



Profile of Hearing Loss and Related Risk Factors among Geriatric Patients at RSUD Prof. Dr. H. Aloei Saboe

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ABSTRACT

Introduction. Hearing loss is a common health problem in the geriatric population and significantly affects quality of life and independence. This condition is multifactorial, involving interactions between natural degenerative processes, comorbid conditions, environmental factors, and lifestyle factors. This study aims to describe the factors that influence hearing loss among geriatric patients at RSUD (Regional General Hospital) Prof. Dr. H. Aloei Saboe, Gorontalo City. **Methods.** This study employed a quantitative descriptive survey method involving 63 geriatric respondents at the Internal Medicine Polyclinic who were selected using purposive sampling. Data were collected through questionnaires and physical examinations (Rinne-Weber test at 512 Hz) and were analyzed using univariate analysis with SPSS to determine the frequency distribution of each variable. **Results.** The majority of respondents (57.1%) experienced sensorineural hearing loss, were aged 60-69 years (79.4%), and were female (74.6%). The dominant comorbid factors were hypertension (42.9%) and a combination of hypertension and diabetes mellitus (22.2%). Regarding environmental factors, 49.2% of respondents lived near sources of noise, while 11.1% reported occupational noise exposure. In terms of lifestyle factors, obesity was found in 25.4% of respondents, while the prevalence of smoking (27%) and alcohol consumption (9.5%) was relatively low. **Conclusion.** The study site's geriatric patients experience predominantly sensorineural hearing loss, with a high proportion of vascular comorbidities among affected patients.

1. Introduction

Hearing loss is a common health problem among older adults (geriatrics) and represents an important public health concern due to its impact on communication, social interaction, emotional well-being, and overall quality of life. According to the World Health Organization (WHO) and Indonesian Law No. 13 of 1998, older adults are defined as individuals aged 60 years or older. Advancing age is associated with progressive physiological changes across multiple organ systems, including the auditory system, which plays a central role in daily communication and psychosocial functioning.^{1,2}

Globally, population aging continues to increase, with approximately 771 million individuals aged 65

years or older reported in 2022.² In Indonesia, similar demographic trends have been observed. Data from the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia) reported a hearing loss prevalence of 0.4% in Gorontalo Province. In addition, Statistics Indonesia documented that older adults constituted 9.2% of the total population in Gorontalo City in 2018.³ These data indicate a growing geriatric population that is potentially vulnerable to age-related health problems, including hearing impairment.

Hearing loss among older adults is often accompanied by various medical and non-medical characteristics.⁴ Medical conditions, such as hypertension and diabetes mellitus are frequently

found in geriatric populations and are commonly discussed in the context of degenerative changes affecting multiple organ systems.⁵ Non-medical characteristics, including age group, sex, exposure to environmental noise, smoking habits, alcohol consumption, and nutritional status, are also commonly observed among older adults. These characteristics collectively form an important clinical and demographic profile of geriatric patients with hearing impairment.⁶

At RSUD Prof. Dr. H. Aloei Saboe, Gorontalo City, preliminary hospital data showed a high number of geriatric visits to the internal medicine outpatient clinic, totaling 4,688 visits over a three-month period. This finding reflects a substantial utilization of healthcare services by older adults and indicates a considerable burden of chronic conditions within this population. However, hospital records have not yet provided specific descriptive data regarding the profile of hearing loss and the distribution of accompanying patient characteristics among geriatric patients attending the clinic.⁷

To date, studies describing hearing loss among older adults in eastern Indonesia remain limited, particularly those that present detailed descriptive data on the types of hearing loss and the distribution of related medical and non-medical characteristics at the regional level. Most available information focuses on national prevalence estimates, while local hospital-based descriptive data are still scarce. This lack of regional descriptive data represents an important research gap, especially in areas experiencing an increasing geriatric population such as Gorontalo City.

Therefore, this study aims to describe the profile of hearing loss and the distribution of related factors among geriatric patients at RSUD Prof. Dr. H. Aloei Saboe, Gorontalo City. By providing a comprehensive descriptive overview, the findings of this study are expected to serve as baseline data for future analytical research, support early detection efforts, and contribute to the improvement of geriatric health services. Furthermore, the results may assist healthcare providers and institutions in developing appropriate educational, preventive, and management strategies to enhance the quality of life of older adults in the Gorontalo region.

