|| Print ISSN: 2589-7837 || Online ISSN: 2581-3935 ||
International Journal of Medical Science and Diagnosis Research (IJMSDR)
Available Online at www.ijmsdr.com
PubMed (National Library of Medicine ID: 101738825)
Volume 3, Issue 9; September: 2019; Page No. 60-64
Original Research Article
crossref DOI: https://dx.doi.org/10.32553/IJMSDR/v3i9.13

INCIDENCE OF HEARING IMPAIRMENT IN HIGH RISK NEONATES

Dr. Muhammad Saeed Gohar[1], Dr. Sabeen Khan[2], Dr. Saba Manzoor[3]

[1]MBBS, FCPS, Professor of ENT and Head & Neck Surgery, FMH College of Medicine & Dentistry, Shadman, Lahore.

[2]MBBS, FCPS, Obstetrics & Gynecology, Visiting Consultant, FMH College of Medicine & Dentistry, Shadman, Lahore.

[3]MBBS, M.Phil. part 1, Community Health Sciences, WMO, FMH College of Medicine & Dentistry, Shadman, Lahore.

Conflicts of Interest: Nil

Corresponding author: Dr. Muhammad Saeed Gohar

Abstract:

Objectives: The proportion of high risk neonates among live births in Pakistan is estimated to be over 50%. This study was carried out to assess the incidence of hearing loss among pre- defined high risk newborns. Hearing loss cases were evaluated in relation to the type of risk in inclusion. This provided the need for screening and managing such cases. One hundred (100) neonates fulfilling the criteria of being high risk were included in the study carried out at Fatima Memorial Hospital Lahore during July 18 to Dec 18.

Method: This was a cross sectional analytical study in which two successive otoacoustic emission recordings were followed by brain stem auditory potential and otolaryngeal consultation, in the cases screened to have hearing loss.

Result: Among high risk neonates 92 (92%) were found normal, 8 (8%) cases were found to have bilateral hearing impairment. Prematurity alone or in combination with some other risk factors were found to have highest association.

Conclusion: 8% hearing impairment on screening test is quite high to initiate such tests in major obstetrical units. Early detection and early management carries better prognosis.

Keywords: Otoacoustic emission, brainstem auditory potential, hearing impairment.

Introduction

This study shows 6 months screening of high risk neonates by otoacoustic emission and brain stem auditory evoked potentials. All the neonates were delivered at Fatima Memorial Hospital. These were 100 high risk neonates. This was a program to assess the need for screening of high risk neonates. Universal neonatal hearing screening have provided the opportunity to identify neonates with permanent congenital hearing loss, and thus initiate auditory rehabilitation before 3 months age. Universal neonatal hearing screening represents secondary prevention of hearing loss and the worldwide documented delayed identification of children with congenital hearing impairment will no doubt be improved with the implementation of early neonatal hearing screening programs[1]. For this programme, the prevalence of hearing impairment greater than 20 dB in either ear was 2.8 per 1000 live births. For five acceptable programme reports addressing at mild congenital PCHI in any ear (unilateral or bilateral hearing loss), the median unadjusted prevalence was 2.2 per 1000 live births. The adjusted median estimate accounting for children lost to follow up is 3.2 per 1000 live births[2].

Most PCHI is sensorineural but structural conductive impairment is included[3]. The US Joint Committee on childhood hearing impairment has published series of guidelines for risk indicator that predisposed newborns and infants to congenital, progressive, acquired PCHI[4]. Prevalance estimates for PCHI in at risk groups vary greatly. Reported proportions of infants at risk vary with the risk indicator set and range from 3% to 15 %[5].

Essential reasons for early childhood hearing screening are childhood hearing loss has a serious impact on cognitive development, language acquisition and social integration. Very early auditory experience will play a part in language development, language acquisition beginning straight after birth, with the neonate listening to his or her native language[6].

