

Editorial

Newborn Hearing Screening

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Introduction

Congenital sensorineural hearing loss remains one of the most common congenital disorders in children. The prevalence of permanent bilateral sensori-neural hearing loss varies according to the screening protocols used, and the definitions of severity and type of hearing loss. For well babies, prevalence rates range between 1 and 3 per 1000. However, this rate increases when babies with risk factors for hearing loss are considered. Lack of screening for this relatively common disorder has been called “the great omission” in newborn screening.

Newborn Hearing Screening is a strategy for early detection of permanent congenital hearing loss. This screening separates children into two groups—those with a high index of suspicion (more likely to have permanent congenital hearing loss) and those with a low index of suspicion (less likely to have permanent congenital hearing loss). Those in the first group are referred for diagnostic testing.

Newborn hearing screening is becoming popular as it aims to reduce the age of detection for hearing loss—meaning that diagnosed children can receive early intervention, which is more effective because the brain’s ability to learn language (spoken or signed) reduces as the child ages. Children born with permanent congenital hearing loss have historically performed worse educationally, had poorer language acquisition, social functioning and vocational choices than their hearing peers.

Importance of early Diagnosis

A delay in the detection of permanent childhood sensorineural hearing loss can affect speech and language development and may result in delayed emotional and social development, and later scholastic and vocational difficulties. Interventions for children with permanent congenital hearing loss ranges from devices that amplify sound (e.g., hearing aids) to devices that replace the function of a damaged inner ear (cochlear implants) and spoken and sign language support.

Newborn hearing screening describes the use of objective testing methods -usually otoacoustic [HYPERLINK “https://en.wikipedia.org/wiki/Otoacoustic_emission”](https://en.wikipedia.org/wiki/Otoacoustic_emission) emission (OAE) testing or automated auditory brainstem response (AABR) testing) to screen the hearing of well newborns in a particular target region. Whereas traditional methods of behavioral childhood hearing screening are subjective & deficient. Using these behavioral methods of screening, the average age of identification of children with hearing loss has been shown to be between 18 and 30 months. This falls far short of the recommended standard, that hearing loss in newborns be detected by 3 months of age & intervention implemented by 6 months of age.

Recent advances in the area of hearing screening have facilitated the availability of more sensitive & easy to use screening tools that can effectively & reliably test hearing soon after birth.

Newborn hearing screening programs exist in many countries, including the United

States, the United Kingdom and New Zealand. Many developed countries have adopted universal newborn hearing screening (UNHS) program. UNHS has in fact, become standard practice in medical care & many Asian countries have begun to develop & report studies of different models of newborn screening & rehabilitation programs. Unfortunately they are very costly, technically sophisticated and beyond the affordability of the poor & developing countries of the world where vast majority of the people live.

High-Risk New born hearing screening:

The joint committee on infant hearing in the US (JCIH) has recommended that every newborn infant should be screened. The average age of diagnosis of hearing impairment where universal hearing screening is utilized has been reported to be as low as 3 months. Where universal screening is not available, "At Risk" screening may be conducted utilizing criteria to determine screening. Registration of risk babies & periodical check-up of them also helps in the early diagnosis of hearing impairment. It may be more cost-effective to continue screening to the 6% to 8% of babies who are at high risk of developing hearing loss. In 1994, Position Statement of the American Academy of Pediatrics Joint Committee on Infant Hearing recommended the maintenance of a role for high-risk indicators associated with sensorineural and/or conductive hearing loss in newborns and infants and modified the list of indicators described in the 1990 position statement. The committee recommends a specific hearing protocol for high-risk infants when universal screening is unavailable. The indicators associated with hearing loss for use with neonates are:

- Family history of hereditary childhood sensorineural hearing loss;
- In-utero infection, such as cytomegalovirus, rubella, syphilis, herpes, and toxoplasmosis;

- Craniofacial anomalies, including those with morphological abnormalities of the pinna and ear canal;
- Birth weight of less than 1500 g (3.3lb);
- Hyperbilirubinaemia at a serum level requiring exchange transfusion;
- Ototoxic medications, including but not limited to aminoglycosides used in multiple courses or in combination with loop diuretics;
- Bacterial meningitis;
- Apgar scores of 0 to 4 at 1 minute or 0 to 6 at 5 minutes;
- Mechanical ventilation lasting 5 days or longer; and
- Stigmata or other findings associated with a syndrome known to include sensorineural and/or conductive hearing loss.

The 2007 guidelines were developed to update the 2000 JCIH position statement principles and Infants in NICU also included in high risk target population because research data have indicated that this population is at highest risk of having neural hearing loss.

However, this argument is not tenable because about 50% of infants with hearing loss do not fall within the high-risk category. To identify these children, as well as those in the high-risk group, it is necessary to screen all newborns.

Universal Newborn Screening:

Historically, moderate-to severe hearing loss in young children was not detected until well beyond the newborn period, and it was not unusual for diagnosis of milder hearing loss and unilateral hearing loss to be delayed until children reached school age.

