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Commentary

Newborn hearing screening in developing countries: Needs & new directions

Recent surveys indicate that, world-wide, hearing loss is the most common cause of moderate and severe disability and a leading cause of disability in low- and middle-income countries[1]. Children with disability in developing countries are more likely to face discrimination and restricted access to social services, be malnourished, and face physical abuse[2]. Children with a disabling hearing loss are at risk of delayed speech and language development with consequent poor academic performance[3]. Newborn and infant hearing screening, followed by early rehabilitation of positive cases, has been widely promoted in developed countries as an effective form of secondary prevention of disability. There is a clear consensus that hearing screening and intervention at an early age improves later speech and language development outcomes[4] and these in turn, should lead to improved socio-economic prospects in adult life.

In many developing countries family suspicion of hearing disorder is still the main mode of detection of childhood hearing impairment, and diagnosis may not occur until children are two years of age or older[5]. Screening programmes in developed economies have been stimulated by the advent of reliable screening techniques. In particular, the introduction of two objective, rapid, physiological tests of auditory function - otoacoustic emission recordings and automatic auditory brainstem response measures - have enabled newborn hearing screening to be very widely adopted. In many developed economies newborn screening with one of these tests is now mandatory, or at least strongly encouraged, prior to maternity hospital discharge. Where universal newborn hearing screening is practiced, average ages of detection of hearing loss have fallen dramatically. For example, in the Australian state of New South Wales the mean age of diagnosis of infants with permanent bilateral hearing loss declined from approximately 18 months to 1.6 months following the introduction of a universal hearing screening programme for newborns[4]. However, for hearing health care professionals in many developing countries the implementation of neonatal screening is not so straightforward. There are often barriers to the introduction of physiological screening measures. The required equipment can be relatively expensive in a developing country and personnel with the expertise to adequately train screeners are scarce. There is a global shortage of skilled maternal and newborn health workers, particularly in rural areas[6]. In addition, births may not typically take place in maternity hospitals where objective screening test resources are usually located - the majority of births in India are not performed by skilled attendants in a clinical setting[5].

Given that early identification and intervention is vital for infants with significant hearing loss, how can screening be adapted to better meet the realities of developing countries? One option is to consider targeted rather than universal hearing screening. Certain factors, such as a family history of hearing loss, *in utero* infections, craniofacial anomalies, and low birth weight, put newborns at a greater risk of significant hearing loss. Infants with these factors may be more likely to be attended in, or referred to, a hospital setting where objective test procedures can be performed. Reliable hearing screening tests that only target neonates with such risk factors can detect approximately 50 per cent of all babies with major hearing impairment[7]. Targeted screening, although inherently inefficient, may be a good initial starting point for newborn screening before resources become available for full, universal screening coverage. In regions where hospitals are not appropriate bases for newborn hearing screening, community-based screening can be considered. In

many developing countries, mothers routinely bring their babies to immunization clinics and such centres may provide an opportunity for an effective infant hearing screening with a wide population coverage[3,8,9].

However, community-based screening need not be linked to immunization clinics. Ramesh and colleagues[10], in this issue, outline a newborn hearing screening programme that is designed to be used by village health workers and carried out during home visits. Ideally, such a programme would make use of low-cost versions of either of the two objective physiological hearing screening tests mentioned earlier. The authors note that, at present, less costly behavioural and questionnaire methods of hearing screening may be the only feasible option in some developing regions. Behavioural screening tests of newborns require a trained observer to rate newborn responses to sound. In the past behavioural approaches have been of limited success because young infants are often unresponsive to test sounds. Ramesh *et al*[10] have designed low-cost, calibrated noisemakers that produce fixed sound intensities and frequencies and have found that their higher intensity noisemakers - in conjunction with a well - trained observer - provide reliable screening results. They have designed what may prove to be a useful tool to screen for bilateral, severe and profound hearing loss. In this sense they have created an instrument for targeted screening (in that it is not sensitive to neonates with mild or moderate levels of hearing loss) that may be of value in a community-based setting. Well-designed, large-scale studies that evaluate this screening technique in a number of community settings are warranted.

Some community-based hearing screening programmes have used simple, behaviour-based questionnaires to identify infants with hearing loss but results have generally been disappointing[5]. Ramesh and colleagues[10] have chosen to provide parents with a short checklist of normal hearing, speech and language milestones for young children, as a safeguard for infants who have a false negative screening outcome. This is wise and is a practice routinely observed in neonatal hearing screening programmes throughout the world.

A recent World Health Organization document[3] notes that there is widespread agreement on the benefits of newborn hearing screening but that there are little data on the cost-effectiveness of screening. Studies in China[11] and India[12] have carefully examined the cost effectiveness of hearing aid fittings for disadvantaged school children and adults, respectively. Such studies should be used as guidelines for ongoing research that considers the detection and intervention costs for newborn hearing screening programmes in developing countries. It is only with reliable, positive data in this additional area that programmes will be able to fully justify their existence and help promote newborn hearing screening throughout the developing world.

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