RESEARCH

Characteristics of Presbycusis Patients Based on Audiogram Results at Prof. I.G.N.G Ngoerah General Hospital 2019 - 2024

Made Gede Krisna Rendra Kawisana *, I Made Wiranadha, I Made Nudi Arthana*****

Department of Otorhinolaryngology - Head and Neck Surgery, Faculty of Medicine, Universitas Udayana/I. G. N. G. Prof Ngoerah Hospital Bali*

Department of Otorhinolaryngology - Head and Neck Surgery, Faculty of Medicine, Universitas Udayana/I. G. N. G. Prof Ngoerah Hospital Bali**

Bali Association of Otorhinolaryngology Head and Neck Surgery (ORL-HNS Bali)***

ABSTRACT

Background: presbycusis, or age-related hearing loss, is a cause of hearing loss and is also the most common neurodegenerative disorder. This age-related hearing loss occurs in the population over 60 years of age. The highest incidence is in those over 65 years of age, affecting more than 40% of the population in this age group. This then increases to 50% in the population over 70 years of age. **Purpose:** what are the characteristics of presbycusis patients in the ORL-HNS Polyclinic at I.G.N.G Ngoerah General Hospital, Denpasar, from January 2019 to January 2024. **Method:** this study is a retrospective descriptive study that takes secondary data from the register of pure tone audiometry test results of presbycusis patients who came to the ORL-HNS Department, Neurotology Division, Prof. I.G.N.G Ngoerah General Hospital, Denpasar from January 2019 to January 2024. **Result :** Based on this small descriptive study, in terms of gender characteristics, presbycusis was higher in men than women, namely 62 men (63%) and 36 women (37%), and most were in the 60-70 year age group. The average degree of deafness in the right and left ears was moderate-severe, with the dominant type of presbycusis being the strial or metabolic type.

Keywords: presbycusis, pure tone audiometry, hearing loss severity, audiogram pattern

Correspondence address: I Made Nudi Arthana.. Email: neoxdie@gmail.com

Citation: Kawisana, M. B. K. R., Wiranadha, I. M.,Arthana, I. M. N.,(2026) . Characteristics of Presbycusis Patients Based on Audiogram Results at Prof. I.G.N.G Ngoerah General Hospital 2019 - 2024 . Research in Journal of Otorhinolaryngology Bali, 1(1).
DOI: -
ISSN : -
Journal Editor: Ketut Tadeus Max Nurcahya Pinatih
Received: 10 Januari 2026
Revised: 16 Januari 2026
Accepted: 17 Januari 2026
Published: 18 Januari 2026

INTRODUCTION

Aging is the progressive decline or loss of tissue and organ function over time due to the gradual accumulation of adverse biological changes.[1,2,3] The aging process has three distinct components: biological degeneration, extrinsic damage, and intrinsic damage. These factors depend on genetics and general susceptibility to age-related diseases.[4,5,6]

The inner ear consists of two sensory structures: the cochlea, which is responsible for hearing, and the vestibular organ, which is responsible for balance (along with vision, proprioception, and the motor system). Both of these structures exhibit age-related structural and functional changes, and age-related hearing loss, or presbycusis, and age-related loss of vestibular function, are common in older adults.[7,8,9] Presbycusis, or age-related hearing loss, is a cause of hearing loss and is also the most common neurodegenerative disorder. This age-related hearing loss occurs in people over 60 years of age. The incidence is highest in those over 65 years of age, affecting more than 40% of the population in this age group. This rate increases to 50% in those over 70 years of age.[10,11,12]

Based on the histological changes and location of cochlear degeneration, Schuknecht identified four types of presbycusis reflected in pure-tone audiometry. These four types of presbycusis are sensory, neural, metabolic or strial, and cochlear conduction or mechanical. Accurately measuring hearing ability in elderly patients is crucial to identify the difficulties they face in their daily lives.[13,14,15]

Presbycusis is a hearing disorder that has received attention from the Hearing Impairment and Deafness Management Program. The program aims to reduce the incidence of presbycusis by 90% by 2030. It is hoped that this program can prevent an increase in the presbycusis population by addressing risk factors.[16,17]

Based on the above background, the researchers were interested in conducting a study on the characteristics of presbycusis based on pure-tone audiometry findings at the ORL-HNS Polyclinic of I.G.N.G Ngoerah General Hospital, Denpasar.

