

Effect of Age and Sex on Hearing by Pure Tone Audiometry

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Abstract

Hearing loss is known to vary from place to place and country to country in both sexes with advancing age. There is scarcity of such information in India, and even no study is available from the Ghaziabad belt of North India. This prompted us to undertake a study on hearing impairment in the local population at Ghaziabad. It included three hundred persons, half of them were males and rest of the half were females. Selection of cases was done randomly. The age of the subjects ranged from 15 to 80 years, cases were divided into four groups. Only healthy subjects were selected for the study after thorough history taking and examination. Mild degree of hearing loss was observed in both men and women at middle and older age groups, percentage of males having hearing loss was more than women. Mean age of hearing loss in women was 51.22 years and 51.55 years in men, but with advancing age further hearing loss in women takes less time than in men. With advancing age loss of hearing threshold is less in lower frequencies in men as compared to women whereas with advancing age loss of hearing threshold in higher frequencies is more in men than women, statistically the results were highly significant.

Key Words

Hearing Loss, Advancing age, Audiometry

Introduction

Various authors in past had done work on various factors like occupational trauma, noise trauma, drugs, effect of smoking and organic solvent exposure which can be one of the cause of hearing loss (1-5)

Effect of presbycusis and sex had been reported by various authors (6-10), but hearing loss is known to vary from place to place and country to country in both the sexes with increasing age. Therefore it was necessary to do hearing impairment study in our local population in various age groups at Ghaziabad in both sexes Males and Females.

There is scarcity of such information in India, and even no study was available from the Ghaziabad belt of North India. This consideration prompted us to undertake the

study on hearing impairment in the local population in various age groups at Ghaziabad in both sexes.

Material & Methods

This study was carried out in the Department of Physiology and Otorhinolaryngology of Santosh Medical College and Hospital at Ghaziabad.

The study group included three hundred persons. One hundred fifty were males and rests of the one hundred fifty were females. The age of the subjects was in the range of 15 to 80 years. The hearing tests were carried out in a sound - proof room in the department of Otorhinolaryngology of Santosh Medical College and Hospital, Ghaziabad.

Selection of cases was done randomly as and when

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they attended outpatient department. Cases were divided into four groups, Group I from 15 to 25 years, Group II from 26 to 40 years, Group III from 41 to 60 years and Group IV from 61 to 80 years.

From every individual an enquiry was made regarding any hearing loss, tinnitus, hyperacusis, hallucinations and vertigo. Further all the selected cases had no abnormality of pinna, discharge from the ear, any abnormality of the external auditory canal and tympanic membrane. None of the selected case had any operative surgery of ear or head injury with unconsciousness or history of taking ototoxic or antihypertensive drugs or was not working in noise industry or mill or had history of familial deafness. None of the case had congenital abnormality.

They were in good general physical condition and ear was free from any disease. Examination of cardiovascular system, central nervous system, respiratory system, gastrointestinal system and locomotive system was normal. For all the selected cases tuning fork tests (Rinne's , Weber and Absolute bone conduction tests) and Pure Tone Audiometry was done .

Pure Tone Audiometry was done by the portable audiometer-ELKON EDA 3N3 audiometer.

Results

It is clear from the sector diagram *Fig 1&2* that there were more males participants in Group I and II; the reason may be that females at younger age were reluctant to undergo audiometry. There were more females in Group III and IV, the reason may be at old age women have less inhibition, more expressive and more concerned about change in hearing acuity and easily come forward for audiogram. In our study the cases who had hearing loss, the type of hearing loss was sensorineural .

The results of the observations made in (*Table 1 & Table 2*) both men and women are almost identical. They showed that there is no uniformity or pattern in statistical

Table 1. Statistically significant better ear (Right vs Left) in various frequencies in different age groups in men

Group	Frequency (Hz)							
	125	250	500	1000	2000	4000	6000	8000
I (15-25)	-	-	-	-	L	-	-	-
II (26-40)	L	-	-	-	-	-	-	-
III (41-60)	L	-	R	-	R	-	R	-
IV (61-80)	-	L	-	-	-	-	R	-

L= Left Ear, R=Right Ear.

difference in our cases between left and right ear in men and women, with some occasional exceptions in each group at different frequencies. None of the ear, be it right or left, is dominant for all the frequencies in any group for hearing acuity in men and women.

