

Clinico-Audiometric Study And Management Of Hearing Loss In A Rural Based Hospital Of Bihar

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Abstract:

Background: Hearing loss is an extremely common medical condition, progressing in incidence and severity with age. The affected population is also vast, varying between neonates to elderly people, and is nearly omnipresent in the 70+ age group. In India there is an overall prevalence of hearing loss of 26.9% among persons aged 5 years and over. 15.8% had a sensorineural hearing loss, 10.3% had a conductive hearing loss and 0.8% had a mixed hearing loss. Pure tone audiometry is the main hearing test used to identify hearing threshold levels of an individual, enabling determination of the degree, type and configuration of a hearing loss. This study aims to analyze the pattern of hearing loss among patients visiting ENT department in teaching hospital in rural area of Bihar.

Materials and Methods: In this prospective study, 100 patients with complaints of hearing loss visiting teaching hospital aged between 10-70 years were included. Average of pure tones of 0.5, 1, 2 and 4 kHz frequencies was used to calculate the hearing threshold for bone and air conduction PTA records of 100 patients were tabulated and analyzed. The WHO classification was used to determine the degree of hearing loss. Microsoft Excel and SPSS 21 were used to analyze the data, and a p value of less than 0.05 was considered significant.

Results: In present study, maximum number of hearing loss was seen in 31-40 years (30%) followed by 21-30 years (22%). This may be due to higher level exposure to risk factors among these age groups as these age groups constitute working class of people.. This difference might be due to lack of awareness about hearing impairment and poor access to health care services especially among elderly in the rural area of India. Conductive hearing loss was more common in younger age groups whereas sensorineural hearing loss was more common in older age group.

Conclusion: Hearing loss was more common in male population with younger age group involvement. Sensorineural hearing loss was the most common type. Mild degree of hearing loss and bilateral involvement was most common. Audiometric assessment is an important tool that helps in early diagnosis and proper management of the hearing impairment.

Keyword: Audiometry, pure tone audiometry, conductive hearing loss, sensorineural hearing loss.

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I. Introduction

A prevalent issue affecting people of all ages is hearing impairment. Globally, it impacts around 1.33 billion individuals [1]. A person's quality of life can be negatively impacted by hearing loss at any age [2]. Negative outcomes such as poor overall health, subpar academic performance, elevated unemployment, social isolation, and a higher risk of depression can result from hearing impairment [3]. In developing nations, like India, community-based studies (all ages) reported prevalence of hearing loss between 6% and 26.9% and prevalence of disabling hearing loss between 4.5% and 18.3%. Rural areas and elderly showed a higher prevalence of hearing impairment. [4,5]

One or both ears may be affected by hearing loss. It falls into one of three categories: mixed, sensorineural, or conductive [6].

A flaw in the ear's sound-conducting system causes conductive hearing loss.

A defect in the cochlear nerve, neural system, or auditory cortex causes sensorineural hearing loss. Both conductive and sensorineural hearing impairments are components of mixed hearing loss. The grading system was created by the World Health Organization (WHO) to determine the extent of hearing impairment [7].

One method for diagnosing hearing loss is pure tone audiometry (PTA). According to the otorhinolaryngologists' recommendation, audiologists carry it out [8]. PTA assists in further management planning by providing information on the kind, degree, and configuration of hearing loss [9]. For the study, a total of 100 patients who had undergone PTA for a possible hearing loss were chosen. Two skilled audiologists used an

Amplaid 309 clinical audiometer to perform PTA. Average of pure tones of 0.5, 1, 2 and 4 kHz frequencies was used to calculate the hearing threshold for bone and air conduction.

PTA records of 100 patients were tabulated and analyzed Both a percentage and a number were used to express the results.

The WHO classification was used to determine the degree of hearing loss [7]. Microsoft Excel and SPSS 21 were used to analyze the data, and a p value of less than 0.05 was considered significant.

II. Material And Methods

This prospective comparative study was carried out on patients of Department of Otorhinolaryngology, Katihar Medical College and Hospital, Bihar, from July 2022 to July 2023. A total 100 adult subjects (both male and females) of aged 10-70, years were enrolled for in this study.

Study Design: Prospective observational study

Study Location: This was a tertiary care teaching hospital based study done in Department of Otorhinolaryngology, Katihar Medical College and Hospital, Bihar.

Study Duration: July 2022 to July 2023

Sample size: 100 patients.

Sample size calculation: Calculated with a precision of 5%, prevalence of Chronic otitis media in India, according to WHO, being 7.8% and confidence limit being 95%.

Subjects & selection method: One hundred (100) patients with hearing loss were enrolled for the study. These patients were chosen randomly. A detailed history taking and clinical examination was performed. Relevant hematological and radiological examinations were performed. A pure tone audiometry was performed. In patients undergoing surgical procedure, the preoperative pure tone audiometry findings were studied to determine their correlation.

