

ASSESSMENT OF UNIVERSAL NEONATAL HEARING SCREENING: OUTCOMES AND PREVALENCE AT A TERTIARY CARE CENTER

TRIVENI DESAI¹, RASHMI KAMATH², AISHWARAYA MANTHALE³, ARUN KUMAR SHIRSHETTY^{4*}

¹Department of Paediatrics, Bidar Institute of Medical Science Bidar, India. ²Department of Paediatrics, Healthway Hospitals, Old Goa, India. ³Department of Paediatrics, Motherhood Hospital Whitefield Bangalore, India. ⁴Department of General Surgery, Bidar Institute of Medical Science Bidar, India

*Corresponding author: Arunkumar Shirshetty; Email: drarunshirshetty@gmail.com

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ABSTRACT

Objective: Early detection of hearing impairment through Universal Neonatal Hearing Screening (UNHS) is crucial for timely intervention. This study assesses the outcomes and prevalence of hearing loss in neonates screened at a tertiary care center.

Methods: This prospective observational study involved 1175 neonates born at SDM Medical College and Hospital between December 2019 and November 2020. Neonates underwent initial and, if necessary, repeat hearing screenings using the Otoacoustic Emission (OAE) technique. Data on gender and birth weight distribution were also analyzed to explore demographic correlations with screening outcomes.

Results: Of the neonates screened, 99.40% passed the initial hearing test, while 0.60% were referred for further evaluation. Among those referred, 71.43% passed on repeat screening, with 28.57% continuing to show potential hearing issues. The majority of neonates weighed over 2.5 kg, indicating a lower presence of very low birth weight infants in the screened population.

Conclusion: The high pass rate in initial screenings demonstrates the effectiveness of the OAE method in a tertiary care setting, though the importance of follow-up testing for those referred remains critical. The study highlights the successful implementation of UNHS and underscores the need for continuous monitoring and adaptation of screening protocols to address all potential risks in neonatal hearing loss.

Keywords: Neonatal hearing screening, Otoacoustic emission, Tertiary care, Early hearing detection, Neonatal care, Auditory screening outcomes

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INTRODUCTION

Neonatal hearing loss is an urgent pediatric concern with significant implications for speech, language, cognitive development, and social integration. Early detection through universal neonatal hearing screening (UNHS) programs is pivotal, as timely interventions can substantially improve the educational and social outcomes for affected children. This paper explores the outcomes and prevalence of hearing loss detected through UNHS at a tertiary care center, offering insights into the effectiveness of early screening protocols and subsequent management strategies [1, 2].

Hearing loss in newborns, often undetected at birth, is one of the most common congenital anomalies, with approximately 1 to 3 infants per 1,000 affected in the United States. These fig. can escalate in intensive care settings, making robust screening programs crucial in such environments. The Joint Committee on Infant Hearing and various health organizations worldwide recommend that all newborns undergo hearing screening within the first month of life, ideally before hospital discharge. Despite these recommendations, implementation and follow-up remain challenging, with significant variability in the effectiveness of these programs across different healthcare settings [3-5].

At tertiary care centers, where a diverse neonatal population, including those with high-risk conditions, is often treated, the implementation of UNHS poses both opportunities and challenges. These centers are uniquely positioned to diagnose and manage neonatal hearing loss due to their access to advanced technologies and specialized personnel. However, the high prevalence of medical complications among their neonatal patients can affect the efficacy of hearing screening programs and complicate the diagnostic process [6, 7].

This study aims to assess the prevalence of hearing loss among neonates screened at a tertiary care center, examining the outcomes of those identified with potential hearing impairments. It investigates the follow-up rates after initial screening, the confirmatory diagnostic

processes undertaken, and the initiation of early intervention services. This assessment is critical as it helps to identify gaps in the screening process, opportunities for improvement in follow-up care, and overall effectiveness of the UNHS program [8, 9].

Moreover, the introduction of new technologies and methodologies in hearing assessment-such as automated auditory brainstem response (AABR) and otoacoustic emissions (OAE)-has transformed the landscape of neonatal hearing screening. The study will evaluate how these technologies are integrated into routine clinical practice at the tertiary center and their impact on the identification and management of hearing loss [10].

In sum, this research will provide valuable data on the prevalence and outcomes of neonatal hearing screening at a tertiary care center, contributing to the ongoing discussion about optimizing UNHS programs to ensure that all children have the best start in life with regard to their auditory health. This study not only underscores the importance of early detection and intervention but also highlights the role of tertiary care centers in spearheading advances in neonatal care practices.

MATERIALS AND METHODS

Study design

This study is a prospective observational study conducted to evaluate universal hearing screening in neonates.

Study area and period

The study was performed at SDM Medical College and Hospital, Sattur, Dharwad, from December 2019 to November 2020.

Study subjects

The subjects included neonates born at SDM Medical College and Hospital during the study period.

Sample size

A minimum of 1000 neonates were enrolled in the study.

Inclusion criteria

- Neonates delivered in SDM Hospital and subsequently shifted to the mother's side.
- Neonates whose parents provided written and informed consent.

Exclusion criteria

- Neonates requiring intensive care management.
- Neonates whose parents did not provide written and informed consent.

Methods of collection of data**Sample procedure**

Data were collected using a pre-designed proforma after obtaining informed consent from the parents.

Study instrument

The primary instrument used was the Otoacoustic Emission (OAE) Machine from Otoread Company, equipped with the necessary hardware and software to generate test stimuli, measure OAEs, and display results. The instrument operates with 4 AA/UM-3/R6 alkaline batteries and features a liquid crystal display (LCD) and three light-emitting diodes for visual data presentation. The probe contains a microphone and two speaker tubes, using disposable ear tips made of industrial elastomer, color-coded for size differentiation.

