

A STUDY OF HEARING IMPAIRMENT AMONG PATIENTS WITH ESSENTIAL HYPERTENSION

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Abstract

Background: Hearing impairment is still a neglected public health concern in underdeveloped countries, even though approximately half of all cases are avoidable through prevention and early detection. Thus, we have determined the proportion, type, and degree of hearing loss among patients with essential hypertension and the correlation between the duration and degree of hearing impairment in patients with essential hypertension. **Materials and Methods:** A descriptive cross-sectional study was conducted on 120 patients with essential hypertension (18 to 60 years). All patients were tested for deafness using tuning fork tests, pure tone audiogram, general physical examination, ear, nose, and throat examination, and laboratory tests. After completing the clinical examination, the patient's blood pressure was assessed in a sitting position using a manual sphygmomanometer. All patients were then put through an audiological assessment. **Results:** The Age distribution was 1.7%, 8.3%, 27.5%, and 52.5% in <30 years, 31-40 years, 41-50 years, and 51-60 years age groups, whereas 44.2% were females and 55.8% were males. The comparison of tinnitus, hearing loss, vertigo, other symptoms, Otoscopy, TFT right, TFT Left, Systolic BP, diastolic BP, and duration/Months with gender indicates no statistical significance. Comparing the duration of hypertension with hearing loss in the right and left ears showed high statistical significance. The correlation of PTA right and left with SBP, DBP, and age shows highly statistical significance positive correlation difference at $p < 0.01$ level. **Conclusion:** Although most hypertensive participants exhibited minor hearing loss, there is a correlation between hypertension and hearing loss. With increasing hypertension levels, hearing loss becomes more common and more severe.

INTRODUCTION

The World Health Organisation (WHO) defines hearing loss or impairment as having hearing thresholds of 25 dB or higher in both ears.^[1] When hearing loss occurs in adults, it lowers people's quality of life. In India, it was discovered that the prevalence of adult-onset deafness was 7.6%. Affections of the hearing system can have psychological effects, including low self-esteem, loneliness, sadness, and irritation. These issues reduce the quality of life.^[2]

A type of hypertension known as essential hypertension which has no known cause affects 95% of those with hypertension. Presbycusis can develop early in life in patients with hypertension and worsen

due to other variables, including noise pollution and vascular diseases.^[3] In India, hypertension is a frequent ailment, and our populace doesn't get routine health checks or periodic blood pressure checks. Public health awareness is increasing, but not to the point where people are concerned about their health and fitness. Obesity awareness, hip-to-abdominal ratio awareness, and BMR awareness are not widely prevalent in our population.^[2]

Due to its potential effect on the microcirculation of the inner ear and the ensuing degeneration of the inner ear, hypertension is a standalone risk factor for hearing loss. Thrombus development due to damaged artery inner lining brought on by elevated pressure can indicate hypertension's effects on the inner ear.^[4] An increased risk of hearing loss is independently

linked to a high body mass index (BMI) and a wide waist circumference, which are risk factors for hypertension.^[5] Internal auditory artery hardening and constriction and a decrease in cochlear blood flow are also possible effects of atherosclerosis brought on by obesity. Cell death, capillary constriction, and hearing loss can result from this.^[6] Even though roughly half of all cases of hearing impairment are preventable by prevention, early detection, and management, hearing impairment remains a neglected public health issue in developing nations. Studies on hearing loss and hypertension exist, although the evidence for hypertension as a risk factor for hearing loss is scant.^[7-9] Thus, additional research on hypertension as a risk factor for hearing loss is required, as is routine early detection of hearing loss in individuals with essential hypertension to enhance their quality of life. This study, therefore, sought to determine the proportion, type, and degree of hearing loss among patients with essential hypertension and the correlation between the duration of hypertension and degree of hearing impairment in patients with essential hypertension.

MATERIALS AND METHODS

The descriptive cross-sectional study was conducted at the Department of Otorhinolaryngology and Head and Neck Surgery and Hypertension Clinic, Department of Medicine, of a tertiary care centre for six months on 120 essential hypertensive patients.

Inclusion Criteria

Patients with essential hypertension aged between 18 to 60 years of both sexes and it included those already on medications and newly diagnosed as well.

Exclusion Criteria

The exclusion criteria were defined as family history of deafness, aural discharge and deafness, congenital deafness, noise-induced hearing loss, previous otological surgery, pregnant and lactating mothers, obesity and diabetics alcoholics and smoker patients with renal disorders, and patients taking drugs for other associated illness with possible ototoxic effects were excluded.

