Correlation Between Presbycusis with Quality of Life Based on Hearing Handicap Inventory for the Elderly Screening Version (HHIE-S) in Dustira Army Hospital

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Abstract. Presbycusis is an age-related hearing loss caused by a degeneration process which is a cumulative effect of various risk factors. The unpreparedness of the elderly to encounter these conditions will have an impact on the low achievement on their quality of life. Hearing Handicap Inventory for the Elderly-Screening version (HHIE-S) questionnaire is a questionnaire that can be used to measure quality of life in patients with hearing loss. This study was aimed to determine whether there is a relationship between presbycusis with the quality of life, using cross sectional analytical research methods. The data used in form of primary data is the result of filling in the guided questionnaire and the results of the audiogram, while secondary data is in the form of medical records of presbycusis patients at Dustira Hospital in the period January 2017-December 2018. Data were analyzed descriptively, by Chi Square Test and Spearman Correlation Test. The incidence of presbycusis in the period January 2017-December 2018 at Dustira Hospital is 2,6%. The result showed most of the patients were aged 65–74 years (61,8%), male (52,7%), married (58,2%), economic were similarities between moderate and low economic status (49.1%), had a history of chronic diseases (76, 4%), had a moderate degree of hearing loss (61,8%) and had a mild-moderate degree of quality of life (52,7%). The results showed that there was a significant and strong relationship between presbycusis and patients's quality of life ($p < 0.001$) and $r = 0{,}509$. So more severe degree of hearing loss in presbycusis patients, more severe decrease in patients quality of life.

Keywords: HHIE-S · Presbycusis · Quality of life

1 Introduction

The aging process is a normal and natural process for every individual, accompanied by a decrease in physical, psychological, and social conditions that interact with each other due to increasing age [1]. Changes in these conditions for someone who has entered old

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age will be seen from various body systems, one of which is a decrease in the sensory system, namely a decrease in hearing function [2].

Presbycusis is an age-related hearing loss caused by a degeneration process and is the cumulative effect of the influence of hereditary factors, metabolism, drugs, food, noise exposure, or is multifactorial. On pure-tone audiometry test, patients with presbycusis show moderate to severe reduction in bilateral symmetrical high-frequency sensorineural hearing loss [3–6].

The occurrence of hearing loss at the age of 65 years is five times more than the age of less than 65 years. According to the World Health Organization (WHO), currently there are about 360 million (5.3%) people in the world experiencing hearing loss, 328 million (91%) are adults consisting of 183 million men and 145 million women [7]. The prevalence of hearing loss increases with age. The prevalence of hearing loss in people over the age of 65 varies from 18 to almost 50% worldwide [8]. The results of the National Health Survey of Sight and Hearing in 7 provinces in 1993–1996, the prevalence of hearing loss of 16.8% caused by presbycusis was 2.6% [9]. Based on research conducted by Hoffman in 2016, 51.1% of adults aged 60–69 years in the United States experienced bilateral high-pitched hearing loss [10].

Nationally, in Indonesia, according to the results of the 2013 Indonesia Basic Health Research (Riskesdas), the highest prevalence of hearing loss was in the age group 75 years and over, which was 36.6%, followed by the age group 65–74 years at 17.1%. Prevalence of respondents with hearing loss in female tend to be slightly higher than male and the highest prevalence for deafness is in the same age group with hearing loss, namely age 75 years is 1.45%. In a study conducted by Latansa, the prevalence of presbycusis in the elderly was 21.7% [11, 12].

The elderly usually is not aware of the decreased function of the sense of hearing and feel fine. Impaired communication and socialization are problem that will arise due to presbycusis. The existence of these disorders will influence the psychosocial of the elderly such as social isolation, withdrawal, irritability, anxiety, and loss of self-confidence. The unpreparedness of the elderly to face this situation will have an impact on the low achievement of the quality of life [13–15].

Quality of life according to WHO is an individual's perception of the individual's position in life according to the cultural context and the value system he/she adheres to in which the individual lives and its relationship to the expectations, goals, standards set and the concerns of a person. Problems that cover quality of life are very broad and complex including problems of physical health, psychological status, social relationships, and the environment in which they are located [16, 17].

