ORIGINAL RESEARCH PAPER

ENT

KEY WORDS: Deafness, school performance, rural children

CONDUCTIVE DEAFNESS AND SCHOOL PERFORMANCE IN CHILDREN BETWEEN NINE AND FOURTEEN YEARS OF AGE IN RURAL SOUTH INDIA

Dr. R. Venkataramanan* M.S (ENT), Department of ENT, Sri Lakshmi Narayana Institute of Medical Sciences, Osudu, Koodapakkam, Pondicherry - 605502.*Corresponding Author

Dr. S. Ganesh M.S (ENT), Department of ENT, Sri Lakshmi Narayana Institute of Medical Sciences, Osudu, Koodapakkam, Pondicherry - 605502.

Dr. Nithish Timothy M.S (ENT), Department of ENT, Sri Lakshmi Narayana Institute of Medical Sciences, Osudu, Koodapakkam, Pondicherry - 605502.

ABSTRACT

This study was conducted to evaluate the impact of conductive deafness on school performance of children between nine and fourteen years. After a detailed history, 327 school children from rural South India were subjected to otoscopic examination of both ears and tuning fork test. Those subjects who failed the screening tests underwent pure tone audiometry. 22.3% of the children had conductive hearing impairment. In all the children with conductive hearing loss, the cause was identified to be a temporary one. Temporary hearing loss was identified in 23.25%, 22.97% and 20.72% of poor, average and good performers respectively who were classified based on their academic performance during the study period. On analysis, temporary hearing impairment does not have a significant impact on the school performance of the children ($p>0.05$).

INTRODUCTION:

Hearing impairment is a physiological barrier to communication and learning. A child with hearing impairment will find it difficult to listen, understand and assimilate information delivered in the class. In spite of being such an important condition, hearing impairment is not detected as often as it should be. Parents often increase the pitch of their voice as an auto-corrective measure, and hence, rarely notice the hearing deficit in their children. At school, among a huge pool of students, the teacher cannot readily recognize the problems faced by children with undiagnosed hearing deficit. Even if the parent or teacher notices the child's unresponsiveness to their auditory input, it is often misinterpreted as a behavioral problem and the physical disability goes unnoticed. This is even more so in the children between nine and fourteen years of age who are entering their teens.

Deafness is a common condition affecting school children in India. An Indian Council of Medical Research study reported the incidence of conductive hearing loss as 48% in rural areas. Mann et al screened 1670 Indian school children aged between twelve and fourteen years children and found that 6 percent of urban students suffered from hearing loss compared to 33 percent in the rural group. According to the National Sample Survey Organization (NSSO) report, there were 3.24 million deaf people in the age group of five to fourteen years.

Hearing impairment in school children can be either temporary or permanent. It is likely that the temporary deafness does not get identified as, neither the parents nor the teachers expect the child to have a hearing disability. Hence, there is a need to study the effect of temporary hearing impairment on school performance, particularly in high risk population like the rural children.

The objectives of this study were to estimate the prevalence of undiagnosed conductive deafness in school children between nine and fourteen years of age and to study the impact of hearing impairment on school performance.

MATERIALS AND METHODS:

This prospective cross sectional observational study was conducted in a rural South Indian school over a three month period. Prior informed consent from parents and written permission from the concerned authorities was obtained before the study was undertaken. All the children between nine to fourteen years of age who were apparently normal and whose parents had consented were included in the study. Children pre-existing hearing impairment were excluded from the study.

After a detailed history, the nose and throat of the children were examined followed by an otoscopic examination of both the ears. Hearing ability was assessed by Rinne's test, Weber's test and absolute bone conduction using a 512 Hz tuning fork. All children who were identified to have a hearing impairment underwent pure tone audiometry. Hearing frequencies of 500 Hz, 1000Hz, 2000Hz and 4000Hz were used. For each ear, pure tone average was recorded in decibels. Hearing impairment was graded based on American Speech Language Hearing Association Classification. After their school assessment, the performance of the children at school was analyzed based on the grades obtained by them in the examinations held during the study period, and the students were categorized into good, average and low performers. Those who secured distinction and first class were categorized as good performer; students with second class results were categorized as average performer; and those who failed were classified as low performer. Data from standardized study forms were entered into a computer database for analysis. The effect of hearing impairment on the school performance was assessed by chi – square test. The study protocol was approved by the Ethical standards committee of the institute.

