Screening for Hearing Loss among the Preschoolers: Development of a Tool and Measurement of its Efficacy

A Minor Research Project

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By

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Declaration

I, Ms Gayatri Sirur, hereby declare that work presented in the minor research titled '***Screening for Hearing Loss among the Preschoolers: Development of a Tool and Measurement of its Efficacy***' is a record of original and independent research work done by me *and has not been submitted for any other degree or any other university on any occasion*

The material that has been obtained from other sources is duly acknowledged in the report. To the best of my knowledge work carried out in this project has not been reported so far and hence this work can be considered as original

…….

Date Dr Gayatri Subodh Sirur

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CHAPTER – I
INTRODUCTION

1.1 THEORETICAL BACKGROUND

1.1.1 Hearing:

Role of hearing is so vital in the lives of human beings. Hearing is the physiological phenomena that mainly depend on intact anatomical structure of the ear. Flexer (2016) has reinforced the concept that we hear with our brain where as ears just act as a doorway for the sound/information. If ability to hear and process auditory information is affected then several areas of development including the (verbal) language development gets affected.

1.1.2 Hearing loss:

As per the Rights of Persons with Disability act (2016) (a) "deaf" means persons having 70 dB hearing loss in speech frequencies in both ears; (b) "hard of hearing" means person having 60 dB to 70 dB hearing loss in speech frequencies in both ears.

Impact of hearing loss on any individual depends on many factors such as type of hearing loss (conductive/sensorineural/Mixed), degree of hearing loss (mild/moderate/ moderately severe/severe/profound), onset of hearing loss (congenital/acquired), number of ears affected (unilateral/bilateral) etc. Hearing loss depending on degree will deprive an individual to perceive various sounds occurring in day to day life. If the degree of hearing loss is high as in cases of severe/profound hearing loss cases, these individuals will not be able to hear conversational speech which, typically is in the range of 50-60 dBHL. If one is unable to hear a speech sound, he/she will fail to develop speech, unless intervened. Hearing loss especially congenital/acquired (before/after language acquisition) has devastating effect on speech and language development.

Age of identification and age of intervention have great significance on language outcomes. Evidence points out that the probability of appropriate language development

drops from 80% to 35% with later identification of hearing loss and later enrollment in appropriate early intervention services (NECAP, 2009).

Verbal language development in children with hearing impairment, apart from degree and type of hearing loss depends on many factors such as age of identification, age of intervention, the type and quality of intervention program, age of amplification, type and use of amplification, parents participation, presence or absence of additional disabilities, cognition etc. (Moeller, 2000; Kennedy et al., 2006). It is utmost important to initiate intervention immediately after identification of hearing loss to tap the critical period of language development.

1.2 IMPORTANCE OF EARLY IDENTIFICATION AND INTERVENTION

If not detected early the long term effects of hearing loss can cascade from delayed language development into inadequate literacy skills, decreased academic success, limited job opportunities, social emotional challenges, lowered career opportunities, reduced quality of life (Hayes, 2008). Though hearing loss is not a life threatening condition, failure to intervene in time renders it as a severe threat to essential quality of life indicators (Swanepoel, Louw, & Hugo, 2007). It is uneconomical for a child, his/her family and community at large to experience the consequences of hearing impairment (WHO fact sheet, 2010).

Thus early identification of hearing loss and its immediate intervention is the key for verbal language development which in turn facilitates the overall development. If identified early, impact of hearing loss can be prevented to a great extent. Worldwide, it has been clearly documented that early identified and intervened children with hearing loss can develop verbal language skills at par with their normal hearing /typical children. The primary aim of early identification and intervention is to help in the fullest utilization of critical age as also to benefit the child with maximum intervention time, thus preventing hearing loss from turning into disability or handicap.

1.3 GOVERNMENT'S INITIATIVE FOR EARLY IDENTIFICATION OF HEARING LOSS

Many countries now have well-developed, comprehensive program of screening, identification, and early intervention for childhood hearing impairment but in Indian scenario the situation is still not satisfactory, still much more focused work needs to be undertaken, though the fact is government of India has taken some proactive steps in identification of hearing impairment**.** Section 17 of RPWD act has notified that the appropriate Government and the local authorities shall take the following measures for the purpose of section 16, namely:— (a) conduct survey of school going children in every five years for identifying children with disabilities, ascertaining their special needs and the extent to which these are being met

AYJNIHH and other institutions in the area of speech and hearing have worked on various aspects of early identification of hearing impairment. NIHH has developed materials for community workers. Under UNICEF sponsored project they used a high risk register, hand held low cost hearing screener and a mass hearing screening procedure through TV.

In the 11th Five Year Plan the Ministry of Health and Family Welfare, Government of India has launched the National Program of Prevention and Control of Deafness (NPPCD). This project was initiated in August 2006, and pilot project covered many districts. The long term objective of the program is to prevent and control major causes of hearing impairment and deafness, so as to reduce the total disease burden by 25% of the existing burden by the end of 11th Five Year Plan. Prevention of hearing loss due to diseases, early diagnosis, treatment, medical rehabilitation, strengthen linkages, creation of database and facilitation of evidence based research are the few targets aimed by this project (NPPCD, 2006).

1.4 IDENTIFICATION OF HEARING LOSS- DIFFERENT WAYS

Universal new born hearing screening (UNHS) is the most often followed procedure for identification of hearing loss in babies'.UNHS means hearing screening of

each baby born before their discharge from the hospital. Hearing loss being an invisible disability poses a challenge to be easily identified by parents, care givers and even healthcare professionals. Hearing screening methods such as UNHS are adopted in many western countries; relieve the parents of the onus of suspecting hearing loss in their infants. Revolutionary changes in technology has lead to availability of advanced audiological assessment equipments such as Auditory Brainstem Response Audiometry (ABR), Oto Acoustic Emission (OAE) which allow, identification of hearing loss even in newborn babies. These advance technologies are very much available in India, however resources available for identification of hearing loss in babies are certainly inadequate compared to the rate of births, also new born hearing screening is not yet mandatory and has not emerged as a national policy in India. UNHS still looks a distant dream in Indian context, thus babies born with hearing impairment in India are at risk of being identified comparatively late, sometimes as late as when they enter the preschool. According to a statement issued by SSA (2002), about 70% of children with disabilities have still not been identified after more than 10 years of implementation of the Education for All programmes.

To facilitate early identification of children, who have missed hearing screening immediately after birth or who have developed hearing loss later, after passing the hearing screening earlier, hearing screening can be performed as routine for all the preschoolers.

1.5 HEARING SCREENING

Hearing screening is a quick test, which is meant to segregate individuals who 'Pass' the screening or do not pass the screening, which is called as 'Refer'. The individual passes the screening, means he is able to hear the sounds (test stimuli) well, they do not require any further testing. Those who get 'refer' in the screening, are needed to undergo further testing. Hearing screening is basically meant for large population, which can give only preliminary information about the status of hearing. Hearing screening can be done for newborn babies, school going children or adults. Hearing screening is usually done by audiologist in India, but when it comes to huge population,

community workers such as nurse, anganwadi workers, social workers, teachers can be given intensive training in hearing screening, however the further audio logical testing if needed, has to be carried out by a trained audiologist.

1.5.1 Hearing screening tools:

There are various hearing screening tools available. Hearing screening using high risk register, questionnaire, checklist, hearing screening through audio logical instruments such as OAE, ABR, PTA. Any hearing screening tool has to offer reliable and valid results, it has to be easy to administer and easy to interpret and most importantly easily accessible and economical. Although OAEs are considered an acceptable screening tool, pure-tone screening remains the gold standard and is ideally accomplished by the time the child is 5 years old (ASHA, 2016a). Kreisman et al. (2013) have quoted advantages of using OAE protocol as it takes less time than pure tone protocols, more children may be screened on a given day. There are others who vouch for screening with behavioral testing for better results.

