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## Development of checklist for mild to moderate hearing loss in school children

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### Abstract

Children with mild to moderate hearing loss may have significant difficulties in their language, academic and social emotional development compared with their peers with normal hearing. This checklist will help in early detection of hearing and intervention of such children. The aim of the present study is to detect mild to moderate hearing loss in children. Children with mild-moderate hearing loss have a problem in development of speech-language skills. If they are detected early, this problem can be minimized. Academic achievement will be poorer as a result of delayed identification of hearing loss. For this study, a checklist containing 16 questions were developed both in Bangla and English. The questions were given to 10 audiologist and speech- language pathologist for the purpose of validation. They validated the questions. The validity of the questionnaire was tested quantitatively through cronbach's alpha method. Then these questions were asked to the class teacher of Bengali and English medium school. 500 children ranging from 6 to 10 years were considered for this study. Teachers were instructed to answer in 'yes' or 'no' only. The answers would be given on the basis of class performance of the child and any other activities in the school. We select those children for whom the answer comes as 'yes' from the teacher for at least one question. The selected children were brought to A.Y.J.N.I.H.H., E.R.C. for detailed audiological assessment. The audiometric test as well as tympanometry was carried out to rule out if there is any hearing loss is present. The result showed that the class teachers respond as "yes" for 30 students out of 500 students. Out of 30 students 5 students audiometric result showed PTA less than 25 dBHL with suggestive of normal hearing having 'A' type tympanogram with presence of acoustic reflex both ipsi and contralaterally. Rest of the 25 students' threshold were 26 to 55 dBHL which suggestive of mild to moderate hearing loss unilaterally or bilaterally. The result of this activity will able to better identify those children who have late-onset hearing loss or who are missed during newborn hearing screening. With this study we hope to generate an understanding of the impact and importance of this checklist to detect mild to moderate hearing loss in children.

**Keywords:** Hearing loss, Checklist, Tympanometry, Detection

### Introduction

Now a day's mild-moderate hearing loss is common conditions of childhood. Historically, late diagnosis at 4-5 years of age was a common phenomenon for both mild bilateral and unilateral hearing loss. Many hereditary, environmental factors, infections, illness, trauma etc can be considered as the causes of hearing loss that are either progressive or late in onset. But this types of hearing loss can be identified through newborn hearing screening and especially unilateral hearing loss in early childhood. But it is so unfortunate that very few newborn 5 year old children are regularly screened for hearing loss using objective screening tools. There is large number of individual facing mild hearing loss rather than the person with moderate, severe, profound losses. If it is late to identify and to start intervention, it can adversely affect development of such children. Children with mild to moderate hearing loss may have significant difficulties in their language and social emotional development compared with their peers with normal hearing. Although, a lot of literature suggest that children having mild hearing loss face difficulties at school age including poor speech understanding in noise and localization problems also.

Children with mild hearing loss face more complication than those of adults as they do not have enough vocabulary skills and involvement. It is most often found to be difficult for teacher to perceive mild to moderate hearing loss and the steps to be taken for reducing its effect.

Systematic hearing screening having periodic intervals will be necessary for those children to be identified. Parents need to be practical to confirm about their child to get the support from the professional like teaching assistance, deaf teacher. Public Health Policies recommend, in addition to the Neonatal Hearing Screening Program, the School-age Hearing Screening, in order to early diagnose hearing loss and perform the necessary interventions as early as possible [1]. Among the tests used in different screening programs, the hearing assessment can be performed by using objective tests. The tympanometry is an electroacoustic test that contributes to the identification of middle ear alterations by investigating the integrity of the tympanic-ossicular system. This low-cost, fast and simple procedure is the method of choice for differentiating among the middle ear conditions that may affect individuals in all age groups, especially in school age, when most hearing impairments are due to middle ear alterations.

