

Predominance of High-Risk Babies with Hearing Loss in Malabar Region, Kerala, India

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ABSTRACT

BACKGROUND

Among all the disabilities, hearing loss is the most prevalent all over the world. It does not cause mortality but results in huge loss in one's social, educational and economic well-being. The prevalence rate of hearing loss in India is 5 - 6 newborn infants per 1000 births. The disabled infants are identified on an average at the end of second year; by then irreversible damage would have occurred with failure to develop speech. Global screening to detect infants with hearing loss would only decrease the burden of deafness in our society. The purpose of the study is to find out the profile of the High Risk Babies with hearing loss in Malabar region in Kerala, India and determine the common high risk factors for hearing loss among the new-born infants.

METHODS

A retrospective study was conducted between 1st January 2015 and 31st December 2017, wherein the new-borns of Malabar region, Kerala were screened for their hearing disorders. 45,867 new-born infants were screened by adopting High Risk Register (HRR) - A New-born screening for communication disorders developed at All India Institute of Speech and Hearing, [AIISH] Mysore which was used between 0 to 28 days. Trained medical staff collected the data as per the High Risk Register (HRR).

RESULTS

Among the 5728 infants with positive high risk factors 3547 (61.92 %) were male infants and the remaining 2181 (38.07 %) were female infants. Among the risk factors enlisted in the High Risk Register (HRR), premature births, low birth weight, delayed birth cry, low APGAR score and consanguinity were most common among the new-born with hearing loss in Malabar region of Kerala. The incidences of risk factors based on HRR for the three-year period showed premature births in 24.71 % of the infants, delayed birth cry in 11.22 %, low APGAR score in 06.71 %, low birth weight in 04.46 % and history of consanguinity in 03.06 %.

CONCLUSIONS

The overall prevalence of high risk factors among the new-born infants screened was 12.48 % which was higher than the national prevalence. The study has a bearing and relevance to new-born hearing screening in Kerala state, where this type of screening was not performed routinely in all hospitals.

KEYWORDS

New-born Infants, Hearing Loss, High Risk Registry, New-born Screening and Speech

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BACKGROUND

Loss of hearing affects millions of people all over the world and remains fourth leading cause of all disability. Current estimations by WHO states that the figure was at over 466 million with disabling hearing loss in 2018.¹ If the magnitude of problem is not properly addressed, it leaves a long lasting impact on those affected posing a significant challenge to their everyday lives. As the impairment of hearing is quite common in the general population, early detection and treatment before the age of 6 months facilitate normal development of language, regardless of the severity of hearing loss.² Large scale screening of new-born using High Risk Registry was done by Yathiraj, Sameer, and Jayaram in 2002³ to detect hearing loss and to determine the most effective method of screening was attempted. Presence of hearing loss at birth is one of the major causes of disabilities occurring in childhood and its early detection could prevent further disability in speech, language and cognition as the child grows.⁴

Hearing impairment could be present in neonates at risk or not at risk. Its prevalence ranges from 0.09 to 02.3 %^{5,6} in low risk neonates and 0.3 to 14.1 %^{7,8} in the high risk population. Whereas the incidence of hearing loss increases up to 17 % in very low birth weight neonates.⁹ It was observed in a study that new born infants staying in neonatal intensive care unit (NICU) for more than 5 days showed hearing losses up to 20.68 %.¹⁰ But in another study the hearing loss prevalence rate was ranging from 03 to 14.1 %.¹⁰ The risk factors to be included to estimate the prevalence of hearing loss was proposed by the Joint Committee on Infant Hearing (JCIH).^{11,12}

These indicators were adapted in the present study as a HRR helping to start primary screening indicator of the new-born for hearing loss. The present study was a verification of such prevalence of hearing impairment and its correlation with risk factors in neonates at a tertiary level hospital.

Need of Study

Out of every 1000 children born in India, there may be 5 – 6 children who cannot hear properly. Because there are no visual indicators, most hearing-impaired children, who are not screened at birth are not identified until between 1½ and 3 years of age, which is well beyond the critical period for healthy speech and language development. As per the State Initiative of Disabilities [SID] survey (2015) 02.32 % of population in Kerala are affected with some form of disability.

Among them 60,925 were having hearing disability based on definition of hearing impairment in PWD Act 1995. The number of mild to moderate degree of hearing loss was excluded from this survey. In this context the present study was conducted as an attempt to find out prevalence of high risk babies and high risk factors causing hearing loss as no such attempt was done at Government Medical Colleges in Kerala and which would also help to design the protocol for new born hearing screening.