Though hearing screening currently is done predominantly with instruments such as pure tone audiometer /OAE/ABR, this type of screening still requires ample time, energy, trained professionals, and calibrated instruments and suitable space. In a vast country like ours, more economical, viable at the same time reliable and valid method of hearing screening could be desirable. One of the methods for carrying out such screening could be separating high risk children from those who are not having high-risk for hearing impairment with the help of check list or questionnaires. There are few advantages of using this method such as, it is inexpensive, requires only copying costs, minimal training is required for the personnel who will carry out hearing screening. There are also some drawbacks in using this method such as, it may fail to identify or differentiate between mild or moderate hearing loss cases. This method does not meet the requirement for professionally objective assessment criteria (Anderson, 2011).

1.6 PRESCHOOL HEARING SCREENING

Objective of carrying out preschool hearing screening is to rule out hearing loss in preschool students. This type of screening allows catching young children who have not undergone hearing screening as an infant, children who have progressive hearing loss or children who have had late onset of hearing loss. It becomes easy to carry hearing screening in preschools as it is easier to test children as they grow. Preschool hearing screening of this type can be easily carried out by preschool teachers after brief training.

1.6.1 Role of preschool teachers in hearing screening:

Separating at risk from no risk children could be done by preschool teachers, who have the biggest advantage of spending enough time daily with their students. This gives them lot of opportunity to interact with them, observe them, and judge their behavior. They also get ample opportunity to check child's responses to various environmental sounds and verbal language. This exploratory study capitalizes on these advantages of using services and expertise of preschool teachers to screen 'At risk' children from 'No risk' children. Hearing screening in preschools can easily filter out unidentified cases of hearing impairment at birth or cases with acquired/progressive hearing loss. However, a teacher needs to undergo some training, need some experience to mark the responses precisely for the child which will facilitate accurate results through screening.

1.6.2 Indian preschool scenario:

In India various types of preschools are currently operational. Private preschools, preschools run by NGOs, preschools (Balvadi) aided by BMC but managed by NGOs. Balvadi is an Indian pre–school run for economically weaker sections of the society. Meant for children in the age group of 3 to 6 years, Balvadi prepares children for schooling. The purpose of balvadis is to facilitate physical and mental growth at school and at home. Balvadis were developed as a part of the government of India's poverty alleviation programme by universalizing education. This study has explored the facility of balvadis which predominantly enroll children from lower socioeconomic class and two private preschools which cater to middle /upper socioeconomic class.

1.7 ORIGIN OF RESEARCH PROBLEM

Early identification through Universal Newborn Hearing Screening, early intervention and advance hearing technology like digital hearing aids and cochlear implants have created greater opportunities for verbal language development of children with hearing impairment in the 21st century. In many western countries Universal Newborn Hearing Screening is mandatory which has drastically lowered the age of identification of hearing loss. Though Universal Newborn Hearing Screening bears the onus of identifying babies with congenital hearing loss, in children born without significant hearing loss also, there remains a possibility of later onset of hearing loss. Such cases of acquired hearing loss can be detected only with repeated hearing screening. Unlike western countries, in India, Universal Newborn Hearing Screening is yet to be implemented at the national level, adversely affecting the early identification of hearing impairment in children. Thus, early identification of hearing impairment in children with congenital hearing loss or with acquired hearing loss poses a great challenge. Under such circumstances early identification largely depends on how early parents suspect the hearing loss in their infant/child. Many instances hearing loss is suspected by teachers in school going children. This study will make an attempt to find a solution to the research question, how to facilitate early detection of congenital /acquired hearing loss in preschoolers.

1.8 NEED

Though the need for early identification of hearing impairment is very well understood by professionals working in India, the practices followed in western world may not be feasible and practical for Indian families. It is important for us to evolve a model for early detection of hearing impairment which suits our cultural diversity, vastness at the same time which is economical and easily implementable on the huge population.

1.9 RATIONALE

A large number of children with hearing impairment are born to parents who are of normal hearing or who have little or no awareness about hearing impairment. The teachers of such children may not have sufficient training or experience in suspecting hearing impairment in these children. Under the circumstances, it is necessary to develop simple tools to suspect and screen children with hearing impairment so that further tests are performed to confirm or rule out hearing impairment. Studies have demonstrated that early diagnosis of hearing impairment followed by appropriate therapeutic interventions can lead to nearly seamless integration of such children into the social fabric. There is dearth of research in the areas of early identification of hearing loss or hearing screening in India, an empirical study like this could throw some light on issues which need to be addressed in children earlier as to give them a chance of development at par with their hearing peers.

1.10 AIM

To devise a valid, cost effective tool to facilitate early detection of hearing impairment among preschool going children.

1.11 OBJECTIVES

(1) To develop a validated tool for teachers to be used as a screening tool to detect hearing impairment in preschool children.

(2) To profile the outcomes of the hearing screening after administration of the validated tool on preschool children.

(3) To validate diagnostic accuracy of the screening tool by comparing the results with standardized instrumental hearing screening test.

1.12 OPERATIONAL DEFINITIONS

(1) Validated hearing screening tool –It refers to a questionnaire specially developed and validated to undertake hearing screening of preschool children studying in Balvadis, situated in M ward.

(2) Teachers –It refers to the teachers who teach in Balvadis/preschool situated in M ward.

(3) Preschool children –It refers to children studying in Balvadis/preschools, which are situated in M ward.

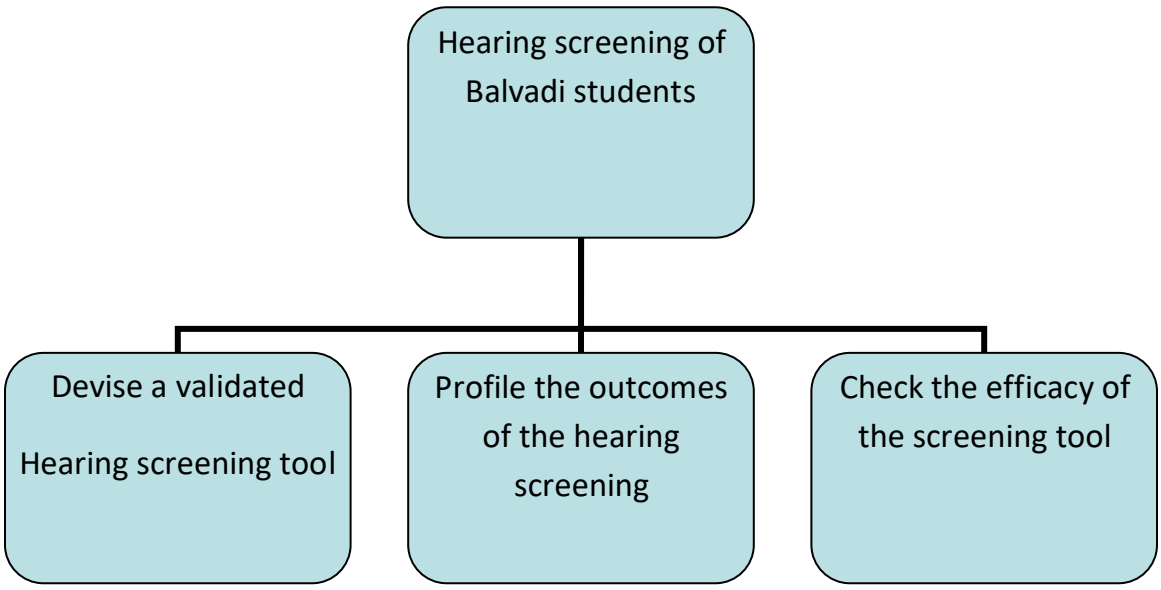
(4) Standardized instrumental hearing screening test –For the purpose of this study standardized instrumental hearing screening test refers to OAE (Oto Acoustic Emission).

Research question :

What is the efficacy of this hearing screening tool in screening children for hearing loss?

Purpose of this study is to explore, if preschool teachers can be engaged to conduct hearing screening using a validated hearing screening tool.

Figure 1.1: Schematic presentation of objective One, Two and Three



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CHAPTER – II
REVIEW OF LITERATURE

2.1 REVIEW OF RELATED LITERATURE

This chapter will highlight the literature that is relevant to understanding the development this study. Base of the research is formed by reviewing the previous related research; it brings clarity into formulating the objectives and interpreting the results.

