

A Study on the Comorbidity Status and Its Impact on Health-Related Quality of Life in Patients with Presbycusis

Shujie ZHAN^{1,†}, Wei YAN^{1,†}, Ruiling LUO¹, Ying ZENG¹, Lixuan LIU¹, Mingzhu YANG^{1,*}

¹Zhuhai People's Hospital (The Affiliated Hospital of Beijing Institute of Technology, Zhuhai Clinical Medical College of Jinan University) [†]Co-first authors ^{*}Corresponding Author

Abstract

Objective: To investigate the factors influencing health-related quality of life, psychological status, and healthcare resource utilization in patients with age-related hearing loss (ARHL) and comorbidities. **Methods:** A total of 297 ARHL patients admitted to Zhuhai People's Hospital from August 2024 to May 2025 were enrolled. Clinical data were collected, and validated questionnaires were used to assess health-related quality of life [EuroQol 5-Dimension scale (EQ-5D)], depressive symptoms [Self-Rating Depression Scale (SDS)], sleep quality [Pittsburgh Sleep Quality Index (PSQI)], medical coping styles [Medical Coping Modes Questionnaire (MCMQ)], illness perception [Brief Illness Perception Questionnaire (BIPQ)], family functioning [Family Assessment Device (FAD)], and chronic disease resource utilization [Chronic Illness Resources Survey (CIRS)]. Patients were divided into a better health utility group and a poorer health utility group based on the mean EQ-5D utility score. Spearman correlation analysis was performed to examine the relationships between each scale and quality of life, and factors influencing the quality of life in ARHL patients were analyzed. **Results:** There were significant differences between the two groups in age, number of comorbidities, SDS, PSQI, BIPQ, and FAD scores ($P < 0.05$). Correlation analysis showed that SDS, PSQI, MCMQ-avoidance, MCMQ-yielding, BIPQ, and FAD were negatively correlated with quality of life ($r = -0.456, -0.523, -0.345, -0.412, -0.467, -0.512$, respectively; all $P < 0.05$), while MCMQ-confrontation and CIRS were positively correlated with quality of life ($r = 0.398, 0.545$, respectively; both $P < 0.05$). Linear regression analysis indicated that age, number of comorbidities, SDS, PSQI, MCMQ-yielding, BIPQ, and FAD were independent risk factors for quality of life in elderly patients with ARHL, whereas MCMQ-confrontation and CIRS were independent protective factors ($P < 0.05$). **Conclusion:** Quality of life in patients with ARHL is associated with factors such as age, number of comorbidities, depression, and sleep quality. Comprehensive intervention strategies should be adopted clinically to improve health outcomes in this population.

Keywords presbycusis; comorbidity; quality of life; depressive symptoms; sleep quality

1 Introduction

Age-related hearing loss (ARHL), commonly known as presbycusis, is one of the most prevalent chronic conditions among the elderly worldwide. It is primarily characterized by high-frequency hearing impair-

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ment and reduced speech recognition ability^[1], which significantly affect the quality of life of older adults and impose additional burdens on their families and society^[2].

In China, due to insufficient public awareness of ARHL, many elderly individuals lack knowledge about the prevention and management of ARHL and have an inadequate understanding of its detrimental effects. Consequently, some older patients do not take the condition seriously, leading to delayed diagnosis and treatment, which accelerates the progression of hearing decline.

The development of ARHL is influenced by multiple factors, including smoking, noise exposure, ototoxic medications, and infectious diseases. These factors not only contribute to hearing loss but may also increase the risk of other diseases. As a result, comorbidity is common among ARHL patients, and the co-existing conditions may interact with ARHL, collectively impacting patients' health and quality of life^[3].

Comorbidities in ARHL are also considered to be closely associated with the quality of life in the older population. This population, affected by these conditions, commonly experiences communication difficulties, reduced quality of life, and social isolation^[4].

However, existing studies rarely explore the specific association between ARHL comorbidities and patients' quality of life, nor the effects of different types and numbers of comorbidities on quality of life. This lack of evidence makes it difficult to formulate targeted intervention strategies for ARHL patients.

