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# OUT COMES OF SCREENING IN HIGH RISK NEONATES.

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## ABSTRACT

**Background:** Early detection of hearing loss by screening and appropriate intervention is critical for development of speech, language and cognition. Indian data regarding screening for hearing loss among high risk neonates is limited and hence this study.
**Materials And Methods:** This descriptive study included all high risk neonates admitted to our tertiary care NICU over 1year from August 2018 to September 2019. All the high risk neonates were evaluated with Transient evoked Otoacoustic emission (TEOAE). Automated Auditory Brainstem Response (AABR) was done at three months of age for those neonates who failed in the TEOAE screening. Infants with hearing loss were referred for detailed evaluation and appropriate rehabilitation.
**Results:** Out of 100 high risk neonates, 28% had persistent failure with OAE test and 10% had failure with BERA. Extreme low birth weight, extreme prematurity, mechanical ventilation and perinatal asphyxia were the predominant risk factors associated with hearing loss.
**Conclusion:** OAE is safe and effective method of screening for hearing among high risk neonates.

## KEYWORDS

### INTRODUCTION:

Hearing loss is one of the common congenital problems among neonates. The prevalence of significant hearing loss ranges from 1.2 per 1,000 healthy newborn infants and 2 to 5% in high-risk newborns.

Nearly 50% of congenital hearing loss is due to genetic defects.About 50% of hearing defects can be detected in a selective screening based exclusively on hearing risk criteria.

Early detection and intervention at younger age are critical for future speech, language and cognitive development. Neonates with congenital hearing loss should be identified within the first 3 months of life. However, the average age at detection is currently 24-30 months.

Hearing assessment can be done with either by Transient evoked oto acoustic emission (TEOAE) or by Automated Auditory Brainstem Response (AABR).Even though AABR is considered as the gold standard for hearing assessment, there are limitations for its routine use among newborns. Otoacoustic emissions (OAEs) are sounds of cochlear origin, which can be recorded by a microphone fitted into the ear canal. They are caused by the motion of the cochlea's sensory hair cells as they energetically respond to auditory stimulation. OAEs provide a simple, efficient and non-invasive objective indicator of healthy cochlear function. OAEs may be either spontaneous (SOAEs) or induced by acoustic stimulation (EOAEs).

TEOAE is an effective method for neonatal audiological screening both in the general population and in high-risk infants. Developed countries have universal newborn hearing screening protocols in place. However, Indian data regarding screening for hearing loss among high risk neonates is limited and hence this study.All these high risk neonates were evaluated with Transient evoked oto acoustic emission (TEOAE) before discharge or day seven of life whichever was earlier. In case the baby failed, the test was administered again after two weeks.

Automated Auditory Brainstem Response (AABR) was done at three months of age for those neonates who failed twice in the TEOAE screening. Infants with hearing loss were referred for detailed evaluation and appropriate rehabilitation. Normal hearing was defined on the basis of the presence and persistence of the V wave, for acoustic stimuli of 30dB.

The infants with documented hearing defects (TEOAEs absent/V wave absent on AABR) underwent further evaluation and implementation of the sensorial activation program. All these babies were followed up to six months. Results on categorical variables are presented as numbers and percentages.

### Aims And Objectives:

The aim of this study was assess the hearing loss in the neonates and prevent the treatable causes of hearing loss.

### MATERIALS AND METHODS:

This is a descriptive study done for 100 high risk neonates in the NICU at ASRAM Medical College, Eluru, from August 2018 to September 2019 after due approval from the Institute Ethics Committee. The demographic parameters and important clinical details of all high risk neonates admitted during this period were collected.

### RESULTS:

In the present study the risk taken are pre term gestational age between 27 to 34 weeks, hyperbilirubinemia, sepsis, family h/o deafness, intra uterine infections, APGAR Score (<6) and mechanical ventilation (5 days). Out of 100 cases, 25(25%) cases had risk factor pre term gestational age, 16(16%) cases had sepsis, 15(15%) cases of hyperbilirubinemia requiring photo therapy and exchange transfusion, 11(11%) cases had intra uterine infections, 9(9%) cases had a family h/o deafness, 10(10%) cases had low APGAR score, 14(14%) cases had prolonged ventilation (Table 1). After 1st OAE screening out of 100 cases 53(53%) cases passed and 47(47%) cases referred. 12(26.6%) preterm cases passed and 13(27.6%) cases referred. 7(13.2%) sepsis cases passed and 8(17%) cases referred. 10(18.8%) cases of hyperbilirubinemia passed and 11(23.4%) cases were referred. 6(11.3%) cases of family h/o deafness passed and 4(8.5%) cases referred. 4(7.5%) intra uterine infections cases passed and 2(4.2%) cases referred. 5(9.4%) cases of low APGAR score cases passed and 6(12.7%) cases referred.9(16.9%) cases of prolonged ventilation passed and 3(6.35%) cases referred (Table 2). After 2weeks theses cases were retested.