High risk group is listed by international committee are (1) Family history of hereditary childhood sensorineural hearing loss, (2) In utero infections such as, cytomegalovirus, rubella, syphilis, herpes and toxoplasmosis, (3) Bacterial meningitis, (4) Ototoxic medications, (5) Birth weight 1500 g or less, (6) Serum hyperbilirubinemia

requiring exchange transfusion or phototherapy, (7) Apgar score of 0-4 at 1 min or 0-6 at 5 min, (8) Five days or more mechanical ventilation, (9) Craniofacial anomaly, (10) Prematurity[7].

A comparative study on otoacoustic emission, auditory brain stem response identified 6 patients with hearing loss indicating prevalence in our high risk population of 2.9%. A congenital hearing loss was present in 5 patients, in 3 patients of sensorineural hearing loss the combination of severe preterm birth and low apgar score at 1 min seemed important factors[8].

SUBJECTS & METHODS:

100 high risk neonates fulfilling the criteria (Table 1) were cross sectionally investigated at Fatima Memorial Hospital from July 2018 to Dec 2018 by performing two routine otoacoustic emissions in pediatrics department from 3rd day after birth. Those found failing were considered having hearing loss and were subject to brain stem auditory potential (Table 2). Cases failing were examined by otolaryngologist. Finally cases maintaining the failure status were referred for treatment and follow up. Collected information was analyzed through SPSS version 12 and presented in terms of qualitative & quantitative indices. As this study was without any control group, so did not required any test of significance.

Table 1: Risk factor and modes of identifications for assessing hearing impairment

Sr. No	Criteria	Mode of Identification
1.	Family history of hereditary hearing loss	Consanguinity
2.	Vertical transmission of TORCH syndrome	Lab Test positivity
3.	Craniofacial anomalies	Anthropometry
4.	Birth weight	Less than 1500 g
5.	Hyperbilirubinemia	Hematocrit
6.	Ototoxic medications during pregnancy. Aminoglycosides, vancomycin, furosemide	History & prescription
7.	Bacterial meningitis	CSF positivity
8.	APGAR score	0-4 at 1 min or 1-6 at 5 min after birth
9.	Mechanical ventilation to neonate	Lasting 5 days or longer
10.	Prematurity	Birth at less than 34 weeks of gestation
11.	Seizures	History & Clinically

Table 2: Description of hearing tests used in study

Hearing Tests used in the study	Description
Otoacoustic Emission test (OAE)	OAE is the recording of sounds that are produced by the outer hair cells of cochlea. There are two types of OAE in clinical use Transient OAE: It is produced in response to a very short duration acoustic stimuli. Distortion product OAE: In it sound is emitted in response to two simultaneous sounds of different frequencies. The OAE devices used in most clinics are screeners. It typically check 5-10 frequencies and report whether the signal/ noise ratio exceeds a pre-set limit, in which it indicates that the ear is a “pass”, or if not, “referred”. This “go/no-go” type of output is often helpful in deciding whether there is any hearing problem or not.
Auditory Brain Stem Response (ABR)	The ABR test is a useful diagnostic tool for measuring hearing, when more conventional hearing test cannot be used. ABR is reliable, objective, noninvasive & painless test. In this test brain activity in auditory center is recorded in response to a series of clicks presented to each ear. Thus the ABR test indirectly estimates the level of hearing in peripheral auditory system. The ABR test does not rely on any form of subjective response from the individual being tested. It is not effected by the use of anesthesia or sedation or whether the patient is asleep or attentive. ABR can be used As a screening procedure for newborns who are at risk for hearing loss As a diagnostic tool to identify infants and small children with hearing loss. To estimate hearing levels in difficult to test patients, e.g, mentally retarded patients. To evaluate patients with suspected retro cochlear pathology. Intra operative monitoring

Table 3: Data Collection Plan:

Distribution of information brochure to all parents of neonates, admitted in nursery and ICU.
Label the neonates as high risk for hearing deficit, admitted to Pediatrics nursery & ICU.
Informed consent taken from parents.
List the High Risk neonates who opt for hearing test.
Call for ENT team for hearing assessment-1 within 48 hours after delivery.
Result of hearing assessment -1 documented.
Sending a call to ENT team for hearing assessment-2 for neonates with stay longer than 5 days.
Counselling for hearing assessment -3 at the time of discharge.
Date of hearing assessment -3 for all neonates undergone hearing test 1 was given.
Copy of form sent to center for health research.
Data entry on computer at Health research center.
List of neonates with due date of hearing assessment -3 will be send to ENT OPD 1 week before the due date.
Hearing assessment-3 conducted after 3 weeks.
Result of hearing aseessment-3 documented.
Data analyzed at Center for Health research.

