International Journal of Community Medicine and Public Health
Norman P et al. Int J Community Med Public Health. 2017 Jan;4(1):200-205
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20164738

Original Research Article

The factors associated with hearing impairment in school children

Prasan Norman[1]*, Mahendran Chandran[2], Pandiyan Kr[2], Kokila Selvaraj[2]

[1]Department of Community Medicine, Karpaga Vinayaga Institute of Medical Sciences, Madhuranthagam, Tamil Nadu, India
[2]Department of Community Medicine, Meenakshi Medical College, Kanchipuram, Tamil Nadu, India

Received: 02 November 2016
Accepted: 01 December 2016

***Correspondence:**
Dr. Prasan Norman,
E-mail: namronhere@gmail.com

ABSTRACT

Background: The morbidity of ENT infections have increased considerably in recent decades, so that they are now amongst the most common chronic disorders of childhood. Awareness of hearing deficit is poor in India. The major proportion of childhood hearing impairment in developing countries is secondary to preventable causes. At the same time, even mild degrees of hearing impairment can affect proper learning in noisy class rooms where speech is produced at a distance. This in turn can have significant impact on the scholastic performance and overall development.
Methods: A cross sectional study was conducted to identify the factors leading to hearing impairment in school children aged 8years to 14 years in the schools in Vadamavanthal area during the months of January 2013 to July 2013. The students were interviewed through pre - tested questionnaire and aural examination was done by a qualified otolaryngologist.
Results: Out of 700 school, 216(30.9%) school children were suffering from hearing impairment. 139 (19.9%) students were found to be suffering from impacted wax, 67 (9.6%) were suffering from otitis media with effusion, 17 (2.4%) students were suffering from chronic suppurative otitis media and 5 (0.7%) students were suffering from foreign body impaction in ear.
Conclusions: Simple measures like regular screening for ear diseases and hearing assessment done at the school level can help identify hearing impairment which can be modified with early health education for students and teachers.

Keywords: CSOM, School children, 8 years, 14 years, Wax

INTRODUCTION

Hearing impairment is a neglected chronic condition. It is the most prevalent sensory disability across nations. According to the 2014 estimates of the WHO, 360 million people worldwide have hearing impairment, 328 million adults and 32 million children are suffering from hearing impairment worldwide.[1] That is about 5% of the world population.

The sense of hearing is often taken for granted and people do not realize its importance unless it is lost or impaired. The terms hearing loss, deafness, hard of hearing, anacusis, hearing impairment (considered derogatory by many in the community) mean a partial or total inability to hear.[2,3] In children it may affect the development of language. Consequences of hearing impairment include delay in language acquisition, inability to interpret speech sounds, often producing a reduced ability to

communicate, economic and educational disadvantage, social isolation and stigmatization.[4]

Adults with hearing impairment of any degree have a much higher rate of unemployment in any country. Children with hearing impairment, congenital or acquired, have minimum or no schooling. There are lots of school dropouts in children who have trouble hearing due to trouble keeping up with their peers. So hearing impairment not only affects the economic development but also the social development in communities and countries

A child with hearing difficulties could be wrongly labeled as suffering from Attention deficit disorder [ADD] since both of them have similar problems like difficulty in attending class, remain distracted, concentrate insufficiently and fail to complete school work. Difficulties in communicating lead to isolation and poor self-concept.[5] As the degree of hearing impairment worsens, the child tends to be shunned by his/her peers .The child has learning problems that reflect on academic activities. Hence the child opts for a low profile in his/her classroom. A child with hearing disorders finds it hard to concentrate as he/she cannot understand what's going on around him/her.

