

Sensorineural Hearing Loss among Hypertensive Patients: A Clinical Study

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ABSTRACT

Sensorineural deafness is a bilateral, progressive hearing loss of gradual onset which predominantly affects the higher frequencies and old patients. Hypertension, being the most common vascular disorder, may facilitate structural changes in the heart and blood vessels. High pressure in the vascular system may cause inner ear hemorrhage, which may cause progressive or sudden hearing loss.

Keywords: Adults, High frequency audiometry, Sensorineural hearing loss.

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INTRODUCTION

Hearing is considered one of the important factors which enriches our day-to-day life. One of the most common chronic medical conditions encountered by physicians is hypertension. This condition may be associated with progressive hearing loss of sensorineural type. Chronic hypertension has also been implicated in the development of hearing loss.^{1,2} Studies have shown that chronic hypertension causes a decrease in cochlear function and leads to histologic cochlear damage.

AIMS AND OBJECTIVES

- To evaluate the prevalence of sensorineural hearing loss among patients 50 years and above who are suffering from hypertension.
- To evaluate sexual preponderance of sensorineural hearing loss in hypertension.
- To evaluate the relationship between sensorineural hearing loss and duration of hypertension

MATERIALS AND METHODS

A cross-sectional study with sample size of 100 patients aged 50 years and above suffering from hypertension, attending Otorhinolaryngology, and General medicine outpatient department of VMKV Medical College and Hospital, Salem from December 2016 to June 2018 was undertaken. Patients of both sexes presenting with hypertension (140/90 mm Hg) were subjected to an audiometric procedure. Hearing assessment was done on all patients with the same audiometer and pure tone thresholds for 250, 500 Hz, 1, 2, 4, 6, 8 KHz for air conduction and bone conduction was determined using Alps Pure Tone Audiometer (Model AD 2000) and recorded in a pure tone average (PTA) report. PTA of 500 Hz, 1 and 2 KHz air conduction threshold was taken and tabulated on data spreadsheet.

RESULTS

Age Distribution

A total of 100 hypertensive patients were enrolled in this study and they were subdivided based on the age into 50–60, 61–70,

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and 71–80 (Table 1). Out of the total 100 hypertensive patients, 37 patients were in the age-group 51–60, 55 patients in 61–70 age-group, and eight patients in 71–80 age-group (Fig. 1).

Prevalence of Age and Hypertension

Out of 100 hypertensive patients, 55 patients were found to have hearing loss, in which 20 patients were in the 51–60 age-group, 32 patients in 61–70 age-group, and three patients in 71–80 age-group (Table 2, Fig. 2).

Grading of Hearing Loss

Out of 54 patients with hearing loss, 22 patients (40%) had mild hearing loss, 27 patients (49.09%) had moderate hearing loss, and six patients (10.9%) had moderately severe hearing loss (Fig. 3). In the age-group 51–60, nine patients were having mild hearing loss

