Literature Review

Correlation of hearing aid use and quality of life in elderlies: A systematic review

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ABSTRACT

Background: Aging can lead to degeneration processes in multiple organs, including the auditory organs, resulting in hearing loss. Hearing loss in the elderly often affects their quality of life (QOL). One of the procedures to improve this could be done by fitting hearing aids (HA). According to the National Center of Health Statistics (NCHS) data, hearing loss in people over 65 years old is 26.8%. However, only 14.4% use hearing aids. **Purpose:** To find out the correlation between the use of hearing aids and the quality of life of the elderly. **Literature review:** This was a systematic review with an observational study approach. Data analysis was performed using Review Manager software. QOL was assessed with the Hearing Handicap Inventory for Elderly (HHIE) questionnaire. Afterwards, comparing between the elderly who used HA and those who did not use HA. **Results:** The literature identified from the medical database reached 728 features, but only 4 met the criteria. From the research results, it was found that there was a statistically significant difference in HHIE scores between elderly people who used and did not use hearing aids. In social HHIE p=0.03 (p<0.05), emotional HHIE p=0.02 (p<0.05), and total HHIE p=0.006 (p<0.05). Total HHIE, a combination of social and emotional HHIE, described the overall quality of life. **Conclusion:** Hearing aids were considered effective for reducing limitations due to hearing loss, especially communication in the elderly. In other words, the quality of life in the elderly who used HA was better than in the elderly who did not use HA.

Keywords: elderly, hearing loss, hearing aids, quality of life

ABSTRAK

Latar belakang: *Penuaan dapat menyebabkan proses degenerasi pada berbagai organ, termasuk organ auditori sehingga terjadi gangguan pendengaran. Gangguan pendengaran pada lansia seringkali memengaruhi kualitas hidupnya. Salah satu upaya untuk memperbaiki hal tersebut dapat dilakukan dengan pemasangan alat bantu dengar (ABD). Menurut data* National Center of Health Statistics (NCHS), *gangguan pendengaran di usia lebih dari 65 tahun mencapai 26,8%; tetapi, hanya 14,4% diantaranya yang menggunakan alat bantu dengar.* ***Tujuan:*** *Mengetahui hubungan penggunaan alat bantu dengar terhadap kualitas hidup lansia.* ***Tinjauan Pustaka:*** *Menggunakan metode* systematic review *dengan pendekatan studi observasional. Analisis data dilakukan dengan perangkat lunak* Review Manager. *Kualitas hidup dinilai dengan kuisioner* Hearing Handicap Inventory for Elderly (HHIE), *lalu dibandingkan antara lansia yang menggunakan dan tidak menggunakan ABD.* ***Hasil:*** *Literatur yang teridentifikasi dari* medical database *mencapai 728 tulisan, tetapi hanya 4 yang memenuhi kriteria. Dari hasil penelitian didapatkan bahwa terdapat perbedaan skor* HHIE *yang signifikan secara statistik antara lansia yang menggunakan dan tidak menggunakan alat bantu dengar. Pada* HHIE *sosial didapatkan p=0.03 (p<0.05),* HHIE *emosional p=0.02 (p<0.05), dan* HHIE *total p=0,006 (p<0,05). Kualitas hidup secara keseluruhan digambarkan oleh* HHIE *total yang merupakan gabungan antara* HHIE *sosial dan emosional.* ***Kesimpulan:*** *Alat bantu dengar dinilai efektif untuk menurunkan keterbatasan akibat gangguan pendengaran, terutama komunikasi pada lansia. Dengan demikian kualitas hidup pada lansia yang menggunakan ABD lebih baik daripada lansia yang tidak menggunakan ABD.*

Kata kunci: *lansia, gangguan pendengaran, alat bantu dengar, kualitas hidup*

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INTRODUCTION

Aging can cause degeneration in various organs, including the auditory organs, resulting in hearing loss. Hearing loss in the elderly, starting at the age of 65 years, is called presbycusis and is bilaterally symmetrical with slow progressivity.[1,2] The degeneration process causes changes in the structure of the cochlea and vestibulocochlear nerve. This leads to perceptual disturbances in the form of tinnitus.[2,3] A definitive diagnosis of presbycusis is made with a pure-tone audiometry examination, which shows bilateral symmetrical high-tone nerve deafness.[2,4]

