

ORIGINAL ARTICLE

Tinnitus Incidence and Characteristics in Children with Hearing Loss

Nagihan Celik, Munir Demir Bajin, Songul Aksoy

Department of Otorhinolaryngology-Head and Neck Surgery, Hacettepe University Hospital, Ankara, Turkey, 06100. (NC, MDB)

Department of Otorhinolaryngology-Head and Neck Surgery Audiology Unit, Hacettepe University Hospital, Ankara, Turkey, 06100. (SA)

Objective: The objective of this study is to determine presence and prevalence of tinnitus in children with hearing loss under the age of eighteen in central Ankara.

Materials and Methods All children were asked: "Do you hear any noises in your ears?" If they answered "yes" they were asked nine more questions. Associated symptoms, pitch, level and general descriptions were also noted.

Results and Conclusion: Children with hearing loss had a high incidence of tinnitus. Even though they don't express, they have tinnitus and it effects their lives. By using a survey specific to tinnitus we can identify tinnitus in children with impaired hearing and develop new ways to manage their problems.

Submitted : 28 September

Accepted : 09 July 2009

Tinnitus may be defined as an auditory sensation without any external stimulus. It is a common phenomenon in the adult population but it is mostly neglected in the children - especially with the hearing impaired^[1]. Overall incidence of tinnitus is about 17% and it is the primary symptom of 60% of patients with audiological complaints^[2].

The word tinnitus is derived from the Latin word 'tinnire' which means ringing^[3]. It is distinguished clinically into subjective and objective types: subjective when only the patient hears noise, and objective when others may hear the noise^[4].

Because subjective tinnitus is seen more in the overall population. Tinnitus may be unilateral or bilateral^[5]. Unlike adults, children tend not to report tinnitus spontaneously. Most children who report tinnitus do not realize that it is abnormal because they have had it for a long time, and they have adapted or grown accustomed to it^[6,7].

Even though children do not complain about tinnitus, it may cause serious problems like concentration difficulty, speech disorder and behavioral disorders^[8].

The concept of tinnitus may not exist in children with hearing impairment as they may not be able to differentiate the normal from the abnormal^[9]. In the largest study to date, of the 331 profoundly deaf children (ages 6 to 18 years) 30 % reported tinnitus when not using hearing aids^[10]. In two other studies, tinnitus was reported in 29% of 66 children^[11] and 23 % of 102 children^[5] with profound hearing loss.

By defining the incidence and properties of tinnitus in the children with impaired hearing, we hope to help developing new ways to manage their problems.

Materials and Methods

Five hundred hearing impaired children, 216 girls and 284 boys (Grades 1 to11) from 3 schools were included in this study. Audiograms and otoscopic examinations were obtained from all children.

Hearing levels ranged from severe to profound. Out of 500 children, 17% (85) had severe, 83% (415) had profound sensorineural hearing loss.

Of all children, 99.6% had a hearing aid and 0.4% had a cochlear implant.

Corresponding address:

Münir Demir Bajin

Resident in the Department of Otorhinolaryngology-Head and Neck Surgery, Hacettepe University Hospital, Ankara, Turkey 06100.

Phone: +90 505 772 3547; Fax: +90 312 311 3500; E-mail: dbajin@hacettepe.edu.tr

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Informed consents were taken from every family. There are some important considerations to be acknowledged. First of all, it is hard for the hearing impaired children to define tinnitus. Children with profound hearing loss hardly hear any normal environmental noise, thus they cannot separate tinnitus from the environmental noise.

The questionnaire (Appendix A) used in this study consists of two phases and highly influenced by an important study by Savastano^[12] and also Aksoy^[13]. In the preliminary phase, children were asked “Do you hear any noise in your ear or in your head without any known cause?” If the answer is “Yes”, they further asked 9 more questions to define the characteristics of the tinnitus.

These questions analyzed the annoyance, localization, frequency and period of tinnitus. Family history along with the surgical history were also obtained.

Every question answered under the supervision of a class teacher in order to maintain accuracy. Misunderstood questions were re-explained; and extra time was given for children to complete the questionnaires fully.

For each student who reported tinnitus, pure tone screening audiometry was performed and otoscopic examinations were completed.

SPSS 11.5 package program was used to analyze the data obtained from the study. Tables and graphics were made using the same software.

Results

In this study, 500 children, 216 girls and 284 boys were analyzed, of whom 167 had tinnitus, 75 girls and 62 boys. The prevalence of tinnitus in this study was 33.4%. Of the children with tinnitus 133 had profound hearing loss and 34 had severe hearing loss. Two children with cochlear implants did not have tinnitus.

All children had otoscopic examinations performed by an ENT specialist. Examinations revealed that one child had acute otitis media, two had bilateral tympanic membrane perforation, three had unilateral tympanic membrane perforation. These children were not included to the study.

The ages most commonly reporting tinnitus was 14, 17 and 18 years, and it ranged 8 to 18 (Figure 1). Children under the age 8 did not report tinnitus. This is mostly because this age group can be easily distracted by the external stimuli thus take no notice of their tinnitus. Also their mental status and lingual abilities might have a role in difficulty to define tinnitus.