Results:

The 100 high risk neonates were distributed as listed in Table 4. This shows that birth rate less than 1.5 kg along with prematurity was the major group. Low birth weight without prematurity, in combination with first group formed 45% of the subjects. Septicemia (17%), jaundice with prematurity (12%), jaundice alone (10%) were the other main factors.

Table 4: Distribution of subject by types of high risk at the time of inclusion:

Sr. No.	Risk Factors	Number (n)
1.	Low birth weight with pre maturity	32
2.	Septicemia	17
3.	Low birth weight	13
4.	Jaundice and pre maturity	12
5.	Septicemia and pre maturity	11
6.	Hyperbilirubinemia	10
7.	History of ototoxicity in parents	02
8.	History of deafness in parents	01
9.	Microtia	01
10.	Fits	01
	Total	**100 (100%)**

This flow chart shows that 24 patients failed, out of which 10 passed in the second examination, 6 further passed in the third step with one drop out. By the final step 2 cases dropped out, 6 were quoted to clinical follow up.

94 neonates passed while 6 were detected to have hearing impairment while 2 were dropped out from the study.

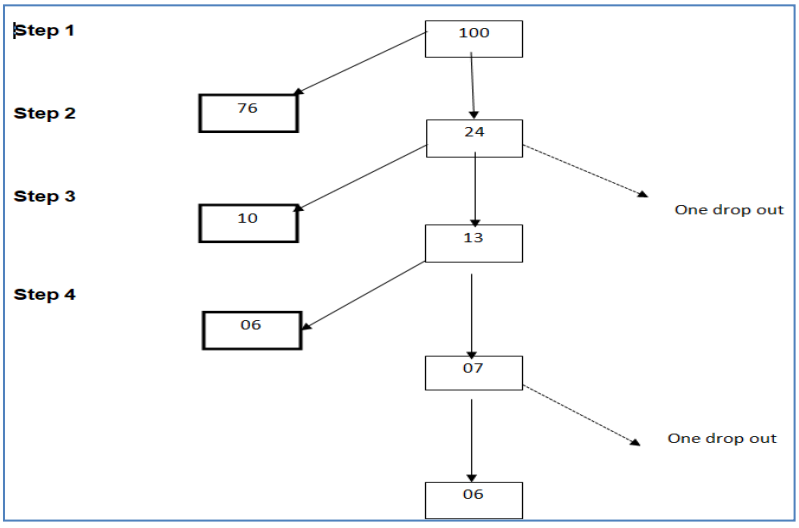

Figure 1:

Table 5: Distribution of fail cases by sex, step of examination and risk factor:

Sr. No.	Risk Factor	Step I (n=24)		Step II (n=13)		Step III (n=07)		Step IV (n=06)	
		Male	Female	Male	Female	Male	Female	Male	Female
1.	LBW with prematurity	06	04	04	03	03	01	03	-
2.	Jaundice with prematurity	03	02	02	01	01	-	01	-
3.	Septicemia & prematurity	03	-	01	-	01	-	01	-
4.	Jaundice	02	-	01	-	-	-	-	-
5.	Parental deafness	01	-	01	-	01	-	01	-
6.	Septicemia	01	-	-	-	-	-	-	-
7.	Ototoxic drugs	01	-	-	-	-	-	-	-
	Total	17	06	09	04	06	01	06	00

Table 5 suggest that among failed cases from I to IV step, prematurity and the low birth weight separately or in combination accounted for 70% or more of cases. 29% of cases were female at step I and they all passed by step IV. The 2 drop out cases was male.

DISCUSSION:

Childhood hearing impairment has a serious impact on cognitive development, language acquisition and social integration has encouraged most researchers to find if the hearing in neonates had any predisposing risk factors and if detected early, would be of beneficial value for early referral and management[9].