Objectives

1. To find out the prevalence of High Risk Babies for hearing loss in Malabar region in Kerala, India
2. To determine the common high risk factors for hearing loss among the new-born infants.

METHODS

A retrospective study was conducted between 1st January 2015 and 31st December 2017 at Government Medical College, Kozhikode, Kerala, India, to include children, who were born in Malabar region of Kerala and underwent new-born hearing screening. Totally 45, 867 new-born infants were screened by adopting HRR a New-born screening for Communication disorders developed at All India Institute of Speech and Hearing, [AIISH] Mysore was used between 0 to 28 days.¹³

The questions as in HRR were given below. Junior Public Health Nurses (JPHN) audiologists and junior resident were trained to elicit the risk factors from the parents of the new-born infants and response were jotted on the printed proforma provided to them. They were also trained to use the exclusion criteria. All the filled in forms were analysed by the Audiologists and senior residents and tabulated.

HRR No.	HRR Question
1	Was the marriage of the child's parents consanguineous?
2	Was there any family history of permanent early childhood sensorineural hearing loss?
3	Did the child's mother have any conditions during pregnancy such as measles, mumps, chickenpox, herpes, syphilis, cytomegalovirus, rubella or toxoplasmosis?
4	Was the child's mother hospitalized for long prior to delivery of the child?
5	Did the mother take any ototoxic medication for illness during pregnancy?
6	Was the child born prematurely?
7	Was the child's birth cry delayed?
8	Did the child weigh less than 1500 grams at birth?
9	Did the child have hyperbilirubinemia at a serum level requiring exchange transfusion soon after birth?
10	Did the child have APGAR score of 0-4 minute or 0-6 at 5 minute?
11	Was there any craniofacial anomalies including those with structural abnormalities of the pinna and the ear canal?

Table 1. HRR Questionnaire Used in the Study¹⁴

Inclusion Criteria

New born infants between 0 to 28 days screened with HRR were included and parents of new born infants willing to participate in the study were also included.

Exclusion Criteria

New-born infants above 28 days were excluded. The HRR for the medical professionals for 0 - 28 days was administrated by Junior Public Health Nurse (JPHN) as a part of new born hearing screening. The JPHN nurses were given training for HRR administration and the new-born screening programme. The HRR were marked in a new-born screening register. The data was analysed from new-born screening register and the data included NICU and well baby's nursery.

Statistical Analysis

Standard general statistical methods like mean, percentages and standard deviations were used in analysing the data.

RESULTS

Universal Neonatal Hearing Screening (UNHS) was done for all children irrespective of presence or absence of risk factors to identify hearing impairment as early as possible to provide interventions. Total 45,867 babies were screened at Government Medical College, Kozhikode on the basis of High Risk Registry (HRR) developed at All India Institute of Speech and Hearing (AIISH), Mysore.¹⁵

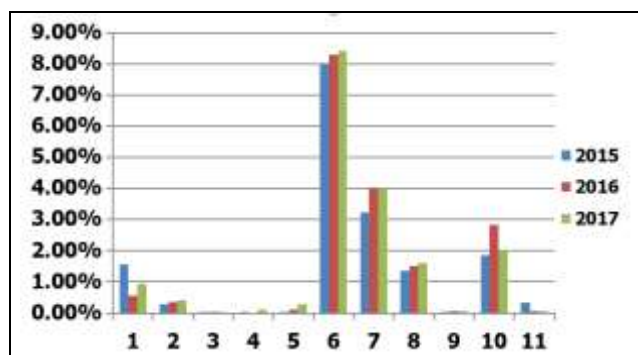


Figure 1. Incidence of Various Risk Factors of HRR in the Study (N=5728)

N.B: X-Axis shows the serial number of risk factor of HRR and Y Axis: Number of infants in percentage for three years

The number of new-born infants with positive high-risk factors were 5728 (12.48 %) in the study. There were 3547 (61.92 %) male infants and the remaining 2181 (38.07 %) were female infants. Among the risk factors enlisted in the HRR, premature births, low birth weight, delayed birth cry, low APGAR score and consanguinity were most common among the new-born in Malabar region of Kerala. The incidences of risk factors based on HRR for the three-year period tabulated in Table 2, showed premature births in 24.71 % of the infants, delayed birth cry in 11.22 %, low APGAR score in 06.71 %, low birth weight in 04.46 % and history of consanguinity in 03.06 %.

