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FREQUENCY OF HEARING LOSS AMONG PATIENTS ATTENDING HOSPITALS IN MOSUL CITY

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ABSTRACT
Background: A hearing loss is either partial or complete loss of hearing, which may develop at some point in life or can be congenital. Hearing loss can be unilateral or bilateral. Hearing defects can cause educational restrictions for kids, and it might cause troubles for adults' social and professional interactions. It may be transient or irreversible.[1] Age-related hearing loss is typically bilateral and results from the degeneration of cochlear hair cells. Isolation and depression both can result from hearing loss in certain persons, especially in older people.[2]

Hearing loss has many causes, such as hereditary, aging process, exposure to loud voices, certain diseases, difficulties during labor, trauma to the head, and drug misuse or toxins exposure.[3] prolonged ear infections are a common condition that causes hearing loss in people. Perinatal diseases can lead to hearing loss in the fetus, including *rubella syphilis* and *CMV*. If an individual cannot listen to sounds louder than 25 dB in at least one ear, they have been diagnosed with hearing loss.[4-5]

It is advised that all babies be tested for hearing impairments. Mild (twenty-six to forty dB), moderate (forty-one to fifty-five dB), moderate-severe (fifty-six to seventy dB), severe (seventy-one to ninety dB), and profound (more than ninety dB) are the different classifications for hearing loss. Conductive, sensorineural, and mixed hearing loss are the three primary categories of hearing loss.[6]

Worldwide, public health interventions can prevent almost 50% of hearing loss cases. These precautions include vaccination, good antenatal care, avoiding loud noises, and avoiding certain medications. In an attempt to reduce noise exposure, the World Health Organization advises young people to restrict their exposure to loud noises and to use personal audio players for no more than an hour each day.[7] For children in particular, early identification and support are crucial. Subtitles, sign language, cochlear implants, and hearing aids are helpful for many people. Another useful talent that some people learn is lip reading.[8]

Definition
Hearing loss is defined as reduced clarity of sounds that one would typically be able to perceive. It occurs when sound waves enter the ears and damage the delicate tissues. The severity of hearing loss is classified by the amount of sound intensity that must rise above average for the listener to notice a change in hearing.[9-10] Figure 1.1.

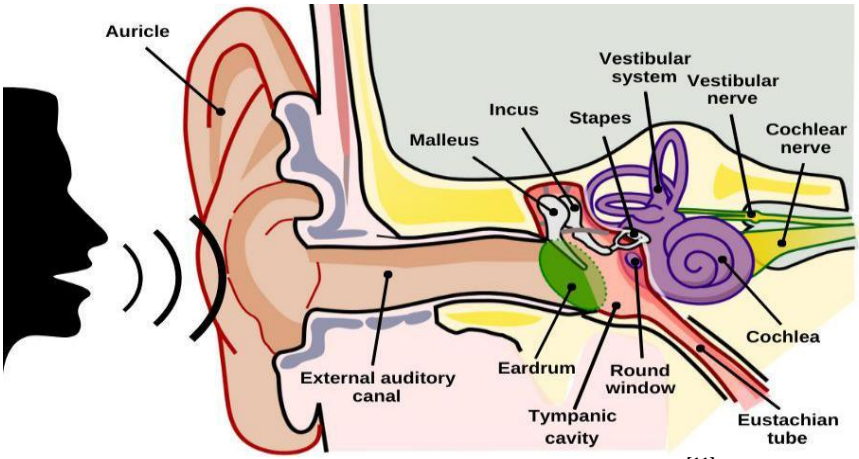

Figure 1.1: The peripheral auditory system).[11]

When hearing loss is so great that it keeps a person from understanding speech, even with amplification, that person is considered deaf. In cases of extreme deafness, an audiometer, a device that evaluates hearing by producing pure tone sounds across a range of frequencies, might not be able to detect even the highest intensity noises. Complete deafness is the inability to perceive sounds independently of production technique or amplification.[12]

Another component of hearing is speech perception, which deals with a word's perceived clarity rather than sound intensity. Speech discrimination tests are typically used to examine speech perception in people since they assess both the capacity to recognize sounds and the ability to comprehend speech. Auditory neuropathy is a form of hearing loss in which the auditory nerve's capacity to transmit sound information to the brain accurately is impaired, while the cochlea's outer hair cells remain intact and functional.[13]

The range of human hearing is 20–20,000 Hz in frequency and 0–120 dB in intensity. The lowest sound level that an average, unimpaired human ear can detect is 0 dB; some individuals can detect sounds as low as -5 or even -10 dB. Noise levels exceeding 90 dB are typically uncomfortable, while 115 dB is considered the pain threshold. Not all frequencies are equally audible; hearing sensitivity peaks around 3,000 Hz. Besides frequency range and intensity, numerous aspects of human hearing are difficult to quantify.[14]