It is clear from Table 3 that percentage of hearing loss was more in males, but both in males and females mild degree of hearing loss was observed.

It is clear from both the tables (*Table 4 & 5*) that women have better hearing acuity than men as there was predominance of females in the data shown in both the tables. At 15 to 25 years (Group I) females have predominantly better hearing than men. From 26 to 40 years (Group II) females have better hearing in all the frequencies except at 125 Hz and 250 Hz while at 125 Hz and 250 Hz men have better hearing threshold.

At frequencies of 2000, 4000, 6000 and 8000 Hz in Group I, II, III and IV there is predominance of females for better hearing. Predominance of females for better hearing in Group III and IV means less decrease in hearing threshold in females than men, it means that in men in these higher frequencies from 2000 to 8000 Hz in Group III and IV there is more fall in hearing threshold.

In lower frequencies of 125, 250, 500, and 1000 Hz females are predominant in Group I for better hearing but as we go down to Group III and IV in all these four frequencies men have better hearing threshold. This only means that at lower frequencies of 125 to 1000 Hz women has more decrease in hearing threshold than men in group III and IV.

Ratio of Hearing Impairment Between Male/Female.

(i) Hearing impairment ratio in Group III in male vs female. It was present in 37.8% cases in men and 28% cases in women. Ratio is $37.8/28 = 1.35$.

(ii) In Group IV (61 to 80) years, it was present in 87.2% cases in males and 75% in females. Ratio is $87.2/75 = 1.16$.

Fig.1 Distribution of Male in various age groups sector diagram

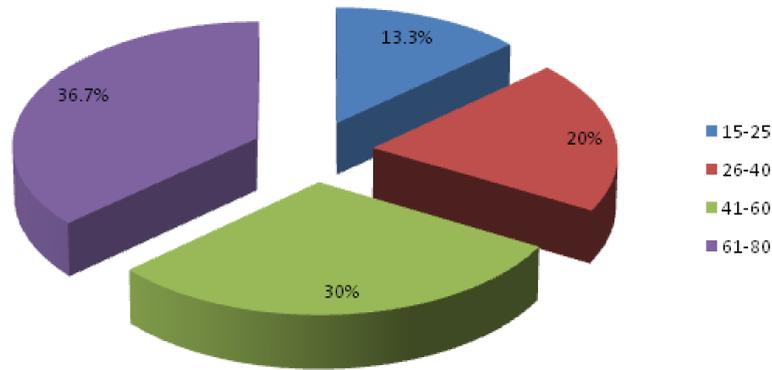


Fig.2 Distribution of Females in Various age groups sector Diagram

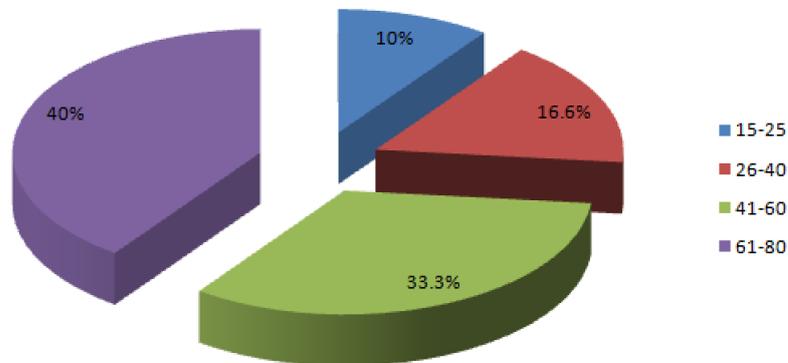


Table No. 2 Statistically significant better ear (Right vs Left) in various frequencies in different age groups in women

Group	Frequency (Hz)							
	125	250	500	1000	2000	4000	6000	8000
I	-	-	L	-	-	-	-	-
II	-	-	R	-	L	L	R	R
III	-	-	-	-	-	-	-	-
IV	-	-	-	L	-	-	-	-

L= Left Ear, R=Right Ear.

Table No.3 Incidence and percentage of hearing loss between males and females in each group.

Group	Hearing Loss Male (%)	Hearing Loss Female (%)	Degree of hearing loss
I 15-25	NIL	NIL	NIL
II 26-40	NIL	NIL	NIL
III 41-60	37.8%	28%	Mild
IV 61-80	87.2%	75%	Mild

75 = 1.16.

