



## Infant Hearing Screening in India: Current Status and Way Forward

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### ABSTRACT

Loss or impairment of auditory sense is the most prevalent deficit of all the sensory organs. With virtually no mortality, hearing impairment causes huge impact on one's social, educational and economic well-being. There are 5-6 infants who are hard of hearing out of 1000 neonates. They will not be identified till they attain 2 or more years of age, by then irreversible damage would have been done. Universal screening for hearing of new-borns is the only way to decrease the burden of deafness in our society. There are tools available which can be administered by health workers after initial training for screening the infants for hearing impairment. Under the aegis of National Programme for Prevention and Control of Deafness (NPPCD) of India universal screening can and should be applied. The programme would entail additional financial burden for the initial purchase of screening machines and rehabilitating the identified children.

**Keywords:** Deafness, hearing, impairment, India, new-born, universal screening

### INTRODUCTION

Ability to hear is one of the five primary senses which help us to communicate properly with fellow human beings. Unfortunately, the sense of hearing is often taken for granted and people do not realize its importance unless it is lost or impaired. Until recently, the problem of hearing loss was not a priority for the Indian Government. However, with the advent of National Program for the Prevention and Control of Deafness (NPPCD) there is a

renewed interest in this mammoth public health problem. Important causes of hearing impairment are ageing, exposure to excessive noise, head, and ear injury, use of ototoxic drugs and infectious diseases such as meningitis, measles, mumps and chronic ear infections, and congenital defects. Half of all these cases of deafness and hearing impairment are avoidable through prevention, early diagnoses and management. Auditory sense is crucial for the mental development of a child. Identifying the hearing loss early will prevent the problem to go out of hand. This will also decrease the burden of hearing loss and thus many presumptively productive years lost will not happen. Screening of the newborns and infants is the cost-effective way to reduce the burden of hearing loss. "Catch them young" should be the central theme of any program for the control of deafness. The objective of the current review is to see the status of the screening the neonates for the hearing impairment in India and the suggesting ways of incorporating it in the national program.

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Globally, hearing loss is the most common sensory deficit in human beings. Hearing impairment can range from slight to profound.<sup>[1]</sup> Moderate to profound hearing loss is disabling conditions which affects 360 million people worldwide, according to the 2012 estimates of the World Health Organization.<sup>[2]</sup> Hearing loss is the second most common cause of years lived with disability (YLD) accounting for 4.7% of the total YLD.<sup>[3]</sup> The much-referred prevalence data for India put 6.3% of Indians suffering from significant auditory loss.<sup>[4]</sup> Rural areas have a high prevalence of hearing loss than urban areas.<sup>[5]</sup> As per 58<sup>th</sup> round of National Sample Survey Organization survey in 2002, currently there are 291 persons per 100,000 population who are suffering from severe to profound hearing loss. Of these, a large percentage is children between the ages of 0–14 years. The survey results revealed that about 7% of people have a congenital hearing loss.<sup>[6]</sup>

The deafness acquired in childhood has an enormous impact on the social, economic, and productive life of an individual. At the same time, there is a huge gap in human resources in health care to meet this health challenge. The Government of India has retained primary health care (PHC) as the strategy of choice for the provision and implementation of prevention of deafness. The Union Government initiated the NPPCD in 2006.<sup>[7]</sup> Initially started as a pilot project in 25 districts in 10 states and 1 union territory, it has been scaled up to cover 203 districts in all states and union territories of the country. The program was launched with the long-term objective of reducing the total disease burden of hearing impairment and deafness by 25% at the end of the eleventh 5-year plan (2007–2012). The program has been merged with the ambitious National Rural Health Mission, an umbrella program, both at the state and district levels. The major components of the program are capacity building and manpower development, wherein each level of health care provider is sensitized to the hearing and ear care, ear health promotion and prevention where the grassroots workers and health personnel delivers information, education and communication (IEC) messages on a continuous basis to community members, early detection of ear problems and management by house-to-house surveys to ascertain hearing problems in all age groups by the Anganwadi Workers and Accredited Social Health Activists, organizing community screening camps regularly at PHC/Community Health Centers/district level to screen the population for deafness and hearing impairment, referral of complicated cases to state medical colleges, rehabilitation and hearing aid provision. A proper system of monitoring and supervision is in place to constantly evaluate the program with predefined indicators.

## HEARING LOSS IN WORLD AND INDIA

By screening, the disease is identified earlier than its usual time of diagnosis. Neonates and infants are not routinely screened for any specific disease in India because of the pressing need to control the infectious causes and deaths due to it. 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.<sup>[8]</sup> Many disabilities can be avoided if we have a proper screening program.

