



Characteristics of Presbycusis Patients at RSUD Prof. Dr. Margono Soekarjo Purwokerto

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ABSTRACT

Presbycusis is a progressive sensorineural hearing loss commonly affecting the elderly and significantly reducing quality of life. RSUD Prof. Dr. Margono Soekarjo Purwokerto, as a referral hospital, treats a large number of elderly patients, making characterization of presbycusis patients essential. This study aimed to describe the characteristics of presbycusis patients based on age, sex, occupation, comorbidities, and degree of hearing loss. A descriptive quantitative study with a retrospective approach was conducted using total sampling of presbycusis patients at the ENT outpatient clinic from 2022 to 2024. A total of 81 patients met the inclusion criteria. Most patients were male

and aged 61–74 years. The most common occupation was farmer, and hypertension was the most frequent comorbidity. Hearing loss was generally bilateral with moderate to moderately severe degree.

1. INTRODUCTION

Presbycusis is a progressive sensorineural hearing loss associated with the aging process and represents one of the most common chronic conditions affecting older adults. It is typically bilateral and initially involves high-frequency hearing loss that gradually worsens with increasing age (Deveci et al., 2025; Gutiérrez & Baez, 2024). As the global population continues to age, presbycusis has emerged not only as an epidemiological phenomenon but also as a significant clinical and public health problem, particularly in geriatric care settings.

Despite its high prevalence, presbycusis is frequently underrecognized and underdiagnosed in clinical practice, with many patients seeking medical attention only after hearing impairment has progressed to a moderate or severe degree (WHO, 2021; Picciotti et al., 2024). This delayed detection limits opportunities for early intervention and contributes to poorer clinical outcomes. Therefore, presbycusis should be regarded as an important clinical and health service issue rather than merely an age-related physiological change.

The clinical impact of presbycusis extends beyond auditory dysfunction and significantly affects overall health and well-being. Hearing loss in older adults has been shown to impair quality of life and is associated with communication difficulties, social isolation, and emotional distress (Picciotti et al., 2024; Evangeli et al., 2023). Furthermore, untreated hearing loss has been linked to cognitive decline, increased risk of depression, and a higher incidence of dementia, which may increase dependency and healthcare utilization among the elderly (WHO, 2021; Gutiérrez & Baez, 2024).

The prevalence of presbycusis increases with age and is reported to be higher in males than in females. Previous studies have shown prevalence rates of 11.2% among individuals aged 50–59 years, 24.7% among those aged 60–69 years, and more than 60% in individuals aged 70 years and older (Tas, 2022). Age and sex are known to influence the onset and severity of presbycusis, while occupational background is closely related to long-term noise exposure, and systemic comorbidities may accelerate auditory degeneration (Tas, 2022; Evangeli et al., 2023). Comorbid conditions such as hypertension, diabetes mellitus, dyslipidemia, and chronic kidney

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disease may exacerbate cochlear damage through mechanisms involving microvascular impairment, chronic ischemia, neuropathy, atherosclerosis, and metabolic disturbances (Azeez et al., 2020; Sodhi et al., 2021; Ratnasari & Wiranandha, 2022; Sitompul & Nasution, 2023).

In Indonesia, the proportion of the elderly population continues to increase, which is expected to be accompanied by a rising burden of age-related hearing loss, particularly among individuals aged 65 years and older (Badan Pusat Statistik, 2023). RSUD Prof. Dr. Margono Soekarjo Purwokerto, as a tertiary referral hospital, manages a large population of elderly patients with complex and advanced medical conditions, whose characteristics may differ from those of the general population. Therefore, hospital-based data are essential for planning otorhinolaryngology services and developing targeted hearing screening programs for older adults.

However, data describing the demographic, clinical, and audiometric characteristics of presbycusis patients based on hospital medical records in Indonesia remain limited, and no specific report from RSUD Prof. Dr. Margono Soekarjo Purwokerto has been published to date. This gap highlights the need for descriptive studies to better understand the profile of presbycusis patients in tertiary care settings. The findings of this study are expected to support early detection strategies, improve hearing loss management planning, and strengthen hearing rehabilitation services for the elderly population. By identifying patient characteristics and patterns of hearing loss, this study may contribute to more comprehensive and patient-centered approaches in geriatric otorhinolaryngology care.