World Health Organization (WHO) reported in 2021, that hearing loss occurs in 20% of the world's population or reaches 1.5 billion people. The prevalence of hearing loss increases with age, reaching 42% of individuals over 60 years of age.[5] In Indonesia, according to the 2013 Riskesdas data, the prevalence of hearing loss was 2.6%. When viewed from the age group, the highest prevalence occurred in the age group 75 years and over (36.6%), followed by the age group 65-74 years (17.1%).[6]

A person with presbycusis will find it difficult to hear high-frequency sounds, especially consonants in a word. Consonants play an important role in conveying the meaning of a word and in the construction of grammar. In addition, presbycusis will also find it difficult to understand words spoken quickly in a place with a noisy background (cocktail party deafness).[2,7,8] This reduces the quality of life of an elderly person with presbycusis. The quality of life is related to the severity of presbycusis; the more severe the presbycusis, the lower the quality of life.[9,10]

Fitting hearing aids can do management for presbycusis. Hearing aids can optimize hearing function and improve psychosocial status, improving quality of life.[7] Hearing aid fitting could also be combined with speech listening and speech reading training conducted by a speech therapist.[2] According to data from the National Center for Health Statistics (NCHS), in the United States, hearing loss in people over 65 years of age reached 26.8%. However, only 14.4% of them used hearing aids.[11]

Based on the description above, presbycusis is one of the problems that affect the quality of life in elderly persons. The incidence of presbycusis is also quite high, especially in Indonesia. The enhancement of hearing ability can be achieved through the utilization of hearing aids, which unfortunately remain unknown to many.

The purpose of this literature review was to figure out the association between hearing aids and hearing loss in the elderly. Furthermore, this study aims to enhance public awareness regarding the advantages of hearing aids.

METHOD

This was a systematic review with an observational study approach that assessed the quality of life of older people who used and did not use hearing aids.

The keywords applied in the search included "hearing aid for presbycusis", "hearing aid" AND "quality of life" OR

"HHIE" AND "presbycusis" OR "elderly", "user vs non user hearing aid" AND "elderly" OR "presbycusis" AND "quality of life". In addition, there were inclusion and exclusion criteria in the literature search. Inclusion criteria: studies on the relationship of hearing aids on hearing loss, study subjects ≥60 years old, using observational methods and HHIE questionnaires, and published between 2013 to 2023 in English. Exclusion criteria: studies that did not have a comparison group, article reviews, and could not be accessed in full text.

After the literature search stage, then we proceeded to the journal quality review. The assessment of journal quality reviews was conducted by following the Scottish Intercollegiate Guidelines Network (SIGN) methodology checklist for the criteria of Cohort and Case control.

Data analysis was conducted using Review Manager (RevMan) software. Mean and Standard Deviation (SD) were used to analyse any differences between the two variables. The Confidence Interval (CI) was set at 95%. Data was considered statistically significant when the p-value was <0.05.

RESULT

Systematic review and meta-analysis research were conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. A literature search through Google Scholar, Cochrane, Pubmed, Pubmed Central, BioMed Central (BMC), Researchgate, ProQuest, NEJM, and Plos One. The search in the databases resulted in 728 literatures. There were only four literatures which met the inclusion and exclusion criteria. Each of the four articles had demonstrated positive SIGN scores, indicating their eligibility for inclusion in the meta-analysis. The results of the literature search were presented in Figure 1.