Few studies used the high risk neonate group approach to find higher incidence and showing the effort-effective status of the screening step[10].

Many studies have used all live births cases to estimate the incidence of neonatal hearing impairment. Most of them found the incidence to be under 2%[11].

In this study we found 6% of high risk neonates to have hearing impairment. We found prematurity alone or in combination with low birth weight to significantly raise the chances of developing hearing loss in early period of life. Other studies have also found prematurity a major risk factor for the hearing impairment[12].

These suggest that sensor neural development of ears is closely related to length of gestation. We have found that male gender is more prone to auditory defects in relation to high risk factors. Many studies have shown reliability of the initial and later test for their sensitivity, false positivity, and found the test to be quiet reliable[13 14].

In this study 6 cases are under clinical follow up and audiometric normalization by age. Another study has found this regression of audiometric problem by 2.7±1.3 months[12].

REFERENCE:

1. A Parving. The need for universal neonatal hearing screening-some aspects of epidemiology and identification. In; Acta Paediatrica, Publisher Taylor & Francis, 0803-5253, Vol.88, Pg.69-72 Online Data Thursday, February 19,2004
2. Prieve B, Dalzell L, Berg A, et al. The New York State universal newborn hearing screening demonstration project: outpatient outcome measures. Ear Hearing. 2000 Apr; 21(2):104-17.
3. Fortnum HM, Summerfield AQ, Marshall DH, et al. Prevalence of permanent childhood hearing impairment in the United Kingdom and implication for universal neonatal hearing screening: questionnaire based ascertainment study. Brit Med J.2001 Sep 8; 323 (7312):536-40.
4. Joint Committee on infant Hearing [homepage on the internet]. Year 2000 Position Statement: Available from: http://www.infanthearing.org/jcih/.
5. **H. Martyn.** Prevalence of permanent Childhood Hearing Impairment. In; Early Hearing and Communication Development Chapter III: Burden of the Target Disorder: http://www.phacaspc.gc.ca/ publicat/eh/chap3 e.html
6. T. Morlet, C.Ferber-Viart, G. Putet, F. Sevin, R. Duclaux. Auditory screening in high-risk pre-term and full term neonates using transient evoked otoacoustic emission and brainstem auditory evoked potential. IN; International Journal of Paediatric Otorhino-laryngology, 45 (1998) 31-40.
7. American Academy of Paediatrics, Joint Committee on infant Hearing 1944 position statement Paediatrics 95 (1995)152-156.
8. A Suppiej, E. Rizzardi, V. Zanardo, M. Ermani, E.Orzan. Reliability of hearing screening in high-risk neonates: Comparative study of otoacoustic emission, automated and conventional auditory brainstem response Clinical Neurophysiology 118 (2007) 870-877 www.elsevier.com/locate/clinph

9. Iiknur K, Karahar H, Kurt T, Ergin H, Sahiner T. Brainstem evokes response audiometry and risk factors in premature infants. Murmara Med J.2007,20(1)21-28

10. Zamani A, Daneshjou K, Ameni A, TakandJ. Estimating the incidence of neonatal hearing loss in high risk neonates, Aeta Medica Iranica.2004; 42(3):176-80

11. Rughani S, B Yas B, Sinha B, Shah M, Kapileshwartes J, Shah S. Hearing screening newborns. World Artie Ear, Nose, Throat 2011; 4:1

12. Hahn M, Dinnesen AL, Heinecke A, Hartmann S, Bulbul S, Schrodor G, et al, Hearing screening in healthy newborns: Pedotorhinolaryngol 1999; 51:83-89.

13. White KR, Vohr BR, Meyer S, Widen JE, Johnson JL, Gravel JS, et al. A multisite study to examine the efficacy of otoacoustic emission/ automated auditory brainstem response newborn hearing screening protocol: research design and result of the study. AJ Audiology 2005; 14:186-99.

14. Mathur NN, Dhawan R. An alternative strategy for universal infant hearing screening in tertiary hospitals with a high delivery rate, with in developing country, using transient evoked otoacoustic emission brainstem evoked response audiometry.J Laryngol otol.2007; 121:639-643