

# STUDY REGARDING CORRELATION BETWEEN PERCEIVED STRESS OF MOTHER & BERA WAVE CHANGES IN INFANTS ATTENDING NEUROPHYSIOLOGY LABORATORY AT R.G.KAR MEDICAL COLLEGE WHICH IS A TERTIARY CARE CENTRE

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## ABSTRACT

**Introduction:** Hearing impairment have an important consequence for language acquisition, communication, cognitive, social& emotional development; Perceived maternal stress is a risk factor for hearing impairment in infants upto 12 months of age. BERA being a noninvasive, objective test when used and interpreted properly provide a useful method of obtaining reliable estimate of hearing sensitivity among the infants.

**Aims:** 1) Screening for Auditory Impairment in infants upto 12 months of age who are at risk.2) Assessment of perceived stress on mother.

**Materials and method:** The present study was an Analytical, Observational study. This study was conducted for a period of 12 months at R. G. Kar Medical College and Hospital, Kolkata. Total 85 subjects were included in this study.

**Result:** Our study showed that, more number of patients had A+ blood group [37 (43.5%)] but this was not statistically significant (p.1556). (Z=1.4204).

**Conclusion:** We concluded that Perceived stress scale was positively correlated with BERA wave changes in infants attending neurophysiology laboratory at R.G. Kar medical college which is a tertiary care centre.

**Keywords:** Hearing impairment, BERA, Perceived stress, PSS scoring and inferior colliculus.

## INTRODUCTION

Hearing impairment have an important consequence for language acquisition, communication, cognitive, social& emotional development; Perceived maternal stress is a risk factor for hearing impairment in infants upto 12 months of age. BERA being a noninvasive, objective test when used and interpreted properly provide a useful method of obtaining reliable estimate of hearing sensitivity among the infants. Assessment of maternal perceived stress can be done by PSS scoring. Perceived stress of mother if affects infants auditory impairment, then it can be detected easily by BERA wave changes;

Neonatal jaundice is a common problem seen in the newborn. It is observed during the first week of life in approximately 60 % of term and 80 % of preterm<sup>1</sup>.

Bilirubin in healthy term neonates especially free bilirubin (FB) could enter brain cells and cause damage which is perceived by brainstem evoked response audiometry (BERA). Studies identify that Bf is more associated to abnormal BERA.

Early detection and rehabilitation of a hearing loss is important for the development of speech and language skills in hearing impaired children.

BERA is an effective and non-invasive means of assessing the functional status of the auditory nerve and brainstem auditory sensory pathway. It is not significantly altered by the state of consciousness, drugs and variety of environmental factors<sup>2</sup>.

The BERA changes in response to hyperbilirubinemia include loss of one or more peaks of waves I–V, raised threshold, increase in latency of waves I, III or V or increased inter peak interval.

It is worth mentioning that BERA can detect subclinical bilirubin encephalopathy even before the appearance of any signs or symptoms of kernicterus.

The acute changes seen in BERA can be reversed by early bilirubin lowering interventions, thereby explaining the transient nature of bilirubin encephalopathy. But persistent elevation of bilirubin can cause neuronal degeneration and thereby persistent changes on BERA.

Some studies have found correlation between the bilirubin level and BERA changes, whereas some have disproved it.

Thus serial BERA can be used as a tool to detect neuro developmental delay secondary to neonatal hyperbilirubinemia.

Neural Generators of the BERA<sup>3</sup>

BERA is generated by the auditory nerve and subsequent structures within the auditory brainstem pathways. Information regarding the origin of individual wave components of BERA was provided by Moller and Janetta.

**Wave I** It is the representation from the compound action potential in the distal portion of cranial nerve VIII. The response is believed to originate from afferent activity of cranial nerve VIII fibres as they leave cochlea and enter the internal auditory canal.

**Wave II** It is generated by the proximal VIII nerve as it enters the brainstem.

**Wave III** Generated mainly in the cochlear nucleus (second order neuron).

**Wave IV** It arises from pontine third order neuron. Mostly located in superior olivary nucleus, but additional contributions may come from cochlear nucleus and nucleus of lateral lemniscus.

**Wave V** Generation of wave V reflects activity of multiple anatomic auditory structures. Sharp positive peak of wave V arises mainly from the lateral lemniscus, following slow negative wave represents dendritic potential in the inferior colliculus.

