Hearing loss

Hearing loss is a pathological condition **resulting in** a partial or complete loss of the sense of hearing [1].It is defined as a reduction in auditory acuity, regardless of its severity and/or etiology. The term **hypoacusis** is also used and generally refers to mild to moderate degrees of hearing impairment. Complete loss of hearing is referred to as **cophosis (anacusis)** and may be unilateral or bilateral.

Hearing impairment perceived by the patient or reported by relatives is a common reason for consultation in **otorhinolaryngology (ENT)**. It represents a significant public health concern. Depending on the anatomical part of the ear involved, hearing loss can be classified into three distinct categories, each with different etiologies, prognoses, and treatment approaches:

- **Conductive hearing loss** (conductive deafness);
- **Sensorineural hearing loss** (perceptive deafness);
- **Mixed hearing loss**, which combines both conductive and sensorineural mechanisms

[2]

According to the International Bureau of Phoniatrics and Audiophonology (BIAP), hearing loss can be categorized into mild, moderate, severe, profound, and total impairment.

Hearing impairment represents the most prevalent sensory deficit, particularly among children. When not recognized and managed promptly, it can contribute to severe communicative and developmental consequences, including deaf-mutism—characterized by profound deafness alongside speech and language impairment.

Although the diagnosis of hearing loss remains largely clinical, determining the underlying etiology is equally critical to guide appropriate therapeutic decisions. Historically, auditory function was evaluated by estimating the distance at which a patient could perceive sounds, followed by observational and bedside assessments such as watch ticking and tuning-fork testing. Contemporary advances in electroacoustic technologies, however, have introduced more objective and

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reproducible diagnostic methods, including Auditory Evoked Potentials (AEPs), thereby improving both accuracy and reliability in auditory assessment.[3]

Severe-to-profound hearing loss requires specialized management due to the extent of auditory deprivation. Such cases present specific clinical challenges related to amplification strategies, the prevention and mitigation of acoustic feedback (e.g., acoustic howling), and the optimization of speech perception and intelligibility. Whether the condition is congenital or acquired—and irrespective of whether it occurs in childhood or adulthood—effective management requires considerable expertise and careful follow-up by audiology specialists and hearing care professionals (audioprosthetists).[4]

Several categories of hearing aids are available, with selection determined by the degree of hearing loss and the audiometric configuration.

Receiver-in-Canal (RIC) hearing aids. RIC devices deliver effective and versatile amplification. Most RIC systems are appropriate for individuals with mild-to-severe hearing loss. In patients with severe impairment, a Super Power (SP) receiver—integrated into a custom earmouldmay be indicated. Embedding the receiver within a precisely fitted shell can provide maximal acoustic gain while reducing transmission of extraneous mechanical vibration and limiting acoustic feedback. As a result, the configuration enhances amplification efficiency and supports improved comfort during wear.

Behind-the-Ear (BTE) hearing aids.When RIC amplification is insufficient, a Behind-the-Ear (BTE) hearing aid may be recommended, particularly for severe-to-profoundhearing loss. Compared with RIC devices, BTE hearing aids typically offer greater output capability, although they are often larger in form factor. Importantly, they retain many of the functional benefits associated with contemporary digital RIC systems.

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Modern BTE devices may also include wireless connectivitywith smartphones, allowing direct audio streaming and telephone call transmission through the hearing aid. This can substantially improve communicative effectiveness, especially in individuals with profound hearing loss, for whom telephone communication is otherwise highly difficult.

Additionally, BTE hearing aids provide advanced technological features and fitting flexibility comparable to those of RIC systems, including digital signal-processing noise-reduction algorithms, directional microphones, feedback suppression, and programmable, individualized amplification parameters tailored to the patient's auditory profile. (4)

Super-Power Behind-the-Ear (BTE) Hearing Aids: Ultra-Powerful Devices for Profound Hearing Loss. Super-power Behind-the-Ear (BTE) hearing aids provide the highest levels of acoustic amplification available among conventional hearing aid technologies. These devices are specifically designed for individuals with severe-to-profound sensorineural hearing loss, offering substantially greater gain and output than standard hearing aids. Their enhanced amplification capabilities enable effective auditory rehabilitation for patients with advanced hearing impairment while incorporating sophisticated feedback management and signal-processing technologies.