2.1 Hearing loss and its impact:

Hearing loss has its greatest impact on verbal language acquisition in very young children. The impact of hearing loss is more distinct with increased severity, delays in identification and intervention. Wake et al. (2005) have reported that, many children with hearing loss show a language delay of at least 1 year by the time they are of school age, and around half have a severe language delay. Despite normal intelligence, deaf children display a prominent delay in language development accompanied by social and educational difficulties (Lederberg & Prezbindowski, 2000).

It has been documented that any severity of hearing loss and even a single ear being affected may create some challenges in normal speech and language development. White (2011) has said that even mild hearing loss significantly interferes with the reception of spoken language and educational performance. Research indicates that children with unilateral hearing loss are ten times as likely to be held back at least one grade compared to children with normal hearing (Bess, Dodd-Murphy & Parker, 1998)

A classical study by Yoshinaga-Itano et al. (1998) compared the receptive and expressive language abilities of 72 deaf or hard-of-hearing children identified by 6 months of age with 78 children who were identified with hearing loss after the age of 6 months. They did not find any significant differences in the language development of children identified at 7–12 months, 13–18 months, 19–24 months, or 25–30 months of age, indicating that with this sample of children, age of identification of hearing loss between 7 and 30 months of age did not significantly affect language quotients. All four late-identified groups, however, differed significantly from the early identified group. These findings may indicate that closing developmental delays for late identified children at the time of diagnosis of hearing loss is much harder.

Apuzzo and Yoshinaga-Itano (1995) compared the development of 14 children (identified in the first 2 months of life through high-risk register) to 11 children (identified between 3 and 12 months), 30 children (identified between 13 and 24 months), and 14 children (identified 25 months or greater). They were administered Minnesota Child Development Inventory (MCDI). Children in the first age group who were early identified/intervened within the first 2 months of age had significantly higher language quotients than those identified in the 3- to 12 month group, the 13- to 24 month group, and the 25+ months age group.

There are ample studies proving the point ‘earlier the better’ that strengthens the belief that every child indeed needs hearing screening at the earliest.

2.2 REVIEWED STUDIES RELATED TO UNIVERSAL NEWBORN HEARING SCREENING

The census 2011 revealed that in India, 20% of the disabled persons are having disability in movement, 19% are with disability in seeing, and another 19 % are with disability in hearing. 8% has multiple disabilities. Specifically with respect to children between 0-6 years of age, census has documented 23% of the disabled children (0-6 years) as having disability in hearing.

WHO estimates in India, there are approximately 63 million people, who are suffering from significant hearing impairment. Over 3 lakhs children in the age range of 0-6 years have hearing impairment. With such a large number of hearing impaired young Indians, it amounts to a severe loss of productivity, both physical and economic (NPPCD-Operational guidelines, n. d.).

Data gathered on screening performed on Early Head Start children ages 0-3 and follow-up suggests that approximately 2 of every 1000 children screened in early childhood settings are being identified with a permanent hearing loss (Anderson, 2011).

Kapoor and Kabra (2010) have a made a profound statement about disability status in India, they have quoted "Though, India as a country has been successful in lowering mortality rates, the burden of disability has not come down, in fact, it has risen down the years. Many disabilities can be avoided if we have a proper screening program''.

Unlike in the developed countries, in India routine neonatal or postnatal medical care seldom includes authentic evaluation of hearing abilities (Bansal, Berry, & Deka, 2003). The lack of an optimum number of professionals and equipments only adds to the adversity of the condition (Deka, 1993; Kumar & Dmello, 2006).

Garg, Singh and Khurana (2016), while specifically discussing the status about hearing screening in India, have reiterated that 'We cannot afford to waste any more time. Regardless of the age of onset, all children with hearing loss require prompt identification and intervention by appropriate professionals'.

Governmental and non-governmental agencies throughout the developing countries have begun to initiate programs to prevent childhood hearing loss or to offer rehabilitation, little or slow progress toward addressing hearing loss has been reported (Olusanya, 2001). In India, government has initiated schemes and programs for early identification of hearing impairment under NPPCD, RBCS however we are yet far off to bring age of identification of hearing impairment to the desired levels.

In India neonatal hearing screening is not mandatory thus not practiced widely; thus there are high chances that hearing impairment may be missed by parents, caretakers and healthcare professionals. Other option of catching these babies for hearing screening could be during their vaccination, if this opportunity is too missed to carry out hearing screening, next suitable and convenient platform for hearing screening of young children could be, when they enter the preschool. Hall (2016) has summarized preschool hearing screening as a logical strategy, he has concluded that, an unacceptable number of infants failing newborn hearing screening do not receive necessary follow-up services in a timely fashion as a result of loss to follow-up problems. In addition, a high proportion of children who pass newborn hearing screening later acquire hearing loss during the preschool years. Systematic pre-school hearing screening offers a logical strategy for detection of hearing loss among these children.

2.3 DIFFERENT HEARING SCREENING TOOLS

Literature has reported many ways of hearing screening, some are considered as gold standards. A study by Prieve et al. (2014) evaluated different hearing screening instruments for preschool - and school-age children and concluded that pure tone audiometry appears to be a better method however much in depth study required to draw further conclusions. Hall (2016) in a study to ascertain methods of effective and efficient preschool hearing screening has concluded Oto Acoustic Emission as a better instrumental test for early detection of hearing loss.

Most of the gold standards considered require audio logical instruments which have high purchase cost and high maintenance cost. There are studies which have been conducted to evolve a cost effective but valid hearing screening method.

The study by Samelli, Rabelo and Chaparin (2011) was to develop and analyze the efficacy of a low-cost screening tool to identify and classify hearing loss in children. It was conducted by providing a questionnaire to the parents and the answers given by the parents were compared with the results of a complete audiological assessment. Results

suggested that the questionnaire could be used as a screening tool to classify children with normal hearing or hearing loss.

There are also studies which have questioned validity of the results obtained through the questionnaire method, one such Chinese study had developed and evaluated a questionnaire. Children were evaluated through the questionnaire and OAE, the questionnaire method revealed average overall accuracy, while accuracy was much higher for OAEs. Study concluded that this questionnaire had to be modified (Bu, Li & Driscoll, 2005).

In Indian context, one such attempt was carried out by Kumar and Demello (2006). They used a questionnaire consisting 9 questions, and screened 6591 children. The questionnaire had a mix of eight close ended and one open ended question. The result of the study revealed 15.96% of children were identified at-risk for hearing loss. In another study Dey and Yatiraj (2016) didn't recommend use of checklist in identifying hearing loss in school children as they found poor efficiency of the checklist with 49% sensitivity and 76% specificity.

Mathur et al. (2015) evaluated the role of Anganwadi workers for detection and prevention of disability in children below six years of age. Anganwadi workers identified 126 subjects out of 1545 children, out of which 118 cases with disability were confirmed by the paediatricians. This study proves that, at grass root level instead of waiting for expensive objective test, services of available manpower can be tactfully utilised after necessary skill development. On the similar lines Olusanya (2001) used a structured questionnaire on parents of school going children. The questions were related to past medical and developmental history of the child. The study concluded that, the questionnaire had only 10% sensitivity and 94% specificity. In another study Gomes and Lichtig (2005) trained seven women employees of a local nursery school, to administer a parent report questionnaire on parents. The study confirmed that services of such volunteers can be utilized after sufficient training. However the questionnaire performed

poor in differentiating the children who had failed the audiological evaluation from those who did not.

Though objective hearing screening methods are the preferred methods for hearing screening as they offer better sensitivity and specificity, Dey et al. (2016) have opined that objective screening is expensive and requires professional services and expertise. Rural parts of India, where adequate infrastructure and professional services are compromised, any one or a combination of the behavioural procedures which make reasonably fair referral can be worth administering.