Inclusion criteria:

All patients aged 10-70 years presenting with hearing loss in department of ENT shall be enrolled in this study.

Exclusion criteria:

1. Patients less than 10 years of age and more than 70 years of age
2. Patients who have already underwent a prior tympanomastoid surgery

Procedure methodology

The present study was conducted after obtaining clearance and approval from the Institutional Ethics Committee of Katihar Medical College, Bihar. Written informed consent was taken from these patients. This study was conducted in the Department of Otorhinolaryngology and it was a Prospective study. The study was done from July 2022 to July 2023. Patients were diagnosed by detailed history, thorough ear, nose, and throat examination, pure tone audiometry and other audiological, radiological investigations as required. Patients aged between 10 to 70 years were included in the study. The total number of patients in the study were 100.

Audiometric assessment was performed by using a clinical audiometer calibrated according to International Organization for Standardization (ISO). The patient's hearing levels in decibel were assessed.

Mean air and bone conduction thresholds were determined at 5 frequencies 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz. The mean air-bone gap was calculated. The air-bone gap is a measure of the degree of conductive deafness. "Hearing level" will be taken as the mean air conduction threshold at 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz. When evaluating correlation between middle ear pathology and hearing loss we used average air and bone conduction thresholds and average air-bone gap.

From the air conduction threshold levels the deafness were graded into several categories according to WHO classification (1980); Normal hearing level (0-25 dB), mild (26-40 dB), moderate (41-55 dB), moderately severe (56-70 dB), severe (71-90dB), profound (> 90 dB).

Hearing loss of the patient was classified as conductive type of hearing loss when bone conduction threshold was within normal levels and air conduction threshold was over 25 decibels; as sensorineural hearing loss when air and bone conduction threshold was over than 25 decibels and air bone gap was less than 10 decibels and lastly as mixed hearing loss when air conduction threshold was over 25 decibels but air bone gap is more than 10 decibels.

Statistical Analysis: Data will be checked for accuracy and completeness then coded and entered into (Statistical Package for the Social Sciences) version 23.0 for analysis. The results will be presented in frequency tables, cross tabulations and figures. Categorical data will be presented as frequency with percentages. Continuous data with normal distribution will be presented as mean with standard deviation.

Statistical analysis

Data was checked for accuracy and completeness then coded and entered into (Statistical Package for the Social Sciences) version 23.0 for analysis. Data was analyzed using SPSS version 23 (SPSS Inc., Chicago, IL). The results were presented in frequency tables, cross tabulations and figures. Categorical data was presented as frequency with percentages. Continuous data with normal distribution was presented as mean with standard deviation.

Chi-square and Fisher exact tests were performed to test for differences in proportions of categorical variables between two or more groups. The level $P < 0.05$ was considered as the cutoff value or significance.

III. Result

In this prospective observational study, 66 males and 34 females were recruited. The maximum number of patients were from 31-40 years age group followed by 21-30 years age group. The lowest representation was from the age group of 10-20 years. For the enrollment into the study, the patients were screened for hearing loss and those with normal hearing were excluded from the study. Table 1 shows that 40 such patients with normal hearing were excluded from the study.

Table no 1: Shows age and gender distribution of patients screened to be enrolled in the study.

	Hearing loss	Normal Hearing	Total
Age (Years)			
10-20	2	11	13
21-30	22	9	31
31-40	30	6	36
41-50	20	5	25
51-60	10	5	15
61-70	16	4	20
Gender			
Male	66	27	93
Female	34	13	47
Total	100	40	140

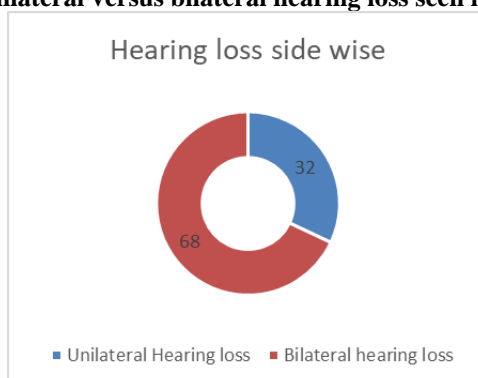
The hearing loss was found mostly bilateral in two thirds of the cases and approximately equal distribution was found amongst right and left ear (Table 2).

Table no 2: Distribution of hearing loss side wise

Ear involved	No of patients	Percentage
Only right ear	17	17%
Only left ear	15	15%
Both ear	68	68%
Total	100	100%

Unilateral hearing loss was found in one thirds of the participants and bilateral hearing loss was found in two thirds of the participants in our study (Figure 1).