Signs and symptoms of hearing loss

- Trouble in hearing people by telephone.
- Difficult localization of sound.
- Trouble in speech understanding, particularly women's and children's voices.
- Hearing background noise and having trouble understanding speech (cocktail party effect).
- Louder volume is required for audio sources such as music, radio, television, and other audio sources because the sounds or speech seem muted, attenuated, or dull.[15-18]

Though it is a sensory impairment, hearing loss may present with other symptoms such as ear pressure pain or a feeling of obstruction. Furthermore, there may be secondary symptoms, such as vertigo and disequilibrium, hyperacusis, increased sensitivity to particular sound frequencies and intensities accompanied by auditory discomfort, which is often known as "auditory recruitment," tinnitus, ringing, buzzing, hissing, or other sounds in the ear when there is no external sound. The abnormal hearing of one's voice and breathing sounds is known as tympanophonia, sometimes called autophonia. Usually, a patulous (always open) eustachian tube or a dehiscent superior semicircular canal are the causes. Additionally, it may happen to those who have Bell's palsy or as a result of abnormalities in facial movement that may be brought on by a tumor or stroke

Complications

- **Cognitive decline**

Concern over hearing loss is growing, particularly in older populations. Every ten years beyond the age of forty, the prevalence of hearing loss increases by nearly double. Another problem related to aging is cognitive loss, which can result in mild cognitive impairment and, ultimately, dementia. In older people with hearing loss, the cognitive load demanded by auditory perception increases, which may lead to structural alterations in the brain and increase potential dementia.[22-23]

Many psychosocial factors, such as an increase in social isolation and a decrease in social contact mediate the association between hearing loss and cognitive decline. Findings about the relationship between hearing loss and dementia are significant for public health because hearing loss accounts for approximately 9% of dementia cases.[24]

- **Fall**

Falls substantially impact health, particularly for the elderly population, since they can increase morbidity and mortality rates. Weaker defense mechanisms and increased bone fragility make older people especially susceptible to the negative effects of fall-related

injuries.[25] Injuries from falls can also put a strain on the health care and financial systems. Age-related hearing loss has been reported to be substantially linked to incidental falls in the literature. Additionally, there may be a dose-response connection between falls and hearing loss. An increased frequency of falls and difficulty with postural control are linked to more severe hearing loss. The fundamental cause of the correlation between falls and hearing loss is still unknown. Many theories suggest that the degradation of the auditory system and the rise in incident falls could have the same process influenced by behavioral, cognitive, and physiological variables. Based on available data, correcting hearing loss may improve older persons' health-related quality of life.[26]

- **Depression**

One of the main causes of sickness and mortality in the world is depression. The suicide rate among older persons is higher than that of younger adults, and depression is a contributing factor in a greater number of suicide occurrences. Numerous research has been conducted to look into possible risk factors that could lead to depression in later life. It has been found that several chronic illnesses, including lung disease, vision loss, hearing loss, and coronary heart disease, are highly associated with the risk of developing depression. A decrease in social engagement, a rise in social isolation, and a decline in health-related quality of life are all linked to hearing loss and raise the risk of developing depressive symptoms.[27-29]

- **Spoken language ability**

Hearing loss that develops after language acquisition is known as post-lingual deafness. It might be brought on by illness, trauma, or medication side effects. Usually, hearing loss occurs gradually, and afflicted individuals' family and friends can often identify the impairment long before the sufferers do. Compared to prelingual deafness, post-lingual deafness is significantly more prevalent. When hearing loss occurs later in life, such as in late adolescence or adulthood, people must overcome particular challenges and adjust to new situations that allow them to maintain independent lives.[30]

Prelingual deafness is a severe hearing loss that develops before language acquisition. It can be brought on by a congenital illness, hearing loss that develops before birth, or hearing loss that occurs in the early stages of infancy. Prelingual deafness affects a person's capacity to learn spoken language in youngsters; however, cochlear implants can help deaf children learn spoken language (often in conjunction with hearing aids). In 90–95% of situations, non-signing (hearing) parents of deaf infants use an oral technique without the assistance of sign language since they are not proficient in sign language and cannot teach their children without first learning it.[31]

A deaf newborn's risk of language deprivation may rise in some cases if cochlear implants are placed later than planned since the infant will not be able to learn spoken language and consequently develop sign language. Five to ten percent of deaf children born into signing families may learn a language at an age-appropriate rate and meet language milestones by using sign language instead of spoken language because of early exposure to sign language by sign-competent parents.[32]

Pathophysiology

The eardrum vibrates as sound waves enter the outer ear and travel down the ear canal to the tympanic membrane. The fluid inside the inner ear receives vibrations from the three small ear bones in the middle ear.[33]