Studies conducted in early identification for school going children have tried different methods, different hearing instruments however there is no single unanimous conclusion about the most feasible and accurate method for hearing screening. A study by Munoz, Caballero and White (2014) reviewed the literature on the effectiveness of parent or teacher-completed questionnaires as a tool to screen school-aged children for permanent hearing loss and concluded that there is insufficient evidence that parent or teacher completed questionnaire screening can be reliably used to identify children with hearing impairment more research is needed before concluding that questionnaires are an effective and low-cost tool for use to screen children for permanent hearing loss.

It has been long debated whether, as a cost and resource saving measure, screening needs to be restricted to only high risk infants. Mauk, White, Mortensen, and Behrens (1991) have pointed out in their study that no specific etiology was found in about 50% of children with sensori-neural hearing loss and hence such children were missed by screening programs that focused only on those infants who were at risk for hearing loss.

To summarize, it is very clear that hearing screening is of paramount importance to early identify babies/children with hearing impairment. Early identification can prevent hearing loss tuning into hearing handicap, however each region needs to determine the most suitable method of screening of large number of children/babies.

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CHAPTER – III

METHODOLOY

The main purpose of this chapter is to describe the research methodology used to develop a validated tool for hearing screening of preschoolers and to validate its efficacy. This chapter will attempt to explain sample selection, tests and protocols used for data collection and data analysis.

3.1 RESEARCH DESIGN

The type of research method utilized in this study is predominantly quantitative type. The main theme of the present study revolves around developing a validated tool for hearing screening of preschoolers to rule out hearing impairment and administering this tool with the help of Balvadi teachers and testing efficacy of this tool. This is a cross-sectional, descriptive study and research design used for this descriptive study is a survey.

The study has been carried out in two phases. The first phase in which the researcher developed a screening tool for hearing impairment.

In the second phase of the study the objective was to profile the outcomes after administering the hearing screening tool and establish the efficacy of this tool. The research method used in this phase too is a survey. In survey, research samples drawn from the population are studied and inferences are made about the whole population. Therefore, a great deal of information can be obtained from a large population with much less expense.

3.1.1 Sampling procedure:

To profile the outcomes of the hearing screening after administration of the validated tool on preschool children, the information about the children was sought from the balvadi teachers. Since incidence of hearing impairment is .001%, it was desirable to

collect a large sample size and main objective of the study was to carry out hearing screening of balvadi students at the mass level, it was desirable to cover all the balvadis situated near chembur. Thus convenience sampling was used to select the samples for administration of this tool. Convenience sampling is a non-probability sampling technique where subjects are selected because of their convenient accessibility and proximity to the researcher (Castillo, 2009).

In the second phase of the study where children identified at risk through the hearing screening tool needed to be ascertained for hearing loss with the help of administration of OAE test, which is a standard objective test used for hearing screening. For this phase only those children who were categorized 'at risk' were considered thus for this phase purposive sampling was done. Purposive sampling is when selection of particular units of population is chosen to constitute a sample.

3.1.2 Sample size:

Considering incidence of hearing impairment is only 1 in 1000 live births it was imperative to constitute a large sample size. The main consideration while selecting this sample was i)number of samples 2)accessibility and suitability for further audiological testing of the 'at risk children', which was done at CAAI (Centre for Audiological Assessment and Intervention, Chembur), thus it was decided to consider all the students studying in Balvadis, which are situated in and around chembur area. Thus in the first phase number of samples were 1067. Profiling the responses obtained after administration of this hearing screening tool was done to conclude that 41 children were found to be 'at risk'category were considered as samples for the second phase.

3.1.3 Subject Profile:

Inclusion Criteria:

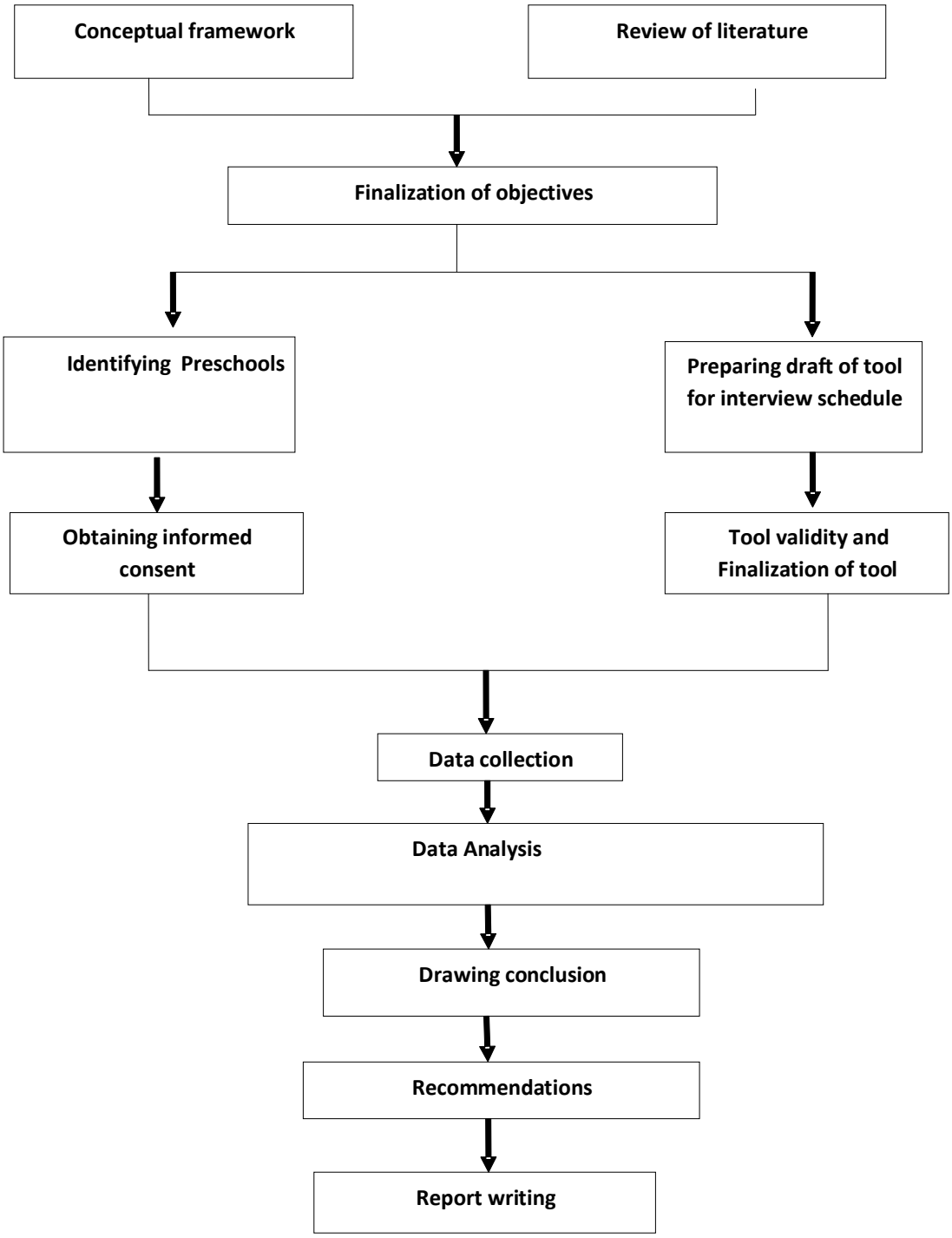
- Children studying in Balwadi /preschools

- Balwadis /preschools situated in and around chembur

Factors which did not matter in subject selection were

- Gender of the child
- Economic status of the family
- Education of the parents

Figure 3.1: Outline of the research procedure



3.2 TOOL DEVELOPMENT

Objective 1

Tool development for hearing screening.

To identify 'at risk' (for hearing impairment) preschoolers at a mass level, a questionnaire was developed for preschool teachers.

