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ORIGINAL ARTICLE

Electrophysiological evaluation of hearing loss in Infants- A clinical study

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***ABSTRACT*:**
Background: It is found that hearing loss (HL) in the early stages of life may guide to emotional, cognitive and social disorders. The present study was conducted to do electrophysiological evaluation of hearing loss in neonates. **Materials & Methods:** The present study was conducted on 86 infants with risk of hearing loss of both genders. The auditory brainstem response (ABR) testing was performed using the Integrity V500 equipment. Response thus obtained was recorded. **Results:** Out of 86 patients, boys were 46 and girls were 40. Age group 1-3 months had 36 subjects, 4-6 months had 22, 7-9 months had 20 and 10-12 months had 8 subjects. The difference was significant (P< 0.05). Risk index for hearing impairment such as family's perception for hearing loss in 8, length of stay in NICU more than 5 days in 5, mechanical ventilation in 4, postnatal infection such as meningitis in 2, gestational events such as drug abuse in 1, use of ototoxic medication in 7, hearing loss in the family in 2, craniofacial anomalies in 1, hearing loss-associated syndrome in 5, failed the newborn hearing screening in 10 subjects.
Conclusion: Authors found that hearing loss in infants is quite common among those admitted to NICU. Implementation of auditory brainstem response (ABR) testing is required.
Key words: Auditory brainstem response, Children, Hearing.

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INTRODUCTION

Hearing is one of the senses at the commencement of human beings, allowing them to give attention, recognize, locate sounds and incorporate essential hearing experiences for the speech and language development. It is found that hearing loss (HL) in the early stages of life may guide to emotional, cognitive and social disorders.[1]

Studies have established relationship between various risk indicators and healing loss among (NICU) infants.[2] A significant hearing loss may affect 1-3 for every 1000 low-risk newborns and this rate can reach 2% to 4% newborns in the ICU.[3] General infants' features such as birth weight, congenital anomalies, infections, specialized procedures and socio-economic factors are risk indicators for HL.[4]

The National Institute of Health recommends Automated Auditory Brainstem Hearing Response (AABR) screening for HL in all NICU infants. This is due to high risk of hearing impairments in NICU admissions.[5] Recent studies have revealed the successful use of the AABR in the neonatal intensive care setting. Hearing loss (HL) may occur before, during or after birth. They can be grouped as genetic and non-genetic, congenital or acquired.[6] Joint Committee on Infant Hearing (JCIH) stated the risk indicators related for hearing loss in infancy such as genetic predisposition, family history of childhood sensorineural hearing loss, birth conditions, family members' perception of hearing impairment, admission at an intensive care unit (ICU) for over 5 days, hyperbilirubinemia and persistent pulmonary hypertension.[7] The present study was conducted to do electrophysiological evaluation of hearing loss in infants.

MATERIALS & METHODS

The present study was conducted in the department of ENT. It comprised of 86 infants with risk of hearing loss of both genders. Ethical approval was obtained from institute prior to the study. All parents were informed regarding the study and written consent was obtained.

Data pertaining to children such as name, age, gender etc. was recorded. A thorough examination was performed in all subjects. The auditory brainstem response (ABR) testing was performed using the Integrity V500 equipment. Response thus obtained was recorded. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 86		
Gender	**Boys**	**Girls**
Number	46	40

Table I shows that out of 86 patients, boys were 46 and girls were 40.

Table II Age wise distribution of subjects

Age groups (Months)	Number	P value
1-3 months	36	0.05
4-6 months	22	
7- 9 months	20	
10-12 months	8	

Table II, graph I shows that age group 1-3 months had 36 subjects, 4-6 months had 22, 7-9 months had 20 and 10-12 months had 8 subjects. The difference was significant (P< 0.05).

Graph I Age wise distribution of subjects

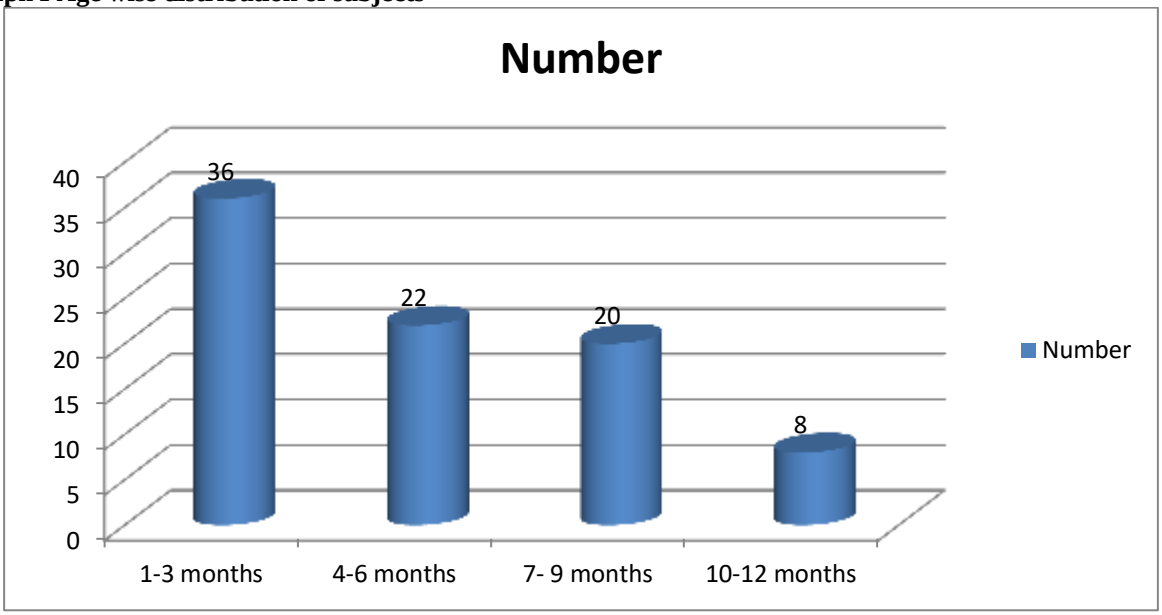

Table III Profile of subjects with diagnosis for sensorineural hearing loss (10)