Methodology

We analysed 120 patients, and after applying the inclusion and exclusion criteria and those willing to

give informed consent, all were tested for deafness using tuning fork tests, pure tone audiogram, general physical examination, ear, nose, and throat examination, and laboratory tests.

After thoroughly explaining the technique, informed consent was obtained for all patients who agreed to participate in the trial. A thorough history is collected, with special attention paid to the hypertension medications used (drug class, dosage, and length of treatment). Thorough ear, nose, and throat exams, including tuning fork tests and otoscopic examinations, to rule out external and middle ear problems. Systemic examination (cardiovascular, neurological, renal, hepatobiliary, endocrine, locomotor system) was conducted for all the patients.

After completing the clinical examination, the patient's blood pressure was assessed in a sitting position using a manual sphygmomanometer. All patients were then put through an audiological assessment. Pure tone averages at three frequencies of 500Hz, 1000Hz, and 2000Hz were determined for the right and left ears and plotted on a graph after air conduction and bone conduction testing. Similar calculations and graphs were made for the air-bone gaps at 500Hz, 1000Hz, and 2000Hz.

Statistical Analysis

The collected data were analysed using IBM SPSS Statistics for Windows, Version 23.0. (Armonk, NY: IBM Corp). Frequency analysis, percentage analysis, and mean & S.D. were employed for categorical and continuous variables to describe the data using descriptive statistics. Pearson's correlation was used to analyse the correlation between the variables. The Fisher's Exact test is performed to determine the significance of categorical data. The probability value of 0.05 is regarded as significant in all of the aforementioned statistical techniques.

RESULTS

Among 120 patients, the age distribution where <30 years was 1.7%, 31-40 years was 18.3%, 41-50 years was 27.5%, and 51-60 years was 52.5%. Gender distribution where female and male patients were 44.2% and 55.8%, respectively, reflecting male predominance.

Table 1: Comparison of tinnitus, hearing loss, vertigo, other symptoms, otoscopy, TFT Right, and TFT Left between Gender by Pearson's Chi-Square test

		Gender		Total	P-value
		Female	Male		
Tinnitus	Absent	17 (32.1%)	15 (22.4%)	32 (26.7%)	0.233
	Present	36 (67.9%)	52 (77.6%)	88 (73.3%)	
Hearing Loss	Absent	30 (56.6%)	28 (41.8%)	58 (48.3%)	0.107
	Present	23 (43.4%)	39 (58.2%)	62 (51.7%)	
Vertigo	Absent	49 (92.5%)	65 (97.0%)	114 (95.0%)	0.404
	Present	4 (7.5%)	2 (3.0%)	6 (5.0%)	
Other Symptoms	Absent	42 (79.2%)	57 (85.1%)	99 (82.5%)	0.404
	Present	11 (20.8%)	10 (14.9%)	17.5%	
Otoscopy	Normal	52 (98.1%)	66 (98.5%)	118 (98.3%)	1.000
	Abnormal	1 (1.9%)	1 (1.5%)	2 (1.7%)	
TFT Right	Normal	37 (69.8%)	40 (59.7%)	77 (64.2%)	0.251

TFT Left	Abnormal	16 (30.2%)	27 (40.3%)	43 (35.8%)	0.226
	Normal	37 (69.8%)	39 (59.1%)	76 (63.9%)	
	Abnormal	16 (30.2%)	27 (40.9%)	43 (36.1%)	

Table 1 compares tinnitus, hearing loss, vertigo, and other symptoms, Otoscopy, TFT right, and TFT Left between Gender by Pearson's Chi-Square, which indicates no statistical significance of Hearing Loss, Vertigo, and other symptoms with gender. Symptoms of tinnitus, hearing loss, and vertigo were observed in 73.3%, 21.7%, and 5% of patients, whereas 98.3% had normal otoscopic findings and 1.7% had abnormal findings like retracted TM (Table 2). Figure 1 compares PTA Right side between Genders ($\chi^2=4.950$, $p=0.422$), which indicates no statistical significance between PTA Right side and Gender. PTA revealed varied degrees of hearing loss in the right ear, with mild hearing loss (36.7%) being the most common type.