Wave V is the component analysed most often in the clinical application of the BERA.

**Wave VI and VII** These waves appear to be generated in the inferior colliculus, perhaps in the medial geniculate body.

## **MATERIALS AND METHODS**

Study was commenced after getting ethical clearance from Institutional Ethics Committee, R. G. Kar Medical College and Hospital, Kolkata

**Study type-**Analytical, Observational study

**Study design:** Cross-sectional

**Sampling design-**Availability or Convenience sampling at R.G.KAR MEDICAL COLLEGE AND HOSPITAL, KOLKATA

**Study Area-**Department of Physiology

**Study population-**Infants up to 12 months of age along with their mothers attending Neurophysiology Laboratory, Department of Physiology at R.G.KAR MEDICAL COLLEGE AND HOSPITAL for conduction of BERA test.

**Inclusion criteria –**

- a) Infants upto 12 months of age
- b) Either gender
- c) Mother and her consent
- d) Parents or guardians who give consent

**Exclusion criteria-**

- A) Infants suffering from URTI, LRTI, ASOM or CSOM
- B) Congenital anomalies including microtia
- C) Infants whose parents or guardians will not give consent.

## RESULT AND DISCUSSION

The present study was an Analytical, Observational study. This study was conducted for a period of 12 months at R. G. Kar Medical College and Hospital, Kolkata. Total 85 subjects were included in this study.

Our study clearly shows that maternal stress adversely affects auditory capability in infants. Perceived stress in mothers probably affects the process of myelination.

One study revealed that offspring exposed to prenatal stress showed decreased expression of oligodendrocytes which gives rise to myelination in CNS.

**Kaffashi F et al<sup>4</sup>(2013)** showed that skin-to-skin contact (SSC) promotes physiological stability and interaction between parents and infants. Temporal analyses of predictability in EEG-sleep time series can elucidate functional brain maturation between SSC and non-SSC cohorts at similar post-menstrual ages (PMAs). Sixteen EEG-sleep studies were performed on eight preterm infants who received 8 weeks of SSC, and compared with two non-SSC cohorts at term (N=126) that include a preterm group corrected to term age and a full term group. Two time series measures of predictability were used for comparisons.

**Gouri ZU et al<sup>5</sup>(2015)** showed that to screen the newborn by Transient evoked Otoacoustic emission and to assess the incidence of hearing damage and associated risk factors. This longitudinal prospective observational study was conducted at a tertiary care hospital in India. A total of 415 babies were included in the study. All the newborns were evaluated with Transient evoked Otoacoustic emission (TEOAE) which was done by age of 1–3 days. Auditory brain stem response audiometry (AABR) was performed at the age of three months for confirming the hearing loss in the neonates those who failed the TEOAE screening.

In our study, out of 85 patients, most of the patients were 21-30 years of age [63 (74.1%)] which was statistically significant ( $p < .00001$ ). ( $Z=8.3818$ ).

We found that, most of the patients were belong Lower Class [37 (43.5%)] which was statistically significant ( $p.02444$ ). ( $Z=2.2469$ ).

**Boskabadi H et al**<sup>6</sup>(2018) found that hyperbilirubinemia is a common neonatal problem with toxic effects on the nervous system that can cause hearing impairment. This study was conducted to assess the risk factors for sensorineural hearing loss and other coexisting problems in icteric infants. Blood group and Rhesus (Rh) incompatibilities between mother and child and G6PD deficiency are important known causes for hearing impairment due to jaundice.

Our study showed that, more number of patients had A+ blood group [37 (43.5%)] but this was not statistically significant ( $p.1556$ ). ( $Z=1.4204$ ).

**Banerjee S et al**<sup>7</sup>(2020) found that the main consequence of hearing loss, especially in children, is the impact caused by sensory deprivation in the development of auditory and language skills and learning. Any degree of hearing loss can result in significant damage, as it interferes with perception and understanding of speech sounds. This proposed descriptive cross sectional study tries to compare BERA parameters between normal and delayed speech/language impairment children. Study also examines possible abnormalities in BERA in children with speech and language impairment.

