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HEARING IMPAIRMENT AND ITS CORRELATES AMONG NEWBORNS AT TERTIARY CARE HOSPITAL OF SURAT

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ABSTRACT

Introduction: Hearing impairment has a devastating, detrimental and an invariably adverse impact on the development of new-borns and the psychological well-being of their families. **Objective:** To study the incidence and prevalence of hearing impairment and its correlates in the high risk neonates in Neonatal Intensive Care Unit (NICU).

Methodology: This cross sectional study was conducted at NICU of Surat Municipal Institute of Medical Education and Research (SMIMER) between 1st August 2012 to 30th October 2013 after taking written consent of parents and approval of institutional ethical committee.

Results: Among high risk new born 36 (27.6%) new born had hearing impairment. Multiple risk factor increases the risk for hearing impairment in newborns as compared to single risk factor. Newborns with birth weight ≤ 1.5 kg were 2.341 times (CI: 1.15- 4.763) more prone to develop hearing impairment.

Conclusion: The incidence of hearing impairment was 13% in newborns admitted in NICU in our hospital. Factors like early gestational age, low birth weight, birth asphyxia, hyperbillirubinemia, ventilator support and TORCH infection were significantly found to be associated with hearing impairment.

Key words: Hearing impairment, new born, OAE (otoacoustic emissions examination), NICU

INTRODUCTION

Hearing impairment has a devastating, detrimental and an invariably adverse impact on the development of newborns and the psychological well-being of their families.[1]

Reduced auditory input also adversely affects development of the central auditory nervous system, and can negatively impact speech perception that interferes with growth in social, emotional, behavioral and cognitive spheres, academic achievement, vocational options, employment opportunities and economic self-sufficiency.[1] Hearing loss in infants should be recognized in time and appropriate otological and audio logical rehabilitation should be instituted early, to take advantage of the plasticity of developing the sensory system (critical period is 0-3 years).[1] Timely information also provides acceptance of hearing impairment and improves the parents' readiness to initiate a family centered rehabilitation programme. In a recent survey, 4 out of every 1000 children born in India were found to have severe to profound hearing loss.[2] It is indeed a big challenge to provide special education, vocational training and employment to this large population. The present study was undertaken to identify the risk factors for hearing loss in the newborns and to know the magnitude of problem of hearing impairment in high risk as well as normal newborns and to help in planning out of strategies in future for hearing screening in the newborns. The incidence and prevalence of hearing impairment in

newborns with or without high risk factors in Neonatal Intensive Care Unit (NICU) were counted and correlated risk factors were assessed.

METHODS

It was a prospective cross sectional study. Patients were taken from NICU, High risk clinic, and post natal clinic of Surat Municipal Institute of Medical Education and Research (SMIMER). The duration of study was from 1st August 2012 to 30th October 2013 and written consent of parents was taken for participating in the study. Study was approved by SMIMER hospital ethical committee. Total 300 newborns admitted in Neonatal ward in SMIMER were included. In inclusion criteria any newborn including both intramural and extramural deliveries without high risk factors from postnatal ward, High Risk clinic and with High Risk factors from NICU. High Risk factors included familial history of hearing loss, intrauterine infections (TORCH), craniofacial abnormalities including pinna anomalies and canal agenesis, hyperbilirubinemia needing blood exchange or Kernicterus. Bacterial meningitis, APGAR scores of less than 4 in the first minute or less than 6 in the fifth minute, Needing mechanical ventilation for more than 5 days, Birth weight <1.5kg,gestational age<32wks, ventricular hemorrhage.[3,4,12] In exclusion criteria those newborns which are lost during follow up after discharge. Parents/relatives not willing for hearing test of their newborns. Infants which expired during study period.

All eligible newborns were examined in detail, thereafter; they were referred to ENT department for complete Ear examination. First OAE examination was done before newborns were discharged from hospital 2nd OAE examination was done after 1 month of 1st OAE examination and BERA examination was done 3 month after the 2nd OAE examination.[17] If an infant's cochlea is functioning normally, internally generated sounds was recorded and the result was as "PASS". If cochlear hearing loss exists, the cochlea either will not generate a response or it will generate a response that falls below the level that is expected from an ear with normal hearing result was labeled as "REFFERED".

