, particularly in noisy environmental situations (Wu et al., 2019).

Maisara et al. conducted a study on the quality of life of patients with presbycusis, in which 24 of 39 samples (61.5%) were female. Similar findings were reported in a study by Ni Luh Putu Yustina and Komang, which examined the relationship between HHIE-S scores and hearing loss in older adults. Of the 50 samples, 30 were female (60%) (Safitri M, 2022; Ni Luh Putu Yustina Dewi & Komang Andi Dwi Saputra, 2024).

Gender differences are among the factors contributing to hearing loss. Hearing threshold decline at high frequencies is more common in men due to noise exposure in the work environment, whereas in women, it is more pronounced at low frequencies due to vascular stria damage. Estrogen is thought to be neuroprotective and neurotrophic in the auditory system. Estrogen receptors are divided into two primary types: alpha (ERα) and beta (ERβ). ERα is uniquely located in the spiral ganglia. At the same time, ERβ is limited

to vascular strial cells. Both play important roles: ERα in signal transmission and ERβ in maintaining cochlear function stability. It was found to exhibit a significant and rapid decrease in auditory sensitivity after menopause, especially at 1 kHz and 3 kHz. However, in this study, the dominance of women was a coincidental finding because it used a cross-sectional design. So it cannot be concluded that the majority of presbycusis occurs in women (Corazzi et al., 2020; Lien & Yang, 2021; Aloufi et al., 2023).

b. Demographic characteristics of respondents based on degree of hearing loss and type of hearing loss

When viewed in terms of hearing loss, the findings of this study align with those of Mo et al. (2024) in the United States from 1998 to 2018. Of the 15,498 samples aged 20 years or older, mild deafness had the highest prevalence, ranging from 12% to 45.1% across the 20-79 year age range. However, a study by Ji-Su Kim (2015) in South Korea reported different results. Of the 5,447 samples over 60 years old, the majority had normal hearing: 2,834 (50.8%), followed by 1,726 (32.4%) with mild deafness. Wang et al. (2025) conducted research across four provinces in China: Jilin, Guangdong, Shaanxi, and Gansu. With 43,807 samples aged between 0 years and over 65 years, the majority of the sample had normal hearing, as many as 28,398 people, followed by the second, as many as 11,803 people with mild deafness (Mo et al., 2024; Kim, 2015; Y. Wang et al., 2025).

Variations in hearing loss severity across studies can be due to differences in population characteristics and the hearing threshold classification standards used. Studies with the general population tend to show the majority of results in the normal category because they include individuals without hearing complaints. Conversely, studies involving populations with a history of hearing impairment or conducted in clinical settings generally show that most individuals fall within the mild hearing loss.

In addition, the 2021 WHO classification standard, which sets the limit for mild hearing loss at 20-34 dB, may lead more individuals to fall into this category. In contrast to the 1991 WHO classification, which uses a threshold of 26-40 dB as a category of mild hearing loss. Research (World Health Organization, 2021; Olusanya et al., 2019). The National Health and Nutritional Examination Survey (NHANES) 2001–2010 (2016) reported that among individuals aged 12–79 years, the mild category is the most prevalent level of hearing loss. In contrast, in the elderly ≥80 years, the moderate category is more common. These two factors indicate that the prevalence of hearing loss depends mainly on age and the classification method used in the study (Goman & Lin, 2016).

Khanal et al. (2021) conducted a study in Nepal that found results similar to those regarding hearing loss types. Out of 1.654 samples, the majority (49.60%) had sensorineural hearing loss (SNHL), with conductive hearing loss (CHL) at 25.11% and mixed hearing loss (MHL) at 9.41%. (Khanal et al., 2022). A similar finding was reported in a study by Shofoluwe et al (2025) in Kaduna, Nigeria. Among 673 samples, over 70 years old, 76.5% had Sensorineural hearing loss (SNHL), while 5.9% had conductive hearing loss (CHL), and 17.6% had mixed hearing loss (MHL)(Shofoluwe et al., 2025).