The present study aims to investigate the relationship between ARHL comorbidities and quality of life, with the goal of providing a reference for the prevention and management of ARHL.

2 Materials and Methods

2.1 General Information

According to Kendall's sample size estimation method for multivariate analysis, the sample size should be 5–10 times the number of predictor variables. A total of approximately 27 predictor variables were considered, resulting in an estimated sample size of $n = 27 \times 10 = 270$ cases. Accounting for a 10% invalid response rate, the target sample size was $N = n \times (1 + 10\%) = 297$. Using a convenience sampling method, 297 patients with age-related hearing loss (ARHL) who received outpatient or inpatient care in the Department of Otorhinolaryngology at Zhuhai People's Hospital between August 2024 and May 2025 were enrolled.

Inclusion criteria: (1) Age ≥ 60 years, diagnosed with ARHL by pure-tone audiometry^[5]; (2) Mentally alert and able to communicate effectively; (3) Voluntarily participated in this study and signed informed consent.

Exclusion criteria: (1) A clear history of hearing loss due to other identifiable causes (e.g., noise-induced hearing loss, hereditary hearing loss, drug-induced hearing loss, definite lesions of the external, middle, or inner ear); severe cognitive or mental disorders, cardiopulmonary diseases, or malignant tumors that prevented cooperation with the survey; (2) Evidence of otitis media, tympanic membrane perforation, or external auditory canal lesions (e.g., cholesteatoma, osteoma) on otoscopy or endoscopic examination, or significant conductive hearing loss on tuning fork examination; (3) Other circumstances that made continuation of the survey impossible; (4) Participation in other clinical trials or studies that could affect the results of this study, or loss to follow-up or withdrawal.

2.2 Methods

Data on general information, quality of life, negative emotions, sleep quality, coping styles, illness perception, family functioning, and chronic disease resources were collected from all enrolled patients.

(1) **General information.** General demographic and clinical information of the participants was collected, including age, sex, BMI, education level, marital status, monthly household income, place of resi-

dence, family history of ARHL, smoking status, alcohol consumption, living arrangement, type and number of comorbidities, and weekly exercise frequency and duration. Data were extracted from the hospital's medical record system and supplemented by a questionnaire survey.

(2) **Quality of life.** Quality of life was assessed using the EuroQol Five-Dimensional Health Questionnaire (EQ-5D), which consists of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has three levels: no problems, some problems, and extreme problems. Health utility values were calculated, ranging from 0 to 1, with higher values indicating better quality of life. Based on the mean health utility value, patients were divided into two groups: those with utility values $\geq$ the mean were assigned to the “better” group, and those $<$ the mean were assigned to the “poorer” group^[6].

(3) **Negative emotions.** Depressive symptoms were assessed using the Self-Rating Depression Scale (SDS)^[7], which consists of 20 items. A total score of ≥ 50 indicates the presence of depressive symptoms, with higher scores reflecting greater severity of depression.

(4) **Sleep quality.** The Pittsburgh Sleep Quality Index (PSQI)^[8] was used, assessing seven dimensions: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The total score ranges from 0 to 21, with higher scores indicating poorer sleep quality.

(5) **Coping styles.** The Medical Coping Modes Questionnaire (MCMQ)^[9] was used, comprising three dimensions: confrontation (8–32 points), avoidance (7–28 points), and resignation (5–20 points), with scores calculated separately for each dimension.

(6) **Illness perception.** The Brief Illness Perception Questionnaire (BIPQ)^[10] was used, comprising 9 items, of which 3 items (items 3, 4, and 7) are reverse-scored. The first 8 items use a 0–10 rating scale. The total score ranges from 0 to 80, with higher scores indicating that patients perceive the disease as having a more severe impact on their body and life.

(7) **Family function.** The General Functioning (GF) subscale of the Family Assessment Device (FAD)^[11] was used, comprising 12 items. The total score ranges from 12 to 48, with reverse scoring applied, meaning higher scores indicate poorer family function.

(8) **Chronic illness resources.** The Chronic Illness Resources Survey (CIRS)^[12] was used, comprising 6 dimensions and 18 items rated on a 5-point Likert scale. The total score ranges from 18 to 90, with higher scores indicating better access to and utilization of social resources by patients.

