

Newborn Hearing Screening: Experience from a Tertiary level Hospital in Nepal

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ARTICLE HISTORY

Received : 12 March 2021

Accepted: 10 Sep 2021

ACCESS THE ARTICLE ONLINE



DOI: <https://doi.org/10.37080/nmj.152>

ISSN : 2645-8438

KEYWORDS

congenital hearing loss, universal newborn hearing screening

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CONFLICT OF INTEREST : None

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ABSTRACT

Introduction: Congenital hearing loss is one of the commonest cause of hearing impairment and deafness in childhood. Early diagnosis and intervention in time help a child to lead a better life with good language and communication skills. Known risk factors include cytomegalovirus infection and premature birth necessitating a stay in neonatal intensive care unit. Universal newborn hearing screening has been implemented by many countries due to easy and non-invasive screening test and their ability to identify children who may need early intervention.

Methods: All the newborns delivered between December 2018 to November 2020 were screened for congenital hearing loss. Average age at screening was more than 24 hours. Those who were referred in OAE (otoacoustic emissions testing) underwent ABR (auditory brainstem response) test and further work up as needed.

Conclusions: The incidence of congenital hearing loss was 1.8 per 1000 live births. This finding is consistent with other previous research. UNHS will be cost effective easy and feasible method for early detection of hearing loss in newborns. Pediatric health services organizations should prioritize universal newborn hearing screening as a part of standard of care in birthing services.

INTRODUCTION

Childhood hearing impairment has a substantial and long-term impact on the child and his or her family. Early detection, intervention and management of congenital and acquired hearing loss will help to lessen the impact and will lead to better speech and language acquisition and academic performance. It will lead to lesser lifelong deficit in personal-social and behavior problems.^{1,2} Exposure to spoken language, its apprehension and be correctly expressive is vital during early childhood. According to Yoshinaga-Itano C et.al. early identification of hearing loss and appropriate intervention within the first 6 months of life has been demonstrated to prevent considerable delays inspect development and its adverse consequences like disorders of psychological and mental behavior and facilitate language acquisition and academic skills. Universal newborn

How to cite (Vancouver Style)

Ray P, Thakali S, Prajapati S. Newborn Hearing Screening: Experience from a Tertiary level Hospital in Nepal. Nepal Med Jor [Internet]. [cited 2021 Oct 01];4(1). Available from: <https://www.nmj.com.np/nmj/index.php/nmj/article/view/152>

hearing screening (UNHS) is a strategy for earlier identification of infants with congenital deafness and hearing loss. Controlled trials and clinical models of universal newborn hearing screening (UNHS) in the early 1990s were in favor of UNHS.³ The rationale for UNHS is based on two basic concepts. First there exists a crucial and critical period for optimal language skill to develop and second is there is improvement in communication skills with the treatment of existing hearing loss and deafness.^{4,5,6} Data from cohort studies shows six months of age is ideal for early identification of hearing loss and appropriate intervention. But if the screening is not done at birth, diagnosis of hearing impairment and deafness is delayed upto three years. Delayed diagnosis leads to late intervention to be initiated with lesser optimal outcomes.⁷

The Joint Committee on Infant Hearing position statement recommended universal screening of newborn for hearing loss before hospital discharge as an essential system for early detection and intervention. It has three component composed of screening before hospital discharge, follow-up and diagnosis for infants needing additional care and the intervention and habilitation for infants identified with hearing loss.⁸ This paper presents the results of the newborn hearing screening program in a tertiary level hospital in Kathmandu Nepal. Nepal does not have its mandatory newborn hearing screening program and hopefully this study may reckon about implementation of universal newborn hearing screening.

METHODS

All the babies born between December 2018 to November 2020 were included in the study and their records were analyzed retrospectively. Any missing records and babies with gross congenital anomalies were not included in the study. The total number of the newborn were 540. Out of them 280 (51.8%) were male and rest were female baby. The babies included from gestation of 26+5 weeks to post-dated term babies upto 42 weeks. Four babies were below 28 weeks of gestation and the lowest weight in this age group was 720 grams. Sixty babies were of gestation age between 28 weeks to

34+6 weeks. Fifty-five babies were of gestational age of 35 weeks to 36+6 weeks. Four hundred twenty-one babies were of more than 37 weeks of gestations. The weight of the babies ranged from 720 grams to 4185 grams. All well infants were screened for hearing loss after 24 hours of birth and prior to discharge from the nursery. Those babies who were admitted in nursery and neonatal intensive care units were screened after they were transferred to mothers' side prior to discharge. In our screening we used OAE as it can be usually done in 1 min. In OAE a small probe is placed in the ear canal to deliver sound stimuli into the auditory system. The sound stimuli are transmitted through the middle ear to the inner ear where the outer hair cells of the cochlea produce an active response or emissions. These emissions are picked up by a microphone in the probe, analyzed by the screening unit and an automated "pass" or "refer" result is displayed on the unit screen. OAE screening is highly sensitive (between 85 and 100%) and reasonably specific (between 91 and 95%). First stage of screening was done as mentioned above. Babies who were referred in-hospital screening test were asked for repeat testing between 2 and 8 weeks after discharge by OAE followed by ABR. Positive second stage results were referred to otolaryngological and audiological consultation for needful intervention after the final diagnosis and preferably before 6 months of age.