2. Methods

This study employed a descriptive survey design to describe the distribution of hearing loss and related patient characteristics among geriatric patients. The study was conducted at the Internal Medicine Outpatient Clinic of RSUD Prof. Dr. H. Aloei Saboe, Gorontalo City, from June to October 2025. The study population comprised all geriatric patients who visited and received healthcare services at the Internal Medicine Outpatient Clinic of RSUD Prof. Dr. H. Aloei Saboe during the study period.

Participants were recruited using purposive sampling, a non-probability sampling technique. All geriatric patients who met the inclusion criteria and were available during the data collection period were included as study respondents, resulting in a total sample of 63 participants. Inclusion criteria consisted of patients aged 60 years or older, clinically identified as having hearing loss, and willing to participate in the study as indicated by the provision of written informed consent. Exclusion criteria included patients with unstable medical conditions that precluded participation in interviews, patients with severe cognitive impairment, and patients who were not present at the study site during data collection. Ethical approval for this study was obtained from the Health Research Ethics Committee of Universitas Negeri Gorontalo (Approval No.: 039A/UN47.B7/KE/2025).

The study variables included sociodemographic characteristics, medical factors, environmental factors, lifestyle factors, and hearing status. Sociodemographic characteristics consisted of age group (young-old: 60–69 years, middle-old: 70–79 years, and high-risk elderly: >80 years), sex, formal educational attainment (elementary school, junior high school, senior high school, and higher education), and current occupational status (retired, homemaker, or self-employed). Medical factors included major comorbidities such as hypertension and diabetes mellitus, as well as other physician-diagnosed conditions including osteoarthritis, dyspepsia, and additional comorbid diseases. Environmental factors comprised occupational noise exposure, residential proximity to noise sources, and residence in areas with high air pollution. Lifestyle factors included smoking status, alcohol consumption habits, and obesity, which was assessed using body mass index (BMI) with a cutoff value of $>27.0 \text{ kg/m}^2$.³

Hearing status was determined based on the results of Rinne and Weber tuning fork tests, which were used to classify hearing loss as sensorineural or conductive. Research instruments consisted of a structured questionnaire for assessing patient characteristics and risk-related factors, as well as a 512 Hz tuning fork for hearing examination.

Data collection was carried out through face-to-face interviews and clinical examinations using Rinne and Weber tests. Data were analyzed using SPSS software. Univariate analysis was performed to describe the frequency distributions of all study variables, including sociodemographic characteristics, types of hearing loss, and the distribution of assessed factors.

3. Results

This study applied purposive sampling, yielding a total of 63 respondents. As shown in Table 1, the majority of participants were classified as young-old adults aged 60–69 years, accounting for 50

individuals (79.4%). The collected data included respondents' sociodemographic characteristics, clinical profiles of hearing loss, and distributions of medical (comorbid), environmental, and lifestyle-related risk factors. Female respondents predominated, with 47 individuals (74.6%). Regarding educational attainment, the largest proportions were senior high school graduates (34.9%) and elementary school graduates (31.7%). Based on occupational history, most respondents were no longer actively employed, consisting mainly of homemakers (46.0%) and retirees (42.9%).

Based on Table 2, most respondents presented with sensorineural hearing loss, observed in 36

individuals (57.14%), followed by conductive hearing loss in 27 individuals (42.86%).

Table 3 presents the distribution of medical comorbidities among respondents. Hypertension was the most frequently reported major comorbidity (42.9%), followed by combined hypertension and diabetes mellitus (22.2%) and diabetes mellitus alone (20.6%). A majority of respondents (76.2%) reported having other physician-diagnosed conditions, while 14.3% reported no major comorbidities. In addition, most respondents (79.4%) reported a history of medication use that was categorized in this study as self-reported medication exposure.

Table 1. Sociodemographic characteristics of respondents (n = 63)

	n	%
Age		
60 - 69 years	50	79.4%
70 - 79 years	12	19%
≥ 80 years	1	1.6%
Sex		
Female	47	74.6%
Male	16	25.4%
Highest educational level		
Elementary school	20	31.7%
Junior high school	12	19.0%
Senior high school	22	34.9%
Higher education	9	14.3%
Occupation		
Homemaker	29	46.0%
Retired	27	42.9%
Others	7	11.1%

Table 2. Types of hearing loss among respondents

Type of hearing loss	n	%
Sensorineural	36	57.14%
Conductive	27	42.86%
Total	63	100%

