



ROLE OF BERA IN EVALUATION OF HEARING LOSS IN PEDIATRIC AGE POPULATION

<b>Rajendra K.Teharia</b>	Senior Resident, Department of Otorhinolaryngology, Jodhpur Medical College and hospitals, Jodhpur
<b>Rukmini Sharma*</b>	M.Sc. (physiology) Student, Department of physiology, Dr.S.N.Medical College, Jodhpur *Corresponding Author
<b>N .C. Purohit</b>	Assistant Professor, Department of Otorhinolaryngology, Jodhpur Medical College and hospitals, Jodhpur
<b>Jayant Kumar</b>	Professor, Department of physiology, Dr.S.N.Medical College, Jodhpur

**ABSTRACT**

**Introduction:** Hearing impairment in pediatric population specially in early age could affect their learning abilities, skills and communication. Early diagnosis is utmost important in these cases to prevent this disability permanently.

**Aims:** In this study, we evaluate the role of BERA in early diagnosis of hearing impairment specially in high risk pediatric population.

**Materials and methods:** A total 65 high risk cases below 12 years of age are included in the study and BERA was obtained and data obtained and analysed.

**Results:** In our study, 40.9 % cases showed hearing impairment on BERA investigation. Severe to modified hearing loss was found in 24 cases (88.9 %).

**Conclusion:** In our study, BERA is very simple, useful, reliable, screening tool specially in high risk and un-cooperative pediatric population for early diagnose and management of hearing loss.

**KEYWORDS :** Hearing , BERA , Pediatric, High risk

**INTRODUCTION**

Normal hearing is essential for normal development of speech and language in pediatric population. Any hearing impairment could affect their learning ability skills and complications specially in children. Hearing impairment is the most common sensory deficit in pediatric population (1). The prevalence of congenital hearing loss has been estimated between 1.2 to 5.7 per 1000 live birth (2). In hearing impaired child, early detection of hearing loss with appropriate treatment and management leads to normal development and communication skills in critical period of hearing development (3). However to diagnose such hearing impairment in these children in early stage by appropriate method and instrument is very difficult task (4).

Hearing assessment is primarily a subjective task and usually done by Pure Tone Audiometry (PTA). But this subjective test PTA can't be done in un-cooperative patients like infant, children, malingers, mentally retarded children. In these cases, objective tes Brainstorm Evoked Response Audiometry (BERA) is a simple, reliable, noninvasive screening test specially in new born, infant, children and in uncooperative patients (5). In this study we evaluated role of BERA in early diagnosis of hearing impairment in infants, children and uncooperative patients.

**MATERIAL AND METHODS**

This study done in 66 patients in ENT department of Jodhpur medical college hospital and S.N. Medical College Physiology department from July 2015 to August 2018. Informed consent was taken from all the patients or their parents. All the patients below 12 years of age with high suspicion of hearing loss like neonates and children with delayed speech and language development, neonates did not responding to sound, neonates with high risk factor like low birth weight, birth asphyxia & neonatal jaundice, mental retardation and uncooperative patients for Pure Tone Audiometry, patients on ototoxic medications, malingers were included in study. Patients above 12 years of age and patients below 12 of age who were cooperative for PTA excluded from

study. After taking detailed history central and ENT examination were done and any pathology of external ear and middle ear like wax, otitis media ruled out. BERA was recommended in a quiet room on Smart EP IHS instrument in natural sleep. Those who were awake were given 20 mg / kg Triclofos specially small babies and children for sedation. Active electrode attached on ipsilateral mastoid, ground on contralateral mastoid and reference electrode on forehead after cleaning by conduction jelly. 2048 click stimuli used at rate of 35 click/second at 25 DB intensity with rare faction click of 0.1 mSec. Both ear were tested separately with making noise of contralateral ear to 55 DB. Filter setting was 100 to 3000 HZ. Absolute latencies of wave I, II, III and interwave latencies of I – III and I – V were measured. Abnormal BERA was defined as the abnormality of one or more wave forms in either ear. Quantitative measurement of patients hearing assessment was done on following basis.

- Normal hearing : - less than 25 dB
- Mild hearing loss :- 25 to 40 dB
- Moderate hearing loss:-41 – 60 dB
- Severe hearing loss :-61 to – 90 dB
- Profound loss:- more than 90 dB

**RESULTS**

Out of total 65 cases, 35 patients were male and 30 cases were female. Among them 27cases (40.9 %) were showed hearing impairment. Total 15 cases of male and 12 cases of female showed some hearing impairment. Table 1 showed the distribution of patients according to their age. In our study, maximum cases had shown hearing impairment between 1 to 5 years of age (55.5 %) then followed by below 1 years of age (29.6 %).