The cochlear nerve carries the nerve impulses produced by the fluid's movement of the hair cells, or stereocilia, to the brain. The brainstem receives the signals from the auditory nerve and forwards them to the midbrain. Ultimately, the signal is processed as sound by the temporal lobe's auditory cortex.[34]

Long-term exposure to loud noises, whether at work or during relaxation, damages hair cells, which do not regrow on their own and is the most prevalent cause of hearing loss.[35]

Diagnosis

Hearing loss is usually identified by an otolaryngologist, general practitioner, certified and licensed audiologist, school or industrial audiometrist, or another audiometric specialist. The diagnosis of the underlying cause of hearing loss is made by an otorhinolaryngologist or specialized physician (audiovestibular physician).[36]

The most common method for measuring hearing loss is to listen to recorded or generated sounds and assess the subject's ability to hear them. An **audiogram** can be used to represent hearing loss across a variety of frequencies. A **hearing test** conducted through a hearing aid device or mobile application corporation a hearing test is an additional technique for measuring hearing loss.

Using a mobile application for hearing diagnosis is comparable to the audiometry method. Applications for hearing aids can be adjusted with the help of audiograms, which can be acquired via smartphone apps. A **speech-in-noise test** is another tool used to measure hearing loss. It measures a person’s ability to perceive speech in a noisy setting. Toddlers and young children unable to participate in a traditional hearing test may be given the **otoacoustic emissions test**, an objective hearing test. An electrophysiological test called **auditory brainstem response** testing is used to detect hearing impairments caused by diseases of the cochlear nerve, the ear, or the brainstem.[37-38]

A case history may provide crucial information regarding the circumstances leading to the hearing loss and recommend the most effective diagnostic methods. Tympanometry, otoscopy, and Weber, Rinne, Bing, and

Schwabach tests are used in exams to help with differential diagnosis. If an infection or inflammation occurs, blood or any other bodily fluid may be sent for laboratory examination. MRI and CT scans can be used to identify the pathophysiology of many types of hearing loss.[39-41]

Aim of study

The study aims to estimate the frequency of hearing loss among patients attending ear, nose, and throat consultation units in hospitals in Mosul city.

Specific objectives

1. To describe the demographic distribution of hearing loss among the study population.
2. To assess the types and severity of hearing loss distribution among the study participants.
3. To assess hearing loss according to symptoms, laterality, and severity.

PATIENTS AND METHODS

Study settings

The letter of permission for conducting this study was obtained from the Directorate of Health on the 2nd of March 2024. The Local Scientific Council of the Arab Board of Health Specializations of Family and Community Medicine in Iraq also approved this study. The concept and aims of the study were explained to all participants, and verbal consent was obtained. The administration of Al Jamhori and Al Salam Teaching Hospital have been informed about the nature and range of the study. Data collection will be kept confidential and not divulged except for study purposes.

A specifically designed questionnaire on paper collected the information, and then the collected papers were transferred to an electronic application called Google Form.

The research was conducted at two ear, nose, and throat consulting units in Nineveh governorate. One of the specialized ENT consultation units was located on Mosul's right bank (Al Jamhori), and the second was on Mosul's left bank (Al Salam Hospital).

Study design

An observational, descriptive, cross-sectional study was adopted to achieve the objectives of the present study. Data was collected from the participants retrospectively using the non-randomized convenient technique. Verbal informed consent will be obtained, and a modified questionnaire will be used to assess the important, relevant information regarding hearing loss.

The study period

Data collection was done for six months, from the 2nd of January 2024 to the 30th of June 2024.

Study sample

Two hundred and fifty participants were involved in the study.

Case definition

Data was obtained from both genders, all ages, and any race, and they had been diagnosed by specialists in ear, nose, and throat consultation units with audiogram help, according to hearing loss definition.

Inclusion criteria

- Patients who have proven diagnosis.
- All ages
- Both gender
- All races

Exclusion criteria

- Patients with insufficient data.
- Patients refused to answer the questionnaire.
- Patients do not have hearing loss.

The questionnaire form

In addition, the demographic information includes patient number, age, gender, residency, occupation, and educational level. Specific questions were designed to focus on the hearing loss-related issues, such as smoking details history, onset of hearing loss, whether it is sudden or gradual, duration of hearing loss, unilateral or bilateral, associated symptoms, past medical history as hypertension, diabetes, stroke, Parkinson, chronic kidney disease, dementia, chronic ear infection, mumps, meningitis, chicken pox or other diseases. Drug history and ototoxic drug exposure like aspirin, furosemide, antimalarial drugs, cytotoxic drugs, and antibiotics like amikacin and gentamycin. Family history of the same condition. History of using auditory aid devices, loud noise exposure, history of head trauma. Lastly, specific questions were asked regarding the severity and type of hearing loss.