### NEED for the study

The most important goal of Joint Committee on Infant Hearing, 2007 position statement was the universal detection of infant hearing loss before one months of age and planning of early intervention services by six month of age. But in case of many children, especially with mild bilateral and unilateral hearing loss occurs after the newborn period. So, better screening procedure in early childhood and elementary school period are essential to effectively identify those type of children who have late onset of hearing loss or who missed the newborn hearing screening program. Due to the fact that many children have no access to any sort of hearing evaluation before school age, the School-age Hearing Screening is an important instrument for early identification of hearing impairment. It provides the possibility to offer greater attention to children's auditory health and, especially, to the diagnosis of hearing loss and early intervention in this population. The detection of hearing loss in school-age children is essential. The later the hearing loss is detected, the greater will be the difficulties. Early diagnosis allows the referral to specialists, who will act to provide rehabilitation and prevention of children's cognitive, social, emotional and communicative alterations. This checklist will help in early detection of hearing and intervention of such children.

### Aim and Objective

The aim of the present study is to identify mild to moderate hearing loss in children attending regular school. Children with mild-moderate hearing loss have a problem in development of speech-language skills. If they are detected early, this problem can be minimized. Academic achievement will be poorer as a result of delayed identification of hearing loss.

### Method

For this study, a checklist containing 16 questions were developed both in Bangla and English (Appendix 1). The questions were given to 10 Audiologist and Speech-Language Pathologist for the purpose of validation. They validated the questions. The validity of the questionnaire was tested quantitatively through Cronbach's alpha method. For this study students were selected from Bengali and English medium school situated in urban areas near at A.Y.J.N.I.S.H.D (D), E.R.C., Kolkata. A written consent

form was sent to the family through the students' agenda book and explained the entire study and the methodology involved. Only the subjects who were willing to participate were taken for the study. 500 children ranging from 6 to 10 years were considered for this study.

The checklist included 16 questions, which were objective and easy to understand. Questions were divided into two rating scale in the aspect of child's development and otologic history. The questions were asked to the class teacher of Bengali and English medium school. Teachers were instructed to answer in 'yes' or 'no' only. The answers were given on the basis of class performance of the child and any other activities in the school. We selected those children for whom the answer came as 'yes' from the teacher for at least one question.

The selected children were brought to A.Y.J.N.I.S.H.D. (D), E.R.C. for detailed Audiological assessment. Baseline Audiometry was done through MAICO MA 53 audiometer in the sound treated audiometric booth (having two rooms set up). Maximum permissible ambient noise levels (MPANLs) allowed in an audiometric test room that produce negligible masking ( $\leq 2$  dB) of test signals presented at reference equivalent threshold levels specified in ANSI S3.6-1996 American National Standard Specification of Audiometers. The audiometric test was done on the frequency ranging from 250 Hz to 8000 Hz. Middle ear pathology and any other possible auditory neural involvement was ruled out through GSI 39 auto tympanometer. The classification proposed by Jerger was used to analyze the values of tympanometric curves.

### Result and Discussion

The result showed that the class teachers respond as "yes" for 30 students out of 500 students. All of them were submitted to audiological procedures in both ears, hence 60 ears were assessed. Out of 30 students 5 students audiometric result showed PTA less than 25 dBHL with suggestive of normal hearing sensitivity (according to the classification of Lloyd and Kaplan, 1978) having 'A' type tympanogram with presence of acoustic reflex both ipsi and contralaterally. Rest of the 25 students' threshold were 26 to 55 dBHL which suggestive of mild to moderate hearing loss unilaterally or bilaterally. Among 25 students 8 students had unilateral and 6 students had bilateral conductive hearing loss with 'B' and 'C' type tympanogram with absent of acoustic reflex. 6 students had unilateral and 3 students had bilateral sensorineural hearing loss with 'A' type tympanogram with absent of acoustic reflex. 2 students had bilateral mixed type of hearing loss with 'As' and 'Ad' type of tympanogram with absent of acoustic reflexes.

In otoscopy 16 ears presented alteration. The presence of excessive cerumen in the EAC was the most common alteration found in students. All students with alterations in the otoscopy were referred to the E.N.T.