The questions designed in the hearing screening tool were formulated after reviewing many screening tools, reviewing high risk factors mentioned in JCIH 2007 (Joint Committee Infant Hearing) for delayed onset of hearing loss, considering speech and auditory developmental milestones; discussions with professionals who are working with children with hearing impairment in special or inclusive set up. The criteria preferred while developing this tool were

(1) Questions had to be direct and formed in a very simple and colloquial language

(2) Questions had to be easy to understand while describing certain technical terms

(3) The questionnaire could not be very lengthy but had to be complete enough to encompass all the aspects

(4) Developmentally appropriate

(5) Items described in the tool had to be from every day situation

(6) Questionnaire had to be designed in the language, in which balvadi teachers were conversant with.

After brainstorming sessions on construction of the tool, Pre-validity questionnaire was sent for validation to 10 professionals working in the field of hearing impairment.

Table 3.1: Details of validation experts

Sr. No.	Designation of the Experts	Qualification	Experience	Number of experts
1	Audiologist	Masters	5 -25 years	5
2	Special educators	PhD	4-21 years	3
3	Speech pathologist	Masters	8 years	1
			TOTAL EXPERTS ……	**10**

A covering letter explaining the purpose of the research was addressed to the experts. Experts were requested to complete the validation within the specific time-frame. They were asked to read each question and select only one option out of the four options. The four options provided were as follows (i) Most appropriate (ii) Appropriate (iii) Not appropriate and (iv) Irrelevant.

3.3.1 Result of validity:

The responses of the experts were graded as follows: most appropriate - 4 points, appropriate-3 points, not appropriate-2 points and irrelevant -1 point

Tool for identification of hearing impairment

- Items scoring less than 33 were rejected, Since none of the items scored less than 33, all items were retained
- The language used in many items was further simplified
- Few more everyday examples were added as per the suggestion of the experts
- Thus, the final questionnaire had 7 items in section A, 11 items in section B (Annexure A).

The tool was devised in English but most of the teachers who were teaching in Balvadis were conversant in Marathi, thus the need was felt to translate the tool in Marathi.

3.3.2 Tool used for profiling of the outcomes:

The research tool of the current study consisted of computerized entries in a excel sheet. It contained the following demographic information

(i) Name of the child
(ii) Age
(iii) Gender of the child
(iv) Date of birth
(v) H/O middle ear infections
(vi) Family history of deafness
(vii) Parental concern about child's unclear speech /inability to speak /inability to hear
(viii) Total score obtained for responses in section B

3.4 DATA COLLECTION

First Phase:

The project mainly aimed to target children attending Balvadis in and around chembur area. All the 33 Balvadis except 6 came under purview of Brihan Mumbai Mahanagar palika. Thus education officer of PP cell (Public Partnership cell) was contacted and explained in detail about the project and benefits of the project. Permission to conduct this project was granted after the health department of BMC also approved this project. Six other Balvadis under the purview of lok seva sangam and 2 private preschools of Wonderland preschools also were contacted and consent was obtained from principals/in charge of all these preschools to participate in this study. Researcher met most of the principals and explained to them, the importance of hearing screening in preschoolers and thus consent was obtained from all the balvadis/preschools.

Each preschool teacher was given the questionnaires, to facilitate the understanding before filling responses, an orientation was conducted for all the balavadi teachers, in which following points were discussed very elaborately:

- Introduction of the researcher
- Nature of work done by an audiologist,
- Research project undertaken by the researcher
- Importance of hearing screening among preschoolers
- Each item mentioned in the tool and the responses expected from them.

They were explained each item very elaborately and were also given examples about how they could cross check the responses of the children through every day activities. For example item number 1, where teacher has to check if child responds to his name call from a distance. Teachers were asked to check this while taking attendance in a play way method. Let the children form a line. Draw a circle at around 8 ft away from the line, each child has to stand one by one in this circle. Give a ball to the child when he stands in the circle; call out his name by covering your mouth from 8 feet, tell the child to throw the ball if he hears his name.

Total number of questionnaires given to teachers was equal to number of students enrolled in her class. Preschool teachers were encouraged to fill the questionnaire for each child separately. They were provided with researcher's contact details and the point was emphasized to contact the researcher in the event of any difficulty to seek clarification. Teachers had to tick mark the options given for each item in the tool.

Most of the teachers cooperated and completed the form for each child except one balvadi teacher who just gave a remark on one form saying their balwadi does not have a single child with hearing impairment. Total 1067 filled questionnaires (hearing screening tools) were collected from all the teachers by visiting their respective schools.

In the second phase of the study, after detail analysis of the questionnaire**,** scoring and categorizing the responses was done diligently. 'At Risk children' were filtered out. Balvadi teachers of these identified 'At Risk' children were contacted individually via

telephone to fix the date and time for further hearing assessment. Balvadi teachers were asked specifically to inform parents following things:

(1) Why further audiological assessment of their children is desired.

(2) A qualified professional will be testing their child.

(3) Testing will be free of cost.

(4) The purpose of testing is to rule out hearing loss, it will not cause any physical harm to the child.

(5) If the child has any issue related to his speech or hearing, further guidance will be provided to the parents as to how to help their child.

3.5 SCHEME OF ANALYSIS

The data collected through the questionnaire was tabulated and coded wherever necessary. Using Microsoft excel the research data was analyzed.

Individual scores for each item were calculated as per the teacher's response. Response to each question was scored as follows:

Table 3.2 –Scoring pattern for responses

Response	Scores
Often	4
Most of the times	3
Sometimes	2
Rarely	1
Never	0

The cumulative score for each factor was calculated. A list of 'At risk' children were segregated on the following basis

1. All the children having history of middle ear pathology (h/o Ear discharge, h/o ear infection)
2. All the children having family history of deafness

3. All the children, whose parents had shown concern about speech /hearing of the child.
4. Children who had obtained score the range of 0-14 in the section B of the questionnaire.

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CHAPTER – IV
RESULTS AND DISCUSSION

This chapter describes statistical treatment of the data, and attempts to interpret the results with various statistical analyses. The main objective of this chapter is to extract numerical information from analysis, link it with discussions. This process facilitates understanding of the present situation, and creates evidence for further actions.

4.1 Total 1067 filled questionnaires were collected from 41 preschools consisting of 33 Balvadis under BMC, 6 Balvadis under NGO Lok Sevagram and 2 private preschools. Out of 1067 responses, 51 questionnaires were disqualified as teacher had indiscriminately written the same answer for all the questions for all the balvadi children which itself was very contradictory.

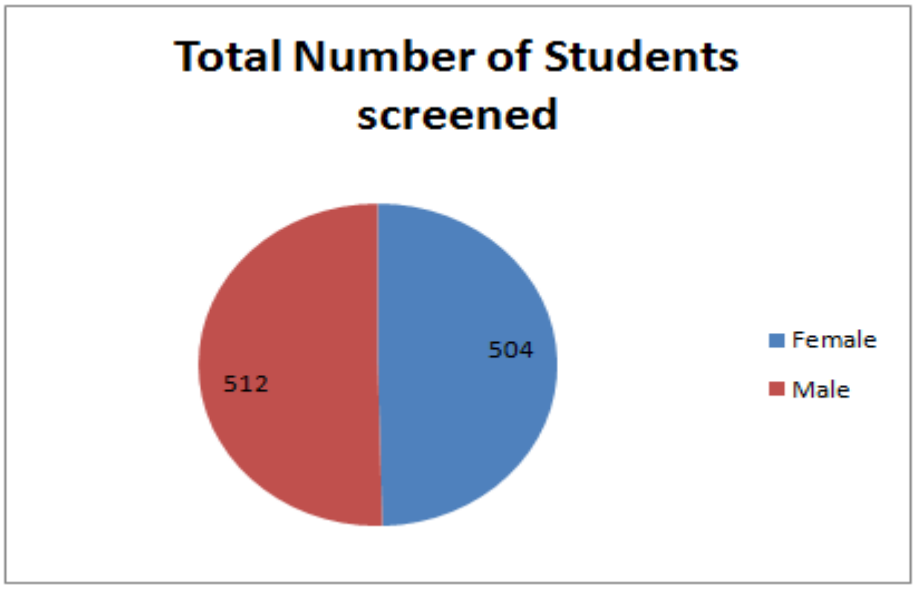
Table 4.1: Details of the preschools

Details of the Preschools	Total
Balvadis aided by BMC, managed by NGO	33
Unaided Balvadis, managed by NGO	6
Private preschools	2
Total……	41

Table 4.2: Details about the questionnaires collected

Total Forms	1067
Total valid Forms	1016
Forms Disqualified	51

Graph 4.1: Distribution as per gender



Out of 1016 children who were screened 512 were males and 504 were females. Further analysis revealed the age range of these children as follows:

Table 4.3: Distribution as per age

Age Block	No. of Students
2 – 3 years	9
3 – 4 years	231
4 – 5 years	368
5 – 6 years	313
Above 6 years	2
Age not available	93
Grand Total…….	**1016**

Majority of the Balvadi teachers misinterpreted question numbers 5, 9, 10 and11. Thus, while calculating the cumulative score, scores of responses to these items were not considered. 51 filled questionnaires were disqualified as the responses were written same for all the items and in all the questionnaires given to them. 93 forms did not mention date of birth, 25 forms had not mentioned any option for question number 5 from section A (H/o middle ear infection), 35 forms had not mentioned any option for question number 6 from section A (Family history of deafness) and 36 forms had not mentioned any option for questions number 7 from section A (Parental concern about speech and hearing of the child).

