

A Study on Hearing Profile in Acquired Hypothyroidism



Medical Science

KEYWORDS : hypothyroidism, hearing loss, pure tone audiometry .

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ABSTRACT

Objective: To determine the incidence and type of deafness in patients suffering from hypothyroidism.

Materials and methods: 60 patients were included in the study. Patients with hypothyroidism were compared with age matched controls for their hearing acuity. **Results:** 86% were women with the predominance of the age between 30-40 years. 63.33% had the diagnosis of the hypothyroidism for less than 3 years. 53.33% of hypothyroid patients had normal hearing, 28.33% cases had sensorineural hearing loss, 11.66% had mixed hearing loss, and 6.66% had conductive hearing loss. Mild degree of hearing impairment was present in majority (33.33%) and moderate in 10%. **Conclusion:** It was found that patients with hypothyroidism had predominance of sensorineural hearing loss followed by mixed and conductive type, ranging from mild to moderate in severity. It is seen that there is no relation between duration of hypothyroidism and cochleovestibular symptoms.

Introduction

Hearing loss was first reported in acquired hypothyroidism in 1907^[1]. Hypothyroidism affects 2% of adult women and only 0.2% of men ^[2].

In 1974, Ritter stressed that hearing loss can be the most common otolaryngological manifestation of congenital and acquired hypothyroidism, and auditory symptoms may happen alone or in association with vertigo and tinnitus.^[3] The real incidence of hearing loss in patients with hypothyroidism is still uncertain, and it may affect 25% of the patients with acquired hypothyroidism and 35-50% of the patients with congenital hypothyroidism.^[4,5] It is known that in hypothyroidism there is reduction in cell energy production, compromising the microcirculation and, consequently, oxygenation and the metabolism of the involved organs^[6]. Thyroid hormone also controls protein synthesis, myelin production and enzymes and the level of lipids in the central nervous system. In addition, T4 also acts as a neurotransmitter. Thus it is believed that under hypothyroidism, hearing impairment can originate in the cochlea, in the central auditory pathways and/or in the retrocochlear region.^[7] Based on Pure tone audiometry only, it has been reported to vary from 11.5% to 95% of cases investigated.^[8,9,10]

MATERIAL AND METHODOLOGY

The study was conducted in Kempegowda institute of medical sciences, Bangalore. 60 subjects were included in the study. Study period was for 6 months. 30 patients diagnosed of hypothyroidism and 30 age matched non-hypothyroidism controls were included in the study. The study and consent forms were approved by institutional ethics committee. A detailed history regarding the onset of hypothyroidism, duration of disease, presence of cochleovestibular symptoms (hearing loss, tinnitus and vertigo) were obtained. Clinical examinations were done to rule out conductive causes of hearing loss. Thyroid profile (T3 T4 and TSH) levels were tested. The hearing acuity was examined with pure tone audiometric evaluation. The values were compared with age-matched controls. The controls were matched based on the hypothyroid symptoms and normal thyroid profile and not on any antithyroid medication. Subjects with other known causes of hearing loss such as ototoxicity, noise induced hearing loss, chronic serous otitis media, presbycusis and any other known

cause of hearing impairment were excluded from the study. Patients with any previous thyroid surgeries or malignancy were excluded from the study.

The audiometric results were classified into type and degree. The type of hearing loss was classified into: conductive (airway thresholds above 25 dB and the normal bone conduction threshold, with an air-bone gap); mixed (air and bone conduction thresholds above 25 dB, with air-bone gap) and sensorineural (air and bone conduction thresholds above 25 dB, without air-bone gap). Concerning the grade, the hearing losses were classified into: mild (thresholds between 26 and 40 dB); moderate (thresholds between 41 and 55 dB); moderately severe (thresholds between 56-70 dB) severe (thresholds between 71 and 90 dB) and profound (thresholds above 91 dB).^[1]