RESULTS

According to table 2, out of 300 participant 172 (56.63%) were male and 128(43.3%) female. Out of these, 82 (64%) male and 48 (36%) female had high risk factors.

Table: 1 Classification of New born included in the study

Variables	Frequency (%)
Total no. of Newborns having risk factors for Hearing impairment(n=353)	163 (46.17)
Lost to follow up in High Risk newborns(n=163)	33 (20.24)
Actual no. of Newborns having risk factors for Hearing impairment included(n=163)	130 (79.75)
Total no. of Newborns without risk factors for Hearing impairment(n=353)	190 (53.82)
Lost to follow up in newborns without risk factors(n=190)	20 (10.52)
Actual no. of Newborns without risk factors for Hearing impairment included(n=190)	170 (89.47)

According to table 3, among high risk new born 36 (27.6%) new born had hearing impairment. New born presented with high risk had higher chance of developing hearing impairment and difference was statistically significant.

Table 3 shows Presence of multiple risk factor increases the risk for hearing impairment in newborns as compared to single risk factor.

Table 2: Sex distribution of the Newborns:

Risk factor(s)	Male (n=172)	Female (n=128)
Present (At risk newborns)	82(64%)	48(36%)
Absent (Normal newborns)	90(53%)	80(47%)

In our study, newborns ≤ 32 weeks of gestational age were 2.83 times (CI: 1.209 - 6.635) more prone to develop hearing impairment than newborn >32 weeks of gestation. Newborns with birth weight ≤ 1.5 kg were 2.341 times (CI: 1.15- 4.763) more prone to develop hearing impairment than newborn with birth weight > 1.5 kg. Newborns with birth asphyxia are 4.828 times (CI: 2.152- 10.83) more chance of developing hearing impairment than newborn without birth asphyxia. Newborn having hyperbilirubinemia and exchange transfusion were 5.336 times more (CI: 1.604-17.75) prone to develop hearing impairment than newborn without hyperbilirubinemia and exchange transfusion. Newborns on ventilator support were 6.25 times (CI: 1.81-21.59) more chance to develop hearing impairment than newborn without ventilator support.

DISCUSSION

In our study prevalence of Hearing impairment was 13% similar to what was found in the study by Shahnaz et al[6] (13%).Whereas prevalence of Hearing impairment was (3.2%) in Elysee et al[9]which is less as compared to our study (13%) .

Table 3: Univariate statastical analysis of risk factors

Factors	Hearing impairment		OR (95% CI)	P value
	Present (n=39) (%)	Absent (n=261) (%)		
Risk factor(s)				
Present (At risk newborns)	36 (27.6)	94(72.4)	21.32 (6.392- 71.1)	<0.001*
Absent (normal newborns)	03 (1.8)	167(98.2)		
Number of Risk factor(s)				
3 or more risk factor	2 (5.1)	1 (0.38)	0.00898 (0.0006296-0.1282)	<0.001*
2 risk factor	14 (35.8)	20 (7.6)	0.02566 (0.006785- 0.09706)	
1 risk factor	20 (51.28)	73 (27.96)	0.06557 (0.0189-0.2275)	
no risk factor	3 (7.6)	167 (63.9)	Ref	
Gestational Age				
≤32 weeks	9(26.4)	25(73)	2.83 (1.209 - 6.635)	0.013*
>32 weeks	30(11.2)	236(88.8)		
Mode of delivery				
LSCS	6(8.0)	69(92)	0.5059 (0.2032-1.26)	0.137
Vaginal	33(14.7)	192(85.3)		
Birth weight				
≤1.5 kg	15(21.7)	55(78.3)	2.341 (1.15- 4.763)	0.016*
>1.5 kg	24(10.3)	206(89.7)		
Birth asphyxia				
Present	12(35.3)	22(64.7)	4.828 (2.152- 10.83)	0.004*
absent	27(10.2)	239(89.8)		
Hyper billirubinemia				
Present	5(41.6)	7(59.4)	5.336 (1.604-17.75)	0.002*
absent	34(11.8)	254(88.2)		
On ventilator				
On ventilator >5 days	5(45.4)	6(55.6)	6.25 (1.81-21.59)	0.001
Without ventilator	34(11.8)	255(88.2)		
TORCH infection				
Present	2(66)	1(44)	14.05 (1.244- 158.8)	0.005
absent	37(12)	260(88)		
Congenital anomalies with syndromes				
Present	1(50)	1(50)	6.842 (0.4192-111.7)	0.118
absent	38(12)	260(88)		

*P value significant

In our study incidence of Hearing impairment was 3.6% in NICU whereas other studies reported from 1 to 19%. Various studies show that in majority of the studies, the proportion of the male appears to be more than the proportion of female. In our study no correlation was found between genders of the newborns with Hearing impairment.

