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Original Research Article

Age-related hearing loss and its association with central obesity: experience at a tertiary centre

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ABSTRACT

Background: Presbycusis is a slow, progressive, age-related sensorineural hearing loss, which is insidious, slow, progressive and irreversible disease and usually affects high pitch sound. It can be associated with various factors. Obesity is such a modifiable factor and its independent role with age-related hearing loss needs to be explored.
Methods: This is a prospective study carried out over a period of three years in department of otorhinolaryngology at study institute. It included 1000 cases with symmetrical sensorineural hearing loss.
Results: Among obese cases, high frequency hearing loss was found in significantly large number of cases. The most common audiogram in both male and female was Abrupt high tone loss type, irrespective of presence or absence of obesity.
Conclusions: Obesity is a modifiable factor which has a significant association with high frequency hearing loss among the elderly population.

Keywords: Age related hearing loss, Obesity, Presbycusis, Sensorineural hearing loss

INTRODUCTION

Presbycusis is a slow, progressive, age-related sensorineural hearing loss. It results from degenerative changes in inner ear (cochlea) or auditory nerves due to various mechanism, like, hypoxoia/ischemia, reactive species formation, oxidative stress, leading to apoptosis or necrosis of hair cells in inner ear. It is insidious, slow, progressive and irreversible disease and usually affects high pitch sound. Age-related hearing loss (ARHL) is arising as a major public health issue and has become second most common disease affecting elderly population. It can be due to environmental, genetic or systemic/ metabolic factors.[1-3]

Systemic factors, mainly, central obesity and its comorbidities, like, diabetes, hypertension, cardiovascular disease have been previously reported to be associated with ARHL. However, independent role of these factors still needs to be explored.[4,5] In this audit, authors have studied association of central obesity with ARHL.

METHODS

This is a prospective study carried out in department of otorhinolaryngology at the study institute over a period of three years. 1000 cases with symmetrical sensorineural hearing loss, with difference of hearing loss <15 dB in both ears, were included in the study.

Detailed history, including, age, sex, continuous exposure to environmental noise, exposure to ototoxic drugs, trauma, major neurological or psychiatric disease, addiction to alcohol or other substance abuse, pregnancy or systemic illness, like, diabetes mellitus, hypertension

was taken. It was followed by general, systemic examination, local examination, including, height, body weight and waist circumference (WC), otoscopy and complete head and neck examination and pure tone audiometry (MAICO MA42 audiometer). Cases with unilateral hearing loss, mixed hearing loss, history of acoustic trauma, exposure to ototoxic drugs, trauma, major neurological or psychiatric disease or addiction to alcohol or other substance abuse were excluded from the study.

As per International Diabetes Federation guidelines, WC is measured in a horizontal plane, midway between the inferior margin of the ribs and the superior border of the iliac crest. Central obesity is defined in terms of waist circumference (WC) and body mass index (BMI), as WC of >90 cm for males and >80 cm for females and BMI of 30 or more. Body mass index (BMI) is calculated as weight in kilogram divided by (height in meters)^2.[6]

Degree of hearing loss was assessed by taking average of hearing threshold at speech frequencies, i.e., 500, 1000 and 2000 Hz. According to the pattern of graph, Schuknecht classified audiometric configuration of hearing impairment into three types: Flat, downward sloping, abrupt high tone loss. Hwang J et al added one more type of configuration, i.e., reverse sloping type.

RESULTS

In this study, the age of patients ranged between 30 to 90 years with maximum number of patients in 51-60 years age-group; male to female ratio was 1:1.15 with 464 males (46.4%) and 536 females (53.6%). Central obesity was accessed in terms of waist circumference (WC) and body mass index (BMI). Obesity is defined as WC of >90 cm for males and >80 cm for females and BMI >30; whereas, BMI values between 25 and 30 are considered as overweight. Overall, 564 patients had WC >80 and 633 had BMI >30 (Table 1).

Among cases with WC less than 60 cm, 18 had mild hearing loss, 18 had moderate, 10 had severe and 02 had profound hearing loss; among those with WC between 61-70, 22 had mild hearing loss, 40 had moderate, 47 had severe and 12 had profound hearing loss; those with WC between 71-80, 34 had mild hearing loss, 48 had moderate, 132 had severe and 53 had profound hearing loss; those with WC between 81-90, 12 had mild hearing loss, 43 had moderate, 79 had severe and 24 had profound hearing loss; among those with WC >90 cm, 37 had mild hearing loss, 67 had moderate, 249 had severe and 53 had profound hearing loss (Table 2).