Parameters	Number	P value
Risk index for hearing impairment		
Family's perception for hearing loss	8	0.01
Length of stay in NICU more than 5 days	5	
Mechanical ventilation	4	
Postnatal infection: meningitis	2	
Gestational events: drug abuse	1	
Use of ototoxic medication	7	
Hearing loss in the family	2	
Craniofacial anomalies	1	
Hearing loss-associated syndrome	5	
Failed the newborn hearing screening	10	

Table III shows that risk index for hearing impairment such as family's perception for hearing loss in 8, length of stay in NICU more than 5 days in 5, mechanical ventilation in 4, postnatal infection such as meningitis in 2, gestational events such as drug abuse in 1, use of ototoxic medication in 7, hearing loss in the family in 2, craniofacial anomalies in 1, hearing loss-associated syndrome in 5, failed the newborn hearing screening in 10 subjects.

Table IV Absolute latencies of waves I, III and V, and interpeak intervals by ear

Age range (Months)	Absolute latency right ear (RE)			Interpeak latency RE			Absolute latency left ear (LE)			Interpeak latency LE		
	Wave I	III	V	I- III	III- V	I- V	Wave I	III	V	I- III	III- V	I- V
1-3	1.62	4.12	6.12	2.54	2.02	4.52	1.72	4.17	6.14	2.52	2.04	4.54
4-6	1.61	4.06	6.10	2.52	2.04	4.51	1.56	4.04	6.19	2.50	2.07	4.52
7-9	1.67	3.98	5.98	2.51	1.98	4.36	1.58	3.80	5.86	2.51	1.96	4.38
10-12	1.58	3.94	5.92	2.48	1.95	4.38	1.52	3.95	5.82	2.46	1.94	4.32

Table IV shows absolute latencies of waves I, III and V, and interpeak intervals by ear and age.

DISCUSSION

World Health Organization recommends the newborn hearing screening (NHS) owing to the negative impact of hearing impairment on child development.[8] Useful indicators for HL are drug administration factors that have also been suggested as risk factors for ototoxicity, craniofacial anomalies, in-utero infections such as herpes simplex infection, cytomegalovirus infection, toxoplasmosis, rubella, syphilis, infant infectious/viral diseases, birth traumas and need for chemotherapy.[9] The present study was conducted to do electrophysiological evaluation of hearing loss in infants.

In present study, out of 86 patients, boys were 46 and girls were 40. Age group 1-3 months had 36 subjects, 4-6 months had 22, 7-9 months had 20 and 10-12 months had 8 subjects. Silva et al[10] conducted a study on 104 babies at risks factors for hearing loss. It was found that 53.85% male and the main risk factor found was the admission to the neonatal intensive care unit (NICU) for a period longer than 5 days (50.93%). Eighty-five (81.73%) subjects were screened by NHS at the maternity and 40% of them failed the test. Through the ABR test, 6 (5.77%) infants evidenced sensorineural hearing loss, 4 of them being diagnosed at 4 months, and 2 at 6 months of age; all of them failed the NHS and had family history and admission at NICU for over 5 days as the most prevalent hearing risks; in addition, family members of all children perceived their hearing impairment.

We found that out of 86 children, 10 found to have hearing loss. We found that risk index for hearing impairment such as family's perception for hearing loss in 8, length of stay in NICU more than 5 days in 5, mechanical ventilation in 4, postnatal infection such as meningitis in 2, gestational events such as drug abuse in 1, use of ototoxic medication in 7, hearing loss in the family in 2, craniofacial anomalies in 1, hearing loss-associated syndrome in 5, failed the newborn hearing screening in 10 subjects.

Van et al[11] found that the prevalence of HL was 1.8% among a total of 10830 infants. It ranged from 0.7 to 3.7% between NICUs. Infants' characteristics that significantly increased the risk of HL were the presence of craniofacial anomalies, chromosomal ⁄ syndromal anomalies, central nervous system conditions, circulatory system conditions and intra-uterine infections. The specialized procedures involving >12 days of intensive care and high frequency oxygenation ventilation were independent risk indicators for HL. Approximately 20% of the variance can be explained by the studied risk indicators. Differences in prevalence rates between NICUs were slightly reduced after adjustment for these risk indicators. NICUs with the highest prevalence rates of HL were situated in the largest cities in the Netherlands with a mixed population because of immigration. Therefore, ethnicity may be a risk indicator.

Onoda et al[12] found that twenty-six newborns had failures in the first stages of the Program (1.7%), who were then referred to diagnostic evaluation. Of these, 16 (61.5%) did not come, two (7.7%) had normal results and eight (30.8%) were diagnosed with hearing disorders. The screening failure rate was 1.7% and the frequency of hearing disorders was 0.5%.

CONCLUSION

Authors found that hearing loss in infants is quite common among those admitted to NICU. Implementation of auditory brainstem response (ABR) testing is required.

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