The general objective of this study was to determine the characteristics of patients with presbycusis at the ORL-HNS Polyclinic of I.G.N.G. Ngoerah General Hospital, Denpasar. The benefit of this study is to provide information and knowledge regarding the baseline characteristics of presbycusis patients at I.G.N.G. Ngoerah General Hospital, Denpasar, from January 2019 to January 2024. This data can serve as a basis for further research.

METHOD

This study is a retrospective descriptive study that takes secondary data from the register of pure tone audiometry test results of presbycusis patients who came to the ORL-HNS Polyclinic, Neurootology Division, Prof. I.G.N.G Ngoerah General Hospital, Denpasar from January 2019 to January 2024. Sampling was conducted using total sampling. Using descriptive statistics using frequency and percentag. Each subject's data that met the research criteria was included in the data analysis.

Data collection characteristics include:

1. Age,
2. Gender
3. Degree of Hearing Loss
4. Type of Presbycusis

Inclusion Criteria:

A. The inclusion criteria for this study were elderly patients (over 60 years old) with hearing loss who underwent a pure-tone audiometry test and found sensorineural hearing loss (SNHL) in both ears or bilaterally.

Exclusion Criteria

The exclusion criteria were patients under 60 years old, had hearing loss in one ear, either unilateral or bilateral, with audiometry results other than SNHL and type A tympanometry results in both ears; patients who had undergone middle ear surgery (tympanoplasty or

JOOB 001 Volume I No.I, p 7-11

tympanomastoidectomy); patients who had chronic middle ear infections; and those currently suffering from acute inflammation of the ear, nose, and throat.

RESULT

From the medical record data obtained, there were 98 patients with Presbycusis who had undergone audiometry and tympanometry examinations in the period January 2019 to January 2024 who came to the ORL-HNS polyclinic of Prof. Dr. I.G.N.G. Ngoerah General Hospital, Denpasar.

The most common age group for presbycusis was 63 (64%) people, aged 60-70 years, and the lowest age group was 7 (7%) people, aged over 80 years.

Table 1. Presbycusis by Age

Age	Number	Percentage %
60-70	63	64%
71-80	28	29%
>80	7	7%
Total	98	100%

There were 62 male patients (63%) and 36 female patients (37%). Based on hearing level, the most common presbycusis was moderate-severe in the right ear (28%) and moderate-severe in the left ear (31%).

Table 2. Presbycusis by Gender

Gender	Number	Percentage %
male	62	63%
Female	36	37%
Total	98	100%

Table 3. Presbycusis based on the degree of hearing loss

Degree of Hearing Loss	Number	%
Right Ear		
Normal	-	
SNHL Mild (>25-40 dB)	19	19%
SNHL Moderate (>40-55 dB)	27	27%
SNHL Moderate Severe (>55-70 dB)	28	28%
SNHL Severe (>70-90 dB)	17	17%
SNHL Very Severe (>90 dB)	9	9%
Total	98	100%
Left Ear		
Normal	-	
SNHL Mild (>25-40 dB)	17	17%
SNHL Moderate (>40-55 dB)	22	22%
SNHL Moderate Severe (>55-70 dB)	31	32%
SNHL Severe (>70-90 dB)	23	24%
SNHL Very Severe (>90 dB)	5	5%
Total	98	100%
Degree of Hearing Loss	Number	%
Right Ear		
Normal	-	
SNHL Mild (>25-40 dB)	19	19%
SNHL Moderate (>40-55 dB)	27	27%
SNHL Moderate Severe (>55-70 dB)	28	28%
SNHL Severe (>70-90 dB)	17	17%
SNHL Very Severe (>90 dB)	9	9%
Total	98	100%
Left Ear		
Normal	-	
SNHL Mild (>25-40 dB)	17	17%
SNHL Moderate -- (>40-55 dB)	22	22%
SNHL Moderate Severe (>55-70 dB)	31	32%
SNHL Severe (>70-90 dB)	23	24%