**Table 1 :- age group wise distribution of cases**

Age group (years)	No. of cases with decreased hearing (%)	No. of cases with normal hearing (%)	Total (%)
<1 years	8 (29.6)	16 (41.0)	24 (36.4)

Submitted : 12<sup>th</sup> June, 2019

Accepted : 06<sup>th</sup> August, 2019

Publication : 15<sup>th</sup> November, 2019

1-5 years	15 (55.5)	17 (43.6)	32 (48.5)
6-12 years	4 (14.9)	6 (15.4)	10 (15.1)
Total	27 (100)	39 (100)	66 (100)

Table 2 showed the distribution of all hearing impaired cases according to degree of hearing loss.

**Table 2:- distribution of cases according to degree of hearing loss**

Degree of hearing loss	Age group			Total (%)
	<1 year	1-5 year	6-12 year	
Mild	0	0	1	1 (3.7)
Moderate	0	1	1	2 (7.4)
Severe	1	6	1	8 (29.6)
Profound	7	8	1	16 (59.3)
Total	8	15	4	27 (100)

In our study, severe to profound loss was present in 24 cases (88.9%) and maximum cases 7. Severe to profound loss was found below 5 years of age.

## DISCUSSION

In our study, we did BERA in 65 high risk patients, out of which 27 patients (40.9 %) showed some hearing impairment. The incidence of 40.9 % of hearing loss in high risk patients is comparable to other studies also (6, 7). In our study male to female ratio of affected patients of hearing loss was 1.2: 1 so there is no gross difference in male to female ratio.

In our study, 85% cases of hearing impairment were below 5 year of age and 81.4% of them had profound to severe hearing loss. Study done by Bhagya et al showed 68% severe to profound hearing impaired cases which were less as compared to our study (8). Most of high risk patients presented to our department for confirmation of hearing loss were 0-5 years of age group. This is may be because speech and language development starts early in this age group and any delay and deficiency in developing speech and language cause worries to parents or primary doctors and they refer these high risk patients for definite diagnosis. On other hand mild and moderate hearing loss were present in older children mostly above 5 years of age, mostly unnoticed and presented late to ENT department for audiometric assessment.

BERA is very useful, simple and reliable, objective test for early detection of hearing loss and planning management. Prolonged absolute and interwave latencies are indicative of delayed conduction in brainstem evoked auditory pathway and hallmark of hearing loss (9). It is the only test to confirm normal sensitivity of hearing in uncooperative patients. In all high risk cases specially infants, children or uncooperative patients where PTA can't be done BERA should be carried out as a routine procedure to detect hearing loss (10, 11).

## CONCLUSION

In our study BERA has been proven to very effective means for early diagnosis and management of hearing loss specially children, neonates and uncooperative patients. It is also useful for accessing degree of hearing loss where PTA can't be done specially in children. BERA is very reliable and valuable investigating tool to accessing the hearing threshold and central nervous system maturity specially below 1 years of age. By increasing awareness in peripheral health practices about use of BERA specially in pediatric population help in early diagnosis and culture management of hearing impairment.

## Financial Sponsorship

Nil

## Conflicts of Interest

There is no conflict of interest

## REFERENCES:-

1. C.C.Morton & W.E.Nance, " Newborn hearing screening - a silent

revolution,"The New England Journal of Medicine vol.354,no.20,2006;2151-2164

2. American Speech- Language-Hearing Association. The Prevalence and Incidence of Hearing Loss in Children. Available from:<http://www.asha.org/public/hearing/disorder/children.htm>(last retrieved on 2017 Oct 17)
3. Sujata DE, Archbold AI, JD Ray Clarke. Investigation and management of the deaf child. Scott-Brown's Otorhinolaryngology Head & Neck Surgery.7th edition,2008;844-57
4. Brad Stach, audiological evaluation of otologic/neuro-otological disease.Glasscock-Shambaugh:Surgery of the Ear: 6th edition 2010;189-222
5. Biswas A, Assessing the deaf child. Clinical audio vestibulometry for otologists and neurologists .3rd edition, Bhalani publishing house, Mumbai, 2002;96-100
6. Ansari MS, Screening programs for hearing and impairment in newborns: A challenge during rehabilitation for all. Asia pacific Disabil. Rehabil. J. 2004;15:83-89
7. Thirunavukarasu R, Balasubramaniam GK, Kalyanasundaram RB, Narendran G, Sridhar S. A study of Brain Stem Evoked Response Audiometry in high risk infants and children under 10 years of age. Ind. J. Otolaryngology 2015;2:134-137
8. Bhagya VA, Brids VB, Doddaman M. Incidence of hearing loss in infants at risk. Int. J. Bio. Med. Res. 2011;2:1102-1105
9. Stockard JJ, Pope-Stockyard JE, Shabrough FW: Brainstem auditory evoked potentials in neurology:Methodology, Interpretation, and clinical application : Aminoff MJ(3rd edition).Electrodiagnosis in clinical neurology , Churchill Livingstone;1992; 503-536
10. Galambos R; A use of ABR in infant hearing testing in early diagnosis of hearing loss : Brune and Stratton, New york. 1978; 243-257
11. John Rowe M: Normal variability of the brain stem auditory evoked response in young and old adult subject. Electroencephalography and clinical neurophysiology: 1978; 44: 459-470