In the late 1980s, Dr. C. Everett Koop, then US Surgeon General, on learning of new

technology, encouraged detection of hearing loss to be included in the Healthy People 2000 goals for the nation. In 1988, the Maternal and Child Health Bureau (MCHB), a division of the US Health Resources and Services Administration (HRSA), funded pilot projects in Rhode Island, Utah, and Hawaii to test the feasibility of a universal statewide screening program to screen newborn infants for hearing loss before hospital discharge. The National Institutes of Health, through the National Institute on Deafness and Other Communication Disorders (NIDCD), issued in 1993 a consensus statement on early identification of hearing impairment in infants and young children. In the statement the authors concluded that all infants admitted to the NICU should be screened for hearing loss before hospital discharge and that universal screening should be implemented for all infants within the first 3 months of life. In its 1994 position statement, the JCIH endorsed the goal of universal detection of infants with hearing loss and encouraged continuing research and development to improve methods for identification of and intervention for hearing loss. In 2000, citing advances in screening technology, the JCIH endorsed the universal screening of all infants through an integrated, interdisciplinary system of EHDI. The Healthy People 2010 goals included an objective to “increase the proportion of newborns that are screened for hearing loss by one month, have audiological evaluation by 3 months, and are enrolled in appropriate intervention services by 6 months”.

The purpose of early detection of hearing problems and intervention is to maximize linguistic and communicative competence and liberal development for children who are hearing impaired. The American Academy of Pediatrics Task Force on Newborn and Infant Hearing recommended that universal

detection of infant hearing loss requires universal screening of all infants. Reliance on a physician’s observation or parental recognition has not been very successful. At least five criteria must be fulfilled before universal screening is justified: (1) the availability of an easy-to-use test that possesses a high degree of sensitivity and specificity to minimize referral for additional assessment; (2) the condition being screened for is otherwise undetectable by clinical parameters; (3) there are interventions available to correct the conditions detected by screening; (4) early screening, detection, and intervention result in improved outcome; and (5) the screening program is documented to be cost-effective. Current available evidence confirms that a newborn hearing screening program fulfills most of these criteria. The American Academy of Pediatrics also recommended five essential elements of an effective UNHS program: screening, tracking and follow-up, identification, intervention, and evaluation.

Screening Methods

Typically a two-stage process occurs in the actual screening of the hearing. Children are screened with either OAE’s or AABR. Children passing the test receive no further assessment. Children who fail the initial screen are usually referred for a second screening assessment either with OAE’s or AABR. Children failing this second assessment will usually be sent for diagnostic assessment of their hearing. There is some variation in procedure by region and country but most follow this basic principle.

Screening personnel vary also, in some regions Audiologists are used, whereas technicians, nurses, or volunteers are used in other programs.

Challenges

Universal newborn hearing screening programs aim to have high coverage rates (participation) and many aim to screen babies by one month of age, aim to complete the diagnostic process for referred babies by three months of age, and aim to begin intervention services by six months of age.

In addition to meeting these targets, one of the key challenges for newborn hearing screening programs is to reduce 'loss to follow-up' (where a child doesn't return for the next stage of the process). The Joint Committee on Infant Hearing (US) has reported that this is a significant problem in state screening programs in the United States and other jurisdictions. Measuring loss to follow-up is an important step in understanding and reducing it.

Hospital-based Hearing Screening

Screening babies in hospitals before discharge is also desirable for at least two main reasons. First, it eliminates the need to ask mothers to return specifically to have their babies tested. Parents are likely to be less enthusiastic to seek detection of an invisible and non life-threatening handicap in their apparently normal babies. Besides, taking an apparently well child to hospital for any "check-up" is viewed as socially and culturally inappropriate in many communities because of the notion that hospitals are established only to cater for the sick. Secondly, it helps healthcare professionals to satisfy an important ethical obligation of ensuring that babies have been examined and tested for a hidden abnormality prior to discharge.

Community-based Hearing Screening

In many developing countries home births and deliveries at private maternity homes run by traditional birth attendants account for majority of babies born outside hospitals. Contemplating newborn hearing screening programs at these various locations may be a logistical nightmare. However, the

experiences in most of these countries show that mothers from all birthing locations take their babies to immunization clinics at designated community health centers. Routine childhood immunization is perhaps the most well-established public health program globally, due to the substantial technical/financial support it receives yearly from UNICEF, WHO and several donor agencies/partners. Its popularity is derived from its preventive value for most childhood killer diseases and because it is offered free to parents. Consequently, immunization clinics have been utilized as platforms for delivering new child health intervention packages, especially in the developing world. They equally offer a ready framework for introducing infant hearing screening. However, community-based screening is not limited to immunization clinics and may be implemented during infant welfare clinics and other child health programs.

Recommendations:

Newborn hearing screening should be started in Bangladesh. Initially this may not fulfill all criteria, but may be expanded day by day if effort is given to achieve goal. At first the program will be launched in referral hospitals like medical college hospitals. Screening can be done by a single procedure like Otoacoustic emission (OAE). Behavioral methods (i.e. Moro reflex) may be a method in primary level of health care (Upazila).

In the community level, babies of delayed or non development of speech should be referred to higher centers for detection of deafness and hearing amplification by hearing aid use or cochlear implantation. To strengthen the program, manpower should be trained.

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