ORIGINAL RESEARCH PAPER

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TO STUDY THE CLINICAL ,AUDIOLOGICAL AND RADIOLOGICAL FINDINGS OF HEARING IMPAIRED INFANTS.MY EXPERIENCE

KEY WORDS: Hearing loss, Newborn , BERA, OAE

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ABSTRACT

Hearing impairment is the most common form of sensory disorder in humans. Audiological profile of neonates born at a tertiary care centre in Kashmir was conducted to calculate the prevalence of hearing impairment in the study population. Out of 1800 neonates 962 (53.4%) were females rest being males with a sex ratio of 1.15:1.On initial screening 91.2% (n=1642) of subjects had bilaterally present OAE (B/L PASS). The prevalence of hearing loss in not at risk was 2.97 per 1000 and in high risk was 8.04 per 1000. The combined overall prevalence was found to be 4.07 per 1000.Radiological imaging was the next mode of evaluation in these subjects and included HRCT temporal bone and MRI brain and inner ear.

INTRODUCTION:

Hearing empowers us and enriches our lives. Hearing enables us to socialise, work, interact, communicate and even relax. Good hearing also helps to keep us safe, warning us of potential danger or alerting us to someone else's distress. It however assumes greater significance in the early years of life when the faculties of speech and hearing develop concurrently, and one is dependent on the other and both are essential for normal growth of language, cognition, and behaviour. A child with subnormal hearing acuity suffers from consequences of hearing loss compounded by impaired speech development. Such a child, if untreated, becomes handicapped physically, intellectually and emotionally. History taking constitutes an essential part of the evaluation process. In the neonatal period, concern is related to family history, prenatal infection, perinatal events and physical stigmata.[1]

Hearing impairment is the most common form of sensory disorder in humans.[2] Hearing impairment may be mild, moderate, severe or profound. Hearing loss is one of the most common congenital anomalies, occurring in approximately 2-4 infants per 1000.[3,4,5] Hearing impairment can be present at birth (congenital), or become evident later in life (acquired).

The rationale for newborn screening is to identify a population that may have a disorder with no obvious symptoms at birth. The American Academy of Pediatrics (1999) stated that for justification of universal newborn hearing screening for congenital hearing loss it must meet the following criteria:
Easy to use screen tests are available that possess a high degree of sensitivity and specificity to minimize unnecessary referrals for additional diagnostic assessments.

The condition being screened for is not otherwise detectable by clinical means.

Interventions are available to correct the condition once detected.

Early screening, detection, and intervention result in improved outcomes.

The Joint Committee on Infant Hearing (JCIH) first published a set of risk indicators for hearing loss in 1971, which were used primarily for screening infants in the neonatal intensive care unit (NICU), because most infants with risk factors were found in the NICU. However, subsequent studies reported that 30 to 50 percent of profoundly hearing-impaired children would be missed with targeted, risk factor–based screening.[6]

Otoacoustic emissions, also known as cochlear echoes, are low-intensity sounds originating from the outer hair cells in the .OAEs are used to assess cochlear integrity and serve as a fast objective screening test to evaluate the function of the peripheral auditory system, primarily the cochlea, which is the area most often involved in sensorineural hearing loss. Because of their sensitivity to cochlear dysfunction, TEOAEs have found widespread application in new-born hearing screening programmes.[7]

The auditory brainstem response is an electrical response to auditory stimuli such as clicks, tone pips, and tone bursts.[8] The ABR response has a distinct, repeatable wave pattern. At high intensities there are 5 peaks beginning with Wave I, which originates in the 8th nerve to wave V in the auditory brainstem.Wave V is the most prominent peak.[9]

Radiographic imaging of temporal bone can identify inner ear malformation that may be responsible for hearing impairment. In evaluating children with unexplained SNHL radiological studies such as CT and MRI imaging have made it possible to identify a specific cause auditory impairment. In general, CT is the first line recommended imaging modality for SNHL.[7] MRI is more accurate in detecting cochlear dysplasia, LVA and the presence of the cochlear nerve. Physical findings associated with syndromic hearing loss should be referred for evaluation to a multispeciality clinic.[10]

MATERIALS AND METHODS:

This study was conducted in the Department of ENT & HNS and Department of Paediatrics GB Pant hospital of Government Medical College Srinagar.In This prospective study of 1800 Subjects included neonates born and admitted in GB Pant hospital for a period of 2 years. 1800 neonates were recruited for the study with prior informed verbal consent obtained from the parents. All these subjects were assessed clinically. The clinical work-up encompassed the detailed history (which starts from the time of conception) and a meticulous examination. Handheld TEOAE device, Labat OAE Screener, Italy, was used in Initial Screening and First Follow-Up Screening. It has a clinical sensitivity of more than 99%, without requiring decisions or equipment adjustment by the user. Sound stimulus is by non-linear click sequence with stimulus level 45-60 dB HL and TEOAE testing frequency range from 1.4 to 4 kHz. Results are displayed as PASS- indicating that the patient has normal outer hair cell function, and REFER- suggest a possibility of a Sensorineural hearing loss or indicates requirement of further diagnostic hearing evaluation. All subjects underwent the Audiological tests in

Department of ENT&HNS of GMC Srinagar as per the Screening. Rescreening Protocol and hearing deficit confirmed with ABR.