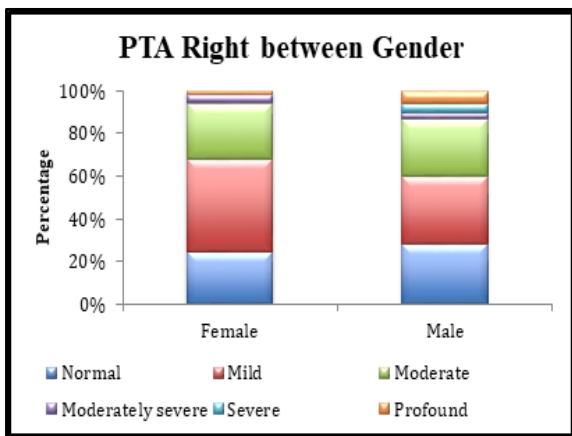


Figure 1: Comparison of PTA Right between Gender by Pearson's Chi-Square test

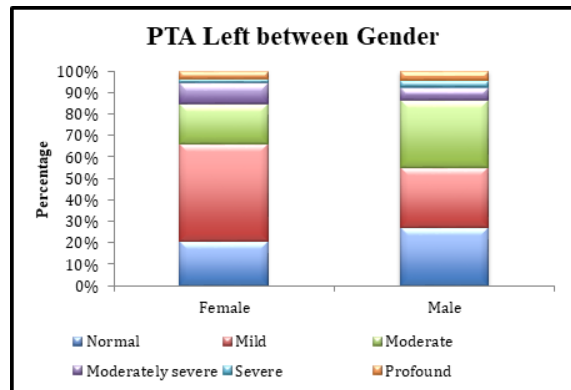


Figure 2: Comparison of PTA left between Gender by Pearson's Chi-Square test

Figure 2 compares PTA Left side between Genders ($\chi^2=5.257$, $p=0.385$), which displays no statistical significance between PTA Left and Gender. PTA presented variable degrees of hearing loss in the left ear, with a mild degree of hearing loss (35.8%) as the most predominant category.

Table 2: Comparison of Systolic BP, Diastolic BP between Gender by Fisher's exact test

		Gender		Total	p-value
		Female	Male		
Systolic BP	120 - 139	52 (98.1%)	65 (97.0%)	117 (97.5%)	1.000
	140 - 159	1 (1.9%)	2 (3.0%)	3 (2.5%)	
Diastolic BP	80 - 89	43 (81.1%)	50 (74.6%)	93 (77.5%)	0.397
	90 - 99	10 (18.9%)	17 (25.4%)	27 (22.5%)	
Duration/Months	< 10	13 (24.5%)	16 (23.9%)	29 (24.2%)	0.996
	10-40	33 (62.3%)	42 (62.7%)	75 (62.5%)	
	> 40	7 (13.2%)	9 (13.4%)	16 (13.3%)	

Table 2 compares Systolic BP, Diastolic BP between Gender by Fisher's exact test, which shows no statistical significance between Systolic BP and Gender. Further, the comparison of Duration/Months between Gender ($\chi^2=0.007$, $p=0.996$) also shows no statistical significance (Table 2).

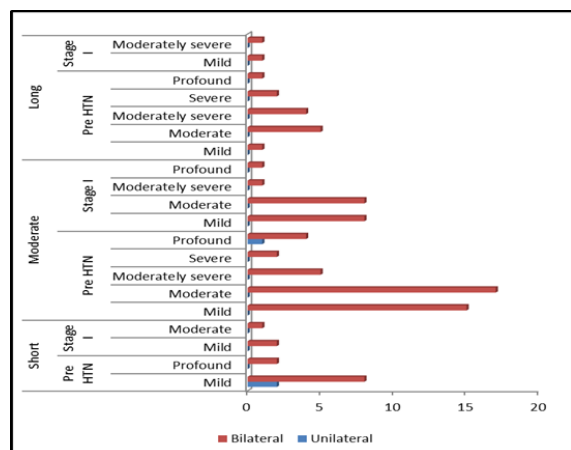


Figure 3: Comparison of duration and degree of hypertension with degree of hearing loss

Figure 3 presents the degree of hypertension with hearing loss and the number of patients affected in each category. Patients in our study presented with varying duration of hypertension, among which the moderate duration of hypertension, i.e., between 10-40 months, was most common, and the degree of hypertension was most commonly in the pre-hypertension category, i.e., SBP between 120 – 139mmHg and DBP between 80 – 89mmHg. A mild degree of hearing loss was the most common degree of hearing loss in this study.