Therefore, this study aims to describe the characteristics of presbycusis patients at RSUD Prof. Dr. Margono Soekarjo Purwokerto based on age, sex, occupational background, comorbidities, degree of hearing loss, and pure-tone audiometry findings, with the intention of providing practical insights for clinical practice and healthcare service planning.

2. METHOD

This study was a descriptive quantitative observational study with a retrospective design conducted at the Ear, Nose, and Throat–Head and Neck (ENT–HNS) outpatient clinic of RSUD Prof. Dr. Margono Soekarjo Purwokerto. A retrospective design was selected due to the availability of medical record data, as well as considerations of time efficiency and cost-effectiveness. Research data were obtained from medical records of patients diagnosed with presbycusis during the period 2022–2024. The study population consisted of all presbycusis patients who visited the ENT–HNS outpatient clinic within the study period. Total sampling was applied, including all patients who met the inclusion criteria and none of the exclusion criteria, resulting in a total of 81 subjects.

The inclusion criteria were patients aged ≥ 55 years who were diagnosed with presbycusis by an otolaryngologist based on clinical evaluation and pure-tone audiometry, and who had complete medical record data, including audiometric results. The exclusion criteria included patients with a history of acute acoustic trauma, chronic otitis media, conductive hearing loss, ototoxic agents, asymmetric hearing loss suggestive of retrocochlear pathology, or incomplete medical records. The variables analyzed included demographic characteristics (age, sex, and occupation) and clinical characteristics (comorbidities and degree of hearing loss based on pure-tone audiometry).

Tools and Materials

The instruments and materials used in this study included secondary data obtained from medical records of presbycusis patients at the ENT–HNS outpatient clinic of RSUD Prof. Dr. Margono Soekarjo Purwokerto for the period 2022–2024. Audiometric data were obtained from pure-tone audiometry examination results. Pure-tone audiometry examinations were performed by trained audiology personnel using audiometric equipment that had been routinely calibrated according to hospital standards. Data collection sheets were used to record demographic and clinical variables. Data processing and analysis were conducted using a computer or laptop with

the assistance of Microsoft Excel software (Microsoft Corporation, USA) to present the data in tables and graphical form.

Research Procedure

This study was conducted from August to November 2025. The research process began with the identification and collection of secondary data from medical records of patients diagnosed with presbycusis at the ENT-HNS outpatient clinic of RSUD Prof. Dr. Margono Soekarjo Purwokerto during the period 2022–2024. Data extraction was carried out by the researcher using a standardized data collection form. The collected data included demographic characteristics (age, sex, and occupation), comorbidities, and pure-tone audiometry results. Data verification was performed through double-checking to ensure accuracy and completeness. Medical records with incomplete or missing essential data were excluded according to the exclusion criteria. After the required sample size was fulfilled, totaling 81 patients, the data were compiled, coded, and prepared for analysis.

Operational Definition of Variables

Age was categorized into elderly age groups based on chronological age. Sex was classified as male or female. Occupation was grouped according to employment type, including formal and non-formal sectors. Comorbidities were defined as clinically diagnosed systemic diseases recorded in the medical records, including hypertension, diabetes mellitus, chronic kidney disease, and dyslipidemia from medical record.

The degree of hearing loss was determined based on pure-tone audiometry results using the average hearing threshold at standard frequencies. Hearing loss was classified into mild, moderate, moderately severe, and severe categories according to World Health Organization (WHO) hearing loss classification criteria. Presbycusis was diagnosed based on clinical evaluation and pure-tone audiometry findings showing bilateral, symmetrical sensorineural hearing loss, predominantly affecting higher frequencies, in the absence of other identifiable causes of hearing impairment, in accordance with accepted clinical guidelines.

Data Analysis

The collected data were analyzed using univariate analysis. Univariate analysis was performed to describe the frequency and percentage distribution of demographic and clinical characteristics of the study subjects. The results were presented in the form of distribution tables and graphs. The demographic variables analyzed included age, sex, and occupation, while the clinical variables comprised comorbidities, degree of hearing loss, and the mean hearing thresholds of the right and left ears based on pure-tone audiometry results. No inferential statistical analysis was conducted, as the primary objective of this study was to describe patient characteristics.