RESULTS

Table 1. cochleovestibular symptoms with duration of disease.

symptoms	Duration of disease		
	<1yr	1yr-3yr	>3yrs
No symptoms	6	3	6
Hearing loss	5	2	2
Tinnitus	1	0	1
Vertigo	1	0	0
Hearing loss, tinnitus and vertigo	0	0	0
Hearing loss and tinnitus	1	0	2

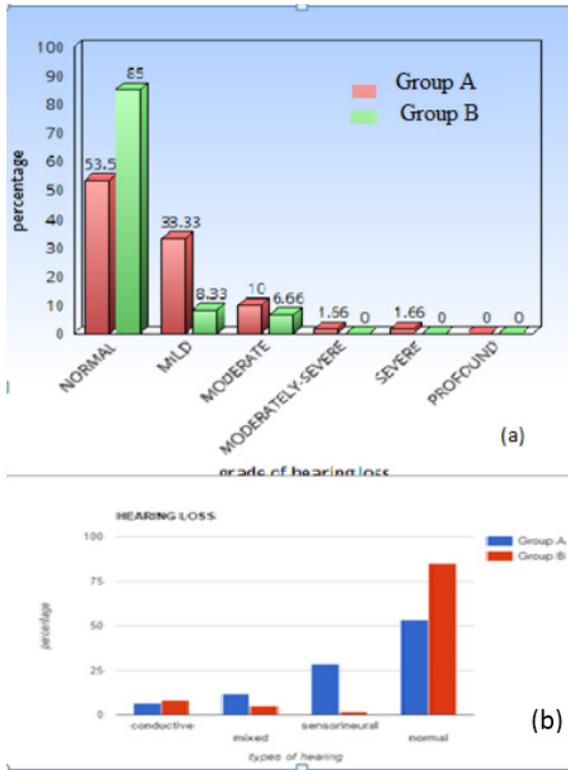
$\chi^2=0.1435$, P value not significant at 0.05

Table 2. List of the cochleovestibular symptoms reported by the participants from both study groups.

Symptoms	Group A	Group B
No symptoms	15(50%)	23(76.66%)
Hearing loss	9(30%)	4(13.33%)
Tinnitus	2(6.66%)	1(3.33%)
Vertigo	1(3.33%)	0(0%)
Hearing loss, tinnitus and vertigo	0(0%)	1(3.33%)
Hearing loss and tinnitus	3(10%)	1(3.33%)

$\chi^2=4.5933$; $p<0.05$; $df=1$

Table 3. Grade and Type of hearing loss in both groups based on Pure tone audiometry .



RESULTS

In this study 86% were women in the hypothyroid group. In both groups there was a predominance of the age range between 30-40 years (36.66%) over the remaining age groups (p<0.05).

Most of the patients with hypothyroidism (63.33%) had known of the diagnosis for < 3 years.(Table:1 about here)

Cochleovestibular symptoms were reported by participants of both groups, they were, however more frequent in those with hypothyroidism (p<0.05) , highlighting hearing loss (30%), tinnitus (6.6%) , vertigo (3.33%) and 15 out of 30 patients (50%) had no symptoms and 3 out of 30 patients (10%) had both hearing loss and tinnitus. (Table: 2 about here)

In our study when compared to patients in the control group, hypothyroid patients had mild hearing loss in 20 ears (33.33%) , 6 (10%) had moderate hearing loss and only 1 (1.66%) had moderately severe and severe hearing loss each.

In our study profound hearing loss was not found in both ear groups. (Table: 3(a)about here) Out of 60 ears examined in group A, 32 had normal hearing (53.33%), 17 had sensorineural hearing loss (28.33%), 7 had mixed (11.66%) and 4 had conductive (6.6%) hearing loss.(Table:3(b) about here)

DISCUSSION

Majority of the patients in the present study were 30-40 years age group (36.66%). 86% of hypothyroid patient were females .The Myxoedema Committee of the clinical society of London(1880) reported that the disease affects women much more frequently than men, and the subjects are for the part of the middle age.