Cochlear Implants

Cochlear implants are an effective rehabilitative option for patients with total deafness (cophosis/anacusis) or profound hearing loss who have reached the functional limits of conventional hearing aids. These implantable auditory prostheses bypass damaged cochlear hair cells and directly stimulate the auditory nerve, thereby restoring auditory perception in appropriately selected candidates.

According to recent estimates from the World Health Organization (WHO), more than 360 million people worldwide live with disabling hearing loss, including approximately one-third of individuals over 65 years of age, representing nearly 165 million people globally [5].

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In Mauritania, hearing loss affects approximately 3% of the population, corresponding to nearly 90,000 individuals, whereas in Burkina Faso, an estimated 1.5 million people are affected by hearing impairment [6].

II- Patients and METHODS

II.1 Study Design and Period

This retrospective descriptive and analytical study investigated hearing loss in Mauritania. The study was conducted over an eight-month period, from April 2024 to November 2024.

II.2 Study Setting

The Audiology and Hearing Aid Center of the National Hospital Center (CHN), which opened on March 5, 2024, and was officially inaugurated on May 24, 2024, comprises six dedicated units:

A conference and speech therapy room with both an individual consultation area and a group therapy area;

A unit dedicated to impedance audiometry (tympanometry) and pure-tone audiometry;

A unit for Auditory Evoked Potentials (AEPs) assessment;

A hearing aid workshop;

An office for the supervising audiologist and a reception area.

II.3 Inclusion and Exclusion Criteria

II.3.1 Inclusion Criteria

The study included all patient records meeting the following criteria:

Clinically and paraclinically confirmed diagnosis of hearing loss;

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Patients were evaluated and managed at the CHN Audiology Center between April and November 2024.

II.3.2 Exclusion Criteria

The following records were excluded:

Incomplete medical records

Patients lost to follow-up.

II.4 Data Collection

Data were collected using a standardized individual data collection form designed to assess the epidemiological, clinical, and diagnostic characteristics of hearing loss.

II.5 Statistical Analysis

Data were extracted from patients' medical records using a structured data collection sheet and analyzed using Microsoft Excel 2016. Results were prepared and selected variables were graphically presented using Microsoft Word 2016 and Microsoft Excel 2016, respectively.

III. DISCUSSION

III.1 Sociodemographic Characteristics

III.1.1 Age

In our study, the mean age of the patients was 41.76 years, ranging from 1 to 70 years. These findings are comparable to those reported by Ismail Berthe in Bamako, who found a mean age of 37.62 years. Similarly, Harris CM et al. reported a mean age of 59.2 years, while Ibrahima Fofana found a mean age of 37.18 years.

The most represented age group in our series was patients older than 60 years, accounting for 25.2% of cases. In contrast, Ismail Berthe reported that the 25–35-year age group was the most prevalent, representing 23% of cases.

III.1.2 Sex

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In our study population, males predominated, accounting for 66.6% of cases compared with 33.4% for females, yielding a male-to-female ratio of 2:1. These findings are consistent with those reported by other authors, including Ag Mohamed et al. in Bamako, Adjibabi in Benin, and Ibrahima Fofana in Mali, who reported male prevalences of 62.55%, 57.6%, and 60%, respectively.

The proportion of male patients in our study was higher than the 50.5% reported by Poumale in Bangui.

The predominance of males may be explained by several factors. Men are generally more exposed to otorhinolaryngological disorders and to environmental risk factors associated with hearing impairment. Furthermore, sex hormones appear to influence auditory function. Several studies have demonstrated that women, particularly during the premenopausal period, exhibit better auditory sensitivity than age-matched men, likely owing to the protective effects of estrogens on the auditory system.

In addition, males are more frequently exposed to occupational and recreational noise, which constitutes a major risk factor for hearing loss. They are also more likely to present with idiopathic hearing loss, in which no specific etiology can be identified. Consequently, both biological and environmental factors may contribute to the higher prevalence of hearing impairment observed among men.