Half of all these cases of deafness and hearing impairment can be avoided through prevention, early diagnoses and management. We all know that auditory sense is crucial for the mental development of a child. Identifying the cause of hearing impairment, early, will prevent the problem to go out of hand

The major cause for hearing retardation is otitis media, which is second most common cause of infection in a child[common cold is the first cause]. Otitis media is one of the most common medical problems in childhood and a common cause of hearing impairment. Making it one of the most frequent ear diseases encountered in day to day clinical practice

Wax, self-induced trauma with twigs or ear buds and any growth in the external auditory canal or middle ear are the other causes worth mentioning. Beside these conditions, foreign body in ear is typically evident in children. Only one third of the community with symptoms seeks for primary care. Most individuals manage their problem in the community without seeking help. Most of them are treated with homemade remedies, over the counter drugs and finally meet a qualified physician or otolaryngologist when none of the remedies have worked. The above mentioned causes when left untreated or ignored for a long time could lead to a residual illness in the child that could affect the hearing indirectly.

Most of the studies done pertaining to hearing impairment in children are hospital based. The clinical cases that the physician gets to treat in a hospital represent the floating tip of an iceberg and in no way comparable to the latent, in apparent undiagnosed cases in the community.[6]

Hence this study was undertaken in primary schools situated in Vadamavanthal ward area.

METHODS

A cross sectional study was conducted to identify the factors associated with hearing impairment in school children aged 8 years to 14 years. Study was conducted in the schools in Vadamavanthal ward area. This study is a part of the main study where prevalence of hearing impairment in school children aged eight years to fourteen years in Vadamavanthal ward area was calculated.

Vadamavanthal ward is a gram panchayat in Cheyyar sub district, Thiruvannamalai District, Tamil Nadu; India. Students from the Schools in the ten villages (namely Namandi, Vadamavanthal, Hariharapakkam, Vellakolam, Thalikkal, Ozhugavakkam, Chettithangal, Arasankuppam, Thiruppanangadu and Pillanthangal) in the ward were selected for this study. All the schools were government schools.

Study was conducted during the months of January 2013 to July 2013. Students aged 8 years to 14 years were included in this study. Students with congenital defects like cleft palate, Students with congenital hearing loss, Students who are or were using hearing aids, Students who had undergone cochlear implant surgery, Students not willing to participate in this study were excluded from the study.

School children till the age of fourteen were selected since as per the gazette of India august 27 2009, chapter two " Every child of the age of six to fourteen years shall have a right to free and compulsory education in a neighborhood school till completion of elementary education. The age group of eight years was selected because in this age, voluntary threshold could be easily measured; it is the age when middle ear problems should have resolved and is the age when education starts to require more cooperation and input from children.

There are six elementary schools and four higher secondary schools functioning. For this study all the ten schools were included. Numbers of children in the age group of eight to fourteen in these six elementary schools were 47, 44, 45, 48, 45, and 44. Numbers of children in the age group of eight to fourteen in these four higher secondary schools were 123, 82, 113, and131.

All the children in the age group of eight to fourteen from these ten schools were included in this study. The students were briefed about the study. And after getting oral assent the questionnaire was administered. This was followed by examination of the ear with an Otoscope and

hearing assessment using a 512 hz tuning fork by a qualified Otolaryngologist. To administer the interview schedule and ear examination, three to five days were spent in each primary school and eight to ten days in every higher secondary school.

A pilot study was conducted among eighty two students of both sexes in the age group of eight years to fourteen years from one higher secondary school.

Three rooms were selected for individual questioning of the students. Each room had a teacher from the respective schools to help organize and make a comfortable environment for the students. The questionnaire was administered to each student by the investigator. All students were explained about the study individually and questioned in the three separate rooms to prevent inhibitions. Every question was read out to the student from the questionnaire in his/her local dialect (Tamil) and doubts raised by the student were cleared. The answers given by the students were marked in the questionnaire by the Investigator. It took around ten minutes to fifteen minutes for a student to finish a questionnaire. Then the students were led to another room where a qualified Otolaryngologist examined their ears with an Otoscope. The procedure of tuning fork tests was explained to the students. The tests were conducted in an almost silent room using a 512 Hz tuning fork. Examination of the ear and conduction of three basic tuning fork tests on each student took around ten to fifteen minutes. On the whole it took around twenty five to thirty minutes to complete the questionnaire and examine a single student. The same procedure was followed all through the study. After appropriate modifications in the questionnaire were made the final version of the questionnaire was prepared.