The analysis of cochleovestibular symptoms showed that 50% of the hypothyroid patients did not have any symptoms.In our

study we found 30% hypothyroid patients had subjective hearing loss.Subjective hearing loss in patients may be either due to actual conductive or sensorineural hearing loss or slowed mentation during hypothyroid state may be interpreted by the patients as subjective hearing loss as suggested by MC Mohan (1947)^[11].

Tinnitus was present in 5 (16.66%)of hypothyroid patients,where as 2(6.66%) of the control group presented with tinnitus.Similar findings were noted by Anand et al(1989)^[12] and Bhatia et al(1977)^[14] who reported the incidence of tinnitus to be around 15% in hypothyroid patients.Tinnitus is a frequent complaint in the general population ,affecting from 35 to 40% of adults and it has multiple causes.In our study vertigo was complained by 3.33% of the hypothyroid patients.The incidence of dizziness in literature has been reported to be as low as absent to as high as 75% by different workers. Bhatia et al showed dizziness was present in 6.66%.However studies conducted by Howarth AE et al^[15] reported that no patient complained of vertigo.

In our study we found patients with less than 3 years duration had more cochleovestibular symptoms then the control group indicating a possible improvement in hearing in hypothyroid patients with thyroxine treatment.Studies by Vent Hoff^[8], Rubeinstein M et al. (1947)^[10] and Anand V T et al (1989)^[12] have reported an improvement in hearing following thyroxinotherapy. However ,we found no relation between duration of hypothyroidism and cochleovestibular symptoms.

On Pure tone audiometry in hypothyroid patients ,hearing within normal limits was present in 53.33% ears,with majority having sensorineural hearing loss (28.33%), followed by mixed (11.66%) and conductive in 6.66%.Mild degree of hearing impairment was present in majority (33.33%) and moderate in 10%,whereas moderately severe and severe hearing loss was found only in 1.66% of the hypothyroid patients. Profound hearing impairment was not found in any case.

Incidence of SNHL among hypothyroid was 28.33% whereas in non-hypothyroid it was 3.33% and it is significantly higher among hypothyroid patients. Among the non hypothyroid group 15% presented with hearing loss, whereas 46.66% of the hypothyroid group presented with hearing loss and the difference was found to be statistically significant with P value <0.005.MK Aggarwal(2013) et al^[6] showed 39% had hearing loss with 15% cases had sensorineural, 8% conductive and 13% mixed and most of them had mild to moderate hearing loss. Similar findings were found by Bhatia et al(1977)^[14], KarlosThiago et al(2010)^[2] indicating predominance of sensorineural hearing loss with mild to moderate hearing impairment.In patients having sensorineural or mixed hearing loss, the neural involvement can be explained by biochemical, metabolic or morphological changes in the nervous system , thus altering the nerve conduction and presenting neural hearing loss In patients with sensory loss the low levels of thyroid hormones affect the different components of cochlea andthus produce sensory deafness.

The conductive impairment in hypothyroid patients may be the result of reduced compliance due to hypertrophy and oedema of the Eustachian tube leading to Eustachian tube catarrah.Myerhoff(1979)^[13],based on experimental study pointed towards changes in ossicles and round window or oval window like crystallized consistency of bone, fusion or distortion of incus and stapes, partial or complete obliteration of oval or round window, as other possible explanations for conductive hearing impairment.

CONCLUSION

The present study was carried out on 30 hypothyroid patients with age and sex matched control group. It was found that hypothyroidism affects the ear at multiple sites producing various

types of hearing impairment, with predominance of sensorineural hearing loss followed by mixed and conductive type, ranging from mild to moderate in severity. Vestibular system was found to be affected only minimally. It is seen that there is no relation between duration of hypothyroidism and cochleovestibular symptoms.

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