SNHL Very Severe (>90 dB)	5	5%
Total	98	100%

Based on presbycusis type, the most common presbycusis was strial in the right ear (71 patients (72%) and left ear (64 patients (65%). The least common type of presbycusis was neural in the right ear (2%) and 4 patients (4%) in the left ear.

Table 4. Presbycusis based on presbycusis type

Presbycusis Type	Right Ear	%	Left Ear	%
Sensory	19	20%	25	26%
Neural	2	2%	4	4%
Strial	71	72%	64	65%
Cochlear / Conduction	6	6%	5	5%
Total	98	100 %	98	100%

Based on Table 4, the most common type of presbycusis was the strial type in the right ear, with 71 patients (72%) and the left ear, with 64 patients (65%). The least common type of presbycusis was the neural type, with 2 patients (2%) in the right ear, and 4 patients (4%) in the left ear.

DISCUSSION

Presbycusis is a sensorineural hearing loss that is a physiological condition of aging of the auditory organs. Presbycusis generally occurs in people over 60 years of age, but it can also occur before that age. Presbycusis usually occurs symmetrically in the left and right ears, with hearing loss at high frequencies, but sometimes also shows a decrease in all frequencies, and most importantly, significant hearing loss.[4,5]

Describes the research findings: the significance or benefits of the research both for the research itself and for clinical application, as well as the differences and similarities with other research. The final discussion paragraph outlines the research conclusions and recommendations (if necessary).

In a study by Ario et al., the highest prevalence of presbycusis was found in individuals aged 65-65 years, with 51 individuals (57.95%).2,8 Mondelli et al. stated that presbycusis affects approximately 30-35% of the population aged 65-75 years, while the prevalence is approximately 40-45% in those over 70 years.31 This study, conducted at the ORL-HNS clinic at Prof. Dr. I.G.N.G Ngoerah Denpasar in the 2019-2024 period found 98 presbycusis sufferers with the highest age range of 60-70 years as many as 63 people (64%) and the lowest age range in the age range >80 years as many as 7 people (7%).

In a study conducted by Ario et al., 135 participants participated: 87 (64.44%) were female and 48 (35.56%) were male. 17 In contrast, a study by Ratih et al. found that there were more males (26 patients) and 8 (23.53%) females. 20 The literature indicates that hearing loss begins in young adulthood and decreases with age due to cell damage caused by oxidative stress that increases and accumulates over time. Other factors influencing the development of presbycusis include gender, age, family history, comorbidities such as hypertension, diabetes mellitus, and hypercholesterolemia, noise exposure, and smoking history. 29,30 In this study,62 (63%) patients were male and 36 (37%) were female. In a 2013 study by Nuryadi et al., conducted at Prof. Ngoerah General Hospital, the highest hearing loss in presbycusis patients was moderate in the right ear (11 patients (42.31%), and moderate-severe in the left ear (11 patients (42.31%). This study found that the highest hearing loss in presbycusis patients was moderate-severe in the right ear (28 patients (28%), and moderate-severe in the left ear (31 patients (32%).

The literature indicates that metabolic presbycusis is the most common type of presbycusis. Damage to this type includes atrophy of the stria vascularis, decreased microphonic potential, and reduced cell function and biochemical/bioelectrical balance in the cochlea. Hearing loss associated with strial presbycusis is sensory loss that begins between the third and sixth decades and progresses slowly.[17]

This study found that the most common type of presbycusis was strial in the right ear (71 patients (72%) and the left ear (64 patients (65%). The least common type of presbycusis was neural in the right ear (2%) and 4 patients (4%) in the left ear.

ACKNOWLEDGMENT

We thank our colleagues for their valuable suggestions and discussions, which significantly improved the quality of this work.

