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Original Research Article

Screening of school children in rural areas to detect early hearing loss: a population based necessity

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ABSTRACT

Background: This study is aimed to detect early hearing loss in school going children and to create awareness about the same in the parents with necessary counselling for further necessary management and correction, so as to avoid hearing disability and to improve social communication.
Methods: School going children in primary classes 1st-6th standard in a village close to the Murbad region of Maharashtra state were screened to detect early loss. A total of 619 students out of 683 students studying underwent screening. After initial checkup of ears, free field hearing (FFH) and tuning fork tests (TFTs) were done. Pure tone audiometry (PTA) was reserved and was done for children who had suspected hearing loss on tuning fork tests.
Results: Hearing loss was detected in 50 students with an overall prevalence of hearing impairment of 8.1% (50/619). Hearing loss was noticed more in girls (9.3%) than boys (6.9%). Most of the hearing loss was conductive in nature.
Conclusions: This screening study highlights the need for conducting regular screening tests for early detection of hearing impairment in rural school going children at an early age to avoid hearing disability and to provide necessary hearing rehabilitation at an early age.

Keywords: Early detection, Hearing screening, Hearing impairment, Intervention, School going children

INTRODUCTION

The study specifically emphasises the detection of hearing loss in rural school children where there is lack of awareness, support services and an environment where hearing loss is a low priority and people are unaware of its huge impact on life. Detection of hearing loss is important at any age, but especially more so when it is diagnosed at an early age as it improves the overall outcome. This would help the child to communicate better with family and friends, have an overall positive outlook in society and avoids hearing disability.

It also becomes important to find out the reason behind hearing impairment; so that the preventable and treatable causes of hearing loss can be taken care; most common in society being wax in the external auditory canal and middle ear pathology like otitis media.[1]The recent study of 2026 also suggests a higher prevalence of hearing loss in rural population.[1] The problems faced by the children with hearing loss includes; the child being ignored by the peers due to lack of communication and speech impairment; as a result of hearing loss, lack of confidence i.e. overall low self-esteem, lack of attention, poor at dictation, frequent requests for repetition in the classes. As per WHO, hearing loss currently affects more than 1.5 billion people worldwide and WHO estimates that by 2050 nearly 2.5 billion people will have some degree of hearing impairment, of which at least 700 million will require some kind of intervention/rehabilitation services.[2] The Census of India 2011 reports about 5.07 million individuals with some hearing disabilities and 1.98 million individuals with speech problems.[3] Children with mild to moderate level of hearing loss can go undetected,

as it does not affect them to an extent to cause problems in day to day life, like speech difficulties or poor scholastic performance, but such undetected children can have a chance of increased hearing disability later in life and can end up with moderate to severe hearing loss. Hence, it is of utmost importance to find out these children and treat them before progression of hearing loss and give necessary rehabilitation.[4] Due to such increasing magnitude of hearing loss, Government of India launched National programme for Prevention and Control of Deafness (NPPCD) which also aims towards early identification of hearing disability.[5]

Screening of children at school levels helps to detect hearing loss early, and since most of the children tend to attend schools, the screening of children can be maximised when done in school, making sure everybody is screened for hearing impairment.

A study also suggested training community health workers (CHWs) in rural areas to conduct screening of children with hearing loss and using short message service (SMS) to help with compliance and future follow-ups.[6] Training CHWs and making them competent enough to make appropriate decision to refer child on time to an ENT specialist/nearby doctor for hearing rehabilitation. This can also help with increasing awareness and increasing the identification of children in rural areas with hearing loss.

Screening of children in such low resource setting can be done by routine ENT examination under headlight/torch followed by FFH, TFTs and conducting PTA for children with abnormal TFT findings as done in current study. The World Health Organisation (WHO) has published a vision and hearing screening for school children: implementation handbook in 2025, which basically provides guidance on conduction of hearing screening programme in school children.[9]

With this increasing burden and prevalence of hearing deafness in rural school children it becomes an important public health concern particularly more so when majority of them are preventable and treatable cause for hearing impairment and hence screening and spreading awareness for the same holds importance.