Out of every 1000 children born in India, there may be 5–6 such children who cannot hear properly.<sup>[9]</sup> Because there are no visual indicators, most hearing-impaired children who are not screened at birth are not identified until between 1½ and 3 years of age, which is well beyond the critical period for healthy speech and language development. However, with the help of newborn hearing screening, a hearing-impaired child can be identified and treated early. In such a case, the child will most likely develop language, speech, and social skills comparable to his or her normal-hearing peers, and thus avoid a lifetime of hearing-loss related disabilities. There has never been any attempt to screen the neonates or infants for hearing defects in large scale in India. The Department of Prevention of Communication Disorders of All India Institute of Speech and Hearing (AIISH) located in the Southern India, conducts infant screening for hearing disorder on regular basis in different hospitals attached to it using Behavioral Observational Audiometry, Otoacoustic Emissions (OAE) screening, and administering High Risk Register (HRR). In the year 2009–2010, a total of 12416 newborns in 10 hospitals associated with AIISH were screened for hearing disorder. Of them, 1010 infants were referred for further check-up.<sup>[10]</sup> The following paragraphs deals with various issues related to the hearing screening of infants in India.

### Time of screening

The formula followed in USA is 1-3-6, that is, screen newborn before 1-month of age, confirm the diagnosis of hearing loss and fit hearing aid before 3 months, and enroll the child for early intervention before 6 months of age.<sup>[11]</sup> The similar formula can be followed in India with screening of every child delivered in a health center before discharging the mother and child.

### Screening techniques

The auditory function can be either peripheral (cochlear) or central (brainstem). The available techniques can differentiate the two. No single test can detect all failure patterns in the auditory system. Thus, use of two tests for the screening of newborns for deafness is recommended. Sequential (two stage) testing can be

done to detect hearing impairment. A less expensive, less invasive procedure (OAE) is performed first, and those who screen positive are recalled for further testing with a more expensive, more invasive test Auditory Brainstem Response (ABR) which may have greater sensitivity and specificity. Two phase screening using two different electrophysiological measures, OAE and ABR allows detection of various failure patterns and provides more complete information about the auditory function.<sup>[12]</sup> OAE measures whether parts of the ear respond properly to sound. During the test, a plastic probe containing both a transmitter and a microphone is inserted into the infant's ear. The transmitter sends sounds down into the inner ear, and the microphone picks up the vibrations the hair cells make in response. In normal-hearing persons, the ear "echoes" sounds, and this "echo" can be detected by the OAE machine. Since the probe of the OAE machine which is very soft and comes in different sizes, is placed just inside the ear canal of the infant it does not cause any discomfort in the child.

### Behavioral screening method

Behavioral techniques to detect hearing loss usually give correct result in infants more than 6 months of age. These tests relying on operant conditioning involves testing an infant's response to specific tones projected within a sound-proof room from different directions. When performed correctly, these tests can yield accurate audiometric thresholds in children as young as 6 months of age who have normal neurologic development. However, in younger infants and in those who have a developmental delay or certain physical disabilities, behavioral tests of any type are unreliable and have a low specificity.<sup>[13]</sup> The behavioral technique for hearing has a sensitivity value of 66.7%, specificity value of 86.9%, positive predictive and negative predictive values of 5.6% and 99.6%, respectively compared to evoked OAE test.<sup>[14]</sup> The major advantage of the later behavioral test is identification of later onset or progressive hearing impairment.<sup>[15]</sup>

### RECOMMENDATION

The screening program can be started initially in the districts where the national program (NPPCD) has been initiated. Gradually, the program should cover the whole country. The infrastructure already developed under the program can be utilized for the screening. It will not create an additional financial burden on the system except the cost of OAE/ABR machines provision of which is already envisaged under NPPCD. Use of IEC materials developed by NPPCD and by Society for Sound Hearing (an agency for the hearing care of masses) should be judiciously used. Properly designed epidemiological studies should be performed to understand the burden, risk factors, knowledge, and

practices regarding the infant hearing loss. These studies will help in fine-tuning the program. Mechanisms should be developed for communicating results of follow-up activities with the parents/guardians and the child's physician, audiologist, and speech therapist. The program managers should identify, develop, and disseminate IEC materials regarding effective hearing screening programs to the community.

Each district hospital can be made the nodal center where data are collated. Critical performance data, including number of infants born; the proportion of all infants screened; the referral rate; the follow-up rate; the false-positive and false-negative rate should be collected in a timely manner.

Many times a new-born does not present with hearing loss at the time of birth. Hearing loss may manifest at a later stage. These children should be re-screened periodically. Since screening every normal-hearing infant every 3–6 months may not be feasible, infants who are at risk of developing hearing loss should be screened every 3 months for hearing. Some of the high-risk infants are, mother infected with rubella or cytomegalovirus during pregnancy, bacterial meningitis in the infant, and head injury. A HRR can be maintained at each health center in which the names and contact details of the infant who are at risk of developing hearing loss later in life is written. If any infant fails a screening test, he/she should receive full audiological and otological examination.

### CONCLUSIONS

Every individual has a right to lead a healthy life. Communication disorder like hearing impairment has its onset very early in life. Only through systematic early detection programs will infants with hearing loss can be assured of a chance to develop their full potential to become fully active, contributing, and integrated members of society. For their sake and ours, 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.

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