Out of 47cases, 5(26.3%) preterm gestational age cases passed and 8(28.5%) cases referred. 8(42.1%) hyperbilirubinemia cases passed and 3(10.7%) cases referred. 4(14.2%) cases of family h/o deafness were referred. 1(5.2%) cases of intra uterine infections passed and 1(3.5%) cases referred. 2(14.2%) low APGAR score passed and 4(14.3%) cases referred. 3(10.7%) cases of prolonged ventilation referred (Table3) . These 28(59.5%) cases were sent to BERA after 3 months out of which 5(27.7%) cases of preterm gestation were passed and 3(30%) cases referred. 3(16.6%) cases of sepsis passed and 20(20%) cases referred.

2(11.1%) hyperbilirubinemia cases passed and 1(10%) cases referred. 3(16.6%) cases of family h/o deafness cases passed and 1(10%) cases referred. 1(10.4%) intra uterine infections passed (Table 4). 2(11.1%) low APGAR score cases passed and 2(20%) cases referred. 2(11.1%) prolonged ventilation cases passed and 1(10%) cases referred.

**Table.1: Observations And Results:**

| Risk factors | No of cases (n=100) | % |
|---|---|---|
| Preterm gestational age between 27 to 34 weeks | 25 | 25% |
| Sepsis | 16 | 16% |
| Hyperbilirubinemia requiring photo therapy and exchange transfusion | 15 | 15% |
| Family H/O deafness | 9 | 9% |
| Intra uterine infections | 11 | 11% |
| APGAR Score (<6) | 10 | 10% |
| Mechanical ventilation (> 5 days) | 14 | 14% |

**Table.2: Comparison Of Selected Variables Based On Risk Factors And Hearing Impairment After 1st Screening Of OAE**

| Risk factors | No of cases pass (n=53) | % | No of cases referred (n=47) | % |
|---|---|---|---|---|
| Preterm gestational age between 27 to 34 weeks | 12 | 22.6% | 13 | 27.6% |
| Sepsis | 7 | 13.2% | 8 | 17% |
| Hyperbilirubinemia requiring photo therapy and exchange transfusion | 10 | 18.8% | 11 | 23.4% |
| Family H/O deafness | 6 | 11.3% | 4 | 8.5% |
| Intra uterine infections | 4 | 7.5% | 2 | 4.2% |
| APGAR Score (<6) | 5 | 9.4% | 6 | 12.7% |
| Mechanical ventilation (> 5 days) | 9 | 16.9% | 3 | 6.3% |

**Table.3: Comparison Of Selected Variables Based On Risk Factors And Hearing Impairment After 2nd Screening Of OAE**

| Risk factors | No of cases pass (n=19) | % | No of cases referred (n=28) | % |
|---|---|---|---|---|
| Preterm gestational age between 27 to 34 weeks | 5 | 26.3% | 8 | 28.5% |
| Sepsis | 3 | 15.7% | 5 | 17.8% |
| Hyperbilirubinemia requiring photo therapy and exchange transfusion | 8 | 42.1% | 3 | 10.7% |
| Family H/O deafness | 0 | 0% | 4 | 14.2% |
| Intra uterine infections | 1 | 5.2% | 1 | 3.5% |
| APGAR Score (<6) | 2 | 14.2% | 4 | 14.2 |
| Mechanical ventilation (> 5 days) | 0 | 0% | 3 | 10.7% |

**Table.4: Comparison Of Selected Variables Based On Risk Factors And Hearing Impairment After Screening Of BERA.**

| Risk factors | No of cases pass (n=18) | % | No of cases referred (n=10) | % |
|---|---|---|---|---|
| Preterm gestational age between 27 to 34 weeks | 5 | 27.7% | 3 | 30% |
| Sepsis | 3 | 16.6% | 2 | 20% |
| Hyperbilirubinemia requiring photo therapy and exchange transfusion | 2 | 11.1% | 1 | 10% |
| Family H/O deafness | 3 | 16.6% | 1 | 10% |
| Intra uterine infections | 1 | 10.4% | 0 | 0% |
| APGAR Score (<6) | 2 | 11.1% | 2 | 20% |
| Mechanical ventilation (> 5 days) | 2 | 11.1% | 1 | 10% |

## DISCUSSION:

Of these 53 (53%) passed and 47% (47%) failed the 1st OAE screening. They were retested after 2weeks. Out of 47, 19(40.2%) passed and 28(59.5%) failed in 2nd OAE screening. These 28 were sent for BERA after 3 months out of which 18 (64.2%)passed the screening of BERA and 10(35.7%) failed and was referred for further treatment.