**Hajare P et al**<sup>8</sup>(2021) showed that babies in Neonatal Intensive Care Units (NICU) have an additional risk for hearing loss due to various risk factors like, prematurity, low birth weight, mechanical ventilation, hyper bilirubinemia, ototoxic drugs, low APGAR score etc. as compared to the babies from well-baby nursery (WBN) who, poses risk factors mostly family history, syndromic deafness. Further BERA was done at the 3rd month of corrected age where 6 out of 11 showed positive responses from NICU and 3 babies from WBN had profound hearing loss. Data analysis revealed that family history of deafness, anemia and hypertension in ANC, TORCH in mother, low Apgar score and hyperbilirubinemia in newborns were a major risk factor for hearing impairment.

**Yadav RL et al**<sup>9</sup>(2022) examined that neonatal hyperbilirubinemia leads to neurological damages including encephalopathy and hearing loss. This study aimed to screen and evaluates the hearing loss in neonates after recovery from hyperbilirubinemia using the Brainstem evoked response audiometry (BERA) test. This cross-sectional comparative study was conducted in Physiology Department at Chitwan Medical College, Nepal. It included 20 age and sex-matched neonates recently recovered from hyperbilirubinemia and 20 normal healthy controls. The external acoustic canals of subjects were checked for any blockage or collapse before BERA testing. The BERA recordings were performed after the neonate's natural sleep following a standard lab protocol explained by Taylor's Evoked Potential in Clinical Testing.

It was found that, the mean BMI of patients was  $[25.9647 \pm 1.9843.]$ , PSS of patients was  $[7.6235 \pm 4.5197]$ , Bera Wave V Latency of patients was  $[7.3373 \pm .7678.]$  and Bera Wave I-V Interpeak Latency of patients was  $[5.2362 \pm 1.1550.]$ .

The positive correlation was found Perceived stress scale vs Bera Wave V Latency which was statistically significant.

The positive correlation was found Perceived stress scale vs Bera Wave I-V Interpeak Latency which was statistically significant.

## CONCLUSION

- ❖ In our study, out of 85 subjects, most of the patients were 21-30 years of age which was statistically significant.
- ❖ We found that, most of the patients belong Lower Socioeconomic Class which was statistically significant.
- ❖ Our study showed that, more number of subjects had A+ blood group but this was not statistically significant.
- ❖ It was found that, the mean BMI of patients was  $[25.9647 \pm 1.9843.]$ , PSS of patients was  $[7.6235 \pm 4.5197]$ , Bera Wave V Latency of patients was  $[7.3373 \pm .7678.]$  and Bera Wave I-V Interpeak Latency of patients was  $[5.2362 \pm 1.1550.]$ .
- ❖ The positive correlation was found between Perceived stress scale and Bera Wave V Latency which was statistically significant. The positive correlation was also found between Perceived stress scale and Bera Wave I-V Interpeak Latency which was statistically significant.
- ❖ We concluded that Perceived stress scale was positively correlated with BERA wave changes in infants attending neurophysiology laboratory at R. G. Kar medical college which is a tertiary care centre.

## REFERENCES

1. American Academy of Pediatrics Practice parameter: management of hyperbilirubinemia in the healthy term newborn. *Pediatrics*. 1994;94:558–562.
2. Agrawal VK, Shukla R, et al. Brainstem auditory evoked response in newborns with hyperbilirubinemia. *Indian Pediatr*. 1998;35:513–518.
3. Arnold SA. The auditory brainstem response. In: Roeser RJ, Valente M, Hosford H, editors. *Audiology diagnosis*. 2. New York: Thieme; 2007. pp. 426–441.
4. Kaffashi F, Scher MS, Ludington-Hoe SM, Loparo KA. An analysis of the kangaroo care intervention using neonatal EEG complexity: a preliminary study. *Clinical neurophysiology*. 2013 Feb 1;124(2):238-46.
5. Gouri ZU, Sharma D, Berwal PK, Pandita A, Pawar S. Hearing impairment and its risk factors by newborn screening in north-western India. *Maternal health, neonatology and perinatology*. 2015 Dec;1(1):1-8.
6. Boskabadi H, Zakerihamidi M, Moradi A, Bakhshae M. Risk factors for sensorineural hearing loss in neonatal hyperbilirubinemia. *Iranian Journal of Otorhinolaryngology*. 2018 Jul;30(99):195.

