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Assessment of Sensorineural Hearing Loss in Patient with Thyroid Disorder: A Hospital Based Study.

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ABSTRACT

Background: Thyroid hormone is necessary for normal development of the auditory system. Hearing loss has also been reported in cases of endemic cretinism and in patients with thyroid hormone resistance. Hence; we planned the present study to assess the sensorineural hearing loss in patients with thyroid disorders. **Methods:** The present study included assessment of sensorineural hearing loss in patients with thyroid disorders. A total of 20 patients were included in the present study and were divided into two study groups Group A- included 10 patients diagnosed with hyperthyroidism, and Group B- included 10 patients diagnosed with hypothyroidism. We conducted comprehensive ear-nose-throat and head-neck examinations of all the subjects participating in the present study. Pure tone hearing thresholds were measured at frequencies of 0.25, 0.5, 1, 2, 4, 6, 8, and 12 kHz. All the results were recorded and analyzed by SPSS software. **Results:** In the present study, we included a total of 20 patients which were broadly divided into two study groups; group A and group B. We obtained significant difference while comparing the mean airway hearing threshold in between the two study groups at frequency of 8000 and 12000 Hz. **Conclusion:** In comparison to the hypothyroid patients, in hyperthyroid patients, the hearing losses occurred at comparatively higher frequencies.

Keywords: Hearing loss, Sensorineural, Thyroid

INTRODUCTION

Thyroid hormone is necessary for normal development of the auditory system and the association between thyroid hormone and hearing development has long been recognized in patients with congenital hypothyroidism (CH), endemic cretinism and thyroid hormone resistance. Recent genetic studies confirmed the relation between thyroid hormone and hearing system development.[1-3] Hypothyroidism has long been recognized as a cause of hearing impairment. About 25% of patients with acquired hypothyroidism and 30% to 50% of patients with late-treated congenital hypothyroidism (CH) managed before the introduction of screening programs are thought to display hearing loss, with partial reversibility after thyroid hormone replacement treatment.[4-6] Hearing loss has also been reported in cases of endemic cretinism, in patients with thyroid hormone resistance, and in patients with thyroid hormone monocarboxylate transporter 8 abnormalities.[7,8] Hence; we planned the present study to assess the sensorineural hearing loss in patients with thyroid disorders.

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MATERIALS AND METHODS

The present study was planned in the department of Otorhinolaryngology and Head & Neck Surgery, Government S.K. Hospital, Sikar, Rajasthan, and included assessment of sensorineural hearing loss in patients with thyroid disorders. Ethical approval was taken from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 20 patients were included in the present study and were divided into two study groups as follows:

Group A- included 10 patients diagnosed with hyperthyroidism, and

Group B- included 10 patients diagnosed with hypothyroidism

Exclusion criteria for the present study included

- Patients not willing to give consent for the study,
- Patients with history of any other systemic illness,
- Patients with any form of congenital cochlear malformation,
- Patients with any form of neurological disorder,
- Patients with any acute or chronic otitis media

Patients with free triiodothyronine (fT3) and free thyroxine (fT4) levels above the normal physiologic range were categorized as affected from hyperthyroid, and patients with fT3 andfT4 below the normal physiologic range were categorized as affected from hypothyroid.

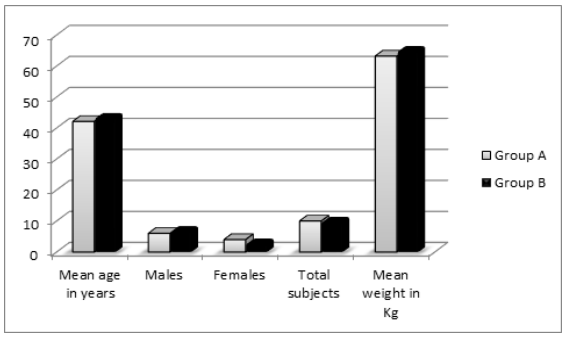
We conducted comprehensive ear-nose-throat and head-neck examinations of all the subjects participating in the present study. High-frequency audiometry and hearing tests with TEOAE was done in all the patients. All the audiology tests were performed by masking the nontest ear. Pure tone hearing thresholds were measured at frequencies of 0.25, 0.5, 1, 2, 4, 6, 8, and 12 kHz. Pure tone thresholds were classified as follows:
Normal hearing = between 0.20 dBs,
Mild = between 21 and 40 dBs,
Moderate = between 41 and 60 dBs,
Severe = between 61 and 80 dBs,
Profound = between 80 and 100 dBs and
Total hearing loss = over 100 dBs.8
All the results were recorded and analyzed by SPSS software. Chi- square test was used for assessment of level of significance. P-value of less than 0.05 was taken as significant.

RESULTS

Table 1: Airway hearing threshold among patients of both the study groups.