RESULTS

The study included 250 subjects, with mean ± standard deviation (SD) age 42.3 ± 10.7 years, 129 (51.6%) male and 121 (48.4%) females.

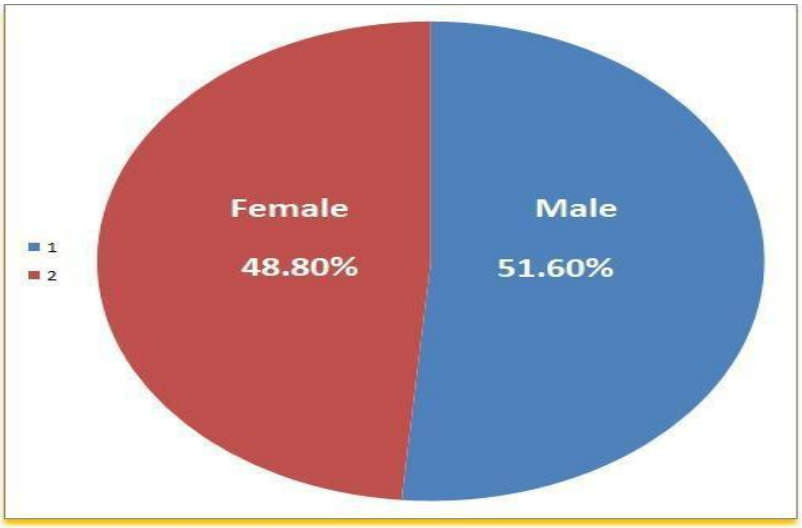

Figure: Distribution of the study population according to gender. Table 1 shows the distribution of the study population according to different severity categories of hearing loss. It's evident that moderate to severe (56-70 dB) hearing loss was prevalent among 63 (25.2%), followed by Sever (71-90 dB) hearing loss among 53 (21.2%), moreover; Moderate (41-55 dB) hearing loss shown to be prevalent among 51 (20.4%), mild (26-40 dB) was prevalent among 47(18.8%) and lastly; Profound deafness (more than 90 dB) was prevalent among 36 (14.4%) of the study population. As shown in table 1. and figure above.

Table 1: Distribution of study population according to different severity categories of the hearing loss.

Severity of hearing loss	No.	%
Mild (26-40 dB)	47	18.8
Moderate (41-55 dB)	51	20.4
Moderate to severe (56-70 dB)	63	25.2
Sever (71-90 dB)	53	21.2
Profound deafness (more than 90 dB)	36	14.4

Table 2 shows the distribution of the study population among different age groups. It's evident that the age group of 60 years and above having hearing loss among 76 (30.4%), followed by the age group 41- 60 years 67 (26.8%). Moreover, the age group of 21- 40 years among 45 (18%), and finally, the age group of Neonates- 20 years among 62 (24.8%). As shown in table 2.

Table 2: Distribution of hearing loss among different age groups.

Age group	No.	%
Neonate- 20 years	62	24.8
21- 40 years	45	18.0
41- 60 years	67	26.8
60 years and above	76	30.4

Table 3 shows the distribution of the study population among different age groups according to severity. In the youngest age group (neonate- 20 years), profound deafness (more than 90 dB) was prevalent among (27.4%) of participants. In the age group (21- 40 years), the most common prevalent severity was a severe type (71-90 dB) among 11 (24.4%). Moreover, In the age groups (41-60 years) and the age group of more than 60 years, the most common prevalent severity was moderate (50-70 dB) among 23 (34.3%) and 25 (32.9%), respectively. As shown in table 3.

Table 3: Distribution of the study population among different age groups according to severity.

Severity of hearing loss		Age Groups			
		Neonate -20 years	21-40 years	41- 60 years	More than or to 60 years
Mild (26-40 dB)	Count	16	9	13	8
	%	25.8%	20.0%	19.4%	10.5%
Moderate (41-55 dB)	No.	11	8	17	15
	%	17.7%	17.8%	25.4%	19.7%

Moderate to severe (56-70 dB)	No.	6	9	23	25
	%	9.7%	20.0%	34.3%	32.9%
Severe (71-90dB)	No.	12	11	7	23
	%	19.4%	24.4%	10.4%	30.3%
Profound deafness (more than 90 dB)	No.	17	8	7	5
	%	27.4%	17.8%	10.4%	6.6%
Total	No.	62	45	67	76
	%	100.0%	100.0%	100.0%	100.0%

Table 4 demonstrates the distribution of the study population according to the type of hearing loss among different age groups. Types of hearing loss were sensorineural in the majority of the subjects, 122 (48.8%), followed by mixed type in 77 (30.8%), and conductive hearing loss in 51 (20.4%). Furthermore, sensorineural hearing loss was the most common type among all age groups, with 35 (56.4%), 19 (42.30), 29 (43.30%), and 39 (51.3%) among the age groups (neonate-20 years), (21- 40 years), (41- 60 years) and (more than 60 years) respectively. As shown in table 4.