The descriptive variables for identifying the risk factors were wax occluding three fourth of the canal, ear infection, foreign body, aural growth, self-induced injury, trauma

Numbers and codes were assigned to each variable. Data entry was done in Excel spread sheet (Microsoft Office 2010).Data was later transformed to SPSS (Statistical Package for Social Sciences) software (version 21.0). Descriptive statistics was used to present the data. Data was analyzed and was expressed as propotion. Chi square was used to find out the association. P value was also calculated.

RESULTS

Out of 216 children suffering from hearing impairment the occurrence was more in children in the age group of eight years followed by the children in the age group of fourteen years (Table 1).

In our study, 139(19.9%) had wax impaction in one or both ears. 5 (0.7 %) students had foreign body impaction. 67 (9.6%) of the students had otitis media in one or both ear. 17 (2.4%) students had a perforation in one or both ears (Table 2).

Table: 1: Age wise distribution of children with hearing impairment.

Age (years)	Hearing impairment n (%)
8	43 (19.9%)
9	12 (5.6%)
10	28 (13%)
11	26 (12%)
12	28 (13%)
13	39 (18.1%)
14	40 (18.5%)
Total	216 (100%)

Table 2: Factors associated with hearing impairment among the study subjects.

Factors associated with hearing impairment	No. of children N=700
Wax	139 (19.9%)
Ome/Retracted tympanic membrane	67 (9.6%)
Csom/Perforated tympanic membrane	17 (2.4%)
Foreign body in ear	5 (0.7%)

The diseases like wax 28 (20.1%) and chronic suppurative otitis media 5 (29.4%) were seen more at the age group of eight years. Otitis media with effusion 16 (23.9%) was highest at the age of fourteen years. Foreign body impaction was seen more in 4 (80%) students at the age group of ten years (Table 3).

Table 3: Age-wise distribution of factors associated with hearing impairment.

Age	Wax	OME	CSOM	Foreign body in ear
8	28 (20.1)	11 (16%)	5 (29.4%)	0 (0%)
9	6 (4.1)	4 (6%)	2 (11.8%)	0 (0%)
10	23 (16.5%)	7 (10.4%)	0 (0%)	4 (80%)
11	16 (11.5%)	9 (13.4%)	1 (5.9)	0 (0%)
12	21 (15.1%)	7 (10.4)	3 (17.6%)	1 (20%)
13	23 (16.5%)	13 (19.4)	3 (17.6%)	0 (0%)
14	22 (15.8%)	16 (23.9)	3 (17.6%)	0 (0%)
Tota	139 (100%)	67 (100%)	17 (100%)	5 (100%)

Cerumen impaction and foreign body impaction, two asymptomatic ear diseases were seen more in female students .This may be due to ignorance or health disparity (poor access to health care by females) (Table 4). Two symptomatic ear diseases, Otitis media with effusion and Chronic suppurative otitis media were more in male students (Table 4).

Table 4: Sex-wise distribution of factors associated with hearing impairment.

Ear Diseases	Male	Female
Wax	63 (17.2%)	76 (22.8%)
Otitis media with effusion	37 (10.1%)	30 (9%)
Chronic suppurative otitis media	12 (3.3%)	5 (1.5%)
Foreign Body	0 (0%)	5 (1.5%)

Wax impaction was more 138(63.9%) in students with hearing impairment when compared to students with normal hearing (Table 5). It is statistically significant.

Table 5: Hearing impairment and wax impaction.

Wax	Hearing impairment (%)	Normal hearing (%)	Total
Presence	138 (63.9%)	1 (0.2%)	139
Absence	78 (36.1%)	483 (99.8%)	695
Total	216 (100%)	484 (100%)	700

[chi-square -380.589[a], df-1, p<0.001].

Foreign body impaction was 5 (0.7%) more in students with hearing impairment when compared to students with normal hearing. It is statistically significant (Table 6).

Table 6: Hearing impairment and foreign body in ears.

Foreign Body	hearing impairment (%)	Normal Hearing (%)	Total
Presence	5(2.3 %%)	O (0%)	5
Absence	211(97.7 %%)	484(100%)	695
Total	216(100%)	484(100%)	700

[chi-square -11.284[a], df-1, p>0.001].