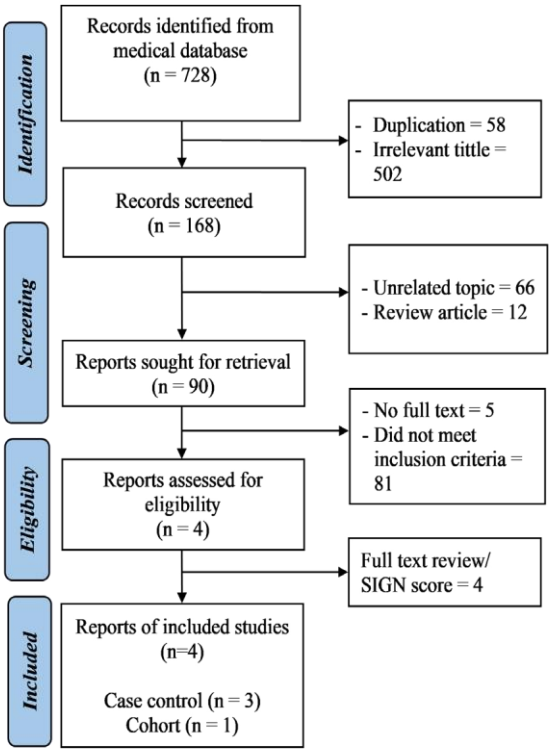

Figure 1. PRISMA flow diagram of literature search

Table 1 showed that one study had a cohort method, while the other three were case-control. The SIGN score (+) meant the quality of the journal was acceptable and (++) meant high quality. The cases in this study referred to the elderly population utilizing hearing aids, whereas the controls pertain to the elderly population without hearing aids. Quality of life was assessed by the HHIE questionnaire, which was divided into social HHIE, emotional HHIE, and total HHIE. The higher the HHIE value, the more severe the social and emotional impairment.[14] Table 2 showed that in the Maeda et al.[12] study, the control HHIE score was better than the case, while in the Tas et al.[7] study, the case HHIE score was better than the control. The Midha et al.[13] study showed variations between social, emotional, and total HHIE scores. In Said[14] study, the HHIE score results were divided by male and female gender.

Table 1. Study characteristics

Study	Design study	SIGN score	Subject	n	Age	Types of hearing loss	Duration of HAs use
Maeda, *et al*., 2016 (12)	Cohort	+	Case	78	75.3 ± 6.5	Mild – moderate SNHL	4 months
			Control	23			
Midha, *et al*., 2015 (13)	Case-control	++	Case	39	≥60	Mild – severe SNHL	
			Control	34			
Said, 2017 (14)	Case-control	++	Case	24	68.4 ± 7.4	Severe SNHL	≥ 6 months
			Control	90			
Taş, *et al*., 2023 (7)	Case control	++	Case	15	68.46 ± 2.72	Moderate SNHL	≥ 1 years
			Control	15			

Table 2. Data on the study

Study	Subject	n	Social HHIE score	Emotional HHIE score	Total HHIE score
Maeda, *et al*., 2016 (12)	Case	78	19.7 ± 11.0	21.5 ± 13.9	41.2 ± 24.1
	Control	23	14.9 ± 10.5	13.0 ± 10.3	27.8 ± 20.0
Midha, *et al*., 2015 (13)	Case	39	31.33 ± 13.34	28.10 ± 14.90	59.44
	Control	34	29.41 ± 9.55	33.29 ± 13.25	62.71
Said, 2017 (14)	Case	24			
		F: 8	8.8 ± 2.6	8.0 ± 2.03	22.1 ± 3.85
		M: 16	9.8 ± 1.98	6.2 ± 1.42	25.7 ± 2.37
	Control	90			
		F: 26	21.4 ± 3.78	26.6 ± 3.95	47.0 ± 7.21
		M: 64	26.2 ± 2.53	28.0 ± 4.31	41.5 ± 6.21
Taş, *et al*., 2023 (7)	Case	15	21.20 ± 7.73	20.40 ± 10.61	41.06 ± 11.82
	Control	15	35.60 ± 6.51	30.40 ± 4.85	64.13 ± 4.86

Correlation between Hearing Aid Use and Social HHIE Score

A comparison of social HHIE scores in hearing-impaired elderly people who used and did not use hearing aids was shown in Figure 2.

The five data obtained a combined mean difference of -7.62 [-14.47, -0.78]. The combined mean difference is illustrated as a diamond shape that shows no intersection with the vertical line and the p-value = 0.03 ($p < 0.05$), which means that there is a statistically significant difference in social HHIE scores between elderly hearing aid users and non-hearing aid users. The heterogeneity of statistical data between studies is seen from Chi^2 <0.00001 and I^2=96%, so it is concluded that the data between studies are heterogeneous.