Table 4: Distribution of hearing loss according to the type of hearing loss among different age groups.

Type of hearing loss		**Age Groups**				
		Neonate - less than 20 years	**20 less than 40 years**	**40-less than 60 years**	**More than and equal to 60 years**	**Total**
Conductive	No.	21	16	9	5	51
	%	33.90%	35.60%	13.40%	6.60%	------
Sensorineural	No.	**35**	**19**	**29**	**39**	122
	%	56.4%	42.20%	43.30%	51.30%	------
Mixed	No.	6	10	**29**	32	77
	%	9.70%	22.20%	43.30%	42.10%	------
Total	No.	62	45	67	76	250
	%	100.0%	100.0%	100.0%	100.0%	------

Table 5 shows the distribution of the study population according to the laterality of hearing loss among different age groups. Hearing loss was bilateral in 184 (73.6%) and unilateral in 66 (26.4%). Bilateral hearing loss was more common than unilateral hearing loss among all age groups, with 46 (74.20%), 24 (53.3%), 51 (76.10%), and 63 (82.90%), among the age groups (birth age less than 20 years), (20-less than 40 years), (40-less than 60 years) and (more than or equal to 60 years) respectively. As shown in table 5.

Table 5: Distribution of study population according to laterality of hearing loss among different age groups.

Laterality of hearing loss		**Age Groups**				
		Neonate – 20 years	**21- 40 years**	**41- 60 years**	**More than 60 years**	**Total**
Bilateral	No.	46	24	51	63	184
	%	74.20%	53.30%	76.10%	82.90%	------
Unilateral	No.	16	21	16	13	66
	%	25.80%	46.70%	23.90%	17.10%	------
Total	No.	62	45	67	76	250
	%	100.0%	100.0%	100.0%	100.0%	------

Table 6 shows hearing loss-associated symptoms. Tinnitus was prevalent among 58 (23.2%), followed by earache among 30 (12%) and vertigo among 14 (5.6%) of the study population. As shown in table 3.6.

Table 6: Hearing loss-associated ear symptoms.

Ear symptoms	**No.**	
Tinnitus	58	23.2
Earache	30	12
Vertigo	14	5.6

DISCUSSION

One of the five senses specialized in humans is hearing. It is essential for developing language, cognition, learning, and social communication. Ninety-five of learning is linked to sight and hearing. Worldwide, hearing loss is considered the most prevalent sensory deficiency in humans. Globally, 432,000,000 people and 34,000,000 children are thought to suffer from hearing

loss. By 2050, it's estimated that over 700,000,000 people will have hearing loss, or 1 person for every 10.[42]

Hearing loss can affect people of any age, including older people and both sexes. The severity ranges from minor to complete loss. Additionally, it may be bilateral or unilateral.[43]

In Iraq, many studies illustrate the prevalence of certain causes of hearing loss in certain populations. However, there is no locally relevant comprehensive study about hearing loss frequencies in different age groups. Besides, understanding hearing loss frequencies is essential for decision-makers to address this public health problem properly. Hence, this study evaluated hearing loss frequencies among patients attending the otolaryngology consultation units in Mosul City, Ninevah, Iraq.

The study population characteristics

1. **Distribution of the study population according to the mean Age and Gender**

The study included 250 subjects, with a mean age of 42.3;). The study explores that (51.6%) of the study population were males and (48.4%) were females; comparable results were found by a prevalence study of hearing loss among patients attending the otolaryngology consultation units in Ramadi City, Anbar, Iraq.[44]

2. **Distribution of the study population according to the degree of hearing loss**

Depending on the study setting, which was hospital-based, and most of the study population were asking for hearing aid devices; it's evident that all types of hearing loss severity were found in the study with moderate to severe grades more frequently than others. Comparable findings were obtained from a study condcted by Saif Nofan et al. in 2023 in Iraq-Mosul.[45]

3. **Distribution of the study population according to the age groups and onset of the hearing loss**

The study showed that more than sixty was more prevalent than other age groups, followed by the age of forty to under sixty. Nienke C. Homans et al. found that the prevalence of hearing loss increases with age.[46] Additionally, the study shows that hearing loss was gradual among (78%), while it was sudden among (8.4%), and congenital among (13.6%). Furthermore, as people age, they may experience progressive hearing loss, commonly called presbycusis. The condition appears to run in families and could be brought on by abnormalities in the auditory nerve, which also sends signals from the ear to the brain and inner ear. With presbycusis, a person may find it difficult to comprehend people or to handle loud noises.[47]

4. **Distribution of the study population according to the Site and Type of hearing loss**

Hearing loss was shown in the study; bilateral in 184 (73.6%) and unilateral in 66 (26.4%).