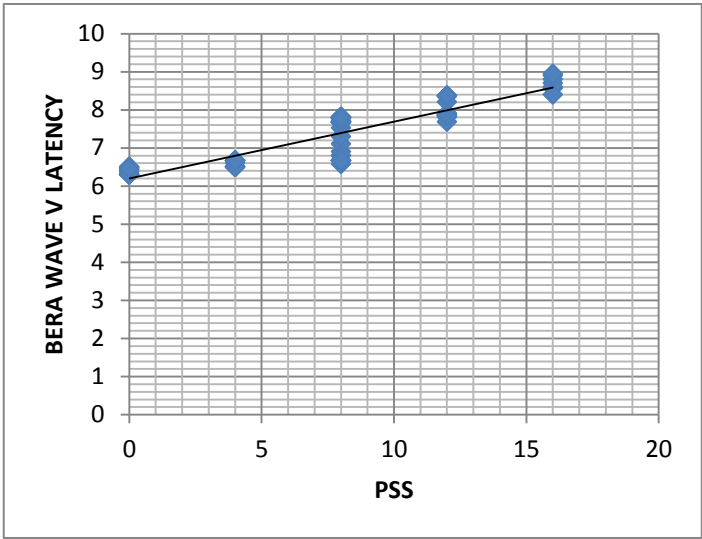
7. Banerjee S, Gorai S, Chattaraj W. A Comparative Study on Brain Stem Evoked Response Audiometry among Pre-school Children with Normal and Delayed Development of Speech Attending BankuraSammilani Medical College.2020
8. Hajare P, Mudhol R. A Study of JCIH (Joint Commission on Infant Hearing) Risk Factors for Hearing Loss in Babies of NICU and Well Baby Nursery at a Tertiary Care Center. Indian Journal of Otolaryngology and Head & Neck Surgery. 2021 Jun 15:1-8.
9. Yadav RL, Yadav LK, Bhusal P, Timilsina S, Sapkota NK, Islam MN. Brain stem auditory evoked potential response in neonates after recovery from hyperbilirubinemia: A neurophysiological approach to screening neuronal hearing loss. Indian Journal of Medical Sciences. 2022 May 11;74(1):27-31.

**Table 1: Distribution of Blood Group**

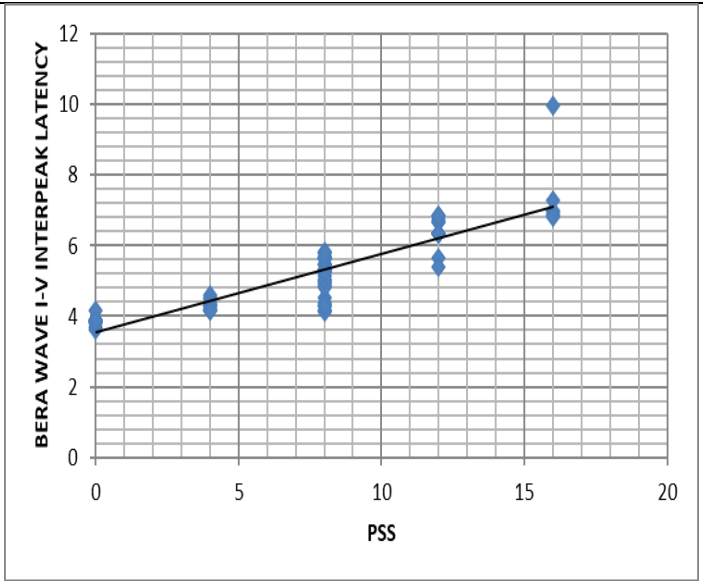
		Frequency	Percent
<b>Blood Group</b>	<b>A+</b>	37	43.5%
	<b>AB+</b>	20	23.5%
	<b>B+</b>	28	32.9%
	<b>Total</b>	85	100.0%

**Table 2: Distribution of mean of BMI, PSS, Bera Wave V Latency and Bera Wave I-V Interpeak Latency**

	Number	Mean	SD	Minimum	Maximum	Median
<b>BMI</b>	85	25.9647	1.9843	23.6000	29.4000 1	25.0000
<b>PSS</b>	85	7.6235	4.5197	0.0000	16.0000	8.0000
<b>Bera Wave V Latency</b>	85	7.3373	.7678	6.3000	8.9400	7.6700
<b>Bera Wave I-V Interpeak Latency</b>	85	5.2362	1.1550	3.6000	9.9800	5.2600



**Bera Wave V Latency**



**Bera Wave I-V Interpeak Latency**