RESULTS:

Three hundred and twenty seven students between the age of nine and fourteen years were enrolled in this study. Of these 195 (59.6%) were male and 132 (40.3%) were female. One hundred and twenty one children had positive otoscopic findings. The most common findings were impacted wax, retracted tympanic membrane, congested tympanic membrane, otitis media and otomycosis (table 1). Interestingly, 69 out of 327 children (21%) were found to have tonsillitis.

On testing by tuning forks, Rinne's test was found to be negative in 29.9% (98 out of 327) of students, thus giving a suspicion of conductive hearing loss. Absolute Bone Conduction test did not show any evidence of sensory neural hearing loss. Ninety eight children were subjected to pure

tone audiometry. Seventy three out of 327 (22.3%) students were found to have conductive hearing loss Forty five of them were male and the rest twenty eight were female. None of the students had sensorineural hearing loss. The conductive hearing loss was of mild degree (loss in 25- 40 dB range) in 52 students and of moderate degree (loss in 41-55 dB range) in 21 students. All these children were found to have temporary hearing impairment and the most important causes were impacted wax, otitis media and otomycosis. 14.1% (46 out of 327) had impacted wax; 4.9% (16 out of 327) students were found to have otitis media and 2.5% (8 out of 327) had otomycosis (table 1).

Out of 111 students who performed well in school, 20.72% (23 out of 111) had hearing impairment. Of the 148 average performers in school, 22.97% (34 out of 148) had a problem with hearing. Among the 68 students who performed poorly in school, 23.52% (16 out of 68) had a deficit in hearing (Figure 1). When the mean of the scores obtained by the children in various groups were analyzed by chi square test with 2 degrees of freedom, the p valve was not significant (p = 0.83). When the performance in individual subjects (English, Tamil and Mathematics) were analyzed, there was no significant difference between those with hearing deficit and those without hearing deficit (p>0.05)

Table 1: Causes of hearing impairment

Condition	Male	Female	Total	Percentage
Impacted wax	26	20	46	14.1 %
Retracted tympanic membrane	18	10	28	8.5 %
Congested tympanic membrane	10	10	20	6.1 %
Otitis Media	12	4	16	4.9 %
Otomycosis	5	3	8	2.5 %
Foreign body	2	1	3	0.9 %
Total	73	48	121	37 %

Table 2: Audiometric Evaluation

Audiometric findings	Frequency	Percentage
Normal audiology findings	254	77.6%
Normal in right ear and mild CHL in left ear	18	5.50%
Normal in right ear and moderate CHL in left ear	5	1.52%
Mild CHL in right ear and normal in left ear	23	7.03%
Mild CHL in right ear and moderate CHL in left ear	3	0.91%
Moderate CHL in right ear and mild CHL in left ear	4	1.22%
Bilateral mild CHL	11	3.36%
Moderate CHL in right ear and normal in left ear	6	1.83%
Bilateral moderate CHL	3	0.91%
Total	**327**	**100**

CHL – conductive hearing loss

DISCUSSION:

Good hearing ability is vital for effective learning and studies have suggested that children with minor hearing impairments may be at a developmental disadvantage. Hearing impairment adversely affects quality educational experience. Temporary hearing impairment is a significant problem among the rural school children. Children with temporary hearing loss do not have specific symptoms. They may talk loudly or exhibit symptoms such as inattentiveness, requests for repetition, inappropriate responses to vocal instructions which are usually dismissed by teachers and parents. The impact of temporary hearing impairment on school performance has not been well studied.