5. **Distribution of the severity, Site and Types of hearing loss according to the different age groups**

The study illustrates that among the youngest age group (neonate- 20 years), the most prevalent severity was profound deafness 16(25.8%), and bilateral 46(74.2%), sensorineural 35(56.4%) hearing loss. Numerous factors contribute to hearing loss in infants and young children; genetic and environmental factors are the two main contributors to the etiology of congenital hearing loss. In the past, it was thought that 50% of cases of congenital hearing loss had a genetic component. Prenatal TORCH (toxoplasmosis, syphilis, rubella, cytomegalovirus, and herpes) infection or postnatal bacterial meningitis are examples of environmental influences. Congenital CMV infection is increasingly understood to be the main environmental factor contributing to congenital hearing loss.[48]

On the other hand, hearing loss among the age group 21-40 years, the most prevalent was severe 11(24.4%), bilateral 24(53.3%), sensorineural 19(42.2%) hearing loss. While among the age group of 41- 60 years, it was found to be more prevalent as moderate-sever 23(34.3%), bilateral 51(76.1%) sensorineural 29(43.3%) hearing loss. These findings were explained by the fact that hearing loss among these ages was commonly related to occupational hazards such as loud noise or blast exposure, trauma, or accidental exposure to ototoxic drugs. The study shows that about (54%) of the study participants reported loud noise exposure, leading to sensorineural hearing loss (SNHL).

Furthermore, the study shows that among those aged more than 60 years, hearing loss was more prevalent as moderate-sever 25(32.9%), bilateral 63(82.9%), and sensorineural 39(51%) type, which was diagnosed as presbycusis. Of note is that this group is the most prevalent among all study groups. Presbycusis, another name for age-related hearing loss (ARHL), is a multifactorial condition characterized by bilateral, symmetrical, progressive hearing loss of sensorineural type and associated with aging.

Hearing loss associated ear symptoms

The study shows that tinnitus was prevalent among 23.2% of the cases. Earache was found among 12% of the study population, mainly linked to acute otitis media, acute otitis externa, or traumatic tympanic membrane perforation. These results were run with a prevalence study conducted by Raid M. Al-Ani et al. in 2024 at Al Anbar City/Iraq.[44] Moreover, vertigo was prevalent among 5.6% of the study population; vertigo can occur due to peripheral or central vestibular disorders. Peripheral vertigo is due to vestibular dysfunction involving the vestibular receptors and nerve. The central vertigo is due to lesions of the vestibular nuclei in the brainstem and the vestibulocerebellum.

CONCLUSIONS

From this study, we conclude that

1- Hearing loss is related to multiple causes; sometimes, it's unclear and unpredictable.
2- Hearing loss becomes more frequent with advancing age.
3- Hereditary factors may play a role among more than a third of the patients.
4- Hearing loss may be more prevalent among urban residency patients.
5- Sensorineural looks more prevalent than conductive hearing loss.
6- Working in the outside environment is more dangerous for hearing loss due to increased noise exposure.
7- Hearing loss appears more commonly among illiterate and low educational level persons.
8- Serious head trauma can cause hearing loss.
9- The majority of hearing loss patients have a gradual onset.
10- Hypertension, diabetes, and chronic otitis media are present among many hearing loss patients.
11- Prolonged periods and high doses of aspirin and aminoglycoside antibiotic use are linked to hearing loss.

Recommendations

1- Controlling modifiable hearing risk factors is very important and has a crucial role in decreasing the overall disease burden and improving prognosis.
2- Iraq's Ministry of Health Promotion programs should continuously inform the families about the risk factors triggering hearing loss and its preventive measures.
3- Comprehensive occupational health and safety measures, including regular hearing assessments, protective equipment provision, and educational hearing conservation programs, are mandatory for all employers and workers.
4- Recommendation for exploring the long-term effects of occupational noise exposure on hearing health, evaluating the effectiveness of intervention programs aimed at preventing noise-induced hearing loss, assessing the impact of different types of hearing protection devices on hearing outcomes, or investigating the economic and social implications of hearing loss in the workplace.
5- Employers' enhancement for regular hearing assessments can protect workers' hearing health and well-being.
6- Hearing loss needs more future studies.