Frequency (Hz)	Airway hearing threshold		P- value
	Group A	Group B	
250	18.84	17.59	0.22
500	14.02	15.11	0.51
1000	12.11	13.82	0.28
2000	13.22	14.12	0.54
4000	18.41	17.16	0.81
6000	21.35	20.08	0.64
8000	27.15	22.82	0.02*
12000	0.55	36.11	0.01*

*: Significant



Graph 1: Demographic details of the patients of the two study groups

In the present study, we included a total of 20 patients which were broadly divided into two study groups; group A and group B. Mean age of the subjects of group A and group B was 42.1 years and 43.5 years respectively. Among group A, 60 percent of the patients were males while remaining were females, while in group B, 70 percent of the patients were males while remaining were females. We obtained significant difference while comparing the mean airway hearing threshold in between the two study groups at frequency of 8000 and 12000 Hz (P-value < 0.05).

DISCUSSION

In the present study, we assessed the sensorineural hearing loss in patients with thyroid disorders. In the present study we observed significant difference while comparing the airway hearing threshold in between two study groups only at higher frequencies. Karakus CF et al measured hearing thresholds in patients diagnosed with hyperthyroidism or hypothyroidism with high-frequency audiometry and otoacoustic emission before and after treatment to determine whether hearing losses were cochlear or retrocochlear and whether they would improve with medical therapy. This study was conducted on patients diagnosed with hyperthyroidism and hypothyroidism and accepting to participate in the study. We measured the hearing thresholds of the study population during the pretreatment period and in posttreatment euthyroid period. Result: The audiometric findings of patients with hyperthyroidism were better than those of the control group especially at high frequencies. Sensorineural hearing loss was detected in the euthyroid period. They compared the audiometric findings of the patients with hypothyroidism and the controls. They found sensorineural hearing loss in patients with hypothyroidism, especially at low frequencies. The results of this study showed that both hyperthyroidism and hypothyroidism may have an effect on hearing pathway disorders. Medical therapy may lead to hearing loss in patients with hyperthyroidism, and the underlying factors should be investigated in detailed future studies. It was shown in our study that the hearing loss induced by hypothyroidism may improve with medical therapy. Therefore, in all patients with thyroid dysfunction, hearing levels should be monitored closely with audiometric tests.[9] Vanderschueren-Lodeweyckx M et al assessed hearing acuity in 45 children with sporadic congenital hypothyroidism during adequate long-term treatment. Otoscopy was performed in each and additional tympanometry in some of them. Secretory otitis media was found in 6 and was treated medically or by inserting grommets in the eardrum. In these children, hearing acuity was assessed after the otitis had been cured. Hearing acuity was measured either by conventional monoaural pure-tone audiometry (125-8000 Hz) or by binaural free field testing depending on the child's age (above and below 4 years respectively). Hearing was normal in 36 (80%) children. In the remaining 9, sensorineural hearing loss to some degree was detected affecting the higher frequencies in particular. Perceptive deafness required the use of a hearing aid in 4 children. No relationship could be found between hearing acuity and chronological age or bone age at diagnosis of congenital hypothyroidism or type of hypothyroidism. Sensorineural hearing loss is common in children with congenital hypothyroidism and should be

searched for carefully and systematically to avoid difficulties related to speech and language development.[10]

Hashemipour M et al investigated the rate of hearing impairment in congenitally hypothyroid (CH) patients, and its relation with factors such as CH severity and age at starting treatment, during CH screening program in Isfahan. Hearing acuity was assessed in two groups of children with and without CH (450), between 2000-2006. Otoacostic emission (OAE) was performed by a two step method. After two tests without OAE signals bilaterally, they were referred for auditory brainstem response (ABR) test. Subjects with both OAE and ABR abnormal test results were considered to have hearing problem. Obtained data was compared in case and control group and also CH patients with and without hearing impairment. Three (3.2%) of patients and 1 of control group (0.2%) were diagnosed with sensorineural hearing loss. The rate of hearing loss was not different significantly in two studied groups (P>0.05). There was no difference between age of starting treatment and first T4 and TSH level in CH patients with and without hearing loss (P>0.05). CH neonates with hearing impairment had thyroid dyshormonogenesis according to the follow up results. The rate of hearing loss was low among our studied CH patients. It may be due to proper management of CH patients.[11] Debruyne F et al studied hearing profile of children with congenital hypothyroidism in 45 patients with thyroid gland agenesis, hypogenesis or dyshormogenesis, during adequate substitution therapy. Preliminary, secretory otitis media was found in 6 patients under the age of 6 years; in these children, hearing assessment was performed after cure of the middle ear effusion. Hearing threshold was measured either by conventional pure-tone audiometry or conditioned orientation reflex audiometry according to the patient's age (above and below 4 years). In 36 patients (80%) the auditory thresholds were normal; in the remaining 9 patients (20%) a sensorineural hearing loss of different degree was detected; in 5 cases (11%) the deafness was important and required auditory rehabilitation, with the use of a hearing aid in 4 of them. No relation could be found between hearing acuity and bone age at diagnosis of hypothyroidism or aetiology of thyroid dysfunction. It is concluded that in about one tenth of the children with congenital hypothyroidism a substantial deafness persists. The sensorineural nature of the hearing loss is in agreement with reported histological findings in congenital hypothyroid animals, where an immature development of the organ of Corti including hair cells and tectorial membrane has been observed.[12]

CONCLUSION

From the above results, the authors concluded that in comparison to the hypothyroid patients, in hyperthyroid patients, the hearing losses occurred at comparatively higher frequencies. However; future studies are recommended.

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