2.3 Data Collection Methods

All researchers involved in data collection received standardized training to ensure consistency and accuracy. After obtaining patients' consent to participate in the study, questionnaires specifically designed for elderly patients were distributed and completed with the researchers' assistance. Once completed, the researchers immediately collected the questionnaires. They then checked for missing items, multiple selections, and other issues, while excluding questionnaires with logical errors. Disease-related and physiological data were collected through the hospital's medical record system. During the study, patients' personal information and medical data were anonymized to ensure data confidentiality and security.

2.4 Statistical Methods

Statistical analyses were performed using SPSS version 26.0. Continuous data were tested for normality using the Shapiro–Wilk test and presented as mean $\pm$ standard deviation ($\bar{x} \pm s$). Comparisons between two groups were conducted using the independent samples *t*-test. Categorical data were expressed as rates [*n* (%)] and analyzed using the chi-square test. Spearman correlation analysis was used to examine the relationships between patients' clinical characteristics, depressive symptoms, sleep quality, and quality of

life. A multiple linear regression model was applied to identify factors influencing the quality of life in elderly patients with ARHL. A P -value < 0.05 was considered statistically significant.

3 Results

3.1 Comparison of Clinical Data between ARHL Patients with Different Quality of Life

The survey results indicated that the mean health utility value of elderly ARHL patients was 0.83 ± 0.09 . Among them, 155 patients with utility values $\geq$ the mean were included in the better-performing group, and 142 patients with utility values $<$ the mean were included in the poorer-performing group. The age of the better-performing group was lower than that of the poorer-performing group. Additionally, the proportion of patients with ≤ 3 comorbidities was higher in the better-performing group than in the poorer-performing group, with statistically significant differences ($P < 0.05$). No statistically significant differences were observed between the two groups in terms of sex, BMI, education level, marital status, monthly household income, place of residence, family history of ARHL, smoking, alcohol consumption, living arrangement, type of comorbidities, weekly exercise frequency, or exercise duration ($P > 0.05$). See Table 1.

Table 1: Comparison of Clinical Data between ARHL Patients with Different Quality of Life

Variables	Better group ($n = 155$)	Poorer group ($n = 142$)	t/χ^2	P
Age (years)	67.86 ± 5.20	71.34 ± 6.94	4.916	< 0.001
Sex			0.559	0.455
Male	82 (52.90)	68 (47.89)		
Female	73 (47.10)	74 (52.11)		
BMI (kg/m^2)	23.82 ± 2.31	24.15 ± 2.20	1.258	0.209
Education level			2.248	0.325
Primary/Illiterate	45 (29.03)	52 (36.62)		
Middle/High school	78 (50.32)	67 (47.18)		
College and above	32 (20.65)	23 (16.20)		
Marital status			1.550	0.213
Married	118 (76.13)	98 (69.01)		
Unmarried/Divorced/Widowed	37 (23.87)	44 (30.99)		
Household monthly income			3.107	0.212
≤ 2000 CNY	38 (24.52)	48 (33.80)		
2000–8000 CNY	72 (46.45)	58 (40.85)		
≥ 8000 CNY	45 (29.03)	36 (25.35)		
Place of residence			0.660	0.417
Rural	53 (34.19)	55 (38.73)		
Urban/Town	102 (65.81)	87 (61.27)		
ARHL family history	62 (40.00)	54 (38.03)	0.121	0.728
Smoking	52 (33.55)	59 (41.55)	1.699	0.192
Alcohol consumption	44 (28.39)	36 (25.35)	0.347	0.556
Living arrangement			0.925	0.336
Living alone	22 (14.19)	27 (19.01)		
Living with family	133 (85.81)	115 (80.99)		
Comorbidity types				
Respiratory diseases	45 (29.03)	55 (38.73)	3.122	0.077
Sensory system diseases	43 (27.74)	52 (36.62)	2.685	0.101
Digestive system diseases	39 (25.16)	45 (31.69)	1.557	0.212
Cardiovascular diseases	80 (51.61)	87 (61.27)	2.807	0.094
Musculoskeletal diseases	69 (44.52)	78 (54.93)	2.765	0.095
Metabolic diseases	54 (34.84)	61 (42.96)	2.059	0.151
Cognitive impairment	27 (17.42)	35 (24.65)	2.344	0.126
Number of comorbidities			9.679	0.003
< 3	104 (67.10)	70 (49.30)		
≥ 3	51 (32.90)	72 (50.70)		