Correlation between Hearing Aid Use to Emotional HHIE

A score comparison of emotional HHIE scores in the elderly with hearing loss using hearing aids and without hearing aids is shown in Figure 3.

Figure 3 illustrates the combined mean difference is - 9.78 [-17.94, -1.61]. The combined mean difference depicted as a diamond does not intersect the vertical line and the p-value = 0.02 ($p < 0.05$) means that there is a statistically significant difference in emotional HHIE scores between elderly people with hearing aids and without hearing aids. The heterogeneity of statistical data between studies is seen from Chi^2<0.00001 and I^2=97%, so it is concluded that the data between studies are heterogeneous.

Correlation between Hearing Aid Use and Total HHIE Score

A comparison of the total HHIE score in the elderly with hearing loss with and without hearing aids is shown in Figure 4.

According to Figure 4, the combined mean difference showed better total HHIE score results in the elderly who used hearing aids than those who did not use them (-13.70 [-23.40, -3.99]) and was statistically significant with a p-value = 0.006 ($p < 0.05$). Heterogeneity test between studies obtained Chi^2 <0.00001 and I^2 =95%, which means that the data between studies are heterogeneous.

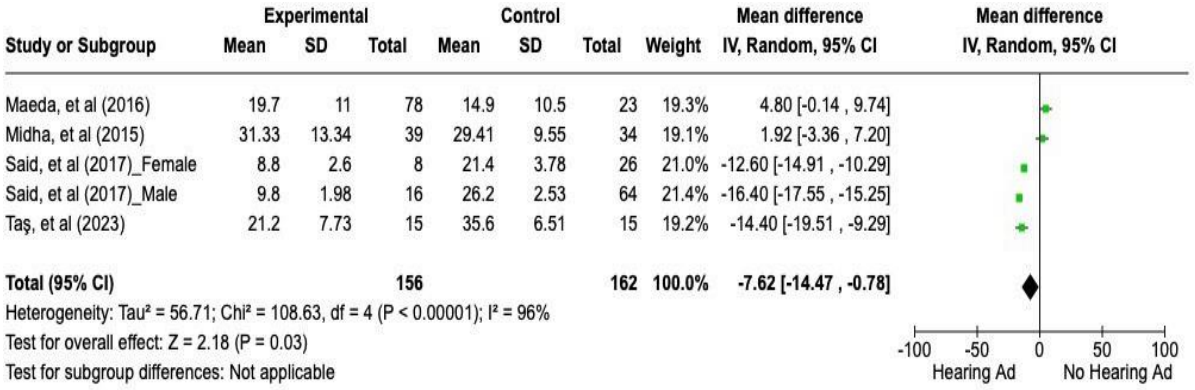

Figure 2. Forest plot diagram meta-analysis of social HHIE scores

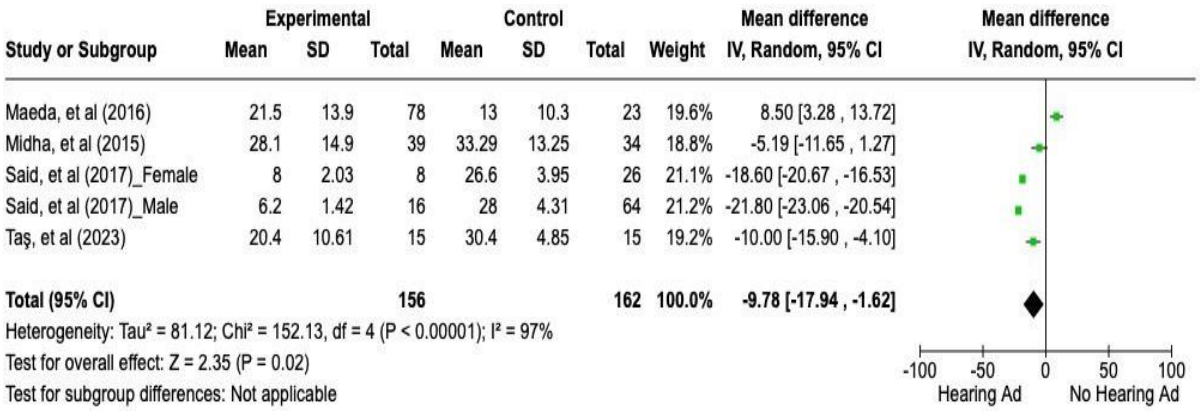

Figure 3. Forest plot diagram meta-analysis of emotional HHIE scores

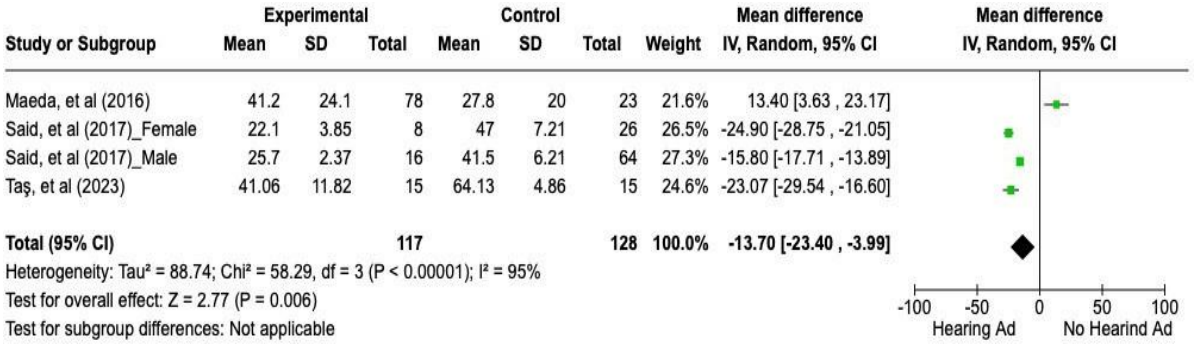

Figure 4. Forest plot diagram meta-analysis of total HHIE scores

DISCUSSION

The social HHIE questions consist of 12 items related to the effects of hearing loss on social and situational conditions, including the use of telephone, television, and radio, as well as social interaction between family, friends, and neighbors, and also some activities such as shopping, or worship activities.[15] According to Kozáková et al.[16], elderly people with hearing loss had the main complaints of difficulty communicating in noisy environments, as well as difficulty listening to television and radio. Communication and interaction between family members was also limited, so elderly people tended to feel isolated.[7]