REFERENCE

1. Wang J, Puel JL. Presbycusis: An Update on Cochlear Mechanisms and Therapies. J Clin Med. 2020 Jan;9(1):218.
2. Paplou V, Schubert NMA, Pyott SJ. Age-Related Changes in the Cochlea and Vestibule: Shared Patterns and Processes. Front Neurosci. 2021 Sep 3;15:680856
3. Kim TS, Chung JW. Evaluation of Age-Related Hearing Loss. Korean J Audiol 2013; 17 : 50-53.
4. Lee KY. Pathophysiology of Age-Related Hearing Loss (Peripheral and Central). Korean J Audiol 2013; 17: 45-49.
5. Hall, J. 2016. Guyton and Hall Textbook of Medical Physiology, 13th edn, Elsevier: Philadelphia.
6. Hansen, J. 2014. Netter's Clinical Anatomy, 3rd edn. Elsevier: Philadelphia.
7. Howarth, A. 2005. Ageing and the auditory system. Postgraduate Medical Journal. 82(965), hal. 166–171.
8. Ito, J. 2015. Regenerative Medicine in Otolaryngology. Springer: Japan.
9. Khan, B. H., Aslam, S. and Palous, P. (2012). Pattern of Pure Tone Audiograms in Presbyacusis. pp. 84–87.
10. Kim, T. S. & Chung, J. W. 2013. Evaluation of age-related hearing loss. Korean Journal of Audiology. 17(2), hal. 50–53.
11. Lee, K.-Y. 2013. Pathophysiology of Age-Related Hearing Loss (Peripheral and Central). Korean Journal of Audiology. 17(2), hal. 45. Levine, S. 1997. Penyakit Telinga Dalam. BOEIS: Buku Ajar Penyakit THT, Ed ke-6. EGC: Jakarta.
12. Lin, F., Thorpe R., Gordon-Salant,S. et al. 2011. Hearing Loss Prevalence and Risk Factors Among Older Adults in the United States. The Journals of Gerontology Series A: Biological Sciences and Medical Sciences. 66A(5), hal. 582–590.
13. Rahayu, M. L., Setiawan, E. P., Sumerjana, I. K., Suryatika, I. B. M., Putra, I. W. G. A. E., Pinatih, K. T. M. N., ... & Widiantari, I. G. A. P. W. (2023). Making tinnitus songs according to the frequency and amplitude of the sound of tinnitus sufferers that are safe and comfortable for sufferers. *Indonesia Journal of Biomedical Science*, *17*(1), 28-32.
14. Rahayu, M. L., Wiranadha, I. M., Suryatika, I. B. M., Sumerjana, I. K., Purba, P. A. B., & Arthana, I. M. N. (2023). Comparison of the comfort of De Tinnitus music plus a sound generator compared to De Tinnitus music in healthy people. *Indonesia Journal of Biomedical Science*, *17*(2), 314-316.
15. Rahayu, M. L., Pinatih, G. N. I., Setiawan, E. P., Lesmana, I. W. L., Pinatih, K. T. M. N., Arthana, I. M. N., & Widiantari, I. G. A. P. W. (2022). Development of a tinnitus sound generator that matches the sound of tinnitus patient. *Bali Med J*, *11*(2), 1018-22.
16. Sutanegara, S. W. D., Saputra, K. A. D., Putra, I. W. G. A. E., Suryatika, I. B. M., & Arthana, I. M. N. (2023). Randomized Clinical Trial: Effectiveness of Tinnitus Treatment Using Music de Tinnitus Therapy Compared with Standard Therapy. *European Journal of Clinical Medicine*, *4*(6), 1-6
17. Pinatih, G. N. I., Setiawan, E. P., Pranitasari, N. P. O. R., Dewantara, I. P. S., Pinatih, K. T. M. N., & Arthana, I. M. N. (2023). Tinnitus characteristics and risk factors in the Bali region. *Indonesia Journal of Biomedical Science*, *17*(2), 257-261.