METHODS

This was cross-sectional observational study carried out in a village near Murbad in Thane District, Maharashtra in which 619 school going children out of 683 total students from 14 different schools between the age group of 6 to 13 years were screened between September 2024 and October 2024 for detecting hearing loss. The study was conducted after taking informed written consent from the parents/guardian. The remaining students could not be screened because they were absent from the school on the days of screening. The study was approved by the institutional ethics committee of the College and Hospital. The data was collected by first interviewing the child for hearing difficulties and then examining first by otoscopy followed by FFH and TFTs. The TFTs were done using 256Hz and 512Hz tuning forks. In students where TFTs were suggestive of hearing loss, PTA was done using a portable audiometer.

Study period

The study was conducted between September 2024 and October 2024.

Inclusion criteria

Rural school going children in the age group of 6-13 years of age who were ready to participate in the study and whose parents/guardian had given written informed consent for the same.

Exclusion criteria

Rural school going children not fitting in the mentioned age category, children who were absent, and those who did not give written informed consent to participate in the given study.

Statistical analysis

The statistical analysis of data was done by the biostatistician at the institutions. Microsoft Excel was utilised for data cleaning, and IBM SPSS version 29 was used to analyse the data. Categorical variables, including age, gender, and diagnosis status (hearing loss vs. normal) were summarised as frequencies and percentages. Cross-tabulation was conducted to determine the relationship between demographic characteristics and diagnosis outcomes. The Pearson Chi-square test of independence was applied to evaluate statistical associations between hearing diagnosis and demographic characteristics. P-value <0.05 was considered as statistical significance.

RESULTS

A total of 619 students between the ages of 6-13 years from 14 different rural schools were screened for hearing impairment. A total of 50 students had some form of hearing impairment. The prevalence of hearing loss was 8.1%. The distribution as per age and gender is given in Table 1 and 2. The majority of the hearing impairment was seen in age group 10-11 years (46%) and lowest hearing impairment seen in age group 6-7 years (16%). The overall hearing impairment is seen more in girls (28/300) i.e. 9.3% than in boys (22/319) i.e. 6.9%. Out of the total 50 hearing impairment students; 48 students had conductive hearing loss (96%), 1 student has sensorineural hearing loss (2%) and 1 student has mixed hearing loss (2%). Wax was seen in 292 students and they were advised to get it removed by visiting the local hospital in Murbad city, as it was not feasible to remove the same at school location due to resource limitation.

Interesting cases which were seen - Two interesting cases were seen as a part of screening of students for hearing impairment, 1) A case of cleft palate and cleft lip was seen during the screening process however the hearing was normal. He was advised to visit the district hospital, 2) A student with an insect in the ear was seen during routine ENT examination however, the hearing was also normal in this student. He was referred to ENT specialist for removal.

Table 1: Age-wise distribution of hearing loss.

			Diagnosis Hearing loss	Diagnosis Normal	Total Total	Chi-square value	P value
Age in years	6-7	Number	8	166	174	16.21	0.001
	6-7	Percent	16.0	29.2	28.1	16.21	0.001
	8-9	Number	10	180	190	16.21	0.001
	8-9	Percent	20.0	31.6	30.7	16.21	0.001
	10-11	Number	23	124	147	16.21	0.001
	10-11	Percent	46.0	21.8	23.7	16.21	0.001
	12-13	Number	9	99	108	16.21	0.001
	12-13	Percent	18.0	17.4	17.4	16.21	0.001
Total	Total	Number	50	569	619	16.21	0.001
		Percent	100.0	100.0	100.0	16.21	0.001

Table 2: Distribution of hearing loss based on gender.

			Diagnosis CAT Hearing loss	Diagnosis CAT Normal	Total Total	Chi-square value	P value
Gender	Female	Number	28	272	300	1.23	0.26
		Percent	56.0	47.8	48.5	1.23	0.26
	Male	Number	22	297	319	1.23	0.26
		Percent	44.0	52.2	51.5	1.23	0.26
Total	Total	Number	50	569	619	1.23	0.26
		Percent	100.0	100.0	100.0	1.23	0.26

Table 3: Percentage of hearing loss based on gender.

Diagnosis			
Gender		Frequency (N)	Percent (%)
Female	Hearing loss	28	9.3
Female	Normal	272	90.7
Female	Total	300	100.0
Male	Hearing loss	22	6.9
Male	Normal	297	93.1
Male	Total	319	100.0

Table 4: Prevalence of hearing loss.