Continued on next page

Table 1: (Continued)

Variables	Better group (<i>n</i> = 155)	Poorer group (<i>n</i> = 142)	<i>t</i> / χ^2	<i>P</i>
Weekly exercise frequency			0.267	0.605
< 3 times	85 (54.84)	82 (57.75)		
≥ 3 times	70 (45.16)	60 (42.25)		
Exercise duration (min)			1.586	0.208
< 30	76 (49.03)	80 (56.34)		
≥ 30	79 (50.97)	62 (43.66)		

3.2 Comparison of Scale Scores between ARHL Patients with Different Quality of Life

The scores of SDS, PSQI, MCMQ-avoidance, MCMQ-yielding, BIPQ, and FAD in the better-quality-of-life group were lower than those in the poorer-quality-of-life group. Meanwhile, the scores of MCMQ-confrontation and CIRS were higher in the better-quality-of-life group than in the poorer-quality-of-life group, with statistically significant differences (all $P < 0.05$). See Table 2.

Table 2: Comparison of Scale Scores between ARHL Patients with Different Quality of Life

Scale scores	Better group (<i>n</i> = 155)	Poorer group (<i>n</i> = 142)	<i>t</i>	<i>P</i>
SDS	36.29 ± 5.73	42.18 ± 6.87	8.048	< 0.001
PSQI	7.15 ± 1.16	9.21 ± 1.53	13.140	< 0.001
MCMQ-confrontation	20.51 ± 4.20	16.73 ± 3.16	8.703	< 0.001
MCMQ-avoidance	15.22 ± 3.26	18.62 ± 4.21	7.817	< 0.001
MCMQ-resignation	9.54 ± 2.03	12.37 ± 3.28	9.021	< 0.001
BIPQ	35.29 ± 6.12	42.72 ± 7.86	9.130	< 0.001
FAD	27.51 ± 4.14	32.69 ± 4.78	10.004	< 0.001
CIRS	49.48 ± 5.54	43.53 ± 4.09	10.452	< 0.001

3.3 Correlations between Scale Scores and Quality of Life in ARHL Patients

Correlation analysis showed that SDS, PSQI, MCMQ-Avoidance, MCMQ-Resignation, BIPQ, and FAD were negatively correlated with quality of life ($r = -0.456, -0.523, -0.345, -0.412, -0.467, -0.512$, respectively; all $P < 0.05$). In contrast, MCMQ-Confrontation and CIRS were positively correlated with quality of life ($r = 0.398$ and 0.545 , respectively; both $P < 0.05$). See Table 3.

Table 3: Correlations between Scale Scores and Quality of Life in ARHL Patients

Variables	<i>r</i>	<i>P</i>
SDS	-0.456	< 0.001
PSQI	-0.523	< 0.001
MCMQ-confrontation	0.398	< 0.001
MCMQ-avoidance	-0.345	< 0.001
MCMQ-resignation	-0.412	< 0.001
BIPQ	-0.467	< 0.001
FAD	-0.512	< 0.001
CIRS	0.545	< 0.001

3.4 Multiple Linear Regression Analysis of Factors Influencing Quality of Life in ARHL Patients

A multiple linear regression analysis was performed, with the health utility value as the dependent variable and age, number of comorbidities, SDS, PSQI, MCMQ sub-scales, BIPQ, FAD, and CIRS as independent variables. The results showed that age, number of comorbidities, SDS, PSQI, MCMQ-Resignation, BIPQ, and FAD were independent risk factors for the quality of life in elderly ARHL patients, whereas MCMQ-Confrontation and CIRS were independent protective factors (all $P < 0.05$). See Table 4.