The purpose of hearing aids is to minimize hearing impairment and enhance quality of life.[17] According to Said et al.[14], Nearly 80% of elderly individuals who used hearing aids experienced an improved social life and enhanced problem-solving abilities. Meanwhile, the elderly who did not use hearing aids tended to withdraw from social activities, and had difficulty finding a way out of their problems due to obstructed communication.

A person who was reluctant to wear hearing aids was usually caused by several reasons, including feelings of embarrassment due to community stigma, and difficulty in adjusting the device to suit environmental conditions.[13,14] These factors sometimes also affected people who already used hearing aids, and caused their social HHIE scores to be no better than people without hearing aids.[13]

The emotional Hearing Handicap Inventory for Elderly (HHIE) serves to assess the patient's attitudes and emotional and other people's responses to their hearing loss which consists of 13 questions.[15] Hearing loss can cause a person to feel embarrassed, irritable, frustrated, tense, depressed, lonely, and experience rejection by others. This triggers disturbances in their psychological state.[14,15]

According to Said et al.[14], negative feelings, such as anxiety, tension, and feelings of sadness, were more common in the elderly who did not wear hearing aids (60.4%) compared to those who wore hearing aids (14.5%). The ability to concentrate in hearing aid users was considered better than people without hearing aids.

The total HHIE score is obtained by combining the social HHIE score and emotional HHIE score. The total score ranges from 0-100. A score of ≤16 means no impairment, 17-42 means mild-moderate impairment, and ≥43 is severe impairment. Data from the four studies included in the meta-analysis showed that the total HHIE score fell into the mild-moderate and severe impairment categories.[13,14]

Data analysis from the four literatures above assessed the quality of life in the elderly based on the HHIE score. The higher

the HHIE score, the more severe the social and emotional impairment. If the HHIE value is low, it indicates that the hearing loss experienced by the elderly does not limit their daily activities too much, and does not interfere with their quality of life.[14] Most of these studies showed HHIE scores classified as mild-moderate impairment.