Otitis media with effusion was more in students 67 (31%) with hearing impairment when compared to students with normal hearing It is statistically significant (Table 7).

Perforation of tympanic membrane/csom was more in students 16 (7.4%) with hearing impairment when compared to students with normal hearing It is statistically significant (Table 8).

In our study, wax (63.9%) was the commonest factor associated with hearing impairment followed by otitis media by effusion (31%) (Table 9).

Table 7: Hearing impairment and OME.

OME	Hearing impairment (%)	Normal hearing (%)	Total
Presence	67 (31%)	O (0%)	67
Absence	149 (69%)	484 (100%)	633
Total	216 (100%)	484 (100%)	700

[chi-square -166.020[a], df-1, p<0.001].

Table 8: Hearing impairment and CSOM.

CSOM	Hearing impairment (%)	Normal hearing (%)	Total
Presence	16 (7.4%)	1 (0.2%)	17
Absence	200 (92.6%)	483 (99.8%)	683
Total	216 (100%)	484 (100%)	700

[chi-square -32.680[a], df-1, p<0.001].

Table 9: Factors associated with hearing impairment.

Factors associated with hearing impairment	No. of children with hearing impairment N=216
Wax Impaction	138 (63.9%)
OME	67 (31%)
CSOM	16 (7.4%)
Foreign body in ear	5 (2.3%)

DISCUSSION

The objective of the study was to identify associated factors like Cerumen impaction, foreign body impaction in ears, otitis media with effusion, and chronic suppurative otitis media in children aged 8 to 14 years in the schools in vadamavanthal ward area.

In this study a total of seven hundred school children participated. Among them 216 (30.9%) students had hearing impairment. Cerumen impaction was the commonest factor in students with hearing impairment 139 (19.85%) students. And 67 (9.6%) students were suffering from otitis media which was the second leading factor of hearing impairment. In our study chronic suppurative otitis media was seen in 17 (2.4%) students and foreign body impaction was seen only in 5 (0.7%) students.

In a study done to assess the data on the prevalence and causes of hearing impairment in Africa by Mulwafu W most common cause of hearing impairment was middle ear disease (36%), followed by undetermined causes (35%) and cerumen impaction (24%). Pure tone audiometry was used as a main tool to assess hearing impairment. But in this study tuning fork, 512 hrtz was used to assess hearing impairment.[7]

A study done in Socotra Island Yemen by Salem Muftahout of a total of 686 children who were examined, 7.4% were found to be suffering from CSOM leading to associated hearing impairment.[8] The percentage of children affected with CSOM is higher when compared with this study.

In a study done in South Sinai, Egypt among 453 primary-school children aged 7–10 years in South Sinai, Hearing impairment was seen in 19.3% and the commonest cause was secretory otitis media (10.8%), followed by occluded earwax (9.5%).[9]

In a study done in Kerala out of the 1048 children with impacted wax, only 41 (3.91%) had hearing impairment, Chronic suppurative otitis media contributed to 7.02% of cases, otitis media with effusion to 3.51% and foreign body in ear to 0.08% of hearing impairment. Improved health education and socioeconomic environment as well as the effective utilization of health facilities may be reason for the relatively low prevalence when compared with our study.[10]

In a study conducted in Northern India, out of 15 718 primary school children in New Delhi, Impacted Cerumen was prevalent in 7.93 per cent of schoolchildren, 3.06 per cent suffered from otitis media with effusion and foreign bodies were found in 0.34 per cent of the children.[11] The results of this study are very low when compared to the current study.

In a study done by Dr. Patangay KK out of one hundred and forty one patients, 26 patients were diagnosed with impacted wax and hearing impairment.[12]

Limitations

Confirmation of hearing impairment using audiometric equipment was not done because of logistic difficulties.