Table 3. Medical comorbidity factors among respondents (n = 63)

	n	%
Major comorbidities		
Hypertension	27	42.9%
Diabetes Mellitus	13	20.6%
Hypertension & Diabetes Mellitus	14	22.2%
No Such Comorbidities	9	14.3%
Other Comorbid Conditions		
Other Diseases (Osteoarthritis. Dyspepsia. Hypercholesterolemia. Gallstones. Kidney Disease. Gout Arthritis. Stroke)	48	76.2
None	15	23.8
Self-reported Medication Exposure		
Reported Exposure to Certain Medications**	50	79.4%
Not Reported	13	20.6%

**Based on respondents' self-reported history of medication use, including antihypertensive drugs, antibiotics, and chemotherapy agents, without classification by drug type, dosage, or duration of use.

Table 4. Environmental Factors Among Respondents (n = 63)

	n	%
Residential proximity to noise sources		
Near Noise Sources	31	49.2%
Far From Noise Sources	32	50.8%
Air Pollution Exposure (Self-reported)		
Living in Areas Perceived as High Air Pollution	21	33.3%
Not Living in Such Areas	42	66.7%

Table 5. Lifestyle-Related Factors Among Respondents (n = 63)

	n	%
Smoking History		
Ever Smoked	17	27%
Never Smoked	46	73%
Alcohol Consumption History		
Ever Consumed Alcohol	6	9.5%
Never Consumed Alcohol	57	90.5%
Nutritional Status		
Obese	16	25.4%
Not Obese	47	74.6%

As shown in Table 4, slightly more than half of the respondents (50.8%) reported living far from noise sources, while 49.2% reported residential proximity to noise sources such as main roads, workshops, or factories. Regarding air quality, most respondents (66.7%) reported not living in areas they perceived as having high air pollution, whereas one-third (33.3%) reported residence in areas perceived as having higher air pollution levels.

As shown in Table 5, most respondents had no history of smoking (73.0%) and had never consumed alcohol (90.5%). Nevertheless, a proportion of respondents reported a history of smoking (27.0%) and alcohol consumption (9.5%). In terms of nutritional status, most respondents were not obese (74.6%); however, obesity was still identified in 16 respondents (25.4%).

4. Discussion

The majority of geriatric respondents in this study experienced sensorineural hearing loss (57.14%), whereas conductive hearing loss was identified in 27 respondents (42.86%). This distribution indicates that sensorineural impairment represents the predominant clinical pattern, consistent with age-related degenerative processes in older adults.⁴ Aging induces progressive damage to the inner ear, particularly affecting cochlear structures and the auditory nerve, including atrophy of the stria vascularis and degeneration of hair cells within the organ of Corti.⁵ These degenerative changes constitute the primary mechanism of presbycusis as a physiological consequence of aging. However, the relatively high proportion of conductive hearing loss (42.86%) suggests the involvement of additional factors beyond pure presbycusis.⁶ One of the most plausible contributing clinical factors is cerumen

impaction, which frequently obstructs sound conduction in older adults.^{6,7} Furthermore, the use of tuning fork tests as screening tools has inherent limitations in diagnostic accuracy compared with comprehensive evaluations using pure-tone audiometry.⁷

Sociodemographic analysis demonstrated that hearing impairment became apparent as early as the young-old stage, indicating that cochlear damage related to oxidative stress and chronic inflammation had already occurred.⁸ The predominance of female respondents may be associated with differences in health-seeking behavior, as women tend to seek medical care more actively than men. Biological factors following menopause may also contribute, as the loss of estrogen's protective effects can disrupt synaptic transmission and cochlear protection. In terms of educational background, respondents with lower levels of education were more likely to have limited awareness of preventive ear health practices.^{9,10} Occupational characteristics dominated by homemakers and retirees suggest that the risk of hearing loss in this sample was more strongly associated with systemic comorbid conditions rather than occupational noise exposure.¹¹

Chronic hypertension, as the most prevalent comorbidity, exerts a direct impact on cochlear function through impaired blood supply to terminal arteries. This condition leads to cochlear tissue ischemia, ultimately resulting in degeneration of hair cells as primary auditory receptors. The high prevalence of diabetes mellitus further supports the likelihood of cochlear structural damage caused by chronic hyperglycemia. Hearing loss has been reported among patients with type 2 diabetes mellitus.¹² Diabetes mellitus induces

microangiopathy characterized by thickening of the basement membrane and atrophy of the stria vascularis. These alterations disrupt endolymphatic ion homeostasis and trigger oxidative stress,¹³ leading to damage of spiral ganglion neurons.^{14,15,16} This phenomenon is supported by findings reported in the *Jambura Journal of Health Sciences and Research*, which highlighted that family history and sedentary behavior substantially contribute to the incidence of metabolic diseases, including diabetes mellitus, in the Gorontalo region.¹⁷