RESULTS

The average age of the subjects at the initial screening test was 48h. The pass rate after the first stage of screening was 93.7% (506/540), resulting in a first stage program referral rate of 6.3%. At the second stage of screening at 2 weeks later from the first screening, out of 34 babies tested 30 (88.2%) of the newborns passed the OAE. Remaining 4 newborn were retested at 8 weeks after discharge from hospital and 3 babies passed both OAE and ABR test however one baby was bilaterally referred in both OAE and ABR and subsequently found to have profound hearing loss.

DISCUSSION

Newborn hearing screening has been advocated and performed in the United States

since the pioneer work of Marion Downs in 1964.⁹ However this was not practically feasible at that time for widespread screening due to the time requirements, variable state of newborn arousal, and subjectiveness of behavioral measurements. Even extremely observant parents typically fail to adequately identify hearing impairment in their children before the first birthday and initial parental concerns are frequently overlooked by well-meaning physician and other health care professional. With the availability of automated machines and high-risk registry for screening helped to select those infants who needs to be tested. High-risk categories include newborns with asphyxia, meningitis, congenital or perinatal infections, anatomic defects or stigmata, hyper- bilirubinemia, family history of hearing loss, low birth weight, APGAR scores 0-4 at 1 minute or 0-6 at 5 minute, ototoxic medications and neonatal illnesses requiring mechanical ventilation for 5 days or more than.¹⁰ Data from Colorado experience showed alarmingly high incidence of congenital hearing loss with bilateral hearing loss in at least 1 of every 500 newborns in comparison to other commonly screened newborn disorders like galactosemia, phenylketonuria, hypothyroidism and bilateral sensorineural hearing loss whose incidence is 2,10,25 and 200 per 100 000 births respectively. Earlier screening was based on risk factors for hearing impairment in newborns.¹¹ According to American Department of Education there were more than 70000 children who received special services for hearing impairment in the year 2002-2003. This targeted risk factor-based screening missed about 19 to 42% of profound hearing loss and the children suffered later.¹² So universal newborn hearing screening (UNHS) has been implemented as the standard of care of many countries all over the world.⁸

However, in low middle-income countries like Nepal infant hearing impairment is passively detected when parents notice their children had delay attainment of speech and language as compared to peers. This is generally after two years of age. Due to lack of mandatory screening programs these children suffer from preventable developmental domains like speech, language, socio-emotional and cognitive development

and suffer life- long deficits.¹³ Early hearing detection and intervention (EHDI) services recommend to identify children with hearing loss before 1 month of age, to complete diagnostic assessments before 3 months of age, and to initiate intervention (amplification and language-based intervention) before 6 months of age.¹⁴ The cost benefit analysis of UNHS shows it worth as benefits are much more than drawbacks and cost. It fulfills all criteria for screening like high prevalence rate, effective treatment modalities and easily accessible and cheaper but accurate diagnostic modalities.

In our study the incidence of hearing loss was 1.8 per 1000 newborns. The incidence of congenital hearing loss is estimated to be 1per 1000 live births.¹⁵ However emerging data from UNHS depicts 1 to 3 per 1,000 live births in term healthy neonates, and 2–4 per 100 in high-risk infants, a 10-fold increase. The study result of our study is also consistent with a study done in Iran which showed the frequency to be 0.001 newborns.¹⁶ This is implied with previous researches and indicates hearing loss to be the most frequently occurring birth defect. Similar studies from South Africa shows estimated prevalence rate of permanent bilateral infant hearing loss is 3 in every 1 000 births.¹⁷ This is also consistent with our study. Compared to other studies the sample size was relatively small in our study but the duration of study was also of shorter period and we excluded babies with gross congenital anomalies in our study though they underwent screening and got needful advice.

CONCLUSIONS

It is a basic and innate human right of every child to human communication despite of his or her hearing status. Majority of newborn babies with hearing loss in Nepal are not screened at birth that leads to delay in identification and developmental outcomes are not optimum. Though few centres in Nepal may be doing UNHS, these are not sufficient enough for integrated and systematic coverages. Successful implementation of UNHS is one of the initial and essential steps towards better outcomes for affected individuals and family and that will boost both family and economy.¹⁸ To achieve

this goal, health care management, neonatal health service providers and family should work together and complement each other.

ACKNOWLEDGEMENTS

The authors acknowledge all the participants in the study.

FUNDING: No funding sources

ETHICAL APPROVAL: The study was approved by the Institutional Ethics Committee.

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