In this study, the majority of hearing loss types identified were sensorineural hearing loss (SNHL), as reported in previous research. Sensorineural hearing loss develops gradually, usually starting around age 50. Generally, this hearing decline is characterized by various pathological changes, including damage and loss of hair cells, degeneration of the

vascular stria, reduced numbers of spiral ganglion neurons, damage to the basal membrane, and disorders in the central auditory cortex. As a result, there is an increase in the hearing threshold and a decrease in the ability to recognize sounds and understand speech (Löhler et al., 2019; Lin et al., 2025).

c. Demographic characteristics of the respondents' quality of life based on the HHIE-S questionnaire

This study's findings align with those of Ruana et al. (2020). Among the 238 samples aged 60-100 years, the majority (174, 73.1%) did not experience disturbances in their quality of life. A similar finding was reported by Xin-Ying et al. (2016) in China. Of the 84 samples aged 80 or older, most participants (48, 57.1%) did not report experiencing disturbances in their quality of life (Da Silva Campos et al., 2022; Liu et al., 2016).

However, a study by Ni Luh Putu Yustina and Komang (2024) in Sukawati district, Gianyar Regency, Bali province, revealed different results. Of the 50 samples from individuals over 60 years of age, the majority (32, 64%) had mild-to-moderate quality impairments. Likewise, in the research carried out by Maisara et al. (2022) at Sultan Syarif Mohamad Alkadrie Hospital in Pontianak, 39 samples were studied, with ages ranging from 50 to over 80 years, the majority of the elderly (19 people, 48.7%) experienced mild-to-moderate quality-of-life impairments (Ni Luh Putu Yustina Dewi & Komang Andi Dwi Saputra, 2024; Safitri M, 2022)

This study's findings align with those of Alexandre and Luceini (2017), who investigated the link between audiometry results and the Hearing Handicap Inventory for the Elderly – Screening version (HHIE-S). In their study, out of 28 elderly participants with standard audiometry, 21 people (75%) reported no hearing difficulties based on their HHIE-S scores. Additionally, among the 110 elderly with audiometric results indicating hearing loss, 98 (89.1%) reported disturbances in daily activities, while 12 (10.9%) did not. These findings suggest that the elderly's perception of hearing loss is not always consistent with objective audiometric results. This indicates that some older people still feel undisturbed in their quality of life even though they are clinically found to have hearing loss. In contrast, others feel disturbed even though the audiometry results are still within normal limits (Servidoni & De Oliveira Conterno, 2018).

d. Data normality test

Normality tests were performed to assess whether the distributions of HHIES scores in each hearing-loss group were normal. This is important because the normality test results guide whether to use a parametric or nonparametric statistical test. In this study, the Shapiro-Wilk test was chosen to evaluate normality because each group's sample size was less than 50. The test results indicated that the HHIES scores for the normal, conductive hearing loss, and sensorineural hearing loss groups were not normally distributed ($p < 0.05$). Conversely, the distribution in the mixed hearing loss group was normal ($p > 0.05$). This indicates that most of the data does not meet the assumption of normality. Based on these results, the researcher used a nonparametric statistical test, specifically, the Kruskal-Wallis test, to compare HHIES scores across more than two groups, and the Mann-Whitney test as a post hoc test for comparisons between two groups (Sugiyono, 2013).

Bivariate analysis

a. The relationship between the degree of hearing loss and quality of life

In this study, 41 respondents (70.7%) had HHIE-S scores of 0–8, with most (24 people, 41.4%) experiencing mild hearing loss. Among the 16 individuals (27.6%) with HHIE-S scores of 10–22, the majority faced moderate-to-severe hearing loss (11 people, 19%). Additionally, one respondent (1.7%) scored 24–40, indicating severe hearing loss. The Kendall's Tau_b correlation test showed a strong positive relationship between right ear hearing loss severity and HHIE-S scores ($r = 0.641$; $p < 0.001$). This indicates that higher HHIE-S scores are linked to more severe hearing impairment among respondents.

In this study, the average hearing threshold in the ear with the best hearing was determined from audiometry examinations performed on both ears. The average hearing threshold was then compared between the right and left ears. Ears with a lower average threshold are called "better ears". This approach was chosen because each ear can have a different hearing threshold, thereby providing a more detailed audiometric picture. In previous studies, the average hearing threshold value approach in the ear with the best hearing was used as a basis for comparison with the HHIE-S score. As reported by Tzong-Han et al. (2021) in Taiwan, a moderate correlation was observed between the subjective HHIE-S score and the best-ear average hearing threshold at 0.5–4 kHz. ($r = 0.45$). This suggests that subjective perceptions of hearing loss are more influenced by the ear with the best hearing threshold than by the ear with the worst. The principle of using (Yang et al., 2021).“Better ears*”* are also in line with WHO guidelines, both in the “Ear and Hearing Survey Handbook” and the “Guidelines for Hearing Aids for Developing Countries”, which state that the determination of the degree of deafness is based on the best hearing threshold of the ear at audiometric frequencies (World Health Organization, 2020; World Health Organization, 2004).