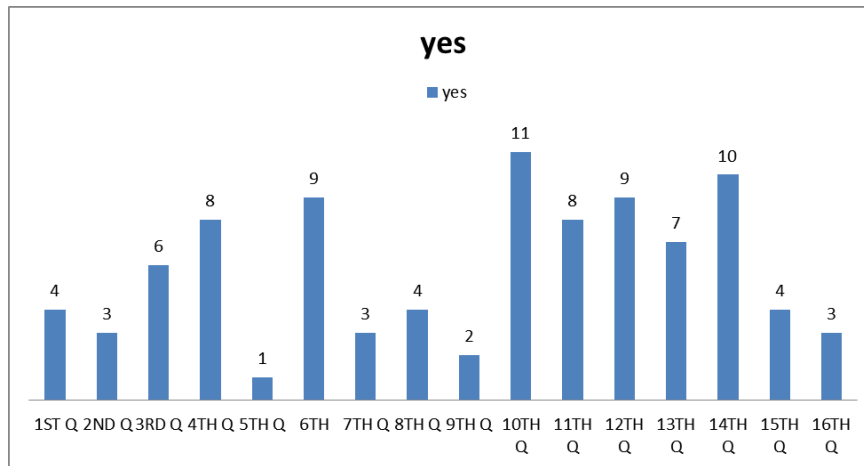
If excessive cerumen is present, it may cause complications such as the hearing loss. In the present study, the most observed alteration in the oatoscopy was excessive cerumen, which is reported in literature as one of the most frequent causes of alterations in preschool and school-age children.

Tympanometry is a testing methodology that is used to evaluate the function of the middle ear. It provides a graphic representation of the relationship of air pressure in the external ear canal to impedance (resistance to movement) of the ear drum and middle ear system. It has been broadly

used in hearing screening programs for precisely identifying conductive alterations. The occurrence of types B, C, As and Ad tympanometric curves in this study's population, which may be related to middle ear and/or auditory tube alterations, infers that the findings were compatible with the types of hearing loss (conductive and mixed) found in the school-age children.

The significant relationship between some of the answers from school teachers and the procedures performed in the

school-age hearing screening demonstrates that it is possible to associate the use questionnaires along with other tests in hearing screenings. Therefore, it is necessary to establish and adopt procedures with lower expenses, such as screenings and/or questionnaires, which are accessible to needy areas and allow the identification of groups of children at risk for hearing loss.



**Fig 1:** Graphical representation of the positive response of each questions.

It has been reported in literature that hearing loss can be noticed by some of the students' behavior, such as: frequently asking to repeat sentences, turning the head towards the speaker, higher or lower intensity in speech, demonstrating effort in trying to listen, looking at and concentrating on the teacher's lips, being inattentive in classroom debates, preferring social isolation, being passive or tense, easily getting tired, no effort in demonstrating capacity, presenting learning difficulties. The impact of hearing loss on learning begins on the first years of school life; however, many children with mild hearing loss will only present considerable learning difficulties in third grade. This difficulty may be due to changes in language complexity, the smaller number of visual cues, the greater need for linked auditory information and evocation, in addition to the loss in the development of prerequisite abilities in earlier grades.

Caregivers often do not notice the hearing difficulty of the child. It is not uncommon to detect the hearing loss only in school, through the school-age hearing screening and the observation of the student's behavior.

The school-age hearing screening has been shown as an effective and accessible mean of identifying impairments that were not diagnosed until school-age, as well as those developed during this period, fulfilling its objective to minimize the difficulties and losses due to hearing deficits.

### Summary and Conclusion

The result of this activity will be able to better identify those children who have late-onset hearing loss or who are missed during newborn hearing screening. The most common alteration found in the students referred for audiological diagnose was the conductive hearing loss. With this study we hope to generate an understanding of the impact and importance of this checklist to detect mild to moderate hearing loss in children.

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