This study was approved by the Health Research Ethics Committee of RSUD Prof. Dr. Margono Soekarjo Purwokerto. Permission to access medical record data was obtained from the hospital authority. Patient confidentiality and data anonymity were strictly maintained throughout the research process, and no personal identifying information was included in the data analysis. This study has several limitations. The retrospective design relied on the completeness and accuracy of medical record data, which may introduce information bias. Additionally, quantitative assessment of noise exposure and functional hearing outcomes, such as speech discrimination ability, were not evaluated. Therefore, the findings should be interpreted cautiously and may not be generalized to the broader elderly population.

3. RESULT AND DISCUSSION

Result

The analysis included 81 subjects who met the inclusion and exclusion criteria and consented to participate in the study.

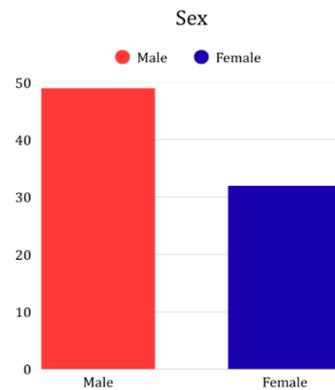


Figure 1. Distribution of Presbycusis Patients by Sex

A total of 81 presbycusis patients were included in this study. The sex distribution showed that the majority of patients were male, with 49 patients (60.5%), while female patients accounted for 32 patients (39.5%). These findings indicate that presbycusis was more prevalent among males than females during the study period.

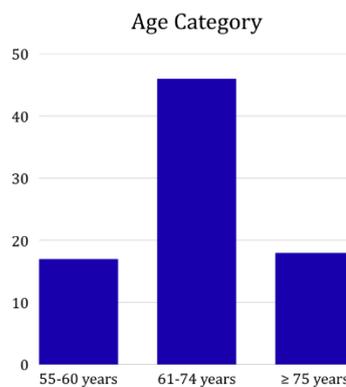


Figure 2. Distribution of Presbycusis Patients by Age Category

A total of 81 presbycusis patients were included in this study, all of whom were aged ≥ 55 years. The majority of patients were in the 61–74 age group, totaling 46 patients (56.8%). The ≥ 75 years age group was the second most common, with 18 patients (22.2%). Meanwhile, the 55–60 years age group had the smallest number of patients, comprising 17 patients (21.0%). These findings indicate that presbycusis was most frequently observed among older adults, particularly those aged 61–74 years.

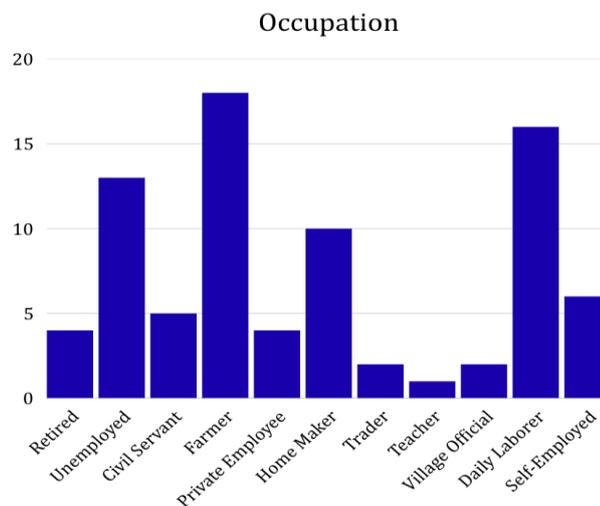


Figure 3. Distribution of Presbycusis Patients by Occupation

Figure 3 shows that among the total of 81 presbycusis patients, the most common occupation was farmer, accounting for 18 patients (22.2%). The second most frequent occupational group was homemakers with 15 patients (18.5%), followed by self-employed individuals with 13 patients (16.0%) and retirees with 12 patients (14.8%). Meanwhile, private employees, civil servants, and other occupations were found in smaller proportions. These findings indicate that presbycusis was more frequently observed among patients with non-formal occupational backgrounds and occupations typically performed over long periods of time.