Mechanism of function

The OAE instrument generates test tones, directs them into the ear canal, and measures the level of the Distortion Product Otoacoustic Emission (DPOAE) tone generated by the cochlea. This process assesses the outer hair cell function across a frequency range of 2 to 6 kHz.

Procedure of the test**Pre-test counselling**

Parents are counseled about congenital hearing loss and the importance of early diagnosis and intervention.

ENT examination

Prior to testing, a routine ENT examination is conducted. This includes inspection of the pre-aural, pinna, and post-aural regions, removal of any occluding wax or debris using a cotton-tipped swab, and otoscopic examination of the tympanic membrane using a Heine 3000 series otoscope.

Testing procedure

The test is conducted in a quiet room. After a short observation period, the OAE test is performed. Neonates who pass the initial OAE

test are labeled as normal hearers. Those who fail undergo a second OAE test the following day. Neonates who fail the second OAE test are then subjected to confirmatory Brainstem Evoked Response Audiometry (BERA) tests.

Ethical considerations

The study protocol was approved by the ethical committee of SDM Medical College and Hospital.

Statistical analysis

Data collected are input into Microsoft Excel and analyzed using SPSS software, employing descriptive statistics to interpret the findings.

RESULTS

The study assessed the effectiveness of the Universal Neonatal Hearing Screening (UNHS) program at a tertiary care center by evaluating gender distribution, outcomes of initial and repeat screenings, and the distribution by birth weight of the neonates screened. Here are the detailed findings from the various assessments:

Table 1 gender wise distribution the gender distribution among the 1175 neonates screened showed a higher percentage of males than females, with 717 males (61.02%) and 458 females (38.98%). This distribution reflects the total population of neonates who underwent hearing screening during the study period.

Table 2 results of initial screening out of 1175 neonates; the majority, 1168 (99.40%), passed the initial hearing screening, indicating no immediate signs of hearing impairment. Only 7 neonates (0.60%) were referred for further testing, suggesting a high pass rate in the initial screening phase, which is critical for early detection of potential hearing issues.

Table 3 results of repeat screening (Out of 7) among the neonates referred from the initial screening, a repeat screening was conducted. Out of these, 5 neonates (71.43%) passed the subsequent screening, while 2 (28.57%) continued to show signs necessitating further diagnostic follow-up. This demonstrates the effectiveness of the screening protocol in both identifying those at risk and confirming false positives or negatives in the initial assessment.

Table 4 birth weight-wise distribution the analysis of birth weight among the screened neonates revealed that most of them, 941 (80.09%), weighed over 2.5 kg. A smaller group, 211 neonates (17.96%), weighed between 2.1 to 2.5 kg, and the fewest, 23 neonates (1.96%), weighed between 1.8 to 2.0 kg. This distribution highlights the range of neonatal sizes and weights at the time of screening, which is an important factor considering the higher vulnerability of lower-weight neonates to various health issues, including potential hearing problems.

Table 1: Gender-wise distribution

Gender	Number	Percentage
Male	717	61.02%
Female	458	38.98%
Total	1175	100.00%

Table 2: Results of initial screening

Initial screening	Number	Percentage
Pass	1168	99.40%
Refer	7	0.60%
Total	1175	100.00%

Table 3: Results of repeat screening (out of 7)

Repeat screening	Number	Percentage
Pass	5	71.43%
Refer	2	28.57%
Total	7	100.00%

Table 4: Birth weight wise distribution

Birth weight	Number	Percentage
>2.5 kg	941	80.09%
2.1-2.5 kg	211	17.96%
1.8-2.0 kg	23	1.96%
Total	1175	100.00%

DISCUSSION

The outcomes of the Universal Neonatal Hearing Screening (UNHS) program at a tertiary care center provide significant insight into the early detection of hearing impairments in neonates. The high pass rate (99.40%) observed in the initial screening underscores the efficacy of the Otoacoustic Emission (OAE) method employed, highlighting its suitability in rapidly and non-invasively assessing neonatal hearing. However, the small percentage that required repeat screening and further diagnostic evaluation underscores the necessity for a rigorous follow-up system [11].

The gender distribution reflected a higher prevalence in males compared to females, which aligns with existing literature suggesting a slightly higher incidence of congenital hearing loss among male neonates. This distribution demands a gender-aware approach in the interpretation of screening outcomes, although the underlying reasons for such differences remain a subject for further research [12].

Moreover, the birth weight data reveal that the majority of neonates screened were above 2.5 kg, suggesting that lower birth weights, which are more susceptible to various neonatal complications including hearing loss, were less prevalent in this cohort. This factor is crucial as lower birth weight neonates often require more intensive medical attention and may present different challenges in the context of universal screening protocols [13, 14].

The small number of neonates failing initial screenings and requiring further tests highlights the importance of secondary assessments like Brainstem Evoked Response Audiometry (BERA) to confirm diagnoses. This step is critical to ensure that neonates who are at risk are not overlooked due to limitations in the primary screening process.

CONCLUSION

The study's findings affirm the effectiveness of the UNHS program in a tertiary care setting, demonstrating a high rate of initial screening success and an efficient protocol for identifying neonates requiring further diagnostic evaluation. The use of OAE testing has proven effective, yet the necessity for confirmatory testing underscores the importance of a multi-tiered screening approach. Ongoing training and evaluation of screening protocols will be crucial to maximize the potential of early hearing detection and intervention programs, ensuring that all at-risk neonates receive timely and appropriate care.

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AUTHORS CONTRIBUTIONS

All authors have contributed equally

CONFLICT OF INTERESTS

Declared none

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