

Study of Risk Factor Associated in Hearing Loss in High Risk Children Less Than 10 Years of Age in Rural Area of West Uttar Pradesh

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Abstract: ***Aims:** To evaluate the threshold of hearing and incidence of hearing loss in infants and children belonging to high-risk category and find out the common risk factors. **Subjects and Methods:** Totally, 100 infants and children belonging to high-risk category were subjected to brainstem evoked response audiometry. Clicks were given at the rate of 11.1 clicks/s. Totally, 2000 responses were averaged. The intensity at which wave V just disappears was noted as threshold of hearing. Degree of impairment and risk factors were analysed. **Results:** Totally, 57 (%) were found to have sensorineural hearing loss. Totally, 67 (67%) children with hearing loss belonged to age group 1–5 years. Consanguineous marriage was the most commonly associated risk factor. Majority 57(57%) had profound hearing loss. **Conclusion:** BERA is important tool for new born screening to identify hearing loss in the prelinguistic period to reduce the burden in the community. Health education and genetic counselling is necessary to reduce the hereditary hearing loss, as hearing impairment due to perinatal factors has reduced due to recent medical and surgical advancements as cochlear implant and hearing aids.*

Keywords: Brainstem evoked response audiometry, Deaf child, threshold of hearing, prelinguistic

1. Introduction

A child's normal speech and language development depend on the ability to hear. The prevalence of hearing loss is 0.5–6/1000 neonates all over the world.¹ so many audio logical methods are used now a days to determine hearing sensitivity in children such as behaviour observation, free field audiometry, visual reinforcement audiometry, play audiometry, etc.² But these tests require cooperation of children and do not give same results every time. Brainstem evoked response audiometry (BERA) is a simple, non-invasive, objective test for early identification of hearing impairment in children and neonates. It can be used as a screening test in new-borns, infants and other difficult to test subjects. In this study, with the use of BERA threshold estimation was done in high-risk infants and children to detect hearing loss and also to know about the degree of impairment.

2. Subjects and Methods

This study was conducted among 100 infants and children in the outpatient department of our institution for a period of 9 month from March 2014 to November 2014. The study was proceeds only after the approval of institute ethical committee. Neonates with high-risk factors, children with delayed speech and language development and those who did not respond to sound were Included for the study.

Risk factors considered

- Consanguineous marriage of parents
- Family history of deafness
- Birth asphyxia

Low/increased birth weight

- Delayed cry

- Prematurity
- Mental retardation
- Neonatal jaundice
- Maternal infection
- Syndromes associated with hearing loss.

The detailed general physical examination and examination of nose, throat and ear were carried out to rule out external ear and middle ear pathology. BERA was done in dust free, sound proof room. Vertex, forehead and both mastoid regions were cleaned with gel, and surface electrodes were applied. Headphones were held in the ear canal. Monoaural testing was done. Rare fraction click sounds were given at the rate of 11.1 clicks/s. totally, 2000 recordings were averaged decreasing in steps of 5 dB starting from 99 dB. The morphology of the graph was noted until wave V is no longer identifiable. The minimum intensity at which wave V is appear is taken as the hearing threshold for that individual. Since threshold estimation was the only aim of the study, latencies and inter peak intervals were not considered. The criteria's of child's hearing sensitivity was assessed based on the following:³ Hearing threshold

- Normal hearing sensitivity ≤ 25 dB
- Mild hearing impairment 30–45 dB
- Moderate hearing impairment 50–65 dB
- Severe hearing impairment 70–85 dB
- Profound hearing impairment 90 dB and above.

3. Results

Of the 100 infants and children screened, 45 were males and 55 were females (table 1). A total of 67 children with hearing loss are belonged to age group 1–5 years (table 2). A total of 57 children were found to have profound hearing loss (table 3). Among the risk factors evaluated, consanguineous marriage of parents, family history of hearing loss, low/increased birth weight, and birth asphyxia

had a significant correlation with hearing loss (table 4). The most common risk factor in children with hearing loss was consanguineous marriage (38 children). In this study, low birth weight was more significantly associated with hearing loss than increased birth weight postulating birth trauma during delivery can lead to hearing loss. 14 children with hearing loss did not have any identifiable risk factor.