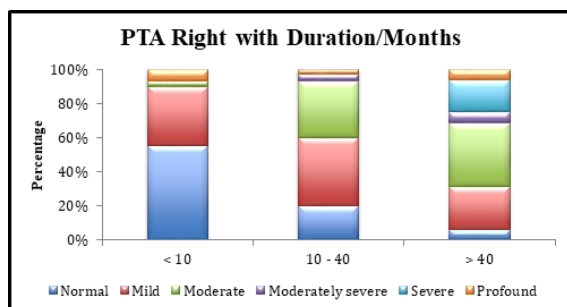


Figure 4: Comparison of duration of hypertension with degree of hearing loss in the right ear

Figure 4 compares the hypertension duration with a degree of hearing loss in the right ear with a p-value of 0.0005, which is highly significant. Our study's pure tone audiogram report indicates that 73.3% of patients had sensorineural hearing loss in the right ear. It suggests that the duration of hypertension and the degree of hearing loss has a definite association.

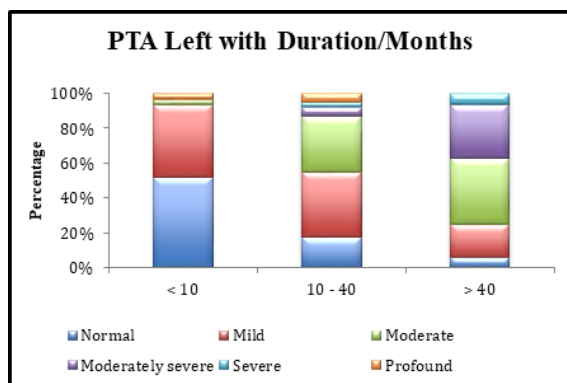


Figure 5: Comparison of duration of hypertension with a degree of hearing loss in the left ear

Figure 5 compares the hypertension duration with a degree of hearing loss in the left ear with a p-value of 0.0005, which is highly significant. Based on the pure tone audiogram report obtained in our study indicates that 75.8% of patients had sensorineural hearing loss in the left ear. It suggests that the duration of hypertension and the degree of hearing loss has a definite association.

75.80% (91) of subjects had hearing loss, and 24.20% (29) had no hearing loss. 96.70% (88) of subjects had bilateral hearing loss, and 3.30% (3) had unilateral hearing loss. The majority of the patients had bilateral hearing loss.

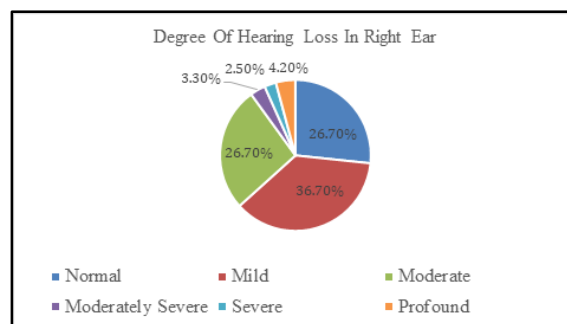


Figure 6: Varying degree of hearing loss in the right ear

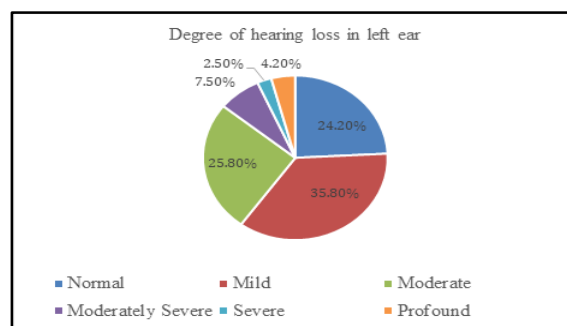


Figure 7: Varying degree of hearing loss in the left ear

Figures 6 and 7 show varying degrees of hearing loss in both ears. In the right ear, a mild degree of hearing loss was 36.7% was the predominant type, and in the left ear, a mild degree of hearing loss was 35.8% was the predominant type.

Table 3: Correlation of PTA with SBP, DBP

Variables	PTA Right		PTA Left	
	r- value	p-value	r- value	p-value
SBP	.548**	.0005 **	.572**	.0005 **
DBP	.225*	.014 *	.289**	.001 **
Age	.200*	.028 *	.255**	.005 **

Table 3 shows the correlation of PTA right and left with SBP, DBP, and age, showing a statistically significant positive correlation difference at $p < 0.01$ level.