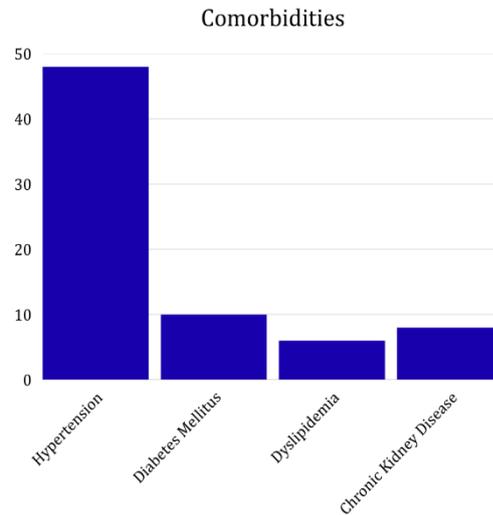


Figure 4. Distribution of Patient Comorbidities

Figure 4 shows that among the total of 81 presbycusis patients, the most common comorbidity was hypertension, affecting 48 patients (59.3%). The second most frequent comorbidity was diabetes mellitus, found in 10 patients (12.3%), followed by chronic kidney disease in 8 patients (9.9%) and dyslipidemia in 6 patients (7.4%). A small proportion of patients had other comorbidities or no recorded comorbid conditions. These findings indicate that hypertension was the most dominant comorbidity among presbycusis patients, accounting for more than half of the total study sample.

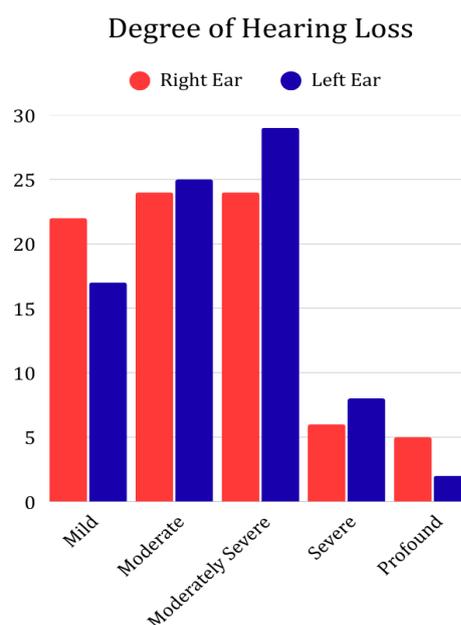


Figure 5. Distribution of Patients by Degree of Hearing Loss

Figure 5 shows that among the total of 81 presbycusis patients, the most common degree of hearing loss was moderate, affecting 32 patients (39.5%), followed by moderately severe hearing loss in 29 patients (35.8%). Meanwhile, mild hearing loss was observed in 12 patients (14.8%), and severe hearing loss in 8 patients (9.9%). These findings indicate that the majority of presbycusis patients experienced moderate to moderately severe hearing loss, with a substantially higher number of cases compared to mild and severe degrees.

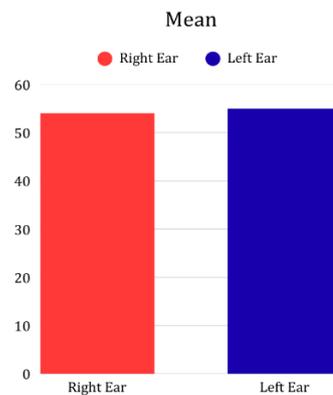


Figure 6. Mean Pure-Tone Audiometry Results in Patients

Figure 6 shows that among the total of 81 presbycusis patients, the mean hearing thresholds based on pure-tone audiometry were relatively high in both ears. The mean hearing threshold of the right ear was recorded at 55.9 dB, while the left ear showed a slightly higher mean hearing threshold of 57.3 dB. These findings indicate that hearing loss in presbycusis patients was bilateral, with the left ear demonstrating a higher mean hearing threshold than the right ear, although the difference was relatively small.

Discussion

The results of this study indicate that presbycusis patients at RSUD Prof. Dr. Margono Soekarjo Purwokerto were predominantly from older age groups, particularly those aged 61–74 years. This finding is consistent with the theory that presbycusis is a hearing disorder closely associated with the aging process, in which degeneration of inner ear structures, especially cochlear hair cells and the stria vascularis, increases with advancing age (Tas, 2022; Deveci et al., 2025). The prevalence of presbycusis is known to increase significantly in individuals over 60 years of age and reaches its peak in the advanced elderly population (WHO, 2021).