REFERENCES

1. Cole EB, Flexer C. Children with hearing loss: Developing listening and talking, birth to six. Plural Publishing, 2019; 22.
2. He ZH, Li M, Zou SY, Liao FL, Ding YY, Su HG, Wei XF, Wei CJ, Mu YR, Kong WJ. Protection and prevention of age-related hearing loss. Hearing Loss: Mechanisms, Prevention and Cure, 2019; 59-71.
3. Benjamin Jr LT. A brief history of modern psychology. John Wiley & Sons, 2023; 27.
4. Yılmaz YZ, Tüten A, Çakan D, Kara E, Akşahin E, Gülmez ZD, Batıoğlu-Karaaltın A. The Relationship Between the Presence of Severe Acute Respiratory Syndrome-Coronavirus-2 during Pregnancy and Neonatal Hearing Loss. Istanbul Medical Journal, 2022; 1: 23(2).
5. Pradhan J, Mallick S, Mishra N, Tiwari A, Negi VD. Pregnancy, infection, and epigenetic regulation: A complex scenario. Biochimica et Biophysica Acta (BBA)-Molecular Basis of Disease, 2023; 1, 1869(7): 166768.
6. Bilici T, Muluk NB, Dundar Y. Newborn Hearing Screening. InBreastfeeding and Metabolic Programming, 2023; 6: 561-573. Cham: Springer International Publishing.
7. Feldman E. The Effect of Personal Listening Devices on Subjective Hearing Status.
8. Blunsum S. The mental health of deaf children: 'Inclusion'or 'equality of experience'?. Specialist placement, 2024; 15.
9. Jameel N, Melén A. Early Detection and Management of Hearing Loss.
10. Bannister S, Greasley AE, Cox TJ, Akeroyd MA, Barker J, Fazenda B, Firth J, Graetzer SN, Roa Dabike G, Vos RR, Whitmer WM. Muddy, muddled, or muffled? Understanding the perception of audio quality in music by hearing aid users. Frontiers in Psychology, 2024; 21, 15: 1310176.
11. The peripheral auditory system, LABORATOIRE DES NEUROSCIENCES DE LA PAROLE ET DE L'AUDITION SPEECH AND HEARING NEUROSCIENCE LABORATORY, 2020; 26.
12. van der Hoek-Snieders HE. Aspects of professional functioning in employees with hearing loss. Hanneke EM van der Hoek-Snieders, 2023.
13. Hall ML, Hall WC, Caselli NK. Deaf children need language, not (just) speech. First Language, 2019; 39(4): 367-95.
14. Meral M, Konukseven Ö. Effect of noise on speech intelligibility and cognitive skills by age. Speech, Language, and Hearing, 2024; 2, 27(1): 58-66.
15. Lubner RJ, Kondamuri NS, Knoll RM, Ward BK, Littlefield PD, Rodgers D, Abdullah KG, Remenschneider AK, Kozin ED. Review of audiovestibular symptoms following exposure to acoustic and electromagnetic energy outside conventional human hearing. Frontiers in neurology, 2020; 28, 11: 234.
16. Ferrán S, Manrique-Huarte R, Lima JP, Rodríguez-Zanetti C, Calavia D, Andrade CJ, Terrasa D, Huarte A, Manrique M. Early Detection of Hearing Loss among the Elderly. Life, 2024; 4, 14(4): 471.
17. Schilder AG, Wolpert S, Saeed S, Middelink LM, Edge AS, Blackshaw H, Pastiadis K, Bibas AG. A phase I/IIa safety and efficacy trial of intratympanic gamma-secretase inhibitor as a regenerative drug