Table 4: Multiple Linear Regression Analysis of Factors Influencing Quality of Life in ARHL Patients

Variables	β	SE	β'	t	P
Age	-0.008	0.002	-0.142	-4.010	< 0.001
Number of comorbidities	-0.015	0.004	-0.128	-3.750	< 0.001
SDS	-0.003	0.001	-0.185	-3.012	< 0.001
PSQI	-0.012	0.003	-0.238	-4.005	< 0.001
MCMQ-confrontation	0.008	0.002	0.175	4.025	< 0.001
MCMQ-avoidance	-0.004	0.002	-0.089	-2.013	0.046
MCMQ-resignation	-0.010	0.002	-0.198	-5.014	< 0.001
BIPQ	-0.004	0.001	-0.165	-4.108	< 0.001
FAD	-0.015	0.003	-0.256	-5.105	< 0.001
CIRS	0.018	0.003	0.298	6.032	< 0.001

4 Discussion

4.1 Analysis of Quality of Life Status in ARHL Patients

The results of this study show that the average health utility value of ARHL patients was 0.83 ± 0.09 , slightly higher than the level of the elderly population in China (0.80 ± 0.13)^[13]. This might be related to the fact that the subjects included in this study were ARHL patients who received outpatient and inpatient treatment. They had relatively stronger health awareness and better access to medical resources. However, 47.8% (142/297) of the patients had a quality of life below the average level, suggesting that the impact of ARHL on the patients' quality of life cannot be ignored. There were significant differences in age and the number of comorbidities between the better-performing group and the worse-performing group, similar to previous studies^[14]. The older the patients were and the more comorbidities they had, the more obvious the decline in their physiological functions. Hearing loss and other chronic diseases further reduced the patients' quality of life.

It is worth noting that although there was no statistical difference in specific comorbidity types between the two groups in this study, cardiovascular system diseases and bone and joint diseases both had a relatively high incidence in both groups, suggesting that these diseases may act together with ARHL to affect the patients' quality of life. In clinical work, ARHL patients should be routinely screened for comorbidities, especially cardiovascular and bone system diseases, and comprehensive management should be achieved through multidisciplinary collaboration.

4.2 Impact of Negative Emotions and Sleep Quality on Quality of Life in ARHL Patients

In this study, the SDS scores and PSQI scores showed significant differences between the two groups, and both were negatively correlated with the quality of life. Regression analysis further confirmed that they were independent risk factors. Due to hearing loss, ARHL patients encounter difficulties in daily communication and are prone to feelings of loneliness and helplessness, which can induce or aggravate depressive emotions^[15]. The depressive state itself can also lead to a decrease in patients' treatment compliance, a

negative response to the disease, and further deterioration of the quality of life. At the same time, there is a bidirectional relationship between hearing loss and sleep disorders. On the one hand, hearing loss may cause changes in the perception of environmental sounds, affecting sleep onset and sleep maintenance. On the other hand, sleep disorders may reduce the blood flow in the ear's microcirculation, thereby having a negative impact on the auditory system^[16]. Therefore, in the intervention plan for ARHL patients, attention should be paid to the assessment of mental health. When necessary, psychological counseling or drug treatment should be introduced. Meanwhile, attention should also be paid to sleep-hygiene education to improve the overall health status of the patients.

4.3 Role of Medical Coping Styles and Illness Perception

Medical coping styles refer to the psychological and behavioral strategies adopted by individuals when dealing with diseases. In this study, the MCMQ scale was used to assess three coping styles: confrontation, avoidance, and submission. The results showed that the MCMQ score for confrontation was positively correlated with quality of life and was an independent protective factor. In contrast, the MCMQ scores for avoidance and submission were negatively correlated with quality of life. This indicates that patients who actively confront their diseases are more likely to actively seek medical help, adjust their lifestyles, enhance their sense of control over the disease, and thus achieve better health outcomes. On the other hand, patients who adopt an avoidance or submission attitude often respond negatively, delay treatment, or give up the opportunity for recovery^[17]. The BIPQ score reflects patients' perception and feelings about the disease. In this study, the BIPQ was negatively correlated with quality of life. This suggests that clinical practitioners should not only focus on the physiological aspects of the disease but also understand the patients' psychological coping patterns and disease perception. Through health education, they can help patients establish a correct view of the disease, encourage positive coping, and reduce unnecessary fear and avoidance behaviors.