RESULTS AND OBSERVATIONS:

The results from the current study are as below:

Table 1: Sex Distribution

Gender	No. Of babies	Percent
Females	962	53.4
Males	838	46.6
Total	1800	100.0

Majority of the infants in our study were females 53% and males constituted 47%

Table 2: At Risk Neonates

Risk	No.of babies	Percent
Not at risk	1365	75.8
High risk	435	24.2
Total	1800	100.0

In the present study 24.2% of the infants were at high risk for hearing loss.

Table 3: Risk Distribution.

High risk factors	No.of babies	Percent
Family history	11	27
NICU> 5days	383	2.5
Assisted ventilation	35	6.6
Ototoxic drugs	16	3
Hyperbilirubinaemia	21	4
Meningitis	9	1.7
In utero infection	15	2.8
Craniofacial anomalies	29	5.5
Syndrome/ stigmata	6	1.1

NICU stay >5days was the most common (72.9%) risk factor present among the high risk infants of our study.

Table 4: Birth Weight.

Birth weight (kgs)	No. Of infants	Percent
VLBW les than 1.5	24	1.3
LBW 1.50-1.99	65	3.6
2.00 - 2.49	211	11.7
NBW 2.50-2.99	782	43.4
3.00 -3.49	555	30.8
>3.49	163	9.1
Total	1800	100

Majority (83.3%) of the subjects in the present study had normal birth weight.

Table 5: OAE

Finding	Number of neonates	Percent
PASS	1642	91.2
REFER	158	8.8
Total	1800	100

In the present study 91.2% of the neonates had bilaterally present OAE whereas 8.8% had absent OAE either unilaterally or bilaterally on initial screening.

TABLE 6: BERA

	Number of babies	Percent
B/L PSNHL	7	1.9
Normal	370	98.1
Total	377	100

In the present study 1.9% of the infants who underwent BERA were found to have bilateral hearing impairment

TABLE 7: Prevalence of hearing loss in high risk & not at risk group.

High risk factor	BERA	
	Abnormal	Normal
Yes	3	370
No	4	1341
Total	7	1711
P Value	0.2221	

In the present study prevalence in high risk group was found to be 8.04 per 1000 screened & in not at risk group 2.97 per 1000 screened

Table 8: HRCT Temporal Bone

Finding	No. Of patients	Percentage
Normal	6	85.7
Large vestibular Aqueduct	1	14.3

In our study 85.7% of the subjects with B/L profound SNHL had normal HRCT and large vestibular aqueduct was seen in 14.3% of the subjects.

TABLE10: MRI Inner Ear And Brain

Finding	No.of patients	Percentage
Normal	5	71.4
Large Vestibular Aqueduct	1	14.3
Kernicterus	1	14.3

On MRI scanning of the 7 hearing impaired infants 1 patient (14.3%) had large vestibular aqueduct ,1 patient (14.3%) had features of kernicterus and remaining 5 patients (71.4%) had normal scan.

DISCUSSION:

Early identification and appropriate treatment of hearing loss in children is critical for normal development. The period from birth to 3 years of life is critical for the development of speech and language, therefore, there is need for early identification and assessment of hearing loss and early rehabilitation in infants and children full stop it was observed that children whose hearing loss was observed and manage it before 6 years of age had higher scores of vocabulary, better expressive and comprehensive language skills than those diagnosed and managed after 6 months of age emphasizing the importance of early identification and treatment.[11] The ultimate goal of early screening and diagnosis is early intervention.

This study comprised of total 1800 neonates with females constituting 53.4% (n=962) and males constituting 46.6% (n=838) which is consistent with the neonatal hearing screening study done by Habib Hs et al[12] on a total number of 11,986 neonates (41.4% male and 58.6% females). 24.2% (n=435) neonates in the present study belonged to high risk group as per guidelines provided by HRR of JCIH 2007 which is consistent with the study conducted by James L Conolly et al[13] who screened 17602 babies of which 18.1% (n=3186) were NICU admitted babies.

On initial screening 91.2% (n=1642) of neonates had bilaterally present OAE (B/L PASS) whereas 8.8% (n=158) of neonates had either unilaterally or bilaterally absent OAE (REFER). OAE was absent bilaterally in 7.3% (n=132), absent on left side in 0.83% (n=15) and absent on right side in 0.61% (n=11) of the subjects. Our pass percentage is similar to other studies conducted by Prieve et al[14] (93.3%), Albert L Mehl Vickie Thompson et al[15] (93.5%), B De Capua[16] (88.35%), Habib et al[17] (91.3%), Tasci Y et al[18] (94.7%). The 7 neonates who were found to have hearing impairment after screening were further subjected to audiological and radiological evaluation.

Radiological imaging was the next mode of evaluation in these subjects and included HRCT temporal bone and MRI brain and inner ear. Radiographic imaging of temporal bone can identify inner ear malformation that may be responsible

for hearing impairment. Thus there is need for urgent implementation of UNHS of all the neonates which can be implemented efficiently and cost effectively provided a proper set up is established in the appropriate hospitals which includes a minimum of sound isolated room and equipments necessary for screening and above all the man power.

Funding: No funding sources

Ethical approval: The study was approved by institutional Ethics Committee.

Conflict of Interest: None

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