b. The relationship between hearing loss types and quality of life

The Kruskal-Wallis test showed a significant difference in the quality-of-life score (HHIE-S) across hearing loss groups ($p = 0.024$; $p < 0.05$). This indicates that the type of hearing loss significantly affects the quality of life for the elderly in this study. Individuals with mixed deafness reported the heaviest quality-of-life barriers (median = 14, range 0-24), higher than those in the sensorineural, conductive, and normal hearing loss groups. In the median sensorineural group 6 (0-18), it was found that although the disorder was permanent, the effects still varied between individuals. In the conductive deaf group and the normal hearing group, a median of 0 indicated that most respondents did not experience significant impairment, although some individuals had relatively low maximum scores. This pattern confirms that the more complex the type of hearing loss (sensorineural > conductive > normal), the more likely it is to be linked to a decrease in quality of life.

Follow-up analysis using the Mann-Whitney test revealed significant differences between the normal group and mixed hearing loss ($p = 0.035$) and between conductive hearing loss and mixed hearing loss ($p = 0.014$). This means that the elderly with mixed impairments experience greater hearing impairment than the normal and conductive hearing loss groups. Meanwhile, comparisons between other groups did not show significant differences.

This study's findings align with previous research indicating that mixed deafness imposes a greater psychosocial and communication burden than either conductive or sensorineural disorders alone. For example, the study "The Bonebridge in Adults with Mixed and Conductive Hearing Loss" found that patients with conductive or mixed hearing loss experienced communication and social challenges prior to intervention but improved quality of life after using bone conduction aids (Skarżyński et al., 2019). Additionally, the research "Effects of the Conductive Component of Hearing Loss on Speech Discrimination Ability" found that speech discrimination in the mixed deafness group was generally lower than in the sensorineural and conductive groups, especially among older adults, suggesting greater communication difficulties (Kurioka et al., 2020).

In conductive hearing loss, an obstacle prevents the mechanical transmission of sound waves from the outer and middle ear to the cochlea. so that the intensity of the sound that reaches the Corti organ is reduced. This condition generally leads to a decrease in the intensity of the sound received or a reduction in the individual's ability to detect low-intensity sounds. In sensorineural deafness, vascular stria dysfunction decreases endocochlear potential, impairing outer hair cell amplification and causing high-frequency hearing loss. Additionally, degeneration of sensory cells, especially outer hair cells, hampers amplification, further contributing to hearing impairment. Neuronal degeneration is also thought to cause speech discrimination problems, particularly in noisy settings (Keithley, 2020).

In mixed hearing loss, the sound received first undergoes a reduction in intensity due to the conductive component, and is subsequently distorted by sensorineural damage. This decrease in signal quality impairs the ability to discriminate sound, especially in noisy environments, more than if it were only one component. This causes the impact of daily communication and quality of life to tend to be heavier in patients with mixed deafness (Anastasiadou & Al Khalili, 2023).

However, so far, no literature explicitly categorizes all types of hearing loss (normal, conductive, sensorineural, and mixed) within a single comprehensive research framework and concludes unequivocally that mixed types have the most significant impact on quality of life. Therefore, additional research with a design that includes all types of hearing loss and a larger sample size is necessary to enhance the validity and generalizability of the findings.

CONCLUSION

The results showed that the majority of respondents were 60–65 years old (44.8%) and female (56.9%). The most common hearing loss was mild (20–35 dB) in both the right (39.7%) and left (43.1%) ears, with sensorineural and mixed hearing loss being the most common types. The analysis revealed a strong correlation between hearing loss severity and quality of life in elderly people ($r = 0.641$; $p < 0.001$). Most of the elderly (70.7%) did not experience quality-of-life impairments, while 27.6% experienced mild–moderate impairments and 1.7% experienced severe impairments. Elderly people with normal hearing and mild impairments generally have a good quality of life, but in moderate to very severe disorders, there is a decrease in quality of life. In addition, there was a significant difference in HHIE-S scores between hearing loss types ($p = 0.024$), with the mixed disorder group having the highest

barrier score and the lowest quality of life. These findings underscore the significance of early detection and intervention for hearing loss to avoid a decline in quality of life among elderly nursing home residents.

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