

## Original Research

### Hearing evaluation of paediatric patients with Insulin dependent diabetes mellitus

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#### ABSTRACT:

**Background:** The present study was conducted for hearing evaluation of paediatric patients with IDDM. **Materials & methods:** A total of 100 subjects with presence of IDDM within the age group of 6 to 15 years were enrolled. Complete demographic and clinical details of all the subjects was obtained. These children were subjected to an ENT examination and Audio logical assessment was done by PTA (Pure tone audiometry) and Otoacoustic emission (OAE). Hearing thresholds were assessed by pure tone audiometric test. Audiological assessment was done in a sound proof room. **Results:** Frequency of SNHL (Sensorineural hearing loss) as assessed by PTA and OAE was 11 percent. Significant positive correlation was seen among patients with SNHL and glycaemic profile. **Conclusion:** Auditory system is spared in children with IDDM at clinical level.

**Key words:** Insulin dependent, Diabetes mellitus, Hearing

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#### INTRODUCTION

Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease. The aetiology of diabetes in India is multifactorial and includes genetic factors coupled with environmental influences such as obesity associated with rising living standards, steady urban migration, and lifestyle changes. The major categories of diabetes are: insulin-dependent DM, type I or IDDM; noninsulin-dependent DM, type II or NIDDM; secondary DM or type S; impaired glucose tolerance, IGT; gestational diabetes; and previous abnormality of glucose tolerance, (PrevAG). Formerly called insulin dependant diabetes mellitus (IDDM) or juvenile diabetes, T1DM is characterized by low or absent levels of endogenously produced insulin. An initial report in 2000 described the incidence of Type 1 Diabetes Mellitus in children  $\leq 14$  years of age in 60 countries worldwide totaling 19,164 cases from a population of 75.<sup>1-3</sup>

Eye, kidney, cranial nerve, peripheral nerve, ear, and vascular system disorders reside among the chronic complications of diabetes mellitus. In the auditory

system, DM may lead to spiral ganglion atrophy, degeneration of the myelin sheath of the vestibulocochlear nerve, reduction on the number of nerve fibers in the spiral lamina, and thickening of the capillary walls of the stria vascularis and small arteries inside the ear canal.<sup>4-6</sup> Hence; the present study was conducted for hearing evaluation of paediatric patients with IDDM.

#### MATERIALS & METHODS

The present study was conducted for hearing evaluation of paediatric patients with IDDM. A total of 100 subjects with presence of IDDM within the age group of 6 to 15 years were enrolled. Complete demographic and clinical details of all the subjects was obtained. These children were subjected to an ENT examination and Audio logical assessment was done by PTA (Pure tone audiometry) and Otoacoustic emission (OAE). Hearing thresholds were assessed by pure tone audiometric test. Audiological assessment was done in a sound proof room. All the results were compiled in Microsoft excel sheet and were analysed by SPSS software. P- value of less than 0.05 was taken as significant.

## RESULTS

Mean age of the patients 13.7 years. Majority proportion of patients were males. Mean RBS and HbA1c was found to be 186.2 mg/dL and 8.7%

respectively. Frequency of SNHL (Sensorineural hearing loss) as assessed by PTA and OAE was 11 percent. Significant positive correlation was seen among patients with SNHL and glycaemic profile.

**Table 1: Frequency of occurrence of high frequency SNHL (Sensorineural hearing loss)**

High frequency SNHL	Number of patients	Percentage (%)
Absent	89	89
Present	11	11
Total	100	100

**Table 2: Correlation of SNHL at glycaemic profile**

Mean Glucose profile	Patients with high frequency SNHL	Patients without high frequency SNHL	t-statistic	p- value
RBS	193.5	165.5	-1.998	0.000 (Significant)
HbA1c	9.9	8.2	-2.235	0.000 (Significant)

## DISCUSSION

Diabetes mellitus is a common non-communicable metabolic disease that causes various impairments of the body systems. As diabetes mellitus occurs most commonly in general population, the effects caused by it on various organs of our body assume greater importance. Prevalence of diabetes mellitus is increasing worldwide and it is more pronounced in India. The incidence of IDDM peaks between the ages of 10 and 14 years during puberty. The increasing incidence of IDDM throughout the world is especially marked in young children. The prevalence of T1DM in children is 1, 11, 500 according to a World Health Organization report of the International Diabetes Federation for the South-East Asian Region. The relationship between diabetes mellitus and hearing impairment remains controversial. Previous studies have been inconclusive regarding presence, pattern and severity of hearing loss in diabetic patient and its relationship to metabolic control. Some of the earlier studies have documented bilateral high and mid-frequencies sensorineural hearing loss in this patient group.<sup>7-10</sup> Hence; the present study was conducted for hearing evaluation of paediatric patients with IDDM. Mean age of the patients 13.7 years. Majority proportion of patients were males. Mean RBS and HbA1c was found to be 186.2 mg/dL and 8.7% respectively. Frequency of SNHL (Sensorineural hearing loss) as assessed by PTA and OAE was 11 percent. Soha M. Abd El Dayem et al evaluated auditory function in a group of Egyptian type 1 diabetic children. This was a cross sectional observational study, which included 40 patients with type 1 diabetes and 40 controls. There was a significantly lower level in speech reception threshold, repetition of words, and masking level of diabetics on the left side. Evaluation of transient otoacoustic emission revealed that diabetics recorded significantly lower signal to noise ratio at 4000 Hz on the right side and at 1000, 1500, 4000, and all Hz on left side. There was significant lower emission amplitude in the right side of the diabetics group at 1500 and 4000 Hz and at 1000, 1500, and 4000 Hz on

the left side. Patients with failed otoacoustic emission were significantly higher in disease duration >10 years. It was concluded that type 1 diabetes is associated with high/extended high frequency hearing loss, more prominent on the left side and with longer disease duration.<sup>10</sup>

Significant positive correlation was seen among patients with SNHL and glycaemic profile. In another study conducted by Hou Y et al, authors evaluated the auditory function of 50 type 1 diabetics and 50 healthy subjects. Auditory brainstem response was significantly related with GHbA1C and microalbuminuria. Only triglyceride was positively correlated to the hearing impairment defined by DPOAE. There was no significance of transient evoked otoacoustic emissions (TEOAE) between groups. TEOAE was associated with age and GHbA1C. It was concluded that type 1 diabetics exerted higher auditory threshold, slower auditory conduction time and cochlear impairment. HDL-cholesterol, diabetes duration, systemic blood pressure, microalbuminuria, GHbA1C, triglyceride, and age may affect the auditory function of type 1 diabetics.<sup>11</sup> Rance G et al evaluated sound detection, auditory neural function and binaural processing ability in a group of school-aged participants with Type 1 diabetes and to assess their functional hearing and general communication ability. Auditory brainstem response interpeak latencies (wave I-V) were longer than in matched controls and wave V amplitudes were reduced. Binaural speech perception in noise was also impaired and perceptual ability was correlated with degree of neural disruption in the auditory brainstem. Hearing deficits severe enough to restrict communication and threaten academic progress were common on our group of school-aged children with Type 1 diabetes.<sup>12</sup>

## CONCLUSION

Auditory system is spared in children with IDDM at clinical level. These results suggest that hearing evaluation may form an important part of the standard management regimen for children with the disease.

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