The sex distribution in this study showed that presbycusis was more frequently found in males than in females. This finding is consistent with several previous studies reporting a higher prevalence of presbycusis among males, which is thought to be related to long-term noise exposure, smoking habits, and hormonal differences between males and females (Tas, 2022; Picciotti et al., 2024). Estrogen hormones in females are believed to have a protective effect on the auditory system, which may explain the lower incidence of presbycusis before advanced old age.

Based on occupational distribution, most presbycusis patients had non-formal occupational backgrounds, particularly farmers and homemakers. This may be associated with long-term environmental noise exposure, the use of work tools without adequate hearing protection, and limited access to routine health examinations. Chronic noise exposure is known to accelerate damage to cochlear hair cells and worsen the degree of presbycusis (Gutiérrez & Baez, 2024).

The most common comorbidity found among presbycusis patients in this study was hypertension. This finding is in line with the study by Ratnasari and Wiranandha (2022), which stated that hypertension plays an important role in the development of presbycusis through mechanisms involving microcirculatory impairment and chronic ischemia of the cochlea. In

addition to hypertension, other comorbidities identified in this study included diabetes mellitus, chronic kidney disease, and dyslipidemia. Diabetes mellitus may cause microangiopathy and neuropathy that affect the stria vascularis and auditory nerve, thereby increasing hearing thresholds (Sitompul & Nasution, 2023). Chronic kidney disease and dyslipidemia are also known to contribute to metabolic and vascular disturbances that affect auditory function (Azeez et al., 2020; Sodhi et al., 2021).

The distribution of hearing loss severity showed that most presbycusis patients experienced moderate to moderately severe hearing loss. This result is consistent with the progressive nature of presbycusis, which is often detected only when hearing impairment has become sufficiently severe to interfere with daily communication (Picciotti et al., 2024). More severe degrees of hearing loss in elderly patients may also be influenced by the duration of exposure to risk factors and the presence of uncontrolled comorbidities.

Pure-tone audiometry results demonstrated that the mean hearing thresholds in both ears were relatively high and bilateral, with the mean hearing threshold of the left ear being slightly higher than that of the right ear. This finding is consistent with the characteristic of presbycusis, which is generally bilateral and symmetrical due to systemic degenerative processes affecting the inner ear (Deveci et al., 2025). The minimal difference in hearing thresholds between the right and left ears indicates that presbycusis differs from hearing loss caused by trauma or infection, which tends to be unilateral.

Differences in population characteristics, occupational backgrounds, and the presence of comorbidities are believed to contribute to variations in the findings of this study. These factors may influence both the degree and pattern of hearing loss observed in presbycusis patients. This indicates that presbycusis is a multifactorial condition and cannot be separated from the clinical context and individual patient characteristics. Therefore, the results of this study should be interpreted with caution and should not be directly generalized to the entire elderly population.

Conversely, the variation in hearing loss severity observed in this study suggests that the progression of presbycusis does not occur uniformly. Although most patients experienced moderate to moderately severe hearing loss, some patients were still found to have mild or severe degrees of hearing loss. This condition is influenced by the duration of exposure to risk factors, control of comorbid diseases, and individual susceptibility to degenerative processes in the inner ear. Therefore, chronological age alone does not always reflect the severity of presbycusis experienced by patients.

The findings of this study have important implications for clinical practice in Ear, Nose, and Throat–Head and Neck services, particularly in geriatric healthcare. Early detection of hearing impairment in older adults, especially in patients with comorbidities such as hypertension and diabetes mellitus, should be a major concern. Periodic pure-tone audiometry examinations may help identify hearing loss at an early stage, allowing for earlier intervention to prevent further impacts on communication and quality of life.

Audiometric examination as the primary modality for evaluating presbycusis has limitations because it only assesses hearing thresholds and does not fully represent overall auditory function. Presbycusis not only affects the ability to perceive sounds but also impairs speech understanding and social interaction. Therefore, audiometric results should be combined with comprehensive clinical assessments to obtain a more complete understanding of the patient's condition.

