Hearing Loss and Associated Risk Factors in Low Birth Weight Infants - A Clinical Study

ABSTRACT

Aim To evaluate the hearing loss and associated risk factors in low-birth weight infants in our institution.

Materials and Methods This study was conducted in 100 infants who were admitted in our hospital between June 2013 and December 2014. Auditory brainstem-evoked response (ABER) was used to evaluate the hearing threshold with response to audiological clicks-associated risk factors.

Results Of the total 100 infants who were taken up for study, 62 infants had hearing loss, and coexisting risk factors were present in 53 children, major risk factor being of genetic origin.

Conclusion Screening in the low-birth weight is mandatory to identify the hearing loss and associated risk factors for early intervention within 6 months of age to reduce the disability in the child and for better rehabilitation.

KEYWORDS hearing loss, brain-stem evoked response, low-birth weight, risk factors

INTRODUCTION

Normal speech and language development depend on the ability to hear. For children, hearing plays an important role in spoken language, learning and for social engagement. Children with hearing loss can be offered appropriate intervention if identified early in life. WHO estimates that 60% of hearing loss can be detected early and preventable. If the hearing loss is not addressed at the early stage, the impact will be on language, literacy, social skills and self-esteem. Early acoustic stimulation within 6 months leads to increased nerve connectivity and better rehabilitation of auditory pathway. Low-birth weight infants are those born with weight less than 2.5 kg. The sooner the child is identified with hearing loss and early he receives support greater the opportunity for learning spoken language. ABER is used to study the integrity of the auditory pathway from external ear to the lower brainstem. It is the simple, noninvasive objective test for early identification of hearing impairment in neonates. Low-birth weight with associated risk factors produces significant disabilities and hearing loss. Neonatal screening is the main mode of early detection of hearing loss. The use of ABER is recommended as the screening procedure, which evaluates the auditory systems upto the brainstem.

MATERIALS AND METHODS

Inclusive Criteria

Infants with low-birth weight less than 2.5 kg who were admitted in our institution.

Exclusive Criteria

Infants with low-birth weight and known complications and risk factors such as meningitis/encephalitis/mothers with hereditary hearing loss.

This study was conducted in 100 infants who were admitted in our hospital between June 2013 and December 2014. Neonates with low-birth weight less than 2.5 kg without known complications and syndromes were...
included in this study after detailed history and general ENT examination, in which external and middle ear pathology were ruled out. These infants were sedated with trichlofor 0.5 to 1 mg/kg body weight. Recording was done in a quiet room. Electrodes were placed at the vertex, both mastoid and forehead. Acoustic click stimuli at the rate of 10/millisecond were presented to each ear at 90 dB and subsequently at 60 dB and 45 dB to each ear. Electrical activities were averaged to 2000 responses. 30 dB was taken as normal hearing threshold. Children were considered as test passed when normal hearing threshold is 30 dB at wave V in both ears or one ear 30 dB and other ear 45 dB. Associated risk factors were also taken into account such as number of days on ventilator, serum bilirubin level, number of hypoxic events were recorded for correlation of risk factors.

RESULTS

Of the 100 infants who were taken up for study as given in Fig. 1, 62 had hearing loss, which was evaluated with Auditory brainstem-evoked response (ABER) and of them 32 (51%) were male infants and 30 (49%) were female infants. More than 36 (58%) infants were weighed less than 1.5 kg and 16 (29.5%) infants were between 1.5 and 2 kg and 10 (16.1%) were between 2 and 2.5 kg. Of these, 62 children with hearing loss 33 (52%) had mild hearing loss, 24 (41%) infants had moderate hearing loss and 5 (7%) infants had severe to profound hearing loss. Of the 33 infants with mild hearing loss, 17 were below 1.5 kg, 11 were below 2 kg, 5 were below 2.5 kg. Of the 24 infants with moderate hearing loss, 15 were below 1.5 kg, 5 were below 2 kg and 4 were below 2.5 kg, and in severe to profound group, 2 were below 1.5 and 3 below 2 kg as shown in Fig. 2.

On assessing the coexisting risk factors of 62 hearing loss infants, 20 infants had increased bilirubin level about 10–14 mg during the study. 5 children were on prolonged ventilation for more than 5 days. 5 infants had spells of hypoxia during the stay in the hospital. Genetic correlation was found in 23 infants with a history of consanguineous marriage. Of the total 100 low-birth weight infants, 38 had normal hearing of which coexisting risk factors were found in 8 of them such as prematurity, neonatal jaundice consanguineous marriage each 2 in number. 1 had prolonged stay in hospital and 1 had a history of consanguineous marriage.

DISCUSSION

Prevalence of hearing loss in low-birth weight infants is 0.5 to 6/1000 live births across the globe. Early acoustic stimulation within 6 months leads to increased connectivity and better rehabilitation of auditory pathway. For children, hearing plays an important role in spoken language, learning and social engagement. Infants can benefit if hearing loss is identified early in life and offered appropriate intervention. Occurrence of hearing loss is high in low-birth weight infants with associated risk factors. Studies say that neonatal jaundice/mechanical and assisted ventilation stay in ICU longer than 48 h are the risk factors of non-genetic origin in low-birth weight infants. The probability of sensory neural hearing loss was found to be on the rise as the number of coexisting risk factors increases with the probability doubled with more risk factors as per studies conducted by BIEKcki HORBULewicz & WOLAN 2011. Hypoxia has a strong association with hearing loss as asphyxia causes spiral ganglion to be affected first when it damages the outer hair cells and stria vascularis.

Auditory brainstem-evoked response (ABER) is used to evaluate the integrity of the auditory pathway up to the lower brain stem. It is an objective test eliciting brainstem response to audiological clicks until the presentation of the stimuli 5–7 positive peaks are recorded in 10 milliseconds and labelled in letters I to VII. Wave I - action potential of the distal portion of cranial nerve VII and afferent activity of cranial nerve VII as they leave the cochlea/IAC. Wave II - proximal part of cranial nerve VIII. Wave III - second order neuron in or near the cochlear nucleus. Wave IV - pontine third order neurons. Wave V - multiple anatomical auditory structures originating from inferior colliculus.
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CONCLUSION

Since hearing loss in low-birth weight infants is not a visible disability, it goes undetected. Hence, it emphasizes the need for screening. ABER is the simple test and measures the specific part of auditory pathway which in our study correlated with previous studies where low-birth weight is associated with significant disability and risk factors. This device does not require fully trained staff to perform the test. As per the recommendation of joint committee of infant hearing, all infants with hearing loss should be identified by 3 months of age and intervention should be done by 6 months of age. Screening programme should not only include new born screening but also screening in the later period based on risk factors. Hence, ABER should be done as a mandatory screening procedure in low-birth weight infants.

REFERENCES