Diagnosis		
	Frequency (N)	Percent (%)
Hearing loss	50	8.1
No hearing loss	569	91.9
Total	619	100.0

DISCUSSION

The study has shown the prevalence of hearing loss in rural school going children to be 8.1%. In my study, conductive hearing loss (CHL) accounted for 96% of the total hearing impairment. Mild CHL accounted for 10%, moderate accounted for 84% and mild to moderate CHL accounted for 2%. Sensorineural hearing loss accounted for 2% and profound mixed hearing loss accounted for 2% of the total hearing impairment. The examination done during the research reveals that wax contributes maximum to the conductive deafness. The parents were counselled to get the wax removed from the nearest hospital and to get the children rechecked for hearing loss after wax removal. The present study emphasises the need to conduct such screening tests in schools to detect hearing loss as the preventable or curable causes of hearing loss can be well managed. A similar study on 814 students in southeast state of India showed the prevalence of hearing loss to be 9.25%.[6] Similar studies done even in the past has shown that hearing impairment is predominantly conductive in nature and thus can be prevented.[8] A study in similar rural settings also found hearing loss to be 8.8% with the most common cause being impacted wax.[10] Impacted wax contributes to conductive hearing loss of approximately 16-20 dB. Free field hearing is a good and easy method for screening for detection of hearing loss in schools and camps. A study on 630 children found prevalence of hearing loss to be 17.9% with rural population contributing 18.8% to that of urban school going children to be 13.5% again

emphasizing higher hearing impairment in rural population.[11] Another observational study conducted in Ujjain district from 2024 to 2026 covering 2020 children in the age bracket of 5-18 years showed hearing loss in 385 children (19.9%) with conductive hearing deafness contributing maximum 86.5% of total with most common cause found being otitis media with effusion in this study.[12] According to WHO estimates 1995 the global prevalence of hearing loss was 2.1% and with around 120 million people globally suffering from hearing loss.[6] Whereas, as per WHO estimates of 2021, hearing loss currently affects more than 1.5 billion people worldwide.[2] Therefore, the study emphasises the need to conduct such screening for hearing impairment regularly so that the children can be treated and rehabilitated earliest and will have better positive outcome. The ever-increasing burden and prevalence of hearing impairment make it an important public health concern.

In urban area since the facilities are easily available in urban locations, parents are able to get their child evaluated by medical officer and an ENT specialist. In rural settings, weekly based camps for screening, Allocation/ attachment medical officer in rural schools with regular screening, educating/training community health workers with basic understanding to detect hearing disability and making them competent enough to make decision as to when to refer a child to ENT specialist/ nearby doctor for hearing rehabilitation. These few changes and suggestions can be tried for early detection and rehabilitation.

A study also showed that usage of few specific smartphone apps for screening of hearing impairment showed 75 to 100% sensitivity.[13] Although this study was conducted outside India but such innovative advances can assure easy cost effective and reliable screening modality.[13] This can help in understanding proper referral of patients from rural population, ensuring proper rehabilitation. Another study published in 2025 conducted screening of 580 school children in Dharwad, Karnataka, India, using smartphone application for screening hearing loss and same children were then tested by professional audiologists showed that hearing test application can be used as a screening tool.[14]

This study has few limitations. The study was conducted in rural settings with limited resources and thus children with wax in the external auditory canal could not be removed and had to be referred to nearby hospital//ENT specialist for removal. Children with wax in the external auditory canal contributing to conductive hearing loss could not be reassessed after wax removal to check for improvement in the hearing ability. Although neonatal screening programs have increased the identification of children with hearing loss at birth but, due to subsequent non-compliance with reassessment often progression of hearing loss is missed. For children with normal hearing at birth identified due to neonatal screening program can often miss out on acquired causes of hearing loss later in life most commonly being wax impaction causing conductive hearing loss. Therefore, screening for hearing loss at school level can be very helpful in early identification and helping in overall positive outcome for the child. This also helps in early identification and treatment of preventable and curable causes of hearing loss like wax impaction, otitis media etc.

CONCLUSION

The present study suggests the need to promote such screening tests in school preferably at a younger age so as to have an overall positive outcome of the child. The study also highlights the need to increase the school health screening activities for hearing loss. The school teachers should also provide education to children and parents in this context.

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