In our study, otoscopic examination showed that impacted wax was found in 14.1% of all school children. Such high prevalence can be attributed to poor standards of hygiene and lack of awareness. Wax impaction is a minor problem and it can easily be prevented before it causes hearing impairment. Teaching the students basic principles of hygiene will suffice to combat this problem. Surprisingly, 0.9% of the students had an impacted foreign body which was left unnoticed and un cared. Although tuning fork tests suggested that 29.96% of the students might have conductive hearing loss, audiological examination revealed that only 22.3% students had conductive hearing loss. This adds value to the argument that tuning fork tests are not a reliable instrument for determining the hearing deficit in young students.

The frequency of conductive hearing loss in this study was 22.3%. This was much higher when compared with previous studies from India (4.79%) and Bangladesh (11.9%). The prevalence of otological abnormalities is higher in boys than the girls. This may be due to the negligent attitude of boys towards maintaining hygiene and their higher rate of metabolism leading to increased perspiration.

On assessing the school performance of those students affected by hearing impairment, it is found that high percentage of 23.52% were poor performers, 22.97% were average performers and only 20.72% were good performers in school. The results were analyzed using the chi-square test and a ^{2}value of 3.84 (p=0.05) was considered to be significant. But the observed ^{2} value was 0.4197 which was not significant. Hence the null hypothesis that the children with undiagnosed temporary deafness will not be able to meet their scholastic potential has been found to be incorrect.

Despite the deafness, the students may perform well in school as the diagnosed problems of impacted wax, CSOM, etc are only short-term problems and these need not necessarily affect the school performance of the students which has been assessed over a period of more than a year.

CONCLUSION:

This study has detected the presence of hearing impairment in students who were hitherto considered to be normal. Significant number of students in the rural areas has a hearing deficit. The prevalence of hearing impairment is more among the boys than the girls. There is a very low level of awareness about the possibility of hearing impairment in children. Tuning fork tests are not as reliable as audiometry for testing the hearing ability in children. Hearing impairment does not have an impact on the school performance of children.

REFERENCES

1. Kavitha AK. Hearing assessment of kindergarten children in Mangalore. J Clinical Diagnostic Research. 2009; 3: 1261-1265
2. Chermak GD, Musiek FE. Managing Central Auditory Processing Disorders in Children and Youth. American Journal of Audiology 1992: 1; 61-65
3. ICMR. Collaborative Study on Prevalence and Aetiology of Hearing Impairment. Indian Council of Medical Research and Department of Science and Technology; New Delhi, 1983.
4. Mann SBS. Incidence of Hearing Impairment among Rural and Urban School Going Children: A Survey. Indian J Pediatr 65; 141-145.
5. National Sample Survey Organisation. A Publication of Department of Statistics, Government of India, New Delhi. 1991
6. Hearing loss: terminology and classification. Joint Committee of the American Speech-Language-Hearing Association and the Council on Education of the Deaf. ASHA Suppl. 1998; 40 (2 Suppl 18):22-3.
7. Nina Capone Singleton, Brian B. Shulman. Language Development: Foundations, Processes, and Clinical Applications. Edition 2, Burlington. Jones & Bartlett Publishers, 2013 Chapter 5 p94
8. Jacob A, Rupa V, Job A, Joseph A. Hearing impairment and otitis media in a rural primary school in south India. Int J Pediatr Otorhinolaryngol. 1997; 39 (2):133-8.
9. Gell FM. Practical screening priorities for hearing impairment among children in developing countries. Bull. World Health Org. 1992; 70:645-55.
10. S. Chadha, A. Sayal, V. Malhotra, and A. Agarwal, "Prevalence of preventable ear disorders in over 15 000 schoolchildren in northern India," Journal of Laryngology & Otology, vol. 127, no. 1, pp. 28–32, 2013
11. M. M. Shaheen, A. Raquib, and S. M. Ahmad, "Chronic suppurative otitis media and its association with socio-econonic factors among rural primary school children of Bangladesh," Indian Journal of Otolaryngology and Head and Neck Surgery, vol. 64, no. 1, pp. 36–41, 2012.