treatment for sensorineural hearing loss. Nature Communications, 2024; 1, 15(1): 1896.
18. Zhang Z. Association between sarcopenia and hearing impairment in middle-aged and elderly people in China: a prospective cohort study. Scientific Reports, 2024; 13, 14(1): 6061.
19. Ghiselli S, Parmeggiani G, Zambonini G, Cuda D. Hearing Loss in Baraitser–Winter Syndrome: Case Reports and Review of the Literature. Journal of Clinical Medicine, 2024; 5, 13(5): 1500.
20. Jacquemin L, Schecklmann M, Baguley DM. Hypersensitivity to Sounds. InTextbook of Tinnitus 2024 Mar 7 (pp. 25-34). Cham: Springer International Publishing.
21. Park JM, Han JS, Park SY, Park SN. Transtympanic tripod-shaped angiocatheter insertion for patients with intractable patulous Eustachian tube. Otology & Neurotology, 2021; 1, 42(9): e1273-8.
22. Hoover KC. Sensory disruption and sensory inequities in the Anthropocene. Evolutionary Anthropology: Issues, News, and Reviews, 2021; 30(2): 128-40.
23. Bowl MR, Dawson SJ. Age-related hearing loss. Cold Spring Harbor perspectives in medicine, l 2019; 1, 9(8): a033217.
24. Reed NS, Altan A, Deal JA, Yeh C, Kravetz AD, Wallhagen M, Lin FR. Trends in health care costs and utilization associated with untreated hearing loss over 10 years. JAMA Otolaryngology–Head & Neck Surgery, 2019; 1, 145(1): 27-34.
25. World Health Organization. Risk reduction of cognitive decline and dementia: WHO guidelines. World Health Organization, 2019.
26. Misaghian K, Lugo JE, Faubert J. Immediate fall prevention: the missing key to a comprehensive solution for falling hazard in older adults. Frontiers in Aging Neuroscience, 2024; 4, 16: 1348712.
27. Ramu P. Study on Incidence of Falls Among Elderly Population in Rural Field Practice Area of Kempegowda Institute of Medical Sciences Bangaore (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India)).
28. Lawrence BJ, Jayakody DM, Bennett RJ, Eikelboom RH, Gasson N, Friedland PL. Hearing loss and depression in older adults: a systematic review and meta-analysis. The Gerontologist, 2020; 2, 60(3): e137-54.
29. Cosh S, Helmer C, Delcourt C, Robins TG, Tully PJ. Depression in elderly patients with hearing loss: current perspectives. Clinical interventions in aging, 2019; 14: 1471-80.
30. Golub JS, Brewster KK, Brickman AM, Ciarleglio AJ, Kim AH, Luchsinger JA, Rutherford BR. Subclinical hearing loss is associated with depressive symptoms. The American Journal of Geriatric Psychiatry, 2020; 1, 28(5): 545-56.
31. Banda J. Factors affecting literacy skills development among hearing impairments: a case at Magwero school for the deaf in Chipata district of eastern province (Doctoral dissertation, The University of Zambia).
32. Hennies J. Prelingual hearing disabilities and literacy skills. Handbook of Accessible Communication, 2024; 2: 193.
33. ten Donkelaar HJ, ten Donkelaar HJ, Kaga K. The auditory system. Clinical neuroanatomy: brain circuitry and its disorders, 2020; 373-407.
34. Sheikh A, Shabbir K, Imtiaz A. Structure and physiology of human ear involved in hearing. InAuditory System-Function and Disorders 2022 Jun 16. IntechOpen.
35. Sheikh A, Shabbir K, Imtiaz A. Structure and physiology of human ear involved in hearing. InAuditory System-Function and Disorders, 2022; 16. IntechOpen.
36. Fink D, Mayes J. Too loud! Non-occupational noise exposure causes hearing loss. InProceedings of Meetings on Acoustics, 2021; 7: 43-1. AIP Publishing.
37. Cole EB, Flexer C. Children with hearing loss: Developing listening and talking, birth to six. Plural Publishing, 2019; 22.
38. Davidson A, Marrone N, Wong B, Musiek F. Predicting hearing aid satisfaction in adults: A systematic review of speech-in-noise tests and other behavioral measures. Ear and hearing, 2021; 1, 42(6): 1485-98.
39. Aradhana A, Sarangi G, Saboth P, Tripathy R. Assessment of Hearing Impairment in NICU Graduates by Otoacoustic Emission and Brainstem Evoked Response Audiometry Tests. Journal of Neonatology, 2020; 34(3): 109-17.
40. Niemczyk-Cieślak E, Zawadzka-Głos L. REVIEW PAPER PRACA POGLĄDOWA.
41. Dhingra PL, Dhingra S. Diseases of Ear, Nose & Throat and Head & Neck Surgery-E-Book. Elsevier Health Sciences, 2021; 15.
42. Kleinlogel S, Vogl C, Jeschke M, Neef J, Moser T. Emerging approaches for restoration of hearing and vision. Physiological reviews, 2020; 1, 100(4): 1467-525.
43. Humes LE. The World Health Organization's hearing-impairment grading system: an evaluation for unaided communication in age-related hearing loss. International journal of audiology, 2019; 2, 58(1): 12-20.
44. Al-Ani RM, Jamal KK, Fakhri FW, Muhamed SH, Muhamed NH, Ali OF. Prevalence of hearing loss among patients attending the private otolaryngology clinic, Ramadi city, Anbar, Iraq. The Egyptian Journal of Otolaryngology, 2024; 40(1): 1-6.
45. Nofan S, Ibrahim RH. Occupational Noise-Induced Hearing Loss in the City of Mosul: A Cross-sectional Study. Malaysian Journal of Medicine & Health Sciences, 2023; 1: 19(6).
46. Homans NC, Metselaar RM, Dingemanse JG, van der Schroeff MP, Brocaar MP, Wieringa MH, Baatenburg de Jong RJ, Hofman A, Goedegebure A. Prevalence of age-related hearing loss, including sex

differences, in older adults in a large cohort study. The Laryngoscope, 2017; 127(3): 725-30.
47. Mo F, Zhu S, Jia H, Xia Y, Lang L, Zheng Q, Yuan X, Wu S, Bai Y, Yang W, Wang L. Trends in prevalence of hearing loss in adults in the USA 1999– 2018: a cross-sectional study. BMC public health, 2024; 8, 24(1): 976.
48. Choe G, Park SK, Kim BJ. Hearing loss in neonates and infants. Clinical and Experimental Pediatrics, 2023; 66(9): 369.