One of the qualities of life is influenced by physical health. Presbycusis is one of the common physical health problems found in the elderly. Problems with quality of life cannot stand alone based on a single causal factor. Factors that need to be considered include age, gender, marital status, income, and the presence of chronic diseases in the elderly. This factor is a risk factor in determining the quality of life of the elderly in the future because changes or disturbances in one of these points can reduce the quality of life of the elderly. According to a 2018 study in Lampung, there is a relationship between presbycusis and the dimensions of physical, psychological, social, and environmental

health. Another study conducted in Aceh stated that hearing function is directly proportional to quality of life. Patients with bilateral sensorineural hearing loss 92% of their quality of life is impaired [18–20].

Many questionnaires have been developed to measure quality of life. The Hearing Handicap Inventory for the Elderly-Screening Version (HHIE-S) questionnaire is a questionnaire that can be used to measure the quality of life in patients with hearing loss which has a sensitivity of 93.24% and a specificity of 93.75%. According to research in Gowa in 2010, the elderly with hearing loss who experienced a mild to moderate decrease in quality of life based on the HHIE-S questionnaire were 49.2% and the elderly with hearing loss who experienced severe quality of life was 14.75% [13, 21–24].

There are quite a lot of patients diagnosed with presbycusis at the Ear Nose Throat (ENT) clinic at Dustira Hospital. Until now, there is no research data conducted at the Ear Nose Throat Polyclinic at Dustira Hospital regarding the relationship between presbycusis and the quality of life of patients as measured using the HHIE-S questionnaire.

2 Materials and Methods

The research method is an analytic study with a cross-sectional design. The subjects of this study were patients aged 65 years and over at the Ear Nose Throat Polyclinic, Dustira Hospital. The minimum sample required is 48 samples. Sampling was done by using purposive sampling technique. Inclusion criteria in this study: 1) Patients diagnosed with presbycusis by an ENT-HN specialist at the Ear Nose Throat Polyclinic, Dustira Hospital, 2) Patients aged 65 years and over, 3) Patients with bilateral sensorineural hearing loss audiogram results, 4) Patients who can be contacted and are willing to fill out a questionnaire. Exclusion criteria in this study: 1) Patients who use hearing aids, 2) Patients who have psychosocial disorders before being diagnosed with presbycusis, 3) Patients who have cognitive disorders.

This study begins with collecting data through medical records, then taking a history if it meets the inclusion criteria, pure tone audiometry will be carried out. Patients with bilateral sensorineural hearing loss will be given the HHIE-S questionnaire. Each "Yes" answer gets a score of 4, the answer "Sometimes" gets a score of 2 and for the answer "No" gets a score of 0. The score is classified as follows, 0–8 = no disturbance, 10–22 = mild-moderate disturbance, 24–40 = severe disturbance.

The data obtained will then be examined with univariable analysis to describe the characteristics of the research subjects which include age, gender, marital status, economic status, and history of chronic disease as well as bivariable analysis to determine the relationship between presbycusis and decreased quality of life. To test the correlation between presbycusis and decreased quality of life, the Chi Square test was used. Data analysis was performed using a statistical software program at a 95% confidence level with a p-value ≤ 0.05.

Sampling that met the inclusion criteria was carried out in September 2018-February 2019 at the ENT-HN Polyclinic, Dustira Cimahi Hospital. This research was conducted with Ethical Clearance RSD/015/I/2019.

3 Results and Discussion

From the results of data collection, 223 patients aged 65 years and over were diagnosed with presbycusis and 110 of them underwent re-audiometry examinations. Of the patients who underwent repeated audiometric examinations, 55 patients had an audiogram picture of bilateral sensorineural hearing loss who did not use hearing aids. The data can be seen in the Tables 1, 2, 3, 4, 5 and 6.

The results of the study in Table 1 show the percentage of the incidence of presbycusis at the Ear Nose Throat Polyclinic of Dustira Hospital in 2017–2018, which is the number of new sufferers of a disease in a certain period of time compared to the number of people who may be affected by the new disease in the concerned period. In this study, 233 patients were diagnosed with presbycusis from 8997 patients with complaints in the ear, so that the incidence of presbycusis at the Ear Nose Throat Polyclinic of Dustira Hospital was 2.6%.

The results of the study in Table 2 show that most of the presbycusis patients with the most age characteristics were aged 65–74 years, which is 61.8% of the total number of respondents. The results of this study are in accordance with previous research conducted in Aceh which stated that the greatest hearing loss occurred in the 60–74 year age group [14, 20].

The results of this study are in accordance with the literature that the degeneration process causes presbycusis. The decrease in the number of ganglion cells begins to occur at the age of 60 years, while at the age of 70 years there is a 20% decrease in the number of hair cells. Damaged hair cells cannot be replaced. This relates to the ability of the auditory system to process sound. This research was conducted at Dustira Hospital which is a military hospital in the Kodam III/Siliwangi area where the patients are dominated by soldiers. Many patients diagnosed with presbycusis are less than 65 years old, this is due to the noise generated from the guns used during military training [6].