Teachers were instructed to answer 5th, 6th and 7th item of section A in Yes /No. A single 'Yes' to any of these questions for a child was considered as 'At Risk'. The questions were

i) History of Ear infection/Ear Discharge /Recurrent cold

ii) Any family member has deafness

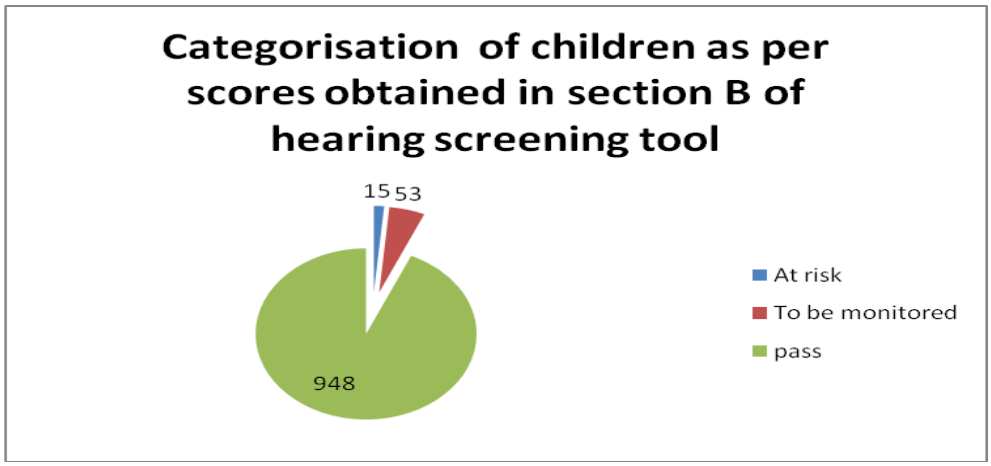
iii) Parental concern about speech and hearing.

It was justified to put these children 'At risk' because two items out of three are already listed as 'High risk factors' for delayed onset of hearing loss. Recurrent ear infections/ear discharge/recurrent cold especially untreated are known to cause conductive hearing loss. Though, conductive hearing loss can be reversed with medical treatment, if untreated, recurrent conductive hearing loss is known to have an impact on speech and language

development. It can be also challenging from the educational point of view. Thus, it is of paramount importance to identify these conditions early, mainly to prevent it from deteriorating and having permanent impact on the hearing acuity. Total 16 children were reported to have history of ear infections /recurrent cold/ear discharge, 9 children had family history of deafness out which one parent had developed unilateral hearing loss after accident, so that child was not considered 'At risk'. Family concern about child not hearing or speaking properly was reported by 29 families.

Expected response for all the items from section B of the questionnaire, if logically expected to be always or most of the times for a child having no significant hearing loss, then a minimum score and maximum score child would have obtained, would be in the range of 21 -28. Thus, for section B, children who had scored above 21 points were considered to be "pass" which means 'not at risk'. 948 children as observed by their respective Balvadi teachers, as per the scores did not require any further audiological assessment. A child with reduced sensitivity in hearing would be logically expected to give responses such as 'some times / Rarely/Never' for items mentioned in the section B of the hearing screening tool and would obtain a minimum score and maximum score in the range of 0-14.Thus, children who had obtained scores below 14 were categorized 'At Risk.' There were 15 children who were categorized 'At risk' with the help of this tool, needed further hearing screening with OAE. There were 53 students who had obtained score between the range of 15-20, though do not require further assessment need to be monitored .

Graph 4.2: Number of Children categorized as 'at risk, pass, to be monitored as per the obtained score

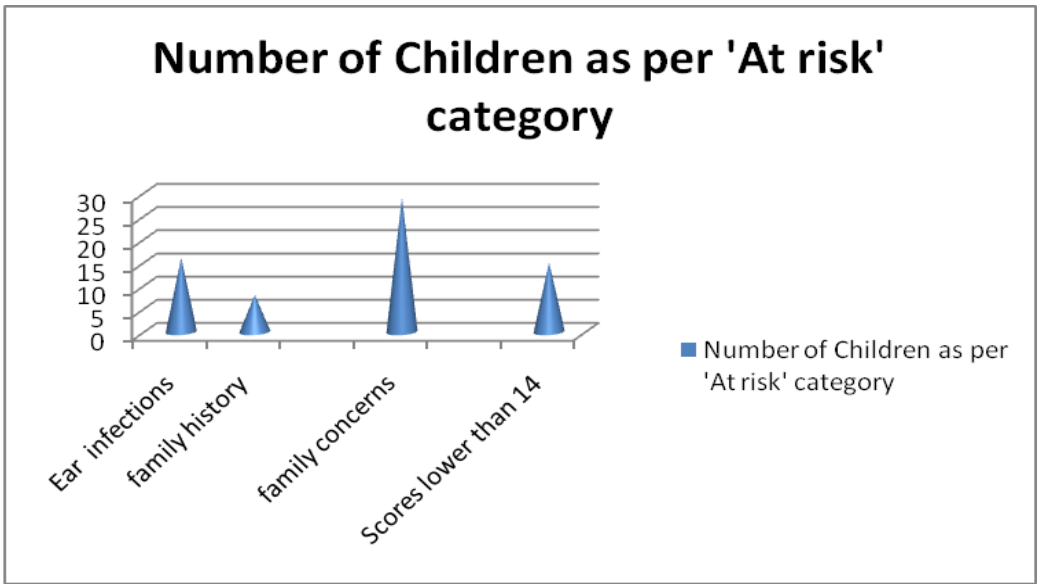


Thus, 16 children due to history of middle ear infections, 8 children due to family history of deafness, 29 children due to concern about speech and hearing shown by the family and 15 children who had obtained scores less than 14 (which means their responses to speech /sound were not appropriate) were categorized as 'At risk'.

Table 4.4: Total number of 'At risk' children and category they belonged to

At risk category 1	Ear infections	16
At risk category 2	family history	8
At risk Category 3	family concerns	29
At risk category 4	Scores lower than 14	15

Graph 4.3: Distribution of children as per risk factors



However there was some overlap in the categories were seen. For example, out of 15 children categorized as 'At risk' as they had scored less than 14 in the B section of the screening tool , 2 children had history of middle ear infections and 7 families had shown concern about child's hearing/speech/speech clarity.

Out of these, excluding the names which were repeated twice /thrice under different categories only 49 students needed to be further screened to rule out hearing loss with some audiological test.