In a prospective cohort study conducted by **Mallikarjun S. Tegnoor et al**[1] among normal neonates and high risk neonates. Out of 400 normal babies two cases had impaired hearing and out of 100 high risk cases 6 had impaired hearing. Out of 35 cases of hyperbilirubinemia 2 cases has hearing loss. 1 case has hearing loss out of 20 cases of LBW. Out of 12 cases of Birth asphyxia with hypoxic ischemic encephalopathy 1 case has hearing loss. Out of 5 cases of Bacterial meningitis or bacteriologic proven sepsis 1 case has hearing loss. Out of 24 cases of Mechanical ventilation lasting 5 days or longer 1 has hearing loss. Study by **Aiyer**[2] on 30 normal and 60 high risk neonates found that all the normal neonates had click threshold consistent with normal hearing, 12 of the high risk neonates showed hearing loss out of which 2 had persistent hearing loss. He concluded that high risk infants have a substantially higher incidence of hearing loss as compared to normal neonates. 164 babies were identified as suspected for hearing loss, but of which, only 58 visited the audiovestibular clinic. Among 45 babies who had confirmatory testing, 39 were confirmed to have hearing loss and were rehabilitated appropriately. 30 babies had one or more risk factors; 6 had evidence of TORCH infection and 1 had connexin 26 gene mutation. In a prospective study conducted by **Tania Nazir et al.,**[3] Out of 100 high risk infants tested with ABRs (BERA/ABR) at 1st visit, 49 (49%) infants showed a clear and reproducible wave V (<30 dB HL) and 51 (51%) infants having varying degrees of hearing loss on 1st visit. On follow up, BERA/ABRs were performed on 51 high risk infants who failed the initial BERA/ABR screening. Out of 51 high risk infants, 38 high risk infants showed reproducible Wave V (<30 dB HL) on repeat ABRs test. In a prospective study done by **Jaideep Bhatt et al.,**[4]the incidence of permanent congenital hearing loss according to diagnostic testing was 5 out of 100 newborn with risk factors (5%). And in well nursing baby it was 0.5% which is 10 times less than high risk population. **Yousefi, Jaleh et al.,**[5]did a study in OAE and BERA of 1000 neonates in there study, 18 cases out of 1000 neonates had failed double–checked TEOAE tests. From these 18 failed cases, 6 were confirmed by ABR test (12 false positive results). 9 out of 1000 neonates had impaired ABR tests, from these patients, 6 had failed OAE. In this study (26.6%) the new borns were having term gestation. Study by Shreeya Kulkarni et al.,[6] B. De Capua et al .,[7]& Boo N Y et al.,[8] and Nikithachaudhari et al.,[9] also favoured this study. In this study, we found that most of the newborns (53%) had passed the 1st OAE test. Study by ShreeyaKulkarni et al.,[6]Glen et al.,[10] , Joyce Pascal Rozario et al.,[11] De Capua et al.,[7] also favoured this study. Among 47 cases of newborns who had failed 1st OAE test, most of the newborns (44.1%) had passed the 2nd OAE test in this study. Study by Shreeya Kulkarni et al.,[6]A.Ciorba et al.,[12]Joyce Pascal Rozario et al.,[11] De Capua et al.,[7] also favoured this study.

## CONCLUSION:

Newborn hearing screening is important in recognizing babies born with congenital hearing loss.Otoacoustic emission (DPOAE) is an excellent for screening device for large country like India & Universal newborn screening should be implemented in each and every institution. Indian association of Paediatrics (IAP) also recommends that if hearing loss is screened by OAE and confirmed by BERA, next step should be hearing aid using at the earliest. Hearing aids may be fitted for infants as early as 2 months of age. This should be followed with auditory training and speech therapy. Children with profound deafness who drive negligible benefit from conventional amplification with hearing aids may be considered for chochlear implants.

JCIH recommended that the hearing of all infants should be screened at no later than 1 month of age, those that do not pass screening should have a comprehensive audiological evaluation at no later than 3 recommended that infants with confirmed hearing loss should receive appropriate intervention latest by 6 months of age. Regardless of previous hearing screening outcomes, all infants with or without risk factors should receive ongoing surveillance of communicative development beginning at 2 months of age during well child visits in the medical home. To conclude, it is necessary to secure holistic development of the child by detecting hearing loss at birth and providing remedial measures at the earliest. At present there are no national policies to this effect although under NPPCD there is a planned provision for hearing aids to children. We need to identify those with mild to moderate hearing loss that are amenable to treatment through a universal Newborn Screening Program.

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