Among cases with BMI less than 25, 47 had mild hearing loss, 47 had moderate, 58 had severe and 6 had profound hearing loss; BMI between 25-29.9, 43 had mild hearing loss, 56 had moderate, 96 had severe and 14 had profound hearing loss; BMI between 30-34.9, 10 had mild hearing loss, 45 had moderate, 142 had severe and 34 had profound hearing loss; BMI between 35-39.9, 13 had mild hearing loss, 40 had moderate, 109 had severe and 25 had profound hearing loss; among those with BMI >40, 10 had mild hearing loss, 28 had moderate, 112 had severe and 65 had profound hearing loss (Table 3).

Table 1: Distribution of cases according to demography.

Demography	No. of cases	Percentage
Age (years)		
30-40	181	18.1%
41-50	291	29.1%
51-60	332	33.2%
61-70	108	10.8%
71-80	69	6.9%
81-90	19	1.9%
Sex		
Male	464	46.4%
Female	536	53.6%
Waist Circumference (WC) (centimeters)		
≤60	48	4.8%
61-70	121	12.1%
71-80	267	26.7%
81-90	158	15.8%
>90	406	40.6%
BMI (kg/m^2)		
<25	158	15.8%
25-29.9	209	20.9
30-34.9	231	23.1%%
35-39.9	187	18.7%
≥40	215	21.5%

Table 2: Distribution of degree of hearing loss with waist circumference (WC).

WC	Mild (26-40 dB)	Moderate (41-60 dB)	Severe (61-80 dB)	Profound (>80 dB)	Total
≤60	18	18	10	02	48
61-70	22	40	47	12	121
71-80	34	48	132	53	267
81-90	12	43	79	24	158
>90	37	67	249	53	406
Total	123	216	517	144	1000

Table 3: Distribution of degree of hearing loss with body mass index (BMI).

BMI	Mild (26-40 dB)	Moderate (41-60 dB)	Severe (61-80 dB)	Profound (>80 dB)	Total
<25	47	47	58	06	158
25-29.9	43	56	96	14	209
30-34.9	10	45	142	34	231
35-39.9	13	40	109	25	187
≥40	10	28	112	65	215
Total	123	216	517	144	1000

Table 4: Relationship of configuration of audiogram with age, sex and obesity.

Pattern	Flat type	Downward sloping	Abrupt high tone loss	Reverse sloping	Total
Female <60 years					
Non-obese	47	47	47	2	143
Obese	64	63	128	3	258
Male <60 years					
Non-obese	22	66	68	1	157
Obese	5	158	81	2	246
Female >60 years					
Non-obese	21	9	15	2	47
Obese	20	29	38	1	88
Male >60 years					
Non-obese	4	8	8	0	20
Obese	3	16	21	1	41
Total	186	396	406	12	1000
Percentage	18.6%	39.6%	40.6%	1.2%	

Table 5: Assessment of hearing loss on the basis of frequencies affected.

	PTA low	PTA high	Total
Obese	184	449	633
Non-obese	177	190	367

Most common audiogram pattern was abrupt high tone loss type, followed by, downward sloping type, flat type and reverse sloping type was rarest type (Table 4).

Among non-obese patients, 177 cases had low frequency hearing loss while 190 cases had high frequency hearing loss. Whereas, among obese patients, 184 cases had low frequency hearing loss while 449 cases had high frequency hearing loss. (PTA low means involvement of low frequencies, i.e., 250, 500 and 1000 Hz and PTA high include 2000, 4000 and 8000 Hz) (Table 5).

DISCUSSION

Now-a-days, age-related hearing loss has become a major public health issue affecting the quality of life. Obesity has been found to be a contributory factor for risk of ARHL. This is a prospective study, where, authors have tried to establish correlation between obesity and ARHL. In this study, a greater number of patients with sensorineural hearing loss were obese with waist circumference more than 80 cm and BMI more than 30 kg/m^2. With increase in WC and BMI, more cases were found to have higher degree of hearing loss.[7,8]

Among non-obese patients, equal distribution was found to have low frequency and high frequency hearing loss. Whereas, among obese, high frequency hearing loss was found in significantly large number of cases.[8-10]

The most common audiogram in both male and female was abrupt high tone loss type, irrespective of presence or absence of obesity.[5]

So, it may be concluded that obesity has a significant association with ARHL and interventions to control obesity, like, dietary changes and exercise nutritional may be useful to control the progression of ARHL.[11]

CONCLUSION

Various factors can affect the progression of age-related hearing loss but only the modifiable factors can be useful to control this disease burden among elderly population.

Obesity is such a modifiable factor which has a significant association with high frequency hearing loss among the elderly population.

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