When teachers were probed individually to reconfirm the issues with children, 8 cases surfaced as erroneously marked having speech /hearing problem by the teachers. Example ,a teacher reported that, her judgment about a child's responses to verbal commands was erroneous, and though she presumed it to be due to hearing loss, actually child was newly exposed to English and primarily was not responding due to instruction in new language, but eventually she started responding extremely well to the teacher's verbal commands. Thus, actually hearing screening needed for only 41 children. Balvadi

teachers of these children were contacted individually via telephone to fix the date and time for further assessment. It would have been ideal to test these children onsite with some portable OAE, however the noise levels in these municipal schools were so high this was the prime reason why in the research planning it was decided to test these children in Centre for Audiological Assessment and Intervention (CAAI) which has conducive acoustic environment for audiological testing and latest infrastructure to perform OAE testing. This was another reason that only Balvadi students from M ward (which covers Chembur and nearby area) were considered, so that the distance should not pose a hindrance for further hearing screening test for the identified 'At Risk children'.

Researcher had to make repeated calls and send reminders to Balvadi teachers for contacting parents of children categorized as 'At risk'. There was a very cold response from parents once they were asked to get their child for further audiological testing. Out of 41, only seven parents reported for further audiological testing at CAAI. Out of the remaining 34 children, one child from an orphanage could not report for hearing testing till this report was finalized due to heavy ear discharge. The child is presently undergoing treatment under an ENT surgeon. He will be assessed once he obtains clearance from the ENT surgeon. Two parents refused to get his child for further testing as she claimed; child is already under care of another hearing professional

However, Thirty one parents showed reluctance for further audiological assessment stating that their child does not need testing for hearing. Out of these two parents made an effort to telephonically talk to the researcher to express that they do not have any concern regarding speech or hearing of the child.

Table 4.5: profiling of At Risk children

Total 'at risk' children identified with hearing screening tool	49
Came for further hearing screening at CAAI	7
Children did not report for further testing in CAAI	31
Parents refusing testing at CAAI due already under care of health care professionals	2
Erroneous judgment by teachers	8
Willing for Audiological assessment but pending assessment	1

Out of these 7 children that reported at CAAI all the children clearly passed OAE testing in both the ears, which ruled out peripheral hearing loss in either of the ears. The protocol followed before hearing assessment of all these children was 1.Brief case history of the child 2. Consent from parents for the testing 3.OAE assessment 4. Speech and language assessment of the spontaneous speech of the child, these responses were collected by asking the child simple questions, showing him/her picture cards and asking him to describe the pictures or eliciting responses while playing games like puzzle/pyramid building.

All the seven children were confirmed to have speech and language impairment. Two children were nonverbal out of which one was diagnosed with Down's syndrome and other girl has cerebral palsy. Both these children needed intensive occupational, physical and speech therapy. Parents were guided to take these children regularly for therapy and were given addresses of hospitals, where these therapies can be given under one roof, for very nominal fees. The other five children though had age appropriate language skills, had poor speech intelligibility. Out of which one girl had cerebral palsy and had age appropriate receptive language but had nasality and misarticulations, other

four boys had only misarticulations. All these children need regular speech therapy. Parents of these children have been counseled about need of speech therapy, what is speech therapy and how their child will benefit from speech therapy.

The reason why children with speech and language impairment got identified with this screening tool, which ideally is supposed to rule out hearing loss in children, is simple and logical. There is a close link between hearing and language, we speak what we hear, how much and what we hear determines how clearly we speak. Thus, it is generally seen that speech and language skills are affected in children with hearing impairment. Thus, it was imperative to add items in the questionnaire which targeted, speech intelligibility and receptive -expressive language skills of the child and the question 7 from section A and question 6 and 7 from section B in the screening tool were designed accordingly. Thus six children with speech and /or Language impairment got detected through this screening tool. However, all the children having speech and language impairment need not necessarily have hearing loss. Speech and/or language impairment are witnessed in many other childhood developmental disorders such as Autism, intellectual disability, cerebral palsy, apraxia and such others. However, the fact remains, any delay /deviation in speech /language skills, hearing testing is warranted. Hearing testing will also rule out late onset of hearing loss. Similarly in this study, upon carrying assessment of these six children, who had speech and language impairment, did not have significant hearing loss in either ear

The third objective of the study was to check the efficacy of this hearing screening tool. This could not be completed within the short span of this study, as very few cases from identified ‘at risk ‘category with the help of this screening tool actually reported for further hearing screening by instrumental test. Not a single child out of seven had any significant hearing loss, who had reported for testing. Thus, it was practically impossible to establish the efficacy of this tool statistically.

The main reason for parent's refusal to get their child for hearing testing could be

(1) Teachers were not successful in conveying the importance and need of this hearing screening to parents

(2) Researcher did not a have direct contact with the parents and could not conduct an orientation for these parents to generate enough confidence about this hearing screening.

(3) Parents could be scared of getting their child for testing with the thought that if identified with hearing loss, their child will not be allowed to take education in the present Balvadi.

(4) It could be, parents are influenced by others, who misguide them by saying, child will hear and start speaking as he grows and nothing needs to be done right now.

(5) Parents could be indifferent to the child's issues.

(6) Parents may not find it feasible to get the child for testing, missing their day of work, which also means, letting go their daily wages. For a socioeconomic class they belong to earning money daily could be a bigger priority than taking the child for the testing and missing a day's work.

In the coming months, diligent attempts will be made to contact these parents directly and child's hearing screening test will be completed.

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CHAPTER – V
CONCLUSIONS

The validated tool for hearing screening of the preschool students was developed after rigorous review of literature, taking in to account developmental milestones of 3 to 6 year old children and in length discussion with experts from the field. Though hearing screening with instruments (OAE /PTA) is the most preferred valid method for hearing screening of masses (ASHA,2016), considering the large number of students studying in Balvadis and dearth of professionals and infrastructure, creating a validated tool which will be easy to administer, effective, economical and most importantly meant to target large population was designed for preschool/Balvadi teachers.

Apart from identifying seven children with speech and language impairment, the other direct and indirect benefits the projects rendered are as follows:

(1) Balvadi teachers have been oriented about what to expect in terms of speech or hearing responses from 3 to 6 year old children. This will enable them to spot cases; rather filter out children who are not developing age appropriate skills. Thus, creating awareness among preschool teachers was the biggest achievement of this project.

(2) Getting permission to conduct hearing screening for these preschools was also a challenge. While obtaining the permission, researcher met many administrators, principals and in-charge of NGOs. The discussion mainly covered what is hearing screening, what is the importance of hearing screening, how early identification and intervention is the key for any rehabilitation /habilitation process of any child with disability. Thus, the whole exercise was successful in orienting these administrators about hearing screening.

(3) These preschool teachers are now equipped to refer the cases to the concerned professionals; actually none of the teachers were aware about the profession of

Audiology and speech pathology. This orientation helped them to know, where the 'At risk' cases when identified can be referred.

(4) Children who were identified 'at risk' from this hearing screening tool were expected to report for further audiological testing at CAAI. Preschool teachers had to discuss with the parents, tell them about where their child is not showing age appropriate responses and convince them to bring their child for further hearing assessment. In this whole effort, parents also were made aware about hearing screening and need to consult a professional to facilitate age appropriate skills in their children.

The total preschools covered for this hearing screening projects were 6 Balvadis managed by a NGO, two private balvadis serving elite group and 33 balvadis aided by BMC but managed by a NGO. All the teachers co-operated and filled and returned the questionnaire except one balvadi, which gave one page with a remark stating they do not have child presently studying in their school with hearing impairment.1067 questionnaires were collected, 51 were disqualified upon analysis total 49 children were categorized 'At Risk' and were called for further audiological screening at CAAI. This screening was offered free of cost and appointments were given with mutual consent. Only 7 children reported for further testing, none of these children had significant hearing loss and were declared pass in both the ears with the help of OAE screening, however all the seven children did have speech and language impairment and were referred for further intervention mainly for speech therapy, in some cases physiotherapy along with occupational therapy. Two parent refused to get her child for further testing as the child is already under a hearing health care professional, one assessment is still pending (at the time of submission of this report) due to heavy ear discharge and clearance from the ENT surgeon. However, 31 children categorized 'at risk 'did not report for further hearing screening at CAAI was quite alarming and disappointing. Though this type of screening through a hearing screening tool was strategically used to reach out to maximum preschool children within a short span of five months, refusal of parents to cooperate and inability to finally identify any case with hearing impairment

from the current preschool children demands some modifications in the strategy of hearing screening by questionnaire method.

