Newborn Hearing Screening

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Background: Congenital hearing loss has a major impact on both cognitive and speech-language development which eventually leads to impaired communication and a lower socio-economic status.

Objective: To evaluate the result of newborn hearing screening.

Design: A Retrospective Study.

Setting: NICU and Post-Natal Ward, King Hamad University Hospital, Bahrain.

Method: A total of 1,834 babies were screened at the time of discharge, using Transient-Evoked Oto-Acoustic Emissions. Infants who failed the screening test were scheduled for a second screening test. Infants who failed the second screening test were tested with Auditory Brainstem Response (ABR).

Result: Five infants were identified with hearing impairment out of 1,834 or 272 per 100,000. The incidence was 0.27% in the infants screened from October 2012 to December 2015 in the hospital.

Conclusion: Five infants were identified with hearing loss according to JCIH standards and advised early intervention. The study could be used to plan services and strategies in the hospital for newborns identified with hearing loss at a very early age to offset the long term consequences of hearing loss.

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Hearing loss is a well-documented congenital abnormality. It has an impact on the quality of life of the patient, the family members and society[1]. Hearing loss is known to affect both cognitive and speech-language development which eventually lead to impaired communication[1,2]. A congenital hearing loss could be a handicap if not identified early[3].

Newborn hearing screening plays a major role in early detection of hearing loss, especially in those at risk. Such a screening was conceived based on two concepts: the critical period for optimal language skills development and early intervention produces better outcomes; managing hearing impairments have been shown to improve communication[4]. In 2007, the Joint Committee on Infant Hearing (JCIH) recommended universal detection of hearing loss in newborns and infants and stated that all infants with hearing loss should be identified before three months of age and receive intervention by six months. To gain access to most infants, the JCIH endorsed evaluation before hospital discharge[5]. According to a technical report by American Speech-Language-Hearing Association (ASHA) in 2004, hearing loss has a severe impact on children before speech development[6]. By intervention at the earliest age possible, this developmental gap, caused by hearing loss, could be bridged. Studies have suggested that earlier interventions had better outcomes[3,7,8].

Newborn hearing screening is universally performed using Oto-Acoustic Emissions (OAE) and Auditory Brainstem Response (ABR). Newborn infants at risk should be tested as soon as possible; those could be having family history of deafness or admitted to neonatal intensive care for more than 5 days or ECMO, had assisted ventilation, exposed to ototoxic medications (gentamycin and tobramycin) or loop diuretics (furosemide/Lasix), and had hyperbilirubinemia which required exchange transfusion; other condition which put infants at risk could be in utero CMV*, herpes, rubella, syphilis and toxoplasmosis, craniofacial anomalies and syndromes, such as neurofibromatosis, osteopetrosis and Usher syndrome, Waardenburg, Alport, Pendred and Jervell and Lange-Nielson, Hunter syndrome, Friedrich's ataxia, and Charlotte-Marie-Tooth syndrome[5].

Most units utilize the two-phase newborn hearing strategy[9]. The first phase involves the initial screening of the infant using TEOAE followed by the second phase, the retest. If an infant fails the retest screening, the infant is referred for a diagnostic

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ABR evaluation. This minimizes a false positive response that is inevitable during screening.

The aim of this study is to evaluate the results of the newborn hearing screening.

METHOD

The newborn hearing screening was performed from October 2012 to December 2015. Newborns were screened at the time of discharge using Transient-Evoked Oto-Acoustic Emissions (TEOAE).

A two-phased hearing screening was implemented. The first phase was performed using TEOAE. The second phase was performed using TEOAE a week after discharge for those who failed the first test. The second phase was performed using TEOAE. Failed test could be due to irritable and uncooperative infants, in which a repeat test is required.

Newborns who failed the second test were tested with Auditory Brainstem Response (ABR) under natural sleep or with the help of mild sedation (chloral hydrate).

Not achieving a normal ABR result (evidence of Wave V at 40dBnHL) is a diagnostic criterion for hearing impairment which mandates counseling and hearing impairment management.