Table 1: Age distribution of hypertensive patients

Age	Total	%
51–60	37	37
61–70	55	55
71–80	8	8
Total	100	100

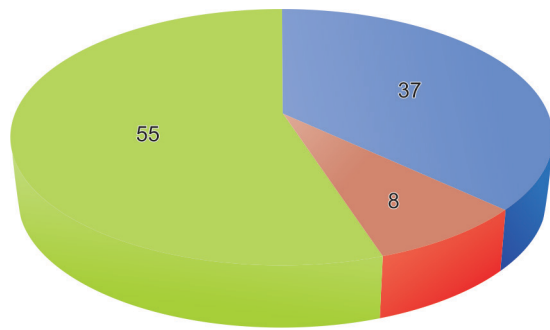


Fig. 1: Age distribution of hypertensive patients

Table 2: Prevalence of age and hypertension

Age	SNHL	%
51-60	20	36.36
61-70	32	58.18
71-80	3	5.45
Total	55	100

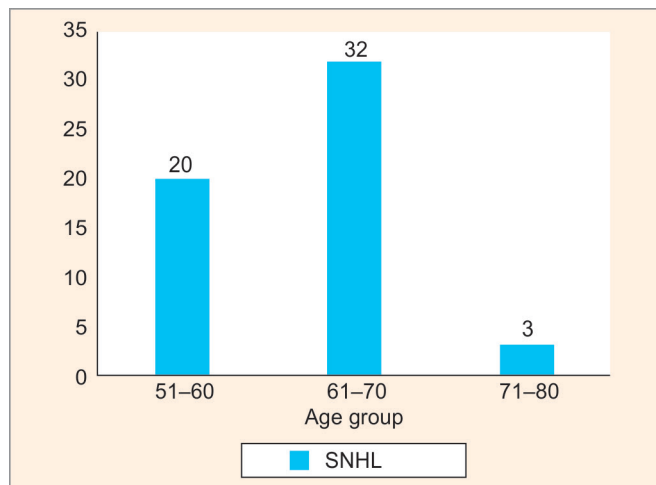


Fig. 2: Prevalence of age and hypertension

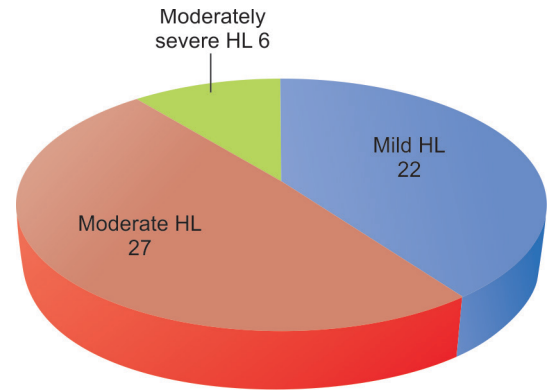


Fig. 3: Grading of hearing loss in hypertensive patients

and 10 patients were having moderate hearing loss, and one patient was having moderately severe hearing loss. In the age-group 61-70, 13 patients were having mild hearing loss, 14 patients were having moderate hearing loss, and five patients were having moderately severe hearing loss. In the age-group 71-80, three patients were having mild hearing loss. Statistical analysis revealed that there was no significant association between the age of the patient and hearing loss (p value >0.05) (Table 3, Fig. 4).

Sex Distribution

Out of the 100 hypertensive patients, 57% were males and 43% were females. In the age-group 51-60, 17 were males and 20 were females. In the age-group 61-70, 36 were males and 19 were females. In the age-group 71-80, four were males and four were females (Table 4, Fig. 5).

Out of the 55 hypertensive patients with hearing loss 31 were males and 24 were females. 13 males and nine females had mild

Table 3: Relationship between age of hypertensive patients and degree of hearing loss

Age-group	Normal	Mild HL	Moderate HL	Moderately severe HL
51-60	17	9	10	1
61-70	23	13	14	5
71-80	5	3	0	0

p value >0.05

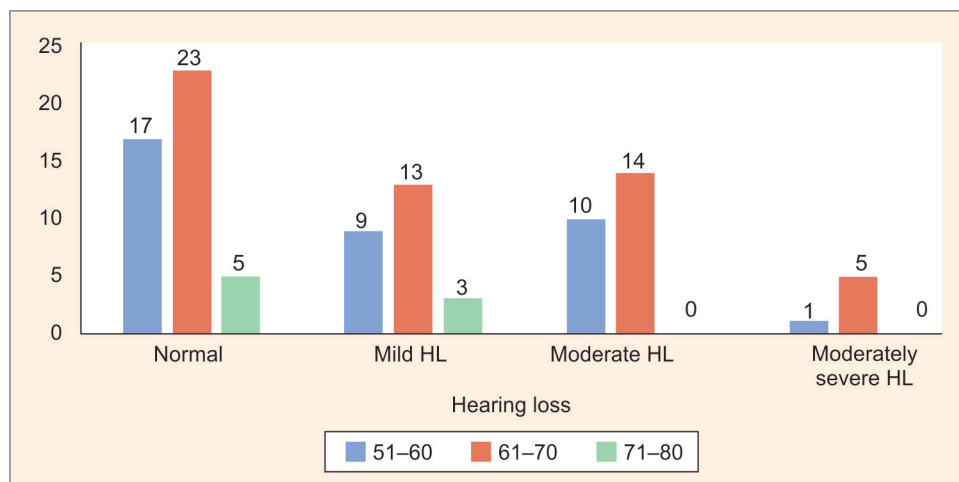


Fig. 4: Relationship between age of hypertensive patients and degree of hearing loss

Table 4: Gender distribution in hypertensive patients

Age-group	Male	Female
51–60	17	20
61–70	36	19
71–80	4	4
Total	57	43

hearing loss, 17 males and 10 females had moderate hearing loss, and one male and five females had moderately severe hearing loss. Statistical analysis revealed that there was no significant association between the sex of hypertensive patients and the prevalence of hearing loss (p value >0.05) (Table 5, Fig. 6).