III.1.3 Geographic Distribution

Our study demonstrated that the majority of patients were from the three wilayas of Nouakchott (NKTT), accounting for 46.6% of all cases. This distribution may be attributed to the greater accessibility and availability of healthcare services in the capital region compared with the more remote inland wilayas.

Tableau I : Distribution of Patients by Geographic Area

Region	Patients	Percentage (%)
NKTT	14	46,7%
Rosso	02	6,6 %

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Aleg	01	3,3%
Néma	01	3,3%
Kiffa	01	3,3%
NDB	02	6,6%
Aïoun	01	3,3%
Atar	03	10%
Zouératte	03	10%
Akjoujette	02	6,6%
Total	30	100%

III.2 Clinical Characteristics

III.2.1 Presenting Complaint and Associated Symptoms

Hearing loss was the primary presenting complaint in all patients, with 56.6% reporting isolated hearing impairment. Additional otological symptoms associated with hearing loss were identified, including vertigo in 20% of cases and tinnitus in 23.3%.

In the study conducted by Nagnouma Camara, 90% of patients presented with isolated hearing loss, whereas 41% reported hearing loss associated with tinnitus. These findings are comparable to those reported by Fofana, who found tinnitus in 46.22% of cases.

Hearing loss is more commonly associated with tinnitus than with vertigo. Moreover, auditory impairment is particularly disabling when it is bilateral. Hearing loss is generally the predominant presenting symptom of otologic disorders and frequently constitutes the main reason for seeking an otorhinolaryngological consultation.

III. 2.2 Medical History

Our findings indicate that 60% of patients had no significant medical or otologic history. These results are comparable to those reported by Nagnouma Camara, who found that 78% of patients had no relevant past medical history.

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A history of otologic disease was documented in 40% of our patients, consistent with findings from Hoppe and Petersen, who reported otologic antecedents in 40% and 63% of patients, respectively.

Consanguinity is a recognized risk factor for sensory deficits, particularly hearing and visual impairments. In our study, 20% of patients were born to consanguineous parents. This finding is comparable to that reported by Boudin, who observed that 28% of deaf individuals at the Imperial Institution of Paris were born to consanguineous unions. Similarly, Lande reported a prevalence of 30% in Bordeaux, while Perrin reported 25% in Lyon.

These observations further support the established role of genetic determinants and hereditary disorders in the pathogenesis of hearing impairment, particularly in populations where consanguineous marriages are prevalent.

Tableau II : **Distribution of Patients According to Past Medical History**

Medicalhistory	**Patients**	**Percentage (%)**
Mastoiditis	02	6.6%
Meningitis	01	3.3%
Noise-induced acoustic trauma	06	20 %
Temporal bone fracture	01	3.3%
Ototoxicmedications	02	6.6 %
Nosignificant past medical history	18	60%
Total	30	

III. 3 Otoscopic Findings

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In our study, otoscopic examination was performed in all patients. Among them, 23.3% had abnormal tympanic membrane findings, including perforations and morphologic alterations.

These results are comparable to those reported by Fofana [9], who found pathological tympanic membranes in 34.5% of patients, whereas Nagnouma Camara [14] and Ismail Berthe [7] reported higher rates of 67% and 83%, respectively.

According to Thomassin [18], the initial otoscopic examination allows hearing loss to be classified into two major entities: hearing loss associated with abnormal otoscopic findings and hearing loss with a normal otoscopic examination. Similar observations have been reported by Camara [19] and Gyebre [20].

