

Preeclampsia: A New Risk Factor for Hearing Loss

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ABSTRACT

Infant hearing loss stands out as the most common congenital sensory disorder. Universal newborn hearing screening is being promoted as an early detection strategy for hearing loss. This cross sectional study performed during 2013 to 2014, based on universal newborn hearing screening program, including two stage Transient evoked Oto Acoustic Emission (TEOAE). The hearing status of the infant who failed the two-stage screening tests was evaluated with the auditory brainstem response (ABR) during the diagnostic stage. All Possible causes of hearing loss and demographic data recorded. Of 5200 infants referred to our center, all screened with transient evoked Oto Acoustic Emission (TEOAE). pre-eclampsia [first TEOAE (P Value: 0.000), second TEOAE (P Value: 0.033) and ABR (P Value : 0.028)], Consanguinity, neonatal intensive care unit (NICU) admission, ototoxic drugs, and mechanical ventilation more than 5 days, birthweight less than 1500 g were significantly associated with hearing loss. There was no statistically significant difference in sex, family history of SNHL, maternal smoking, maternal opium use, severe jaundice that leads to blood transfusions, and low Apgar score at birth. In this study, in addition of known risk factors of neonatal Sensorineural hearing loss, eclampsy and preeclampsia was proposed as a Hypothetic risk factor that affected hearing status in all screening tests. Maybe in future our concern about neonatal hearing loss caused by eclampsy and preeclampsia cleared more

Keywords: Hearing loss, preeclampsia, risk factors, neonate

INTRODUCTION

Infant hearing loss stands out as the most common congenital sensory disorder. Its late detection compromises speech, language and cognitive skills essential for optimal early childhood development.¹ Universal newborn hearing screening (UNHS) is being promoted as an early detection strategy for hearing loss.² Screening is performed in more than 98% of US infants.³ UNHS emphasis on screening newborns in the first month, preferably before hospital discharge, confirms the hearing problems until 3 months and finally therapeutic interventions until 6 months.⁴

The first level of hearing screening takes place during the first 2-3 days of life, using the otoacoustic emission (OAE) test.⁵ Infants that don't pass the screening test and infants with high risk factors for hearing loss are referred to the second

level where infants meet the auditory brainstem response (ABR) testing. The third level is advanced audio logical centers, which are responsible for ultimate treatment and rehabilitation for children with hearing loss or deafness.⁶ Identification of the etiology of Sensorineural hearing loss (SNHL) in children facilitates management and provides important prognostic information. In recent years, the etiology of bilateral SNHL in children has changed due to advances in genetic testing and treatment of perinatal infections.⁷ The aim of our study was to evaluate the frequency of risk factors and their influence on - the distribution and manifestation of - hearing loss in infants.

MATERIALS AND METHODS

This prospective study was conducted from May 2012 to January 2014 in two university-related hospitals in Tehran, Central Iran. Neonates

born in Imam Hossein and Mahdiah Hospitals were screened for auditory disorders in order to evaluate hearing loss risk factors. All neonates were screened before discharge. In the screening program The OAE test (Ero- Scan model, Maico USA company) was used as the first step. Neonates who failed in the primary test were followed-up with a second OAE test after a 4-week gap. Failure in the secondary test led to hearing loss being confirmed in the ABR test (Eclipse EP-25 model, Interacoustic Denmark). The frequency of probable hearing impairment risk factors was assessed, and data analysis was performed using SPSS software.

Probable risk factors include gestational age, birth weight, Apgar score, sex and neonatal intensive care unit (NICU) admission was recorded. Hearing loss refers when no acoustic signal recorded by TEOAE or the changes in the morphology and number of ABR waves occur.

RESULTS

A total of 5200 neonates participated in this study. Overall, 1559 cases (29.9%) failed in first OAE test, of which 1,325 neonates (25.4%) participated in the secondary OAE test. 162 (3.1 %) neonates were referred again after the second OAE test.

148 neonates (91.3% of those who failed the second test or 2.8% of the original 5200 neonates) underwent the ABR test. Finally hearing impairment confirmed in 37 (0.7 %) of neonates.

Of 5200 neonate 2551 (49.1%) were females and 2,649 (50.9%) were male. The rate of Cesarean section was 58.8%. 4.5% of newborns requiring resuscitation and intensive care. Parental consanguinity was documented in 28% of cases.

Maternal alcohol use was not recorded but 0.5% of mothers were smoker.

The rate of preeclampsy was 7.3%. Among the neonates were admitted in NICU (14.5%) The respiratory distress syndrome (RDS) was the most common cause (40%). within the known risk factors for hearing impairment no confirmed case of bacterial meningitis was

recorded. Exchange transfusion was done in 5 infants because of severe jaundice. Ototoxic drugs such as amino glycosides and loop diuretics affected 18.3% of neonates. TORCH Study was done in 8 cases of SNHL and all of them had negative test.

There was no statistically significant difference in sex, family history of SNHL, maternal smoking, maternal opium use, severe jaundice that lead to blood transfusions, and low Apgar score at birth between OAEs passed neonates and referred one ($P > 0.05$).

The risk factors that are statistically significant were Consanguinity, pre-eclampsia, NICU admission, Oto toxic drugs, mechanical ventilation more than 5 days, weight less than 1500 g at birth.

In this study, in addition of known risk factors of neonatal Sensorineural hearing loss, eclamsy and preeclampsia was proposed as a Hypothetic risk factor. Data analysis showed that eclamsy and preeclampsia significantly accompanied with abnormal ABR and OAE tests. Whereas in previous studies such communication has not been established or based on Bakhshae *et al*⁷ studied this effect of pre Aklamsy was temporary. So maybe in future eclamsy and preeclampsia introduced as new risk factors for