5.1 SCOPE AND LIMITATIONS OF THE STUDY

The scope of this research is limited to conducting hearing screening of preschool children studying in Balvadis/preschools under the purview of M ward i.e. Chembur area. This screening was carried out though a validated hearing screening tool (questionnaire) followed with the hearing screening of identified 'AT risk' preschoolers with audiological testing with an instrument. This pilot project was to check the feasibility of involving preschool teachers to screen out children with inconsistent /no responses to auditory stimulus. The questionnaires filled by balvadi/preschool teachers were collected and analyzed to filter out 'At risk' children. Preschool hearing screening is not often conducted in India and there needs to be an ideal hearing screening procedure which is feasible, economical and successful. There are not many studies reported in Indian context which discuss the most suitable hearing screening method for Indian context. Thus, this small scale study was conceptualized to evaluate hearing screening through a validated screening tool.

5.2 LIMITATIONS

(1) The hearing screening of the children identified 'At risk' was dependent on parents bringing their children to CAAI for further audiological testing. Parents' refusal to get their children for further testing was the biggest limitation of this study and lead to inconclusive status of 31 children actually identified 'at risk' with this study.

(2) The hearing tool had 7 questions in the section A and 11 questions in section B. Three questions had to be omitted for analysis as majority of the teachers had misinterpreted the questions in spite all the teachers had attended the orientation program. These questions probably need reframing. One more orientation session for these teachers would have been desired, where progress check while actually filling the questionnaire could have been conducted.

(3) Though teachers filled the questionnaire for all the children, they were apprehensive about filling the responses for the each child. The number of questions and the answers to be chosen for each question out of five options did look tedious for these balvadis teachers.

(4) The biggest challenge to conduct this study was the short span and timing of the study which coincided with the summer vacations. Even after school reopened, teachers and administrators requested researcher to collect the filled questionnaire after a month and half as that much time was required by the teachers to settle down the new entrants in balvadis and observe their responses.

(5) Many measures which could have been repeated or introduced such as one more training session for the teacher or conducting a session for parents thus establishing a direct rapport with the parents. This was beyond scope of this study mainly due to its timeline.

(6) Results of this study cannot be generalized; a population study like this will require a bigger sample from different areas, whereas samples for this study were selected only from Chembur area.

5.3 SUGGESTIONS FOR FUTURE RESEARCH

(1) A district level study needs to be conducted covering all the balvadis to evaluate feasibility and validity of hearing screening through questionnaire.

(2) A comparative study of hearing screening through validated hearing screening tool and hearing screening through instrumental test can be done to decide the valid method in terms of results, time consumed and money and other resources involved.

(3) To evolve an appropriate and pragmatic hearing screening program in India, a in depth study of the already existing preschool hearing screening programs can be undertaken.

5.4 RECOMMENDATIONS

(1) Identification of hearing impairment and other childhood disabilities in the preschool level will need more active efforts from various agencies. More avenues need to be created to spread awareness on hearing loss and other childhood disabilities among preschool teachers.

(2) A very preliminary screening can be made mandatory or can be practiced by every educational institute before the admission of the each child is confirmed in the school.

(3) More systematic efforts can be put in to create importance of early identification and intervention of childhood disabilities among parents. Schools can invite experts to conduct awareness about disabilities among parents.

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Appendix A

Teacher's name: Phone:

Participant Number: Date:

A.	**Demographic Information**	
1	Name :	
2	DOB :	
3	Gender :	F/M
4	Name of the School :	
5	H/O Ear infections/Ear Discharge /recurrent cold	Yes/No
6	Any family member has deafness?	Yes/No
7	Anybody (parent /care taker/relative) has mentioned that child can't hear/doesnot speak/doesn't speak clearly	Yes/No

B.	**Child's responses to sound ,Language stimuli**	Always	Most of the times	Some times	Rarely	Never
1	Child responds to his name when called out from a distance / other room.					

2	Child responds to his name even in noisy situation. Eg – During lunch time when children talk to each other and it is noisy, if you call out to the child, does she/he respond?					
3	Does the child respond to music /rhymes by clapping or dancing or humming the tune or trying to sing himself /herself					
4	When engrossed in an activity child responds to other sounds like school bell/ door bang /phone ring					
5	Child understands requests such as open your bag / pick up a crayon **ONLY WHEN ACCOMPANIED WITH GESTURES**					
6	When you say “show me your nose” / where is your mommy child is able to point out .(**TEACHER DOESN’T USE ANY GESTURE AND CHILD LISTENS TO VERBAL INSTRUCTIONS**)					
7	Child tells names of most common objects.eg fan ,shoes ,bag, door ,phone etc					

8	Speaks clearly that most strangers can understand what he/she is saying					
9	Child communicates his needs more with gestures					
10	Child is inattentive/less interested in the class					
11	During individual conversation, child makes requests for repetitions or uses uh? What?					

APPENDIX B:

To,

Shikshan Adhikari

Mumbai

Dear Sir,

I am Dr Gayatri Sirur, Associate professor of CCYM's Hashu Advani College of Special Education (Chembur).**HACSE** (Affiliated to University of Mumbai, Aided by State Government, Accredited by NAAC and Recognized by the Rehabilitation Council of India) has been in the field of disability management for more than two decades. The core activity of the college is to impart training to teachers for the deaf. **CAAI (Center for Audiological Assessment and Intervention)** is the new endeavour of **HACSE**. Equipped with modern infrastructure for **specialized hearing testing for babies and young children** , CAAI advocates **early identification of hearing loss through hearing screening.**

Early identification is the key word to ensure age appropriate development of these children with hearing loss. Ruling out hearing impairment in all the babies and young children is a challenging task which we wish to address. One of the solutions for this is conducting **hearing screening at mass level**. There are almost no facilities for such screening of children below 5 years.

HACSE (through CAAI) wishes to conduct hearing screening program in nearby preschools. This project has been **sanctioned and funded by University of Mumbai**. I will give a very short and simple checklist - questionnaire for hearing screening to the class teachers and the teachers are expected to fill the questionnaire which further will be analysed. Children who seem to show high risk for hearing impairment will be referred for hearing testing at CAAI.

Kindly note that, under this project I intend to reach unreached underprivileged population rather than English medium private pre schools mushrooming in Mumbai. I will be highly obliged if you grant HACSE the permission to distribute and collect checklists to teachers from the preschools under your regulation. The role of BMC would be acknowledged in the report. This will be the real example of people participation in the development of the children.

Thanking you,

Yours Truly,

Dr Gayatri Sirur
9323790584
sirurg@gmail.com

APPENDIX C:

INFORMED CONSENT

I, Dr Gayatri Sirur, Associate Professor of Hashu Advani College of Special Education have undertaken a research project titled ***'Screening for Hearing Loss among the Preschoolers: Development of a Tool and Measurement of its Efficacy'.*** This project has been sanctioned and funded by University of Mumbai.

I wish to do hearing screening of the preschoolers from your esteemed school in the following ways

i) Validated questionnaire for hearing screening will be given to the class teachers. (I will conduct orientation for the teachers and guide them about how to observe responses in the child and how to fill the questionnaire).

ii) Responses given in this questionnaire will be analysed and High risk (for hearing loss) children will be screened out.

iii) These High Risk children will undergo hearing assessment (free of cost) at Hashu Advani College of Special Education, Chembur

The data collected from your school will remain confidential and will be strictly used for this research project only. Participation in the study is voluntary. You may withdraw from the study at any time without penalty. There are no risks involved in participating in the study.

I will be highly obliged if your school agrees to participate in this study. Kindly confirm your participation by signing the consent form.
Thanking You,
Yours Sincerely

Dr .Gayatri Sirur

Consent

I have read the above information and confirm participation of my school in the project titled '**Screening for Hearing Loss among the Preschoolers: Development of a Tool and Measurement of its Efficacy'.**

Name of the school

Signature
Head of the Institution **Date:**

APPENDIX D:

APPENDIX E: