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Original Research Article

A study on neonatal hearing screening in a tribal based medical college using screening otoacoustic emissions

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ABSTRACT

Background: Hearing screening is a universal procedure for early detection and prevention of hearing loss. The Oto-acoustic emission (OAE) is a very useful screening test to rule out abnormal cochlear outer hair cells functioning which is lead to hearing loss.
Methods: This prospective observational study was carried out among 600 neonates who were admitted to NICU and post-natal ward from April 2024 to September 2024. Only TEOAE (Transient evoked OAE) was considered for this study.
Results: In this study among 600 neonates, 58.33 (%) neonates were male and 41.66 (%) were females, 155 (25.83%) were normal (without risk factors) neonates and 445 (74.16%) were high risk neonates and finally 544 (90.66%) neonates passed the test after second screening.
Conclusions: Screening OAE is a very reliable, fast, noninvasive and cost-effective approach, particularly for neonates. we can easily rule out the early listening to loss with the aid of the use of the device screening OAEs.

Keywords: Neonatal hearing screening, Otoacoustic emission, Prospective observational study

INTRODUCTION

Hearing loss is the most common congenital phenomenon (3.5-9%) considering all degrees of permanent unilateral or bilateral deafness.[1-5] It can affect in the growth of different abilities, such as the development of speech/ language, leading to emotional distress as well as school and social communication. Auditory stimulation is needed in early months of life for preservation of neural connections in auditory pathways.[6] It has been proven that early diagnosis and treatment with hearing aid as early as possible or within first 6 months of life, the infants can acquire language and verbal communication skills.[7-14] So, the universal hearing screening programs in the very early age are very helpful to find out hearing loss.

Screening OAE (OAEs) [especially TEOAEs] test and auditory brainstem response (ABR) are standardized tests to diagnose hearing problems. OAEs are sounds produced by the movement of outer hair cells within a properly functioning cochlea when stimulated by external sounds. OAEs serve as indicators of the cochlear outer hair cells integrity and function within the cochlea, providing valuable insights into auditory health. In OAEs results are displayed as either a "Pass" or "Refer".

Aim

Aims of this study were followings: This study aims to determine the incidence of neonatal hearing loss among normal and high- risk neonates admitted in post-natal ward and NICU using screening OAEs and to find out the

risk factors associated with neonatal hearing impairment in a tribal based population.

METHODS

This was a prospective observational study conducted on high risk and well neonates were admitted to Neonatal intensive care unit (NICU) and post-natal ward in Jhargram Medical College & Hospital, Jhargram, West Bengal, India. Total 600 neonates were included in the study who were admitted to NICU and post-natal ward from April, 2024 to September, 2024. The study population were selected by purposive sampling from those neonates who were admitted to NICU and post-natal ward and matched inclusion criteria. All data regarding study population were collected and compiled in a structured questionnaire thoroughly looked upon ethical implication. Statistical analysis was done through Microsoft excel spreadsheet 2010 and SPSS software version 16. Total 600 neonates were taken as subjects for the study (sound treated environment). Screening OAEs transient evoked (TE) testing (DP was not carried due to Neonate population for quick testing at the low frequency areas) was conducted by using a transportable calibrated tool (Maico Eroscan) all through the natural sleep of the toddlers (without sedation) and interpreted as "Pass/Refer". Neonates who failed preliminary examination were called for repeat testing within 21 days (apart from any excessive cough and cold cases). Neonates who did not show any response to second test were observed for retesting within 3 months for precise audiological evaluation (diagnostic OAEs along with DP/ABR for threshold estimation/ neurodiagnosis of ABR/ frequency unique ABR also).

The neonates were selected as per the under-mentioned criteria:

Inclusion criteria

Neonates were admitted in the hospital and normal cases in post-natal ward and high risk (diagnosed and evaluated) cases admitted in NICU were included.

Exclusion criteria

Neonates with nonconsenting parent, congenital ear anomaly like any form of anotia, microtia etc. and any form of cerumen impaction, Ear discharge or the same were excluded.