Figure 1: Unilateral versus bilateral hearing loss seen in participants



When we analyzed ear wise hearing loss, there were total 168 ears were examined. The conductive hearing loss was found in 29.7% of the ears examined and mixed hearing loss was observed in 11.3% of the ears examined. About 60% of the ears had sensorineural hearing loss (Table 3).

Table no 3: Distribution of ear wise hearing loss seen in participants (Total ears=168)

Type of hearing loss	Right ear	Left ear	Total (Right +Left ear)
	No of ears (%)	No of ears (%)	No of ears (%)
Conductive	24 (28.5%)	26 (30.9%)	50 (29.7%)
Sensorineural	51 (60.7%)	48 (57.1%)	99 (58.9%)
Mixed	9 (10.7%)	10 (11.9%)	19 (11.3%)
Total	84 (100%)	84 (100%)	168 (100%)

The age wise distribution of type of hearing loss revealed that sensorineural hearing loss increased with increasing age group (>30 years) and conductive hearing loss was seen predominantly in lower age groups (<30 years) (Table 4).

Table no 4: Distribution of age group wise hearing loss seen in participants (n=100)

Age group (years)	Type of hearing loss		
	Conductive	Sensorineural	Mixed
10-20	2	0	0
21-30	12	10	0
31-40	15	13	2
41-50	3	14	3
51-60	1	7	2
61-70	1	14	1
Total	34	58	8

Mild grade of hearing loss was seen in 39% of the patients, moderate degree was seen in 25% of the patients, severe degree of hearing loss was observed in 13% of the patients, and 8% had profound degree of hearing loss (Table 5).

Table no 5: Degree of hearing loss among the patients

Degree of hearing loss	Right ear	Left ear	Total
	No of ears (%)	No of ears (%)	No of ears (%)
Mild (26-40 dB)	23	23	46
Moderate (41-60 dB)	14	15	29
Severe (61-80 dB)	8	7	15
Profound (>81 dB)	5	5	10
Total	50	50	100

IV. Discussion

In this study, pure tone audiograms of 100 patients who presented to ENT outpatient department with the complaint of hearing loss were analyzed. In this study, hearing loss was highest in 31–40 years age group and it was 30%. The next order was seen in age group of 21–30 and it was 22% followed by 41–50 years which was 20%. Hearing loss in age group of 61-70 was 16%. Lowest incidence was seen in age group of above 10-20 years which was 2%. These results are different from the study by Browning et al. [10] which showed that the hearing loss was highest in 61–80 years age group (45.3%) followed by 41–60 years age group (17.4%). This difference might be due to lack of awareness about hearing impairment and poor access to health care services especially among elderly in the rural area of India. In present study, maximum number of hearing loss was seen in 31–40 years followed by 21–30 years. This may be due to higher level exposure to risk factors among these age groups as these age groups constitute working class of people. Most of peoples in these age groups have increased awareness as well as easy access to hospital services compared to other age groups. Early visit to hospitals among these age group even after mild hearing impairment is common as slightest loss in hearing power may have negative impact on their work. In present study, among 100 patients with hearing loss, 66% were male and 34% were female. The male to female ratio was 2:1. The study performed by Uju [11] also found the higher prevalence of hearing loss in male as compared to female. Similar results have been shown by other studies [12, 13]. The higher prevalence of disease in male has been attributed to their increased exposure to the outdoor activities and other risk factors as well as early and easy access to healthcare services compared to females. In present study bilateral hearing loss was seen in 68% cases and 32% had unilateral involvement. There was similar distribution of disease in the both ears i.e. 50% right ear and 50% left ear involvement. These results are similar to the studies by Rabbani et al. [9] and Varshney et al. [14], which have shown that bilateral hearing loss more common and similar distribution of right and left ear involvement. In present study, sensorineural hearing loss was the

commonest type (58%) followed by conductive type (34%) and mixed type (8%). In right ear 59% was Sensorineural 30% was conductive and 11% was mixed. Similarly, in left ear, 58% was sensorineural, 31% was conductive and 11% was mixed. These results are similar to the findings of studies by Louw et al. [15], Shuaibu et al. [16] and Browning et al. [10]. In this study mild hearing loss was seen in 39% of ears, followed by moderate in 25%, severe in 13% and profound in 6%. These findings are similar to the results of other studies. [10, 13, 15, 16] The main limitation of this study is the relatively smaller sample size and single centric study. This can hamper the study generalizability. Studies with larger sample size are required to have generalizable result.

V. Conclusion

This study concluded that sensorineural hearing loss was the commonest type among the patients with a complaint of the hearing loss. Most of them were adult male with bilateral mild hearing loss (26–40 dB). Audiometric assessment is an important tool that helps in early diagnosis and proper management of the hearing impairment.

VI. References

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