4. Discussion

Hearing loss affect not only on the child's ability to speak and learn the language but also communication ability. Hence, early detection and intervention is necessary for normal speech and language development. Interventions can vary from sign language to cochlear implantation. Sensorineural hearing loss mostly affect the severe deafness in children rather than conductive loss. Sensorineural deafness can be due to causes such as: (1) Hereditary (genetic), (2) prenatal (rubella), (3) perinatal (kernicterus, birth asphyxia, etc.) and (4) childhood acquired deafness (following meningitis, trauma).² Brainstem evoked response audiometry, and otoacoustic emission (OAE) are two commonly used objective tests for childhood deafness.⁴ OAEs are widely used in neonatal screening programs as they are quicker and easy to perform. Distortion product OAEs are preferred over transiently evoked OAEs. They provide information about outer hair cell function which is commonly affected in congenital hearing loss. It has a high incidence of false positive results as it is affected by external and middle ear function.⁵

Brainstem evoked response audiometry is more time-consuming, but is an accurate test for early detection of neural conduction irregularities in the auditory pathway. It is a short latency response. It detects electrical activity from the inner Ear to the inferior colliculus. It gives an estimate of degree and type of hearing impairment, the cause of delayed speech and localized the site of lesion in patients with hearing loss and vertigo. Also help in detect malingering. Threshold estimation by BERA is used to identify hearing impairment in neonates thus facilitating early rehabilitation. The existence of peak V is considered as sound stimulus perceived by the ear. Pure tone threshold can be obtained by subtracting 5–10 dB from the point where wave V is just identifiable. In this study, majority of children with hearing loss belong to age group 1–5 years. Hence, hearing loss is identified when the child presents with delayed speech. This indicates that neonatal screening can identify such children at an earlier stage which helps in early rehabilitation. Previous era perinatal infection was the most common cause for hearing loss but now a day inherited causes are most common cause for hearing impairment in this childhood period. Consanguineous marriage is commonly encountered in developing countries like India.

Consanguineous marriage is discouraged by awareness programme because it affects lots of infants and children leading to hearing loss.⁶ Low birth weight is also major risk factor for hearing impairment.⁷ In our study, also low birth weight <3.5 kg was more significantly associated with hearing loss. This can be probably due to difficult labor using forceps delivery causing head trauma leading to

hearing loss.^{8,9} Delayed cry, birth asphyxia, cerebral palsy, and neonatal seizures can cause brain hypoxia affecting central auditory pathways leading to hearing loss.¹⁰ In babies with neonatal jaundice, bilirubin toxicity or transient brainstem encephalopathy can also cause severe and profound sensorineural deafness.¹¹ This is usually transient and improves with phototherapy. Persistent hearing loss in some cases is due to axonal degeneration and loss of myelin.

5. Conclusion

Screening is necessary for Hearing of new born and children during prelinguistic period. Because it undetected until it affects the child's communication in the form of speech and language. Congenital hearing loss contributes to a majority of hearing loss in children, it can also occur in the later periods also due to brain infection and complications of prematurity, etc. Screening programmes does not only for the newborn, but also for the later age to detect risk factor. Consanguineous marriage is discouraged because this is a major risk factor for hearing impairment in infants and children now days. BERA gives an accurate picture of hearing sensitivity. Hence, in all infants, in which risk factor associated, BERA should be carried out as a routine procedure in hospital to detect hearing abnormality. Regular follow up and rehabilitative measures should be started as early as possible to reduce the socially handicapped children in our community and improve the quality of life of these patients.

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Table 1: Sex distribution

Sex	No.
Male	45
Female	55

Table 2: Age distribution

Age group	No.
<1 year	22
1-5 year	67
6-10 year	11

Table 3: Degree of hearing loss

Mild	4
Moderate	11
Severe	28
Profound	57

Table 4: Risk factors

Consanguinity	38
Family history	19
Low birth waight	13
Inceserd birth waight	5
Delayed cry	3
Birth asphyxia	1
Encephalitis	6
Cerebral palsy	1