Prevalence of Hearing Impairment in High Risk Infants

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Abstract Hearing impairment is prevalent in the general population, early intervention facilitates proper development. The aim of this study was to establish the prevalence of hearing impairment in high-risk infants born between 2013 and 2014. 100 newborns were evaluated using evoked otoacoustic emissions and distortion produce and auditory behavior. Tests were reported if the results were altered. If altered results persisted, the child was referred for impedance testing and when necessary for medical evaluation. Infants referred for BOA and OAE undergone Brainstem auditory evoked potential testing. Of 100 children, 85 children have hearing within normal limits. Hearing impairment was found in 15 out of which 7 had unilateral hearing loss and 8 had bilateral hearing loss. The high prevalence of hearing impairment in this population underlines the importance of early audiological testing.

Keywords Audiology · Hearing · Risk factors · Hearing loss · Neonatal screening

Introduction

Impairment of hearing is quiet common in the general population. Early intervention before the age of 6 months facilitates normal development of language, regardless of the severity of hearing loss [1].

Hearing impairment may seen in neonates at risk or not at risk. The prevalence ranges from 0.09 to 2.3 % [2, 3] in low risk neonates, and it ranges from 0.3 to 14.1 % [4, 5] in the high risk population. The prevalence of impaired hearing reaches up to 17 % in very low birth weight [6] neonates; this study, however, included conduction, mixed and sensorineural hearing loss. In infants having a NICU stay >5 days hearing loss was up to 20.68 %. Another study which evaluated neonates in neonatal intensive care units found prevalence rates of hearing impairment ranging from 3 to 14.1 % [5, 7].

Risk indicators to be used internationally has been proposed by The Joint Committee on Infant Hearing (JCIH [8, 9], these indicators can be adapted locally supplemented by studies.

The purpose of our study was verification of the prevalence of hearing impairment and correlation of it with risk factors in neonates born and monitored at a tertiary level hospital (Tables 1, 2, 3).

Material and Methods

Source of Data

The study will be conducted on 100 high risk infants referred to the Department of ENT and Audiology, J.L.N. Medical College, Ajmer, between 2013 and 2014.

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Table 1 Distribution of various risk factors among high risk infants

S. no.	Risk factors	No. of infants with risk factor		
		M	F	Total
1	Prematurity (n = 47)	27	20	47
2	NICU stay > 5 days (n = 29)	17	12	29
3	VLBW (n = 41)	26	15	41
4	Sepsis (n = 21)	16	5	21
5	Use of ototoxic drugs (n = 12)	8	4	12
6	Birth asphyxia (n = 51)	35	16	51
7	Neonatal seizures (n = 3)	3	0	3
8	Maternal risk factors (TORCH) (n = 29)	23	6	29
9	Congenital anomalies (n = 4)	2	2	4
10	Hyperbilirubinemia requiring exchange transfusion (n = 22)	7	15	22
11	Family history hearing loss (n = 5)	5	0	5

Table 2 Correlation between various risk factors and hearing impairment

S. no.	Risk factors	No. of infants with hearing loss		
		M	F	Total
1	Prematurity (n = 47)	4	4	8
2	NICU stay > 5 days (n = 29)	2	4	6
3	VLBW (n = 41)	3	4	7
4	Sepsis (n = 21)	0	0	0
5	Use of ototoxic drugs (n = 12)	0	0	0
6	Birth asphyxia (n = 51)	3	3	6
7	Neonatal seizures (n = 3)	0	0	0
8	Maternal risk factors (TORCH) (n = 29)	0	0	0
9	Congenital anomalies (n = 4)	0	1	1
10	Hyperbilirubinemia requiring exchange transfusion (n = 22)	3	5	8
11	Family history hearing loss (n = 5)	0	0	0

Table 3 Prevalence of hearing impairment in various study

Study	High risk neonate (%)
Nagapoomima et al. [10]	1
Rughari et al. [11]	22
Present study	15

Method of Collection

Study Group

High risk infants born in Rajkiya Mahila Chikitsalya, Ajmer or referred to ENT and Audiology between 2013 and 2014 will be evaluated for hearing loss by behavioral observation audiometry, otoacoustic emission. These cases will be followed and brainstem evoked response audiometry (BERA) will be done to detect the hearing loss in high risk infants.

Inclusion criteria Infants with at least one of the following high risk factors will be taken into the study.

High Risk Criteria

Family history of congenital or delayed onset childhood sensorineural hearing loss.
Maternal infection TORCH group.
Congenital anomalies (craniofacial abnormalities).
Birth weight < 1500 g.
Hyperbilirubinemia at a level exceeding indication for exchange transfusion.
Prematurity.
Sepsis.
Ototoxic drugs (aminoglycosides) (infant and mother).
NICU > 5 days.
Birth asphyxia.
Neonatal seizures.

Fig. 1 Proposed flow chart of study design

Exclusion Criteria

High risk infants whose parents do not consent to BERA.
Infants on ventilators who are severely ill.

Initial Screening

All eligible newborns enrolled in the study were screened by BOA, DPOAE's preferably within 3 days of life.

Results

Distribution of study subjects according to gender and gestational age.
Out of 100 babies enrolled in the study, 62 babies were male and 38 babies were female.

Distribution of Cases, According to Gender

- Out of 100 infants, 62 males and 38 are females.

Discussion

The study describes the prevalence of hearing loss in high risk infants using BOA, OAE and BERA (Fig. 1).

Our study reported hearing impairment prevalence of 15 % in HRR while other studies reported prevalence of hearing impairment in HRR 1–22 %.

In our study out of 100 neonates enrolled, unilateral hearing loss was found in 7 and bilateral hearing loss in 8. Piper et al. [12] reported a predominance of bilateral hearing loss. However, Meyer et al. [13] reported almost equal incidence of unilateral (3.2 %) and bilateral (2.05 %) hearing loss.

Yoshikawa et al. [14] reported that only congenital infections ($P < 0.01$) and chromosomal aberration had significant association with hearing loss. However, our study shows 25 % distribution of hearing loss in congenital anomalies.

In the present study, prematurity and VLBW associated with hearing loss is 17.02 and 17.05 % which was significant in distribution.

Similarly Iiknur et al. [15] concluded that type of delivery normal or (caesarean section) birth weight <1500 g

hyperbilirubinemia exceeding phototherapy limits and apgar score were significant with hearing impairment.

However, no significant distribution was found between aminoglycosides and hearing impairment.

Rughani et al. 100 reported a significant association of hyperbilirubinemia requiring exchange transfusion NICU stay, sepsis, VLBW, prematurity with hearing impairment.

In our study NICU > 5 days and hyperbilirubinemia requiring exchange transfusion have a prevalence of hearing impairment of 20.68 and 36.36 % respectively.

In our study 12 patients received aminoglycosides (for more than 1 week) none of them showed hearing impairment.

In comparison with Gupta et al. [16] no significant association found between aminoglycosides use, >7 days and hearing loss.

Conclusion

The study was aimed to detect the prevalence of hearing impairment in new born infants exposed to multiple risk factors, as it is thought that the prevalence of hearing impairment is high in our population group. In these subjects, delayed onset or progressive neonatal or postnatal hearing loss may be seen due to multiple factors, which should be assessed and monitored through a hearing screening program.

Early diagnosis and intervention for development of speech are not the reality throughout Ajmer (Rajasthan) in prelingual hearing loss cases. The general population and healthcare professionals involved in child care should be made conscious of the impact of hearing impairment, this could be extremely useful in increased adhesion screening programs for neonates.

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