Most of the presbycusis patients at Dustira Hospital are male, with a percentage of 52.7%. The results of this study are in accordance with a study conducted in Egypt which stated that the percentage of men diagnosed with presbycusis who did not use hearing aids was 60.3% [23].

The gender difference in the high-frequency hearing threshold is due to the fact that male are generally more exposed to noise at work than female. The difference in the effect of gender on presbycusis is not entirely due to changes in the cochlea. This is

Table 1. Incidence of presbycusis in Ear Nose Throat Polyclinic, Dustira Hospital in 2017–2018

	Total Ear Complaints		**Presbycusis**		**Not Presbycusis**	
	N	%	**n**	**%**	**N**	**%**
Year						
2017	5016	55,7	106	45,5	4910	56,0
2018	3981	44,3	127	54,5	3854	44,0
Total	8997	100,0	223	100,0	8764	100,0

Table 2. Characteristics of presbycusis patients

No.	Characteristics	Amount	Percentage (%)
1	Age		
	65–74 years	34	61,8
	75–84 years	20	36,4
	≥ 85 years	1	1,8
2	Gender		
	Male	29	52,7
	Female	26	47,3
3	Marital status		
	Married	32	58,2
	Widow	23	41,8
4	Economic status		
	High	1	1,8
	Moderate	27	49,1
	Low	27	49,1
Total		55	100

related to hormonal factors, the anatomy of the outer ear and also other risk factors such as smoking which can cause presbycusis. Females have a leaf shape and smaller ear canal so that it can cause a masking noise effect at low frequencies [26].

Patients diagnosed with presbycusis at the Ear Nose Throat Polyclinic at Dustira Hospital were mostly married, as many as 32 ppatients (58.2%). Research conducted in Bali showed that 52.6% of patients who had a good quality of life were married. In the results of this study, it can be assumed that marital status affects a person's mental health [18].

Based on the results of the study, patients with moderate and low economic status had the same percentage, which is 49.1%. In a study conducted in Bali, it was stated that patients who have an income above the city minimum wage (UMK) tend to have a better quality of life. Some patients still have income either from retirement or trade, some others have no income and depend on family members. In the results of this study, it can be assumed that the economic status of the patient has an influence on the degree of quality of life [18].

The results of the study in Table 3 show that most of the presbycusis patients in the The Ear Nose Throat Polyclinic of Dustira Hospital has a history of chronic disease as many as 42 patients (76.4%). The results of this study are in accordance with a study conducted in Egypt which stated that there were 83.3% of patients who had a history of diabetes mellitus, 77.8% of patients who had a history of cardiovascular disease and 73.3% of patients who had a history of hypertension [23].

Table 3. Chronic disease history

Chronic Disease	**N**	%
No chronic disease	13	23,6
Have chronic disease	42	76,4
Total	**55**	**100,0**

Table 4. Degree of hearing loss based on pure tone audiometry results

Audiogram result	**N**	%
Mild	7	12,7
Moderate	34	61,8
Severe	14	25,5
Total	**55**	**100,0**

The patient's chronic disease plays a role in the process of decreasing hearing function. Hypertension can cause structural changes in the heart and blood vessels. High pressure on the vascular system can cause bleeding in the inner ear which can lead to gradual or sudden hearing loss. In patients with diabetes mellitus (DM), glucose bound to proteins in the glycosylation process will form advanced glycosilation end products (AGEP) which accumulate in tissues and reduce the elasticity of blood vessel walls (arteriosclerosis). Arteriosclerosis can cause changes in the cochlea. There are differences in the temporal bone that has arteriosclerosis, namely a significant decrease in the number of ganglion cells in the cochlea and there are ganglion cells that experience atrophy. The presence of hearing loss in patients with chronic kidney disease is due to the effects of ototoxic drugs consumed [27].

The results of the study in Table 4 show that most of the patients had bilateral symmetric high-frequency sensorineural hearing loss, as many as 34 patients (61.8%), the rest were severe and mild.

Classification of the degree of hearing loss according to the International Standard Organization (ISO) is mild (26–40 dB), moderate (41–60 dB), severe (61–90 dB) and very severe (> 90 dB) [28].

On pure-tone audiometry test, patients with presbycusis showed slowly progressive hearing loss with bilateral symmetrical symmetric high-frequency sensorineural hearing loss [4, 23, 29].