Duration of Hypertension

Out of the 55 hypertensive patients with hearing loss, nine patients were having hypertension of 1–5 years of duration, 26 patients were having hypertension of 6–10 years of duration, 16 patients were having hypertension of 11–15 years of duration and four patients were having hypertension of 16–20 years of duration. Statistical analysis revealed that there was no significant association between

Table 5: Relationship between sex and hearing loss in hypertensive patients

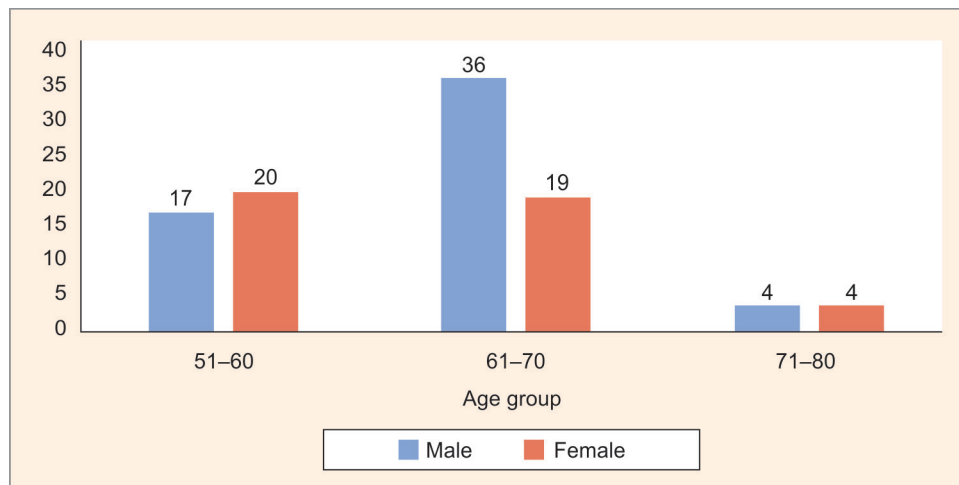
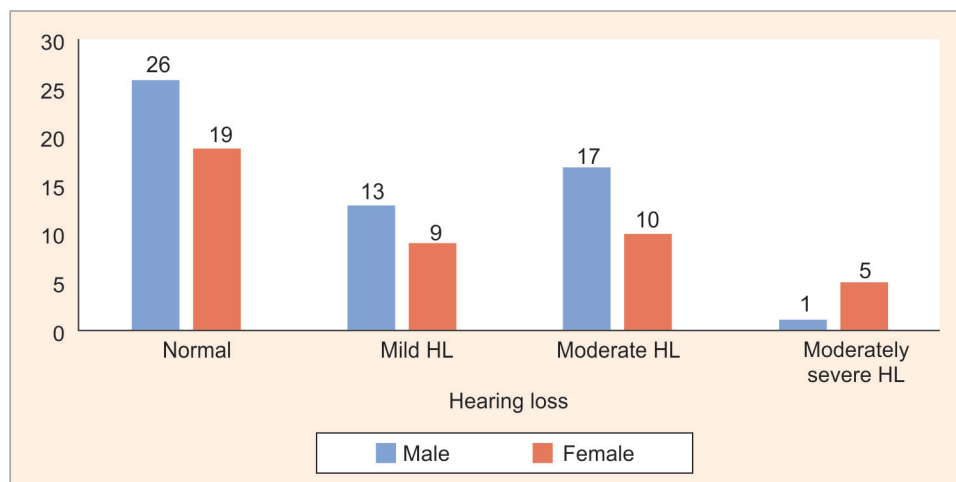
		Sex				Total			
Hearing threshold		Male		Female		N		%	
		N	%	N	%				
Hyper tension	Normal	26	46	19	44	45	45		
	Mild	13	23	9	21	22	22		
	Moderate	17	30	10	23	27	27		
	Moderately severe	1	2	5	12	6	6		
	Total	57	100	43	100	100	100		

p value >0.05

duration of hypertension and prevalence of hearing loss (Table 6, Fig. 7).

Severity of Hypertension with Hearing Loss

Out of the 55 patients with grade 1 hypertension, 39 patients were having no hearing loss, seven patients were having mild hearing loss, and nine patients were having moderate hearing loss (Table 7, Fig. 8).

**Fig. 5:** Gender distribution in hypertensive patients**Fig. 6:** Relationship between sex and hearing loss in hypertensive patients

Out of the 28 patients with grade 2 hypertension, six patients were having no hearing loss, nine patients were having mild hearing loss, 12 patients were having moderate hearing loss, and one patient was having moderately severe hearing loss.

