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A Clinical Study of Hearing Screening With Oae in 300 Highrisk Newborns

DR BHAGIRATH PARMAR	3rdYear ENT Resident , SMT S.C.L GENERAL HOSPITAL SARASPUR AHMEDABAD
DR VATSAL PATEL	ASSOCIATE PROF, SMT S.C.L GENERAL HOSPITAL SARASPUR AHMEDABAD
DR C.S.GOHIL	Professor and HOD, SMT S.C.L GENERAL HOSPITAL SARASPUR AHMEDABAD
DR ALPESH PATEL	ASSISTANT PROF, SMT S.C.L GENERAL HOSPITAL SARASPUR AHMEDABAD
SWATI CHAUDHARY	2nd YEAR RESIDENT , SMT S.C.L GENERAL HOSPITAL SARASPUR AHMEDABAD
DENISH ARDESHANA	1st YEAR RESIDENT, SMT S.C.L GENERAL HOSPITAL SARASPUR AHMEDABAD

ABSTRACT

INTRODUCTION

Neonatal deafness is diagnosed late, approximately at 24 to 36 months of age. At this age rehabilitation procedures are unable to ensure complete development of speech and thus prevent the full participation of the deaf child in social living.2

OBJECTIVES

Our aim of study is to identify various risk factors adversely affecting hearing and to identify hearing impairment in high-risk new-born.

MATERIALS AND METHODS

300 new-borns, born out of high risk pregnancy or intranatal or neonatal complications, requiring NICU admission, were screened for hearing loss with transient evoked otoacoustic emission .Results mentioned in terms of 'pass' (normal hearing) or 'refer' (who needs further evaluation). Follow up OAE examination was done in refer cases after 7 to 10 days. Brainstem evoked response audiometry (BERA) done in those cases, those 'failing' on second examination. Tympanometry done in those cases who shows normal BERA examination to rule out middle ear pathology2, 5, 9, 10.

RESULTS

Out of 300 new-borns 24 showed OAE'refer' at first examination and out of these 24 'refer', 18 were 'fail' on second OAE examination. Out of these 18 who underwent BERA examination, 12 showed pathological deafness and 6 showed normal BERA examination .These 6 new-borns underwenttympanometry study and showed normal results.

CONCLUSION

Incidence of hearing loss in high risk new-borns in this study was 8 % .Thus hearing screening should be implemented at all levels of health care facilities .If all new-borns could not be screened due to infrastructural problem then at least the high risk new-borns must be screened.

KEYWORDS :

INTRODUCTION

Neonatal deafness is found in approximately 1 to 4 per 1000 live births[1,2]. Currently, its diagnosis is markedly delayed, since it occurs approximately at 24 to 36 months of age; at this age rehabilitation procedures (like hearing aids, cochlear implant, speechtherapy, psychological intervention on family) are unable to ensure complete development of speech, thus preventing the full participation of deaf child in social living. Thus if a child has a hearing impairment, it should be corrected before 6 months of age.[2, 6]

To ensure timely therapy, a goal is to establish the diagnosis of severe neonatal hearing impairment before 6 months. The best process for identification of deafness is neonatal hearing screening .If all new-borns could not be screened due to infrastructural problems then at least high risk new-borns must be screened. So neonatal screening has been advocated into the National Programme for Prevention & Control of Deafness (NPPCD) [12].

OTOACOUSTIC EMISSION (OAE) screening test is fast and easy test and can be conducted without sedation to new-born. OAE screening is efficient, reliable and effective and does not require qualified staff. Failure of an ear to register an OAE indicates that further audiological evaluation is needed. Therefore, active intervention and rehabilitation can be carried out in these new-borns to facilitate optimal speech and language programme.

AIMS & OBJECTIVES

1. To identify hearing impairment in high risk new-borns
2. To study various risk factors which adversely affect hearing especially intrauterine infection, ventilator support , congenital anomaly, neonatal septicaemia, prematurity , ototoxic medication, low Apgar score ,birth asphyxia etc.

MATERIAL AND METHODS

300 new-borns born out of high risk pregnancy of mother or any intranatal and neonatal complications requiring NICU admission were screened for hearing loss with TEOAE from July 2009 to November 2013. A follow up OAE test of all 'refer' cases was done 7 to 10 days after the first screening[2]. BERA examination of the neonates with 'refer' OAE results in the follow up screening was done then after. A follow up tympanometry was done in those patients who showed normal BERA and 'refer' OAE result.

OAE testing was done in an acoustically treated room in the audiology department. A written consent of parents of new-borns was taken for participation in this study. After ear inspection and removal of any

vernix or fluid in the external auditory canal, the neonatal probe was inserted into the external auditory canal and adjusted. The OAE was performed and results of 'poor functioning (refer)' and 'normal functioning (pass)' of the peripheral auditory system was recorded. The OAE system used for measuring TEOAE had ILO88 hardware with version-5 ILO88 software.[2, 4, 7, 8,]

The recommendations of the JOINT COMMITTEE ON NEONATAL SCREENING include the following conditions where screening should essentially be done;[1, 2,3,11]

1. H/O in utero infections such as rubella, cytomegalovirus, herpes, toxoplasmosis, syphilis.
2. H/O use of ototoxic drugs by the mother during pregnancy.
3. H/O excessive intake of alcohol by the mother during pregnancy.
4. H/O prolonged/hazardous labour.
5. Any illness that necessitated admission of the child in a neonatal intensive care unit (NICU) immediately after birth.
6. Any illness requiring hospitalization for 48 hours or more in the first 4 weeks of birth.
7. Birth weight of the baby below 1500 Gm.
8. APGAR score below 4 at 1 min or 6 at 5 min after birth.
9. Any recognizable syndrome at birth where hearing loss is known component of syndrome like down syndrome etc.
10. Family h/o permanent marked sensory neural hearing loss.
11. Presences of any craniofacial anomalies of the pinna and the ear canal.
12. Babies born out of consanguineous marriage.