In our study we found 21.7% hearing impairment in newborns of Birth weight ≤1.5 kg compare to what was found in the study by Gisel et al[8] (22%). However, in our study assessment was performed by TrOAE whereas in Gisel et al it was AABR. In the study conducted by Safa et al[7] 54% of newborns with birth weight ≤1.5 kg were having Hearing impairment which was performed by TrOAE method. In the study conducted by Sayed et al[5]incidence of Hearing impairment was 40% in newborns with birth weight ≤1.5 kg. In the study conducted by Zumani et al[4] incidence of Hearing impairment was 17% in newborns with birth weight ≤1.5 kg.

In our study 26.4% of preterm ≤ 32 weeks had Hearing impairment which is comparable to study conducted by Bhagya et al.[11] In most of the studies gestational age was not included in risk factor but according to JCIH[12] (joint committee on infant Hearing 2007, American Academy of Pediatrics statement) gestational age ≤32 weeks is an independent risk factor for Hearing impairment. This is supported by our study and by Bhagya et al.[11]

In our study 35.3% newborns with birth asphyxia were found to have Hearing impairment which was statistically significant ($p< 0.05$) as compared to study conducted by Mishra et al[16] in which 43% of newborns with birth asphyxia were found to have Hearing impairment. In our study we included newborns with moderate to severe birth asphyxia while in study conducted by Sayed et al1[15] included only severely asphyxiated newborns with an incidence of Hearing impairment of 100%. So it can be said that the more severe the hypoxic insult the more is Hearing impairment. In the study conducted by Gisel et al[8] 20.9% of newborns with birth asphyxia had Hearing impairment by AABR method. In Mishra et al[16] 13 out of 30 (43.3%) newborns with birth asphyxia had some abnormalities in one or the other wave forms of BERA.

In our study we had found statistically significant correlation between Hearing impairment and hyperbilirubinemia with exchange transfusion which is similar to Sayed et al[5] in which 44% of newborns with Hyperbilirubinemia and exchange transfusion had Hearing impairment. In the study conducted by Gisel et al[8] and Zumani et al[4] 16% newborns with hyperbilirubinemia and exchange transfusion had Hearing impairment.

In our study 45% of newborns had Hearing impairment on ventilation for>5 days comparable to the study conducted by Ashok et al[10] (41%). Whereas studies of Sayed et al[5] had Hearing impairment of 39% and Gisel et al[8]had Hearing impairment of15% which may be due to more number of cases in their studies. In our study drop out on follow up was 16% .On comparing follow up drop outs in other studies it was 41% in Barsky et al,[13] 23% in Prieve et al[14]and 2% in Jhonson et al[15] As Surat is an industrial city with migratory population many of newborn parents did not turned up on follow up and this could be the reason of drop out in follow up in our study.

CONCLUSION

The incidence of hearing impairment was 13% in newborns admitted in NICU in our hospital. At risk new born had higher chance of developing hearing impairment. As the number of risk factors increase, the risk of developing hearing impairment was also found to be increase. Factors like early gestational age, low birth weight, birth asphyxia, hyperbillirubinemia, ventilator support and TORCH infection were significantly found to be associated with hearing impairment.

RECOMMENDATIONS

Community awareness is required regarding screening for hearing impairment in newborns. The newborns with high risk factors for hearing impairment should be identified and screened before discharge from hospital, so that proper interventions can be made before, it gives rise to, permanent hearing disability. Even in the newborns without any risk factors prevalence of hearing impairment in our study was 1.7% and it is also mentioned high in texts and literatures so screening for hearing should also be advised in them.

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