DISCUSSION

Due to its undetectable character, which precludes identification through standard clinical techniques, hearing loss is known as a quiet, unnoticed pandemic in underdeveloped countries. Between the ages of 18 and 60, researchers looked into the relationship between essential hypertension and hearing loss.^[1-3] The current study demonstrated that people with hypertension can experience hearing loss. Hearing loss might result from uncontrolled hypertension that is more persistent. Numerous environmental factors, particularly a fatty diet, stress, a family history of the condition, and high cholesterol, are crucial. Finding ways to stop people from acquiring hypertension is necessary. Awareness of and managing essential hypertension is crucial for preventing hearing loss caused by hypertension.

In the current study, we examined people between the ages of 18 and 60; the average age of this group was 50±9 years, and they were in their fifth decade. 55.8% of the 120 patients with essential hypertension who took part were men, and 44.2% were women. In our study, 24.2% of patients had short-term hypertension, 62.5% of participants had moderate-term hypertension, and 13.3% had long-term hypertension. We utilised the Chi-square test, and the p-value was 0.996. Ninety-nine percent of the 120 patients with essential hypertension were receiving anti-hypertensive drugs.

In our study, all necessary hypertensive individuals with hearing loss had sensorineural hearing loss based on clinical and audiometric examination. The average pure tone for the right ear was measured, and among them, mild tones made up 36.7%, moderate tones made up 26.7%, fairly severe tones made up 3.3%, and severe tones made up 2.5%. The normal, mild, moderate, and severe percentages for the left ear were 24.2%, 35.8%, 25.8%, 7.5%, and 2.5%. According to the pure tone audiogram report we acquired from our study, 73.3% of patients had sensorineural hearing loss in their right ear and 75.8% in their left ear. There was a prevalence of mild and moderate degrees of hearing loss according to our study. But no statistically significant relationship existed between PTA and gender.

In our study, the correlation of PTA with systolic and diastolic blood pressure in both ears was highly statistically significant. Our study's patients had blood pressure ranging from 120 to 139 millimetres of mercury (mmHg) in their SBP and 80 to 89 millimetres of mercury (mmHg) in their DBP. The moderate duration of hypertension, defined as between 10 and 40 months, was the most prevalent. In our study, mild hearing loss was the most prevalent type of hearing loss. This study demonstrates a clear correlation between the severity of hearing loss and hypertension length.

The prevalence of hearing loss in the hypertension group in our investigation was consistent with earlier prevalence estimates of 46.8%.^[10], 36.7%.^[11],

38.5%.^[12], and 12.83%.^[13] In our study, mild hearing loss was the most prevalent level of hearing loss. This is consistent with other studies findings that the most prevalent type of hearing loss is mild.^[11,12] Agarwal et al. and Yikawe et al. classified mild hearing loss following the previous WHO hearing loss categorisation (26-40 dB).^[11,12] Therefore, it can be contended that mild hearing loss is the most prevalent degree of hearing loss among hypertensive patients. Concerning tinnitus, the current study found that tinnitus was present in 73.3% of both sexes, hearing loss in 51.7%, vertigo in 5%, and additional symptoms in 17.5% of cases, none of which reached statistical significance. Our study's tinnitus prevalence was higher than Mondelli and Lopes, with a reported tinnitus prevalence of 43.7% among hypertensives.^[14] There is a wealth of research indicating a connection between hypertension and tinnitus, despite the lack of certainty on the cause-and-effect link.^[15] Hearing loss, however, is a variable in most research demonstrating a connection between tinnitus and hypertension. Lee et al. found that 85–96% of people with tinnitus have some degree of hearing loss.^[16] The percentage of hypertensives with tinnitus who do not also have hearing loss was calculated to assess whether there is a link between the two conditions. In the current study, 51.7% of hypertensive people also reported hearing loss and tinnitus. Our investigation showed that hypertension is a predictive factor for tinnitus in the hypertensive adult population.^[17]

These findings illustrated the detrimental impact of hypertension on the inner ear, which led to a decline in hearing acuity. It also suggests a link between hearing loss and essential hypertension. The observed hearing loss is often mild and gets worse depending on the severity and duration of hypertension. Regular audiological testing for hypertensive individuals could enhance their quality of life and the care they receive for their condition.

CONCLUSION

Identifying potentially modifiable risk factors is crucial for public health since auditory impairments can be severely handicapping. The results of the current study point to a connection between hearing loss and hypertension, highlighting the necessity of including hearing healthcare services in managing hypertension. The prospect of preventing hearing loss is provided by the early detection, prevention, and improved management of adults with hypertension hearing status.

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