CONCLUSION

Every individual has a right to lead a healthy life. (13) Communication disorder like hearing impairment has its onset very early in life. Only through systematic early detection programs will children with hearing impairment can be assured of a chance to develop their full potential to become fully active, contributing, and integrated members of society. Regardless of the age of onset, all children with hearing impairment require prompt identification and intervention by appropriate professionals

This awareness must be cultivated during school age itself. Factors leading to hearing impairment are always preventable. Health education must be given to children about the factors leading to hearing impairment. Role-plays, small stories, pictorial books to create awareness can be tried to teach school children about the dangers of hearing impairment.

The early detection of ear diseases is essential, as they are associated with hearing impairment, and children with hearing impairment may be at increased risk. The parents must be made aware about the dangers of undetected hearing impairment in school children in parent's teachers meetings. Parents and teachers should be educated on how to identify symptoms for ear diseases in children

Teachers should be taught about how to identify and prevent hearing impairment in school children. Regular workshops for school teachers can be conducted by health professionals which could range from identification basic symptoms and illness to immediate first aid and counseling of school children of various ages

School Health Program is as an important tool for the provision of preventive and curative health services to the population. This program is functioning well in states like Tamil Nadu, Kerala, Gujarat and West Bengal. The components of school health program are screening of general health, assessment of Anemia/Nutritional status, visual acuity, hearing problems, dental checkup, common skin conditions, heart defects, physical disabilities, learning disorders and behavior problems .More emphasis should be given for screening hearing disorders.

The Speech and Language Association of America (ASHA) has provided the following guidelines for screening of school children for hearing deficits.

- The program should be run annually for children aged 3-9 years.
- After nine years of age, the program should be performed annually for children at risk.

Such guidelines can also be followed in our country too. Yearly screening for ear diseases can be done on children from the age of school entry to a minimum of ten years of age .The children at risk can be reviewed annually after the age of ten and referred to higher centers if necessary.

ACKNOWLEDGEMENTS

Authors would like to acknowledge the school Principals, School teachers and the students who provided us a wonderful platform for carrying out this study and for their kind support.

Authors would like to thank Prof. Kokila Selvaraj, Head of the Department Of Community Medicine, Meenakshi Medical College for her inspiration and support.

Authors would like to thank Dr. Mahendran Chandran, Dr.Pandyian, Dr.Robinson without whose help this study would have not been possible.

Funding: No funding sources
Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Deafness and hearing loss. [Online]. Available from: http://www.who.int/mediacentre/factsheets/fs300/.
2. National Association of the Deaf. [Online].; 2014 [cited 2014 july 31. Available from: http://nad.org/issues/american-sign language/community-and-culture-faq.
3. Encyclopædia Britannica Online-Deafness. [Online]. Available from: http://www.britannica.com/ EBchecked/ topic/154327/deafness.
4. WHO-Hearing loss. [Online]. Available from: http://www.who.int/healthinfo/statistics/bod_hearingloss.pdf.
5. ASHA-Effects of hearing loss on development. [Online]. Available from: http://www.asha.org/public/hearing/Effects-of-Hearing-Loss-on-Development.
6. Park K. Iceberg of disease. In Park text book of community medicine-22nd edition. p. 37.
7. Mulwafu W. Prevalence and causes of hearing impairment in Africa. Tropical medicine and international health. 2016 February; 21(2).
8. Muftah SIM. Prevalence of Chronic Suppurative Otitis Media (CSOM) and Associated Hearing Impairment Among School-aged Children in Yemen. Oman Medical Journal. 2015;30(5).
9. Yamamah G. Middle ear and hearing disorders of schoolchildren. Eastern Mediterranean Health Journal. 2012 March.
10. Ebenezer RR. Spectrum of ENT diseases among urban school children in South Kerala, India. International Journal of Biomedical Research. 2014 may; 5.
11. Chadha SK. Prevalence of preventable ear disorders in over 15 000 schoolchildren in northern India. The J Laryngology Otology. 2013;127(01).
12. Patangay DK. Hazards of Ear Buds. International J of advanced research. 2015;3(08).
13. Singh R. Infant Hearing Screening in India: Current Status and Way. International Journal of Preventive Medicine. 2015;6.

Cite this article as: Norman P, Chandran M, Pandiyan Kr, Selvaraj K. The factors associated with hearing impairment in school children. Int J Community Med Public Health 2017;4:200-5.