High Risk Register	% of High Risk Babies
1	3.06 %
2	1.06 %
3	0.13 %
4	0.15 %
5	0.42 %
6	24.71 %
7	11.22 %
8	4.46 %
9	0.16 %
10	6.71 %
11	0.44 %

Table 2. Overall (3 Years) Incidences of Risk Factors in the Study (N=5728)

DISCUSSION

Implementing a screening programme helps in identifying the disease much earlier than its diagnosis after the disease

has evolved completely with its after-effects. In India Neonates and infants are not regularly screened for identification of any specific disease. Even though the infant mortality rates are reduced, the burden of disability remains high in India.¹⁴

Many disabilities could be prevented with regular and appropriate screening programmes for various common diseases. The prevalence of hearing loss in India was 5 – 6 per 1000 children¹⁵ as there were no visual indicators and the earliest a child screened for hearing loss in India was around 18 months to 36 months after birth. This period is the most critical for the development of healthy speech and language. The present study was a retrospective study based on similar studies by the Department of Prevention of Communication Disorders of All India Institute of Speech and Hearing (AIISH), Mysore, which conducts infant screening for hearing disorder on regular basis in different hospitals attached to it using Behavioural Observational Audiometry, Otoacoustic Emissions (OAE) screening, and administering High Risk Register (HRR). In USA the formula followed was 1 – 3 - 6, means screen the new-born before 1 - month, further investigations to confirm the diagnosis of hearing loss and fit hearing aid before 3 months, and finally enrol the child for early intervention before 6 months of age.¹⁶

To avoid rise in the prevalence of hearing loss among the children in India, such measures could be undertaken in all health centres to screen every child delivered before discharging the mother and child. In children above 6 months', behavioural techniques could be used to detect infant's ability to respond to specific tones presented in a sound-proof room from different directions.¹⁷ The behavioural techniques for hearing has a sensitivity value of 66.7 %, specificity value of 86.9 %.

The study by R Cristobal and J S Oghalai in 2008¹⁸ showed that children with very low birth weight are at increased risk of hearing loss. Korres et al.¹⁹ 2005 found that 78 % of new-born, who failed hearing screening were in the well-baby nurseries; further supports the necessity of universal hearing screening instead of selective screening in neonatal intensive care units, even with the obvious impact on cost-effectiveness. In the present study among the 5728 infants with positive high risk factors, 3547 (61.92 %) were male infants and the remaining 2181 (38.07 %) were female infants. Among the risk factors enlisted in the HRR, premature births, low birth weight, delayed birth cry, low APGAR score and consanguinity were most common among the new-born in Malabar region of Kerala. The incidences of risk factors based on HRR for the three-year period showed premature births in 24.71 % of the infants, delayed birth cry in 11.22 %, low APGAR score in 06.71 %, low birth weight in 04.46 % and history of consanguinity in 03.06 % (Table 2).

Review of literature for surveys showing incidence of hearing impairment in India showed that Abraham K Paul at Cochin reported an incidence of hearing impairment among 10.3 / 1000 of high risk group and 0.98 / 1000 in well baby group.²⁰ But from the study by P. Nagapoornima et al.²¹ an incidence of hearing impairment was 05.65 / 1000. Vidya Ramkumar et al.²² from their review concluded that the incidence of hearing loss, in general, seems to be between

1 to 6 per 1000; among at-risk babies, it was between 7 to 10 per 1000 and among babies not at risk the incidence was between 1 to 5 per 1000. The prevalence of high risk factors of hearing impairment in the present study was 12.48 %. This may be because this study was conducted in a tertiary care Hospital which attends to large number of high-risk deliveries leading to larger caseload of at-risk group.

CONCLUSIONS

The overall prevalence of high risk factors among the newborn infants screened was 12.48 % which was higher than the national prevalence. The most common high risk factors were premature births in 24.71 % of the infants, delayed birth cry in 11.22 %, low APGAR score in 06.71 %, low birth weight in 04.46 % and history of consanguinity in 03.06 %. These results could be used to improve new-born hearing screening in our region and to provide awareness of high risk factors which would affect hearing loss in early childhood. The study has a bearing and relevance to new-born hearing screening in Kerala state, where this type of screening was not performed routinely in all hospitals. High risk registries for hearing loss like consanguinity, RH incompatibility and viral infections could prevent hearing disability among infants and provide awareness of hearing loss to an extent.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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