Tableau III : **Distribution of Patients According to Otoscopic Findings**

Tympanic Membrane findings	**Patients**	**Percentage**
Normal	23	76,6 %
MarginalPerforation	02	6,6 %
Non-MarginalPerforation	03	10%
Total Perforation	02	6,6%
Total	30	100%

III. 4 Paraclinical Findings

III. 4.1 Audiometric Findings Following confirmation of the type of hearing loss, pure-tone audiometry demonstrated that sensorineural hearing loss (SNHL) was the most common subtype, accounting for 67% of cases in our study. Conductive hearing loss (CHL) and mixed hearing loss (MHL) represented 20% and 13% of

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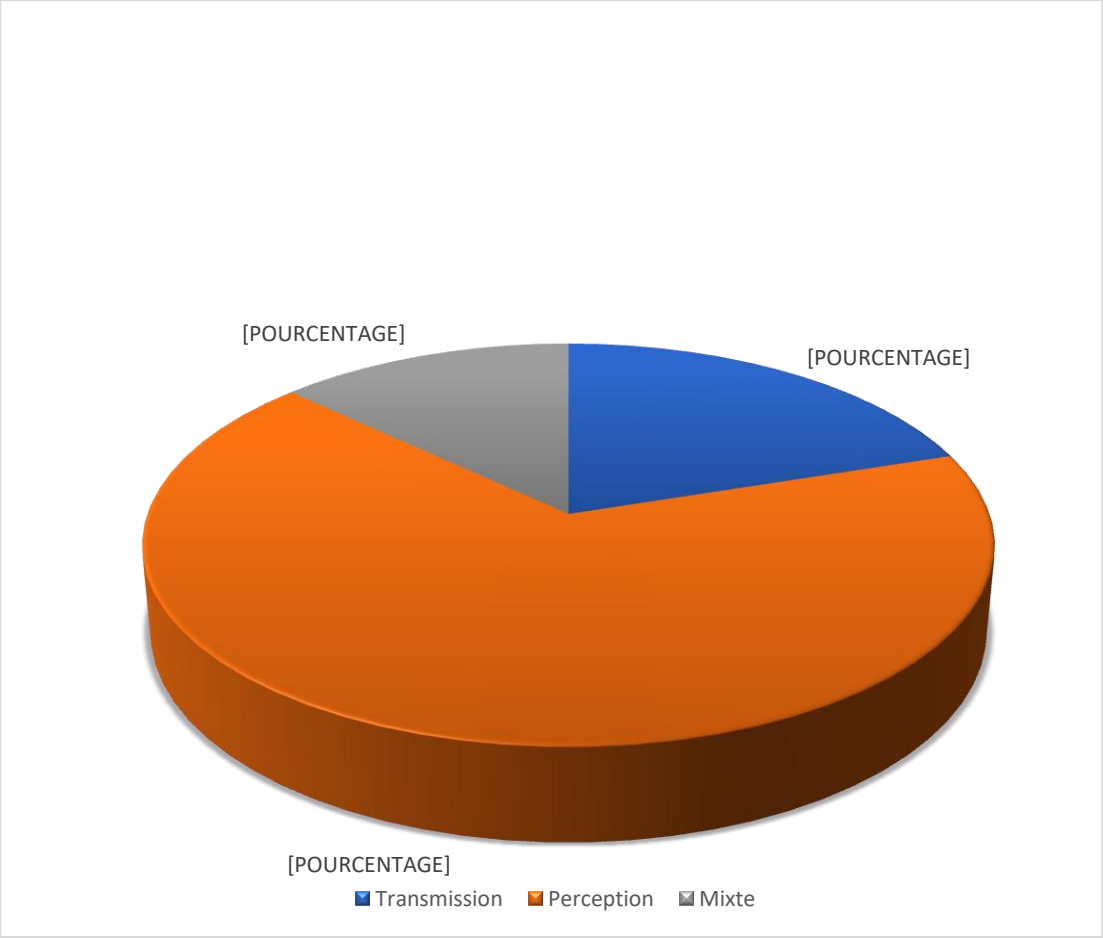
cases, respectively. Our findings are consistent with those reported by Ozcan [21] and Hadizatou Aboubacar [22], both of whom also found sensorineural hearing loss to be the predominant subtype in their respective studies. Similarly, Kimberly [13] reported a high prevalence of sensorineural hearing loss among students despite the absence of previous otologic disease, which was attributed to chronic exposure to noisy environments. In contrast, Ismail Berthe [7] reported a predominance of conductive hearing loss, accounting for 66.08% of cases, whereas Bolajoko [23] and Adjibabi [11] found mixed hearing loss to be the most frequent subtype, with prevalences of 40% and 43.35%, respectively.

