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Prevalence of Neonatal Hearing Impairment Among Different Institutions At Agartala- A Multicentric Study

KEYWORDS

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ABSTRACT *Hearing impairment is a major problem worldwide, significantly delaying acquisition of speech in children. Unfortunately delayed detection of hearing impairment especially in developing countries, adds a significant burden on the society and the nation. Hence early detection of hearing impairment is imperative and the need of the hour lies in developing an easy, cost effective and reliable method for testing large number of infants, Otoacoustic Emissions(OAEs) being one such test. The objective of this study was to asses the effectiveness and utility of Distortion Product Otoacoustic Emissions (DPOAE) as a screening tool for assessment of hearing impairment in infants and to assess the relationship between selected risk factors and hearing loss.1*

Objective : To determine the incidence of hearing impairment in a standardized population of neonates seeking care in Tripura Medical College and Indira Gandhi Memorial Hospital , Agartala ,Tripura, India. Universal hearing screening is implemented in many developed countries. However, neither universal screening, nor high risk screening, exists in India. The incidence of hearing loss in India is found to be 1 to 6 per 1000 newborns screened. 2-4 Screening only the high risk neonates misses 50% of babies with hearing loss, 5,6 hence a cost effective universal screening is the viable option to sustain such a program. In our study, the possible burden of hearing disability was evaluated in babies born at Tripura Medical College and Indira Gandhi Memorial Hospital.

Introduction : Hearing is a vital part of a newborn's contact with his environment. The ability to communicate, acquire skills, and perform academically is all greatly dependent on the ability to hear; especially in the present era which is quite dependent on audio-video based on technology. The less privileged youth of our country depends largely on business outsourced from other countries for economic stability. In this scenario, hearing and language skills are of prime importance, even to the poor urban slum dweller. [17]

As hearing impairment is a hidden disability, it is usually detected after 2 years, by which time there is irreversible stunting of the language development potential.[5] Many developed countries have well established universal neonatal hearing screening programs. Considering the infrastructure limitations in India, it is crucial to adopt a cost effective way of detecting hearing loss to make this program viable. This study was undertaken to evaluate the possible burden of hearing loss among the neonates born in a tertiary care center in northern India and to justify the implementation of a universal hearing screening program in India, using cost effective and

appropriate technology. Screening of neonates was done using Transient Evoked OtoAcoustic Emissions (TEOAE) and Automated Auditory Brainstem Response (aABR). [17]

This study was undertaken in order to detect the frequency of congenital hearing loss among neonates in Tripura Medical College and Indira Gandhi Memorial Hospital , Agartala , Tripura,

India. The study also identifies the challenges in implementing a universal screening programme in normal neonates in Agartala and is among the few similar articles from Agartala, Tripura.

Materials and method : The study was conducted prospectively on all neonates born in Tripura Medical College and Indira Gandhi Memorial Hospital , Agartala ,Tripura, from 1st November, 2013 to 31st October, 2015.

Parents or the grandparents of the neonates were informed about the study and motivated to undergo the screening program. An informed consent was taken from the parent/guardian and approval of research and ethics committee was obtained.

Using a pretested questionnaire, [7] potential risk factors were identified. Both the normal and high-risk neonates underwent hearing assessment after 48 hours of birth using TOAE as the first level of screening. Neonates who failed the initial screening were subjected to repeat testing with TOAE after one month. This was done in the Department of Otolaryngology at Tripura Medical College and Indira Gandhi Memorial Hospital , Agartala, Tripura, using a Neuro Audio Screener SN0009TW™, which is a completely automated analysis system that gives a "PASS" or "REFER" result. Absence of emissions for 2 out of the 4 frequencies tested (2 kHz, 3 kHz and 4 kHz) was given a "REFER" result. Infants who failed the screening twice were undergone Automated Auditory Brainstem Response audiometry (aABR) was used to confirm and determine the extent of deafness in the neonates. Data from the questionnaire and the results of the testing were tabulated in Neuro audio Screen Manager™ and subjected to analysis.