Out of the 17 patients with grade 3 hypertension, six patients were having mild hearing loss, six patients were having moderate hearing loss, and five patients were having moderately severe hearing loss. Statistical analysis revealed that there was significant association between blood pressure levels and degree of hearing loss.

Table 6: Relationship between duration of hypertension and hearing loss

Duration	Normal	Hearing loss
1–5	10	9
6–10	21	26
11–15	11	16
16–20	3	4
Total	45	55

p value >0.05

High-frequency Hearing Loss

Out of the 55 hypertensive patients with hearing loss, 51 patients had high-frequency loss. Statistical analysis revealed that there was significant association between hypertension and increase in hearing thresholds at higher frequencies (Table 8, Fig. 9).

DISCUSSION

In the present study 55% of the hypertensive patients had sensorineural hearing loss and a significant association was found between systemic hypertension and hearing loss (Fig. 7). Rosen³ initially found relationship between hypertension and SNHL. Similar association was later found in the studies

Table 7: Relationship between severity of hypertension with hearing loss

BP	Normal	Mild HL	Moderate HL	Moderately severe HL	Total
Grade 1	39	7	9	–	55
Grade 2	6	9	12	1	28
Grade 3	–	6	6	5	17

p value <0.05

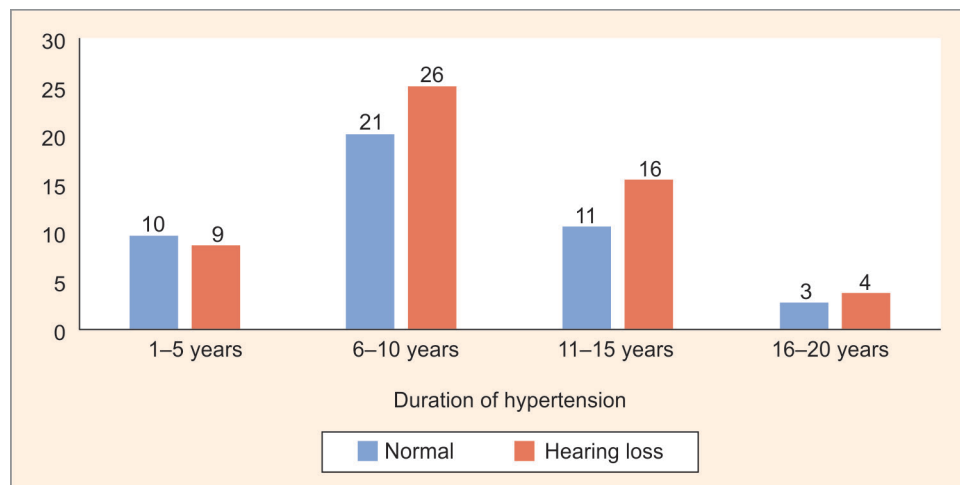


Fig. 7: Relationship between duration of hypertension and hearing loss

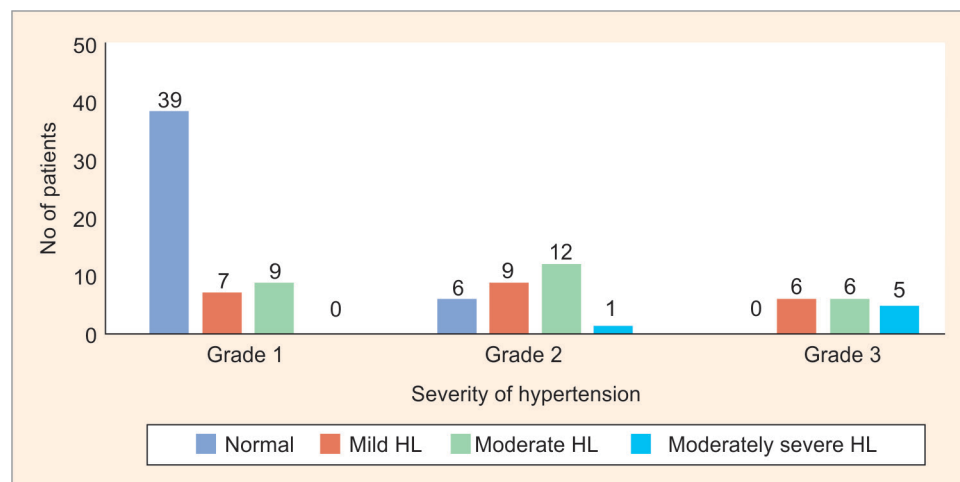


Fig. 8: Relationship between severity of hypertension with hearing loss

by Markova et al., Nazar et al.,⁴ Chen and Ding,⁵ Brohem et al.,⁶ and Marchiori et al.⁷ Some studies justify that the sensorineural hearing loss that happens with aging is related to a microcirculatory insufficiency that occurs due to vascular occlusion caused by emboli,⁸ hemorrhage or vasospasm, and these happen because of a syndrome of hyperviscosity or microangiopathy caused by diabetes or hypertension,¹⁴ and the latter could, through histopathological mechanisms cause the sensorineural hearing loss.^{1,10} However, Leitschuh and Chobanian⁹ argued that isolated systemic arterial hypertension would not cause hearing loss higher than that is observed in normotensive population. This argument is supported by the studies of Hansen et al.,¹⁰ Rey et al.,¹¹ Yan-Lin and Ding,¹² and Baraldi et al.¹³ Our study revealed that there was no significant association between the age of the patient and hearing loss (Fig. 4). Marchiori et al.