RESULTS

In our study among 600 neonates, 58.33 (%) neonates were male and 41.66 (%) were females, 155 (25.83%) were normal (without risk factors) neonates and 445 (74.16%) were high risk neonates. Both normal and high-risk neonates were screened within 48 hours after birth or before discharge. In the first visit out of 155 normal neonates 140 (90.32%) neonates passed the test and 15 (9.67%) failed to response the OAE test and in high-risk group result was different 300 (67.41%) neonate passed the test and 145 (32.58%) neonates did not respond to the test out of 445 (Table 2). Neonates with high risks that was 445, out of which 115 (25.84%) neonates were admitted with neonatal jaundice, 40 (8.9%) neonates had suffered from neonatal sepsis, 135 (30.33%) neonates were preterm with low birth weight, 150 (33.70%) neonates had history of preterm with birth asphyxia 05 (1.12%) neonates were full-term babies but history of birth asphyxia was present (Table 3). Neonates who passed the test in first visit (Table 1) and those neonates did not respond to OAE were called for follow up within 3 months. Out of 160 neonates about 124 (77.5%) neonates visited for second test. Among 124 (77.5%) neonates only 104 (65%) passed the test and 20 (12.5%) neonates did not show any response to OAE test they were sent for further audiological evaluation and treatment. Only 36 (22.5%) neonates did not come for second visit. So, in our study out of 600 babies 544 (90.66%) neonates passed the test after second screening.

Table 1: Results of otoacoustic emission (TE) test on the first screening (n=600).

Test	N	Percentage (%)
Pass	440	73.33
Refer	160	26.66

N=total no. of neonates.

Table 2: Results of otoacoustic emission (TE) test between post natal ward and NICU neonates (n=600).

Places	N	TEOAE screening			
		No. of "Pass" resulted neonates	Percentage (%)	No. of "Refer" resulted neonates	Percentage (%)
Post-natal ward	155	140	90.32	15	9.677
NICU	445	300	67.41	145	32.58

N=total no. of neonates.

Table 3: Clinical condition among the NICU neonates (n=445).

Clinical condition	N	Percentage (%)
Neonatal jaundice	115	25.84
Neonatal sepsis	40	8.988
Preterm with low birth weight	135	30.33
Preterm with birth asphyxia	150	33.70
Fullterm with birth asphyxia	05	1.123

N=total no. of neonates.

DISCUSSION

OAE is indicated for the early detection of hearing loss for some of reasons, together with the reality that it's miles an objective and screening electrophysiological measure for the cochlear outer hair cells functioning up to outer edge. It has been accepted that the infant distraction test is less sensitive than neonatal hearing screening tests, specifically for moderate impairment and also associated with low specificity.[15] Further screening TEOAE is a completely short, beneficial goal test specifically for neonates and kids. Inside a few seconds we will affirm the consequences (with Pass/Refer) about hearing status, even though OAE is not a regular hearing test, it is a check of measuring the useful and integrity of OHCs. till these days OAE is usually universally used to hit upon early listening to loss (screening purposes) in the neonates and kids though that has massive negative aspects (we are not locating out the degree and form of listening to loss via the test).

According to this study we found, out of 600 babies 544 (90.66%) neonates passed the test after second screening which is very similar to the study carried out by Ravi et al in the year 2013.[16]

From above finding it can be concluded that screening TEOAEs are significantly effective to rule out early detection of hearing loss (pass and refer as per screening) in neonates. By the help of the observe we will without difficulty distinguish the presence of hearing loss from absence of listening to loss in neonates. So, OAE is surely a systematic screening device for evaluation of hearing loss in screening purposes especially in rural areas where the advanced audiological tests are not available.

There are some limitations of OAE test using for neonatal screening. It can only test the hearing pathway up to cochlea but the retro-cochlear pathologies remain undetected.[17] However, it has been observed that retro-cochlear pathologies are very rare in the low-risk neonates and therefore the detection of early hearing loss is uncertain. So, OAE test is a useful tool for routine hearing screening in the population.

Another disadvantage of OAE test is high false positive rate (i.e., normal hearing infants evaluated as hearing impaired by OAE) due to lack of proper acoustic environment, debris in external auditory canal, middle ear effusion, and neurological immaturity.

CONCLUSION

Screening OAEs are a very dependable, fast, noninvasive and cost-effective approach, particularly for neonates. This examine confirmed that, we can easily stumble on (rule out) the early listening to loss with the aid of the use of the device screening OAEs.

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Ethical approval: This study was approved by the Institutional Ethics Committee of Jhargram Government Medical College & Hospital, Jhargram, West Bengal, India

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