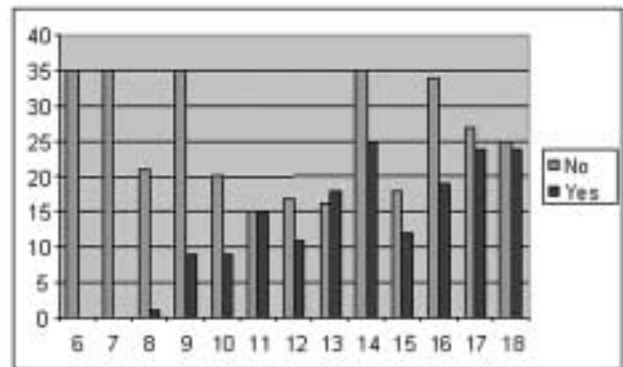


Figure 1. Number of children with tinnitus by age

The descriptions of tinnitus defined by the children were like “ringing” by 90 respondents (53.9%), “buzzing” by 49 respondents (29.3 %) and “hissing” by 28 respondents (16.8%) (Table 1). Of them, 127 (76%) said that they had low magnitude tinnitus and 40 (24%) had high magnitude tinnitus.

Frequency of the tinnitus was mostly defined as low-pitched (Table 2).

Children expressed that they resembled low-pitch with boys’ voice and high-pitch with girls’ voice.

The percentage of children who complained of tinnitus all the time was 13.2% (22 children). Of children, 26.9% (45 children) responded as most of the time and 59.9% (100 children) of them referred to it as some of the time (Table 3). Of children, 35.9% described evenings being the most discomforting of all. Interestingly, 109 (65.3%) children with tinnitus were not disturbed by their tinnitus. Exacerbating symptoms included noise 55.1% (92 children), stress 6.6% (11 children), fatigue 28.1% (47 children) and illness 10.2% (17 children).

Table 1. Description of tinnitus

Description	n	%
Ringings	90	53,9
Buzz	49	29,3
Hum	28	16,8
Total	167	100

Table 2. Tinnitus pitch

Pitch	n	%
Low	54	32,5
High	112	67,5
Total	167	100

Children with tinnitus had coexisting symptoms like dizziness, headache, pain in the ear. Only 6 children did not have any symptom.

Respondents were asked to score their disturbance with VAS (Visual analog scale) between 0-10¹⁴. It ranged from 1.2 to 5.6 (Table 4).

Discussion

Our survey focuses on four main factors. These are age, sex, definition of the tinnitus and most discomforting time of the day.

In our study the incidence of tinnitus is 33.4%. When we look at the literature,

Graham et al. ^[11] (1981) found 29% incidence of tinnitus in the ears of 66 children with hearing loss. Mills et al. ^[15] found 38.5% incidence in 109 children with hearing loss. Drukier et al. ^[10] found 30% incidence in 331 hearing impaired children between ages ^[6-18]. Viani et al. ^[16] in 1989 found 23% incidence in 102 children with profound hearing loss. Our results are consistent with the literature with a greater study population.

In 1981 Graham et al. ^[11] found a 66% tinnitus incidence in 74 children with hearing loss ranging from mild to profound. In this study only 13% of the children had tinnitus before the evaluation which is also consistent with the 10% in our study.

Tinnitus incidence in children with hearing loss is still controversial in the literature. There is a noticeable difference in tinnitus incidence between our study and

Table 3. Occurrence of tinnitus

Description	n	%
Occurrence of tinnitus	n	%
Some of the time	100	59,9
Most of the time	45	26,9
All of the time	22	13,2
Total	167	100

Table 4. VAS for disturbance

VAS	Min.	Mean	Max.
cm	1.2	3.4	5.6

study by Nodar et al. ^[17] This may be due to different severity of hearing loss in both studies. Apparently it is harder for the children with profound hearing loss to define tinnitus than children with mild and severe hearing loss.

Children over the age 14 most commonly reported tinnitus. Children under the age 8 did not report tinnitus. According to Baguley et al. ^[18] this may be due to less well developed body image in younger children, more easily distraction and undeveloped abstract concepts in this young age.

Description of the tinnitus varies in the literature. In our study, 59.9% of the children defined tinnitus as “ringing”, 29.3% as “buzzing” and 16.5% as “hissing”. However these findings are not consistent with the other studies. This is probably because, children in these studies born with hearing loss and do not have practical knowledge about the sounds they use to define tinnitus.

Disturbance is another key finding in our study. Of children, 59 (35.3%) were disturbed by their tinnitus. Shulman ^[15] et al. found 29% tinnitus incidence and 30% disturbance rate in children with profound hearing loss. Mills ^[19] reported a 29% tinnitus incidence and 9.7% disturbance rate in 93 normal hearing British children ages between ^[5-16].

In our study, we found that 59.3% children had bilateral, 40.1% had unilateral and only one child had in the head. This is likely due to the fact that 99.6% children in our study have bilateral hearing loss.

According to our study the most discomforting period of the day is “evening” and the least is “night”. Also it is interesting to note that when children do not use their hearing aids, tinnitus got more discomforting. White found that evening is the most discomforting time of the day. Drukier^[10] showed that 30% of 331 children had tinnitus when they do not use their hearing aids.

More than half of the children (55.1%) indicate that their tinnitus increased after they exposed to noise. Tiredness (25.1%), illness (10.2%) and stress (6.6%) are other important factors that increase tinnitus.

Finally we analyze the coexisting symptoms. Of children, 161 had coexisting symptoms such as dizziness, headache and pain in the ear. Only six children did not have a coexisting symptom. Martin and Snashall^[20] in 1994, also showed that children with hearing loss had the same coexisting symptoms as we found in our study.

Children with hearing loss had a high incidence of tinnitus. Even though they do not express presence of tinnitus, it affects their lives. By using a survey specific to tinnitus, we can identify tinnitus in children with impaired hearing and may develop new ways to manage their problems.

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