The medication profiles reported by respondents indicate that a substantial proportion of geriatric patients had a history of systemic medication use. In this study, information regarding medication exposure was obtained based on self-reported histories without detailed classification of drug type, dosage, or duration of use. Therefore, these findings should be interpreted as a descriptive overview of medication use among respondents rather than evidence of iatrogenic effects on hearing function. While previous literature has discussed potential ototoxic effects of certain medications, the present study was not designed to evaluate pharmacological mechanisms or causal relationships between medication use and hearing loss.^{18,19}

Environmental factors, including residential noise exposure and air pollution, were also assessed based on respondents' perceptions. Nearly half of the respondents reported living near noise sources such as main roads, workshops, or factories. However, this classification was not supported by objective environmental noise measurements or traffic density data. Similarly, air pollution exposure was defined according to respondents' self-reported perceptions of living in high-pollution areas, without quantitative assessment of ambient air quality or reference to standardized air pollution indices. Consequently, the findings related to environmental exposure should be interpreted cautiously as subjective descriptions of living conditions rather than definitive indicators of environmental risk.²⁰

Analysis of lifestyle-related characteristics showed that obesity was present in approximately one-quarter of respondents within the geriatric population studied. This finding highlights the coexistence of metabolic conditions within the geriatric population studied.²¹ However, given the descriptive nature of the study, obesity and other lifestyle factors were documented solely as part of the respondents' health profiles, without assessment of their direct relationship to hearing loss or underlying biological mechanisms. The lifestyle profile observed in this study provides contextual information that may be relevant for future analytical research focusing on metabolic health and auditory function among older adults.²²

This study has several important limitations. First,

the descriptive survey design with single time-point data collection precludes longitudinal observation and limits the ability to determine temporal or causal relationships between reported factors and hearing loss. Second, hearing assessment was performed using Rinne and Weber tuning fork tests without otoscopic examination, which limits the ability to differentiate conductive hearing loss caused by conditions such as cerumen impaction or middle ear pathology. Third, the study did not include stratification of hearing loss severity, as hearing loss was classified only by type (sensorineural or conductive). Fourth, prior use of hearing aids was not assessed or controlled for, which may have influenced hearing test results. Additionally, purposive sampling at a single healthcare facility limits the generalizability of the findings to the wider geriatric population. Finally, reliance on self-reported data for medication use and environmental exposure introduces the potential for recall bias, and genetic factors as well as over-the-counter medication use were not evaluated in this study.

Despite these limitations, the findings provide valuable descriptive baseline data regarding the profile of hearing loss and accompanying characteristics among geriatric patients at RSUD Prof. Dr. H. Aloei Saboe. These results may serve as a reference for future studies employing objective measurements, broader sampling strategies, and analytical designs to further investigate hearing loss among older adults in the Gorontalo region.

5. Conclusion

Hearing loss among geriatric patients at RSUD Prof. Dr. H. Aloei Saboe is predominantly characterized by sensorineural impairment and occurs within a complex clinical context involving multiple comorbid conditions, particularly vascular-related diseases. The findings highlight that hearing impairment in older adults is not an isolated condition but is closely accompanied by multimorbidity and various health-related characteristics commonly observed in geriatric populations. From a clinical perspective, this study underscores the importance of a comprehensive approach in the assessment of hearing complaints among older adults, taking into account general health conditions and potential contributing factors. Although this study does not establish causal relationships, the descriptive findings provide important baseline information that may support early detection efforts and integrated geriatric care. Future research is recommended to incorporate objective hearing assessment methods and analytical study designs to better understand the relationships between hearing loss and associated factors in broader populations.

6. Author Contribution

N.R.D. conducted the study, performed data collection and analysis, and drafted the original manuscript. H.M.Y.N. conceived and supervised the study, provided clinical expertise in otorhinolaryngology, and critically revised the manuscript. M.N.S.Y. contributed to the study design, medical education perspective, data interpretation, and manuscript revision. D.P.I. participated in methodological development, public health analysis, and critical review of the manuscript. S.M.P. contributed to physiological interpretation, scientific validation, and overall manuscript refinement. All authors reviewed and approved the final version of the manuscript.

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