It means that men have more often hearing impairment than women be it at 41 to 60 or 61 to 80 years of age.

Discussion

In the present study , in men hearing loss of mild grade

was present in 17 (37.8%) cases between the age of 41 to 60 years while hearing loss of mild grade was also present in 48 (87.2%)` of cases between the age of 61 to 80 years. In women hearing loss of mild grade was present in 14 (28%) between 41 to 60 years (Group III)

Table No.4 Frequency at which hearing threshold was better among the two sexes in each frequency of each group along with their statistical significance (S) in right ear.

Group (age)	Frequency (Hz)							
	125	250	500	1000	2000	4000	6000	8000
I (15-25)	F(S)	F (S)	F	F (S)	F (S)	M	F	F
P value	.000	.000	.058	.001	.000	.327	.579	.839
II (26-40)	M(S)	M(S)	F (S)					
P value	.000	.000	.003	.019	.000	.000	.000	.000
III (41-60)	M	M	M	M	F (S)	F (S)	F (S)	F (S)
P value	.105	.401	.076	.268	.042	.006	.022	.008
IV(61-80)	M(S)	M(S)	M	M	F	F (S)	F (S)	F (S)
P value	.015	.013	.243	.326	.134	.003	.001	.000

F= Female , M= Male , (S) = Statistically Significant

Table No.5 Frequency at which hearing threshold was better among the two sexes in each frequency of each group along with their statistical significance (S) in left ear.

Group (age)	Frequency (Hz)							
	125	250	500	1000	2000	4000	6000	8000
I (15-25)	F(S)	F (S)	F (S)	F (S)	F	F	M	M
P value	.000	.001	.000	.001	.241	.394	.150	.609
II (26-40)	M(S)	M(S)	F (S)					
P value	.000	.000	.017	.001	.000	.000	.000	.001
III (41-60)	M(S)	M	M	M	F (S)	F (S)	F (S)	F (S)
P value	.007	.169	.875	.584	.003	.006	.002	.005
IV (6180)	M	M(S)	M	M	F	F (S)	F (S)	F (S)
P value	.182	.011	.340	.745	.093	.001	.000	.000

F= Female , M= Male , (S) = Statistically Significant

while hearing loss of mild grade was also present in 45 (75%) between 61 to 80 years. Different incidences of hearing loss at various age groups by different workers have been reported. Hearing loss of mild degree in 35% (18 out of 52 cases), moderately severe degree in 65% (34 out of 52 cases) in old people has been reported (11). Comparison of hearing threshold in right and left ear in men and women was done that showed there is no uniformity or pattern in statistical difference. None of the ear, be it right or left, is dominant for all the frequencies in any group for hearing acuity in men and women. Other authors made almost similar observations, i.e.; no difference in hearing threshold between the left and right ear (12). Some workers reported minor differences of less than 5 dB between the average sensitivity of right and left ears (13). Significance of mean hearing threshold level in each age group in dB at different frequencies in men in right and left ear and in women in right and left ear was also evaluated and findings are similar which show that with advancing age there is decrease in hearing

acuity, viz; between 41 to 60 years and further decrease between 61 to 80 years, our observations have similarity with many studies done earlier(14-19). Comparison of right ear between men and women hearing threshold at each frequency of each group was done. Similar comparison of left ear between the two sexes was done; our findings have already been explained under table number 4 and 5 in detail. Other workers have reported, hearing loss most pronounced at higher frequencies for both sexes at old age but men had on the average 10 dB greater hearing loss at 8000 Hz than women. After 65 years women showed poorer low frequency and better higher frequency threshold than men. Men's thresholds at higher frequency were poorer than for women (20) which are similar to our observations. The hearing sensitivity decreases with increasing age, specifically in high tone areas and in advanced age group, men are more affected than women (21) as in our study

Conclusion

In younger age women have better hearing than men.

Mild degree of hearing loss was observed in both men and women at middle and older age groups, but percentage of males having hearing loss is more than women. Mean age of abnormal fall in hearing threshold was 51.55 years in men and 51.22 years in women, hearing loss gradually increases further on advancing age in 15.32 years in men and 13.24 years in women, i.e.; time taken is less in women, suggesting faster decrease in hearing acuity at old age in women than men. With advancing age loss of hearing threshold is less in lower frequencies in men as compared to women whereas with advancing age loss of hearing threshold in higher frequencies is more in men than women.

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