⁷ also considered systemic hypertension and advanced age as independent risk factors for hearing loss. Many studies however have reported male gender as an independent risk factor for hearing loss.^{6,16} The present study also did not reveal any significant association between the duration of hypertension and hearing loss which was contrary to the findings of Karmarkar¹⁶ who commented that hypertension for a duration of 7–9 years could lead to sensorineural hearing loss. The present study also shows a significant association between the severity of hypertension and hearing loss.⁹ This was in accordance with the findings of Agarwal et al.¹⁴ who reported an increase in hearing threshold in patients with grade 3 hypertension. The audiometric analysis of the hypertensive patients with hearing loss in the present study revealed a pattern of increased hearing threshold for higher

frequencies.¹² The studies done by Rosen,³ Tan et al.,¹⁵ and Agarwal et al.¹⁴ also report similar findings. However, Gates et al.¹ have shown that hypertensive males have high-frequency hearing loss while hypertensive females have higher hearing thresholds for lower frequencies when compared to their normotensive counterparts.

CONCLUSION

India has a large number of hypertensive patients. Among the various complications, hearing loss is the least studied. Among the hypertensive patients, 55% had hearing loss. Bilateral sensorineural hearing loss was noted at all frequencies, but significantly in higher frequencies. Severity of hypertension was found to have a strong association with hearing loss. As hypertension often causes high-frequency nature of hearing loss, it commonly goes undetected and unreported. On the other hand, routine screening for hearing loss in hypertensive patients may also be helpful to diminish comorbidities among them and improve their quality of life. Awareness among public regarding hearing loss, usefulness of hearing aid, control of hypertension is essential.

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Table 8: Relationship between hypertension and high frequency hearing loss

Hearing loss	High frequency loss		Total
	Present	Absent	
Mild	20	2	22
Moderate	26	1	27
Moderately severe	5	1	6

p value <0.05

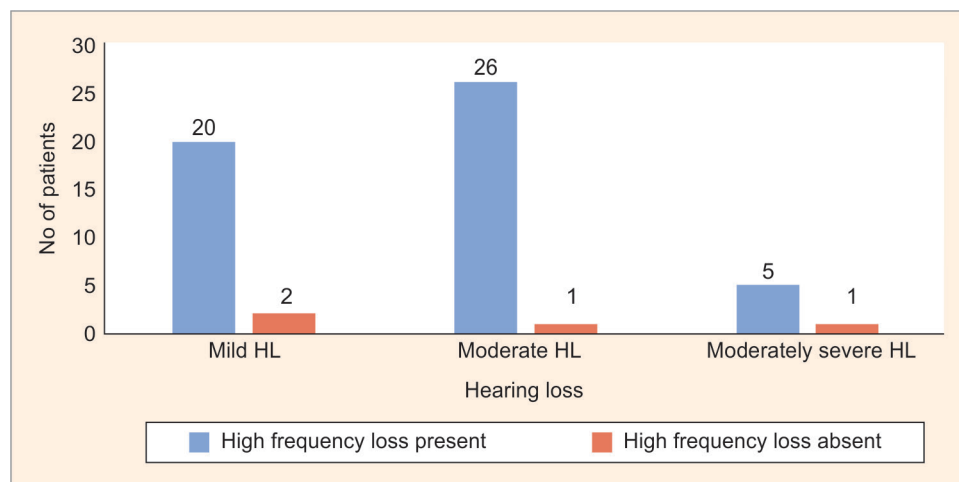


Fig. 9: Relationship between hypertension and high-frequency hearing loss

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