4.4 Significance of Family Function and Chronic Illness Resource Utilization

In this study, the FAD score of the better-performing group was lower than that of the poorer-performing group, and it was negatively correlated with the quality of life. That is, the worse the family function (the higher the score), the lower the quality of life. The family is the primary source of social support for the elderly. Good family function can provide emotional support, daily care, and assistance in seeking medical treatment, which helps patients cope with the challenges brought by the disease^[18]. On the contrary, a dysfunctional family may exacerbate the patients' sense of loneliness and helplessness. The CIRS score showed an opposite trend: the better-performing group had significantly higher CIRS scores than the poorer-performing group, and it was positively correlated with the quality of life, indicating that patients who can effectively obtain and utilize social resources have a higher quality of life. This includes medical resources, community support, health information, etc. Regression analysis showed that CIRS was an independent protective factor. This result provides two key directions for clinical practice in health education and health promotion: (1) Strengthen family support: include family members as the target of health education and guide them through family visits, family classes, etc., to help family members communicate effectively with the elderly with hearing loss (such as face-to-face communication, slowing down the speech rate, simplifying the language), and provide appropriate care rather than excessive protection, thereby improving family function; (2) Link social resources: communities and medical institutions should actively build resource bridges, including distributing "maps of elderly hearing health resources" (covering designated hospitals, hearing aid subsidies, senior universities, community activities, etc.); encouraging the elderly to participate in community chronic disease management programs, expanding social interaction while managing chronic diseases; for those with weak support or living alone, arrange social workers or

volunteers to visit regularly to help them establish an external support network.

4.5 Comprehensive Intervention Strategies

Based on the above discussions, the quality of life of patients with age-related hearing loss is influenced by multiple dimensions of factors. Although intervention targeting hearing loss alone is necessary, it is difficult to comprehensively improve the quality of life of these patients. Clinically, a patient-centered comprehensive management model should be established: (1) Regular screening for comorbidities and health education: identify common diseases such as cardiovascular and skeletal disorders, and explain their interactions with ARHL to patients in an understandable way; (2) Mental health promotion: regular screening for depression, providing psychological counseling or peer support, and conducting sleep hygiene education; (3) Coping strategies and disease cognition intervention: through health education courses, help patients establish a positive view of the disease, teach problem-solving skills, and reduce avoidance and surrender; (4) Strengthening family function: include family members in the education process to improve family communication and support quality; (5) Social resource navigation: help patients link to community and medical resources, draw a “resource map,” and provide active linkage services for individuals with weak resources. Through this comprehensive framework, it is expected to break the vicious cycle of “decreased hearing—social isolation—psychological problems—decreased quality of life,” and truly achieve the goal of improving the overall health outcome of patients with ARHL.

4.6 Study Limitations

This study has certain limitations: (1) It employs a cross-sectional design, which precludes the inference of causal relationships between various factors and the quality of life. Future longitudinal studies are required to verify these relationships; (2) The research subjects are from a single center, and the representativeness of the sample is limited. Caution should be exercised when extrapolating the conclusions; (3) Some data are obtained through questionnaire surveys, which may be subject to recall bias or subjective bias; (4) Although numerous variables were included, there may still be unmeasured confounding factors (such as the severity of hearing loss, the use of hearing aids, etc.) that affect the results. Future research can further expand the sample size, conduct multi-center cooperation, incorporate objective indicators related to hearing and rehabilitation measures into the analysis, and attempt to design intervention studies to verify the actual effectiveness of the comprehensive intervention strategies proposed in this study.

In summary, the quality of life of patients with age-related hearing loss is influenced by multiple factors such as age, the number of comorbidities, depressive symptoms, sleep quality, medical coping styles, disease perception, family function, and utilization of chronic disease resources. In clinical practice, comprehensive assessment and intervention strategies should be adopted, with a focus on the physical and mental health and social support of patients, to improve their overall quality of life.

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