The heterogeneity of data from social HHIE, emotional HHIE, and total HHIE scores showed a considerable value. When viewed from Table 3.1, each study had diverse results, ranging from the number of subjects, average age, degree of hearing loss, and duration of hearing aid wear. The differences in each of these variables could affect the results of the study. Two of the four studies, Maeda et al.[12] and Said et al.[14] had a considerable difference between the number of subjects in cases and controls. Consequently, there was a significant variation in the average age of each study. Then, each research subject also had varying degrees of hearing loss. Some studies only assessed moderate and severe SNHL, but some other studies combined several degrees of hearing, such as mild-moderate and mild-severe SNHL, into one outcome. The duration of hearing aid wear was also quite varied, ranging from 4 months to more than 1 year. Therefore, the data between studies was heterogeneous.

As age increases, a person's quality of life will reduce.[14] On the other hand, there were a number of studies that stated that age had no relationship with quality of life in the elderly with hearing loss.[18-20] The degree of hearing loss also had an impact on quality of life; the more severe the hearing loss, the communication barriers will be greater, and interfere with the quality of life.[14] Said,[14] Ertuğrul et al.[21] and Barbosa et al.[22], assessed HHIE scores in the elderly before and after wearing hearing aids. All three studies showed improvements in HHIE scores after using hearing aids within 4 - 6 months.

Maeda et al.[12], conducted a study with a cohort method to determine whether quality of life was a determining factor for the elderly to wear hearing aids. The findings indicated that elderly individuals who did not perceive hearing loss as a concern, or had a satisfactory quality of life opted against utilizing hearing aids. Meanwhile, older adults with a lower quality of life made the choice to retain the use of hearing aids. Dawes et al.[23], compared HHIE scores in elderly hearing aid users, when using aids and without aids. The results illustrated that HHIE scores were better when hearing aids were in use, but clinically still showed hearing loss. The study explained that the use of hearing aids were beneficial for reducing limitations due to hearing loss, although hearing aid users still felt the presence of interference when hearing.

Other factors also influence the quality of life in the elderly besides hearing loss. The first factor is chronic diseases, such as cardiovascular disease, diabetes mellitus, and hypertension.[14,17] In Said[14] study, elderly people who had these chronic diseases and used hearing aids had better quality of life scores than elderly people who did not wear hearing aids. In addition, economic conditions also had a role in a person's quality of life. If economic conditions were stable, then quality of life could improve.[18,24] Stable financial conditions allowed the elderly to be able to fulfilled their daily needs, one of which was hearing aids. Therefore, financial adequacy was one of the determining factors to having a hearing aid.[14,18] Then, Activities of Daily Living (ADL) is another factor that also affects the quality of life of the elderly. The elderly with good ADL scores have better social-emotional functioning, and help improve their quality of life.[25] Another factor is marital status, elderly who are still married are considered to have a better quality of life because they can share their emotions, thoughts, and daily experiences with their partner. In contrast, older people who no

longer have a partner can feel lonely, sad, and anxious.[25,26]

Hearing loss could affect the quality of life of the elderly.[9,10] In addition, several other factors also affect the quality of life in the elderly.[25] In this review, these factors could not be described. Factors related to hearing aids, such as type, brand, and duration of use during the day, could not be identified. As a result, it might have an impact on the results of the literature review. In addition, these results were not representative of the general population due to the limited literature included in the analysis. Thus, there is still a great need for further research related to hearing aid use in the elderly, especially in Indonesia because the number is still very limited. Also, further research can assess the effectiveness of hearing aids in each degree of hearing loss by including a larger number of research subjects.

Based on the results of the literature review, it could be concluded that hearing aids are considered to correlate with reducing limitations due to hearing loss, especially communication in the elderly. In addition, older people with hearing aids have better social, emotional, and total HHIE scores than older people without hearing aids. The quality of life of the elderly after using hearing aids is also considered better.

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