The results of the study in Table 5 show that patients diagnosed with presbycusis had more mild-moderate decreased quality of life, as many as 29 patients (52.7%).

The results of this study are supported by research conducted in Gowa which states that there are 62.5% of the elderly who have mild-moderate quality of life disorders, followed by elderly who have good quality of life and have severe quality of life disorders with 18.75% [24].

Table 5. Quality of life based on HHIE-S

Quality of Life	**N**	%
No disturbance	6	10,9
Mild-moderate	29	52,7
Severe	20	36,4
Total	**55**	**100,0**

Table 6. Relationship of presbycusis with quality of life based on HHIE-S

Variable	**Quality of Life**						**r**)**	**p-value*)**
	No disturbance		**Mild - moderate**		**Severe**			
Degree of Hearing Loss	**n**	%	N	%	n	%		
Mild	4	57,1	2	28,6	1	14,3	0,509	< 0,001
Moderate	2	5,9	23	67,6	9	26,5		
Severe	0	0	4	28,6	10	71,4		
Total	**6**	**10,9**	**29**	**52,7**	**20**	**36,4**		

p* is calculated based on the Pearson Chi Square Test and is significant if the p value < 0.05.
r** is calculated based on the Spearman Correlation Test and shows a strong degree of relationship if the value of r = 0.41–0.70.

In the elderly, changes in the quality of life tend to lead to a less favorable direction. This is related to changes in the socio-economic environment such as stopping work due to retirement, the inability to continue to participate in society, loss of loved family members and friends, dependence on the necessities of life and a decline in physical condition caused by age. Chronic disease suffered by the patient for years also has an influence on the patient's quality of life [25].

The results of the study in Table 6 show that most patients diagnosed with mild grade have no disturbance in their quality of life that is equal to 57.1%, while patients diagnosed with moderate grade presbycusis mostly have mild moderate quality of life disorder that is equal to 67.6% and most of those diagnosed with severe presbycusis had a severe quality of life disorder, which is 71.4%.

The results of the Pearson Chi Square Test analysis at a 95% confidence level showed that there was a statistically significant relationship between presbycusis and quality of life based on the HHIE-S questionnaire in patients at the Ear Nose Throat Polyclinic at Dustira Hospital with $p < 0.001$ (p-value ≤ 0.05). The results of the Spearman Correlation Test analysis showed that statistically the relationship between presbycusis and a decrease in quality of life had a strong degree of relationship with the value of $r = 0.509$.

Previous research also showed similar results, based on research conducted by the Tresna Werdha Nursing Home in Gowa which showed that presbycusis had a significant effect on quality of life with $p < 0.05$. Another study which showed a significant relationship between hearing function and quality of life was a study conducted at the ENT Polyclinic of RSUDZA Banda Aceh with $p = 0.016$ [20–24].

Hearing loss causes errors in communication that cause individuals to feel isolated and withdraw from their environment so that it affects the patient's social dimension. In addition, due to limitations in the social scope, this will also affect the psychosocial dimension which will cause individuals to feel lonely, frustrated, depressed and feel ashamed. The existence of limitations in communication will also affect the environmental dimensions of the patient, including the patient will have difficulty in getting the opportunity to get various new information from the environment [20–24].

4 Research Limitations

The time required for this research is quite long because of the unavailability of audiometric results in medical record data. In addition, there is a possibility that the patient has mixed hearing loss because the study period is quite long (January 2017-December 2018), the condition of the patient who is elderly causes the patient's mobility impairment, making it difficult to re-examine the audiometry.

5 Conclusion

From the results of the study, it can be concluded that the incidence of presbycusis in Ear Nose Throat Polyclinic, Dustira Hospital period January 2017-December 2018 is 2.6%. The characteristics of most patients diagnosed with presbycusis at the Ear Nose Throat Polyclinic of Dustira Hospital were in the group of 65–74 years (61.8%), male (52.7%), married (58.2%), similar economic status between moderate economic status and low economic status (49.1%), have a history of chronic disease (76.4%), moderate pure-tone audiometric (61.8%), and mild-moderate quality of life (52, 7%). There is a significant relationship with a strong degree of presbycusis and quality of life based on the HHIE-S questionnaire. The more severe the degree of hearing loss in presbycusis patients at the Ear Nose Throat Polyclinic, Dustira Hospital, the more severe the decline in quality of life.

Conflict of Interest. We hereby declare that there is no conflict of interest in the scientific articles that we write.

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