Other risk factor included in study

1. Multiple pregnancies
2. H/o Eclampsia in mother
3. Systemic maternal diseases like diabetes mellitus, hypothyroidism, and hypertension

OBSERVATION & DISCUSSION

300 high risk new-borns were screened by TEOAE method. All 24 'refer' cases were retested 7 to 10 days after 1st screening.On second testing 6 showed normal result and 18 new-borns showed 'refer'results. All 18 tested with BERA .Out of this 18 'refer' cases, 12 showed pathological deafness and 6 showed normal BERA examinations. These 6 new-borns tested with tympanometry to rule out middle ear pathology. In present study out of 300 new born 8 % showed OAE 'refer'.

In the observation to follow;
***n = number of neonates in the specified risk factor.**
***N = sample size.**
*** The summation of 'n 'is not equal to the sample size, i.e. 'N' because a neonate can have more than one existing risk factors requiring NICU admission.**

RESULTS OF OAE SCREENING

Age	Number of neonates	OAE pass	OAE refer 1st	OAE refer 2nd
Up to 10 days	94	83	11	7
11 to 20 days	106	97	9	9
21 to 30 days	100	96	4	2
Total	300	276	24	18

MATERNAL RISK FACTORS

MATERNAL RISK FACTORS	PRESENT STUDY N=300	OAE refer	OAE refer %
Intrauterine infection	10(3.3	2	20 %
Systemic disease in mother	6(2)	-	-
Previous h/o still birth, downs baby	4(1.3)	-	-
Eclampsia	8(2.6)	1	12.5 %
Oligohydroamnions	8(2.6)	-	-
Multiple gestations	11(7.3)	2	18.18 %

In present study out of 300 high risk new-borns,8% showed OAE 'refer'. The most common maternal risk factor found to be intrauterine infections (TORCH) (20 %).Better antenatal care and awareness of rubella vaccination can reduce the risk of at least rubella infections. Multiple gestationswas second common maternal risk factor (18.18%).

INTRANATAL RISK FACTORS

Intranatal risk factor	Present study N=300	OAE refer	% of OAE refer
Low Apgar-birth asphyxia	108(36)	4	3.7%
Meconium stained fluid	14(4.6)	1	7.14%
Prolonged labour/ obstructed labour	8(2.60)	1	12.5%

Among the intranatal risk factors Low Apgar score was most commonly found, 3.7% of these neonates in present study were found to have OAE refer result. The most important cause of cardio pulmonary neurological depression indicated by low Apgar score is birth asphyxia. Therefore, infants with low 5 min Apgar scores should be monitored for manifestations of hypoxic ischemic encephalopathy.

During gestation if foetus exposed to hypoxia, it may make gasping movements and also passes meconium and when such neonates inhale air during delivery, the meconium enters the small air way and alveoli which causes severe lung damage and ischemia of brain .then it may causes neonatal encephalopathy and auditory nuclei damage leading to deafness. Prolonged and obstructed labourincreases the risk of intrauterine hypoxia causing neuronal damage and trauma to skull.

NEONATAL RISK FACTORS

Neonatal risk factors	Present study N= 300	OAE refer	% of OAE refer
Low birth weight	20	3	15 %
Prematurity	16	2	12.5 %
Neonatal septicaemia	20	2	10 %
Neonatal meningitis	15	2	13.3 %
Hyperbillirubinemia	28	1	3.5 %
Ototoxic drug use	16	2	12.5 %
Congenital anomalies	16	1	6.25 %

Preterm (gestational AGE < 37 WEEKS) neonates have immature immune system and so are more susceptible to infection leading to permanent brain damage and hearing loss. Preterm with low birth weight (<1.5 kg) are more susceptible to hypoxia, acidosis causing neurological and central hearing impairment.

Kernicterus (hyperbillirubinemia) causes selective damage to the brain stem auditory nuclei ,auditory nerve and spiral ganglion cell. Ototoxic drugs cause inner hair cell damage and hearing loss, hence administration of ototoxic drug should be done judiciously.

The neonates on CPAP ventilation support have received high intensity noise in post nasal space ,because of proximity of inner ear and post nasal space, enough noise could be transmitted , especially in new-borns receiving high flow rates , to cause cochlear damage and hence hearing loss.so it is wise to avoid using the higher flow rates.

SEX RELATONSHIP

SEX	No of cases	OAE pass	OAE refer 1st	OAE refer 2nd	%n of OAE refer
Male	156	146	13	10	8.3 %
Female	144	136	11	8	7.6%

As the age of neonates increases the risk of false negative result decreases. As the number of risk factors occurring simultaneously in

singleneonate increases, the incidence of deafness also increases. No significant correlation found between sex of neonates and deafness.

CONCLUSION

OAE is accepted as a diagnostic tool for hearing screening programme as it is cost effective, non-invasive, does not require qualified staff, less time consuming then BERA but BERA is still the gold standard test for precise results.

Incidence of deafness in high risk new-borns in this study is 8 %, so ideally all new-borns should be screened with OAE but if all new-borns could not be screened due to infrastructural problems then at least high risk new-borns must be screened. Auditory intervention should be done before 6 months of age. Community awareness regarding hearing screening should increase.New-born found to be havinghearing loss should be referred to tertiary care centre. Hearing screening, disability limitation and rehabilitation should be included in appropriate health programme.

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