This study has several limitations, including its retrospective design, which relies on the completeness of medical record data, resulting in the inability to analyze all risk factors in depth. In addition, this study did not quantitatively evaluate noise exposure or other functional aspects of hearing. Future studies are recommended to use prospective designs with broader risk factor assessments and more comprehensive evaluations of auditory function to provide a more thorough understanding of presbycusis.

4. CONCLUSION

Presbycusis patients at RSUD Prof. Dr. Margono Soekarjo Purwokerto were predominantly from the elderly age group, particularly those aged 61–74 years, with a higher proportion of male patients compared to female patients. Most patients had a non-formal occupational background and were accompanied by comorbid diseases, especially hypertension. The most frequently observed degree of hearing loss was moderate to moderately severe, with hearing impairment that was bilateral and relatively symmetrical based on the results of pure-tone audiometry examinations. These findings indicate that presbycusis is a multifactorial condition associated with the aging process and systemic health conditions, highlighting the need for early detection and a comprehensive management approach in the elderly population.

5. REFERENCES

- Azeez, R. A., Al Ansary, A., & Bt. Yasin, T. Y. (2020). *Presbycusis and hyperlipidemia: Is there any link? Muthanna Medical Journal*, 7(2), 49–57. <https://doi.org/10.52113/1/7.2/2020.57>
- Badan Pusat Statistik. (2023). *Statistik penduduk lanjut usia 2023*. Badan Pusat Statistik.
- Deveci, T. N., Yilmaz, M. D., Domuta, M., & Hizalan, İ. (2025). Presbycusis. In *Otology Updates*. Springer Nature Switzerland.
- Evangelini, M. G., Falerina, R., Firdausi, H., & Nugroho, P. S. (2023). *Karakteristik pasien presbikusis di Rumah Sakit Universitas Airlangga tahun 2018–2021. Medicina*, 54(3), 175–178. <https://doi.org/10.15562/medicina.v54i3.1254>
- Gutiérrez-Torres, A., & Baez, S. (2024). *Presbycusis: Diagnosis, treatment, and its association with dementia*. In *The Palgrave Encyclopedia of Disability* (pp. 1–13). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-40858-8_176-1
- Inggas, Made Agus M., et al. *Patofisiologi Molekuler Penyakit: Pendekatan Sistem Biologis*. Mafy Media Literasi Indonesia Publisher, 2025, doi:10.1112/kakinaan1148.
- Nuswantoro, Ari, et al. *Imunologi Dasar: Memahami Sistem Pertahanan Tubuh Manusia*. Penerbit Mafy Media Literasi Indonesia, 2025, doi:10.1112/kakinaan1112.
- Picciotti, P. M., Di Cesare, T., Libonati, F. A., Libonati, G. A., Paludetti, G., & Galli, J. (2024). Presbycusis and presbyvestibulopathy: Balance improvement after hearing loss restoration. *Hearing, Balance and Communication*, 22(3), 94–99. <https://doi.org/10.1080/21695717.2024.XXXXXX>
- Ratnasari, M. G., & Wiranandha, M. (2022). Hubungan hipertensi terhadap kejadian presbikusis pada lansia di Puskesmas Denpasar Selatan I, Bali, Indonesia. *Intisari Sains Medis*, 13(3), 838–842. <https://doi.org/10.15562/ism.v13i3.XXXX>
- Sitompul, A. D. N., & Nasution, M. E. S. (2023). Hubungan kadar HbA1c dengan gangguan pendengaran sensorineural pada pasien diabetes melitus tipe 2. *Jurnal Ilmiah Kohesi*, 7(2), 97–103. <https://doi.org/10.33751/kohesi.v7i2.XXXX>
- Sodhi, J. K., Sarin, V., & Chandey, M. (2021). To study the effect of chronic kidney disease on hearing function of patients in a tertiary care centre of North India.
- Tas, A. (2022). Description of the characteristics, epidemiology, diagnosis, and risk factors of presbycusis disorder. *Central Asian Journal of Medical and Pharmaceutical Sciences Innovation*, 2(2), 46–56. <https://doi.org/10.22034/cajmps.2022.357875>
- World Health Organization. (2021). *World report on hearing*. WHO Press. <https://doi.org/10.1037/e697982005-001>