The recommendations of the JOINT COMMITTEE ON NEONATAL SCREENING include the following conditions where screening should essentially be done [8-11]

1. H/O in utero infections such as rubella, cytomegalovirus, herpes, toxoplasmosis, syphilis.

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2. H/O use of ototoxic drugs by the mother during pregnancy.
3. H/O excessive intake of alcohol by the mother during pregnancy.
4. H/O prolonged/hazardous labour.
5. Any illness that necessitated admission of the child in a neonatal intensive care unit (NICU) immediately after birth.
6. Any illness requiring hospitalization for 48 hours or more in the first 4 weeks of birth.
7. Birth weight of the baby below 1500 Gm.
8. APGAR score below 4 at 1 min or 6 at 5 min after birth.
9. Any recognizable syndrome at birth where hearing loss is known component of syndrome like down syndrome etc.
10. Family h/o permanent marked sensory neural hearing loss.
11. Presences of any craniofacial anomalies of the pinna and the ear canal.
12. Babies born out of consanguineous marriage.

Other risk factors included in the study:
1. Multiple pregnancies
2. H/o Eclampsia in mother
3. Systemic maternal diseases like diabetes mellitus, hypothyroidism and hypertension

Results : Among the 2068 neonates that were screened initially, 96 babies failed the first screening (4.64%). Out of the failed neonates (07 lost to follow up) came for follow up, out of which 9 babies failed in the second screening as well. Hearing loss in these 9 (0.4%) babies was confirmed using ABR. These findings are depicted in Table 1.

Two neonates out of the 9 who failed to have identifiable risk factors, which were **low birth weight < 1.5 kg** (1 baby), **severe birth asphyxia** (1 baby), **Down's Syndrome and high TSH level** (1 baby), **Periventricular leucomalacia** (1 baby), **Congenital CMV + Rubella infection & CNS involvement** (1 baby), **Omphalocoele** (1 baby), 1 baby had no risk factor for hearing loss.

Table 1. Screening algorithm

Total neonates	Test passed	Test failed
Initial screening (2068)	1972	96
Second screening (89) 7 patients lost to follow up	80	09

Discussion: It is well recognized that unidentified hearing loss can adversely affect optimal speech and language development, acquisition of literacy skills, academic, social and emotional development. [17] There is robust evidence that the identification and remediation of hearing loss, when done before six months of age for newborn infants who are hard of hearing, enable them to perform significantly higher on vocabulary, communication, intelligence, social skills and behavior necessary for success in later life. [5] In 1994, the Joint Committee on Infant Hearing (JCIH) established in the United States recommended screening of high risk babies for hearing loss using High Risk Registry. [12] Several studies thereafter suggested that up to 50% of all the children with congenital hearing loss have no risk factors and would be missed by screening only those at high risk. [13-16] American Academy of Pediatrics (AAP) in 1999 advocated universal newborn hearing screening programme (UNHSP) and remedial intervention, which is being practiced in most of the developed countries. The AAP Task Force on newborn and infant hearing recommends UNHS by three months of age with intervention by six months of age. The Joint Committee on Infant Hearing (JCIH) position statement provides guidelines that include Newborn Hearing Screening (NHS) soon after birth, before discharge from hospital, or before one month of age, diagnosis of hearing loss through audiological and medical evaluation before three months, and intervention through interdisciplinary programs for infants with confirmed hearing loss before six months of age. [7]

Problems and limitations of our study : One problem we faced was getting a noiseless surrounding in the nursery setting. The babies had hence to be transported to the audiology room for testing which in- creased the discomfort for the relatives. Some babies woke up during transit, increasing the time taken for the test.

To improve the follow-up rate, we coincided the immunization visit with that of screening. Performing a test on that day was a little time consuming because one has to wait for the baby to go to natural sleep.

Conclusion : As it has been aptly quoted by Ralph Waldo Emmerson, "a hearing ear is close to a speaking tongue". The importance of infant hearing screening before the 'critical period' of first 3-4 years cannot be over emphasized. In a country burdened with dearth of resources and manpower, where providing basic education to all children is still a challenge, providing inclusive education to hearing disabled just adds to the economic burden. OAE's testing does hold as a good promise in hearing screening . This study was an attempt to show the importance of developing a hearing screening with DPOAE that when repeated appropriately and when required combined with BERA for cases that fail, serves as effective screening test. [1]

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