RESULT

A total of 1,834 infants were screened in the first stage. Out of which, 1,687 passed the test and were discharged. One hundred forty-seven (8.01%) of these failed the first screening test; out of which, 138 (7.5%) infants passed the second screening test and 9 (0.49%) failed. The nine infants were recommended for diagnostic ABR. Four (0.21%) infants passed the ABR test revealing normal bilateral hearing and 5 (0.27%) infants failed indicating bilateral severe to profound hearing loss (due to the absence of Wave V at 100dBnHL). The five infants had certain risk factors (one had severe neonatal jaundice, 2 had family history of hearing loss and 2 were preterm babies). Therefore, the incidence of the hearing impairment was 0.27% out of 1834 or 272 per 100000 infants for the period from 2012 to 2015 in the hospital, see figure 1.

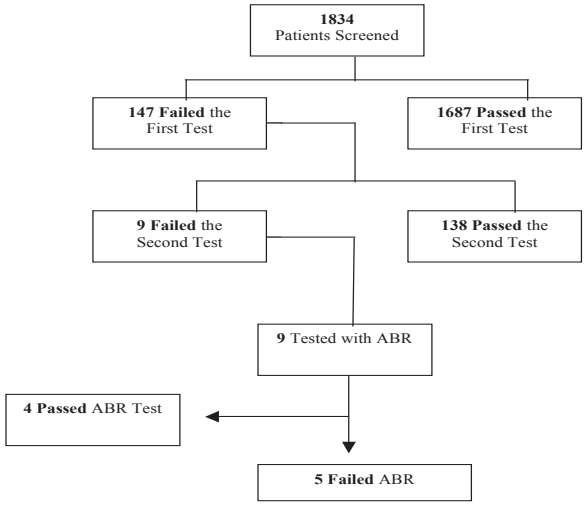

Figure 1: Results of Neonatal Screening (N=5)

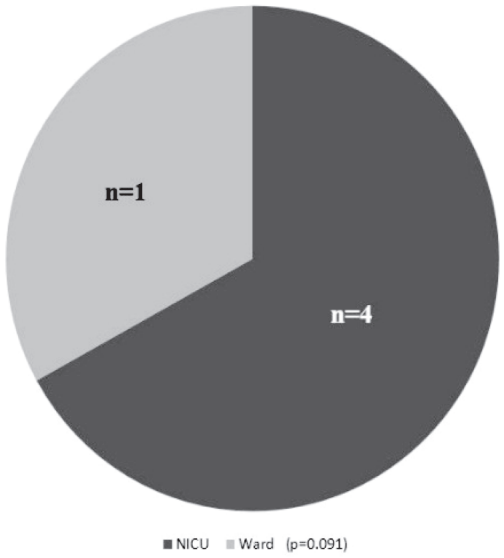

Figure 2: Children Diagnosed with Hearing Loss Admission (N=5)

Four (n=4, 0.21%) infants were admitted to NICU and one (n=1, 0.05%) was in the pediatric ward (P-value=0.091). However, logistic regression analysis of the influence of admission to NICU did not reveal any significant effect on the incidence of hearing loss (Odds ratio =0.250, 95% CI: 0.013 – 4.729).

DISCUSSION

A study found that TEOAE specificity is 98.8% and sensitivity is 66.7% for neonatal hearing screening[10]. Failure of the first hearing screening could be due to the presence of ear canal obstruction; therefore, a repeat test is recommended[11].

In this study, the incidence is small compared to 2.0% in Kuwait[12]. A study in Egypt has identified 9 of every 1000 live births to have hearing loss[13]. On the other hand, a study in Iran reported 1.8 out of every 1000 live births[14]. Similarly, a study in Oman revealed a rate of 0.12%[15]. In our study, 2.6 out of every 1000 live births were assumed to have hearing loss, it is similar to the United Kingdom, which is estimated to be one out of every 1000 live births[16]. A review of literature in the US has revealed 0.22 to 3.61 per 1000 live births[17].

Our incidence revealed to be less than that of other studies; it could be due to the small sample size from one tertiary center in Bahrain.

The five infants that were identified with sensorineural hearing loss were counseled regarding the best early intervention options, such as cochlear implantation. Further efforts have been made to refer these infants to centers where cochlear implantations are performed.

CONCLUSION

Five infants were identified with hearing loss according to JCIH standards and advised early intervention.

It is vital to increase awareness regarding the importance of early screening and applying it to all newborns in the

country. Families, healthcare professionals and social workers should be educated and made to understand that all patients deserve an equal chance for a more promising quality of life.

Further multicenter prospective study is recommended to estimate the national incidence.

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