III. 4. 4.2 Acoustic immittance testing

Immittance testing is an objective audiological assessment that evaluates middle ear function by measuring the impedance- matching properties of the tympanic membrane and ossicular chain during the transmission of acoustic energy from the external auditory canal to the inner ear [18, 21, 18,21,24].



III. 4. 2. 4.2.1 Tympanometry

Tympanometry was performed in 23 patients (76. 6% of the study population), a proportion higher than that reported by Hadizatou Aboubacar [22] (47%).

Among patients who underwent tympanometry, 60. 8% exhibited a normal tympanogram (Type A), comparable to the findings of Alonso- Luján et al. [25] and Savic et al. [26], who reported Type A tympanograms in 72. 9% and 85. 4% of cases, respectively.

Abnormal tympanograms were observed in the remaining patients, with 21. 7% demonstrating a Type C tympanogram and 17. 3% a Type B tympanogram. Similar findings were reported by Lucic et al. [27], who observed Type B and Type C tympanograms in 10. 37% and 14. 63% of patients, respectively. Likewise, Savic et al. [26] reported Type C and Type B tympanograms in 10. 1% and 4. 4.5% of cases, respectively.

Tableau IV : Distribution of Patients According to Tympanometry Findings

TympanometryFindings	Patients	Percentage (%)
Type A	14	60.8%
Type B	04	17.3%
Type C	05	21.7%
Total	23	100 %

III. 4. 2. 4.2.2 Acoustic Reflex Testing

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In our study, acoustic reflex testing was performed in 76. 6% of patients. Of these, 16. 6% had absent stapedial reflexes. This finding may reflect impaired sound transmission through the middle ear or abnormalities affecting the neural pathways involved in the acoustic reflex.

Our results are comparable to those reported by Kowalska et al. [28] and Waissbluth et al. [29], who found absent stapedial reflexes in 19. 1% and 13% of patients, respectively. In contrast, Ayerbe et al. [30], Savic et al. [26], and Picciotti et al. [31] reported higher rates of absent stapedial reflexes, reaching 70%, 70%, and 66. 3%, respectively.

III. 4. 2. 4.2.3 Hearing Aid Fitting

In our study, 90% of patients were fitted with bilateral behind- the- ear (BTE) hearing aids. This finding is comparable to that reported by Morgan et al. [32] in Montpellier, where all patients in the study (100%) received bilateral hearing aids.

IV. CONCLUSION

Hearing is essential for communication and has a major impact on social interaction, professional activities, and quality of life. Hearing loss can lead to communication difficulties, social isolation, and reduced quality of life.

To assess the prevalence of hearing loss and describe its diagnostic and therapeutic characteristics, we conducted a retrospective descriptive study at the Audiology and Hearing Aid Center of the National Hospital Center of Nouakchott between April and November 2024. A total of 30 patients with hearing loss were included.

The mean age was 41.76 years (range: 1–70 years). Males represented 66.6% of the study population, with a male-to-female ratio of 2:1. Patients older than 60 years were the largest age group (40%). Most patients were from the three wilayas of Nouakchott.

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Sixty percent of patients belonged to the middle socioeconomic class. Likewise, 60% had no significant past medical history. Isolated hearing loss was the most common presenting complaint, occurring in 56.6% of patients.

Otoscopic examination was performed in all patients and revealed tympanic membrane abnormalities in 23.4% of cases. Pure-tone audiometry identified sensorineural hearing loss as the most frequent type, accounting for 67% of cases.

Hearing aids are an important part of hearing rehabilitation. They improve hearing, facilitate communication, reduce social isolation, and help prevent deaf-mutism in children with untreated hearing impairment. In our study, behind-the-ear (BTE) hearing aids were the most commonly prescribed devices.

Management of hearing loss should be tailored to the patient's type and degree of hearing impairment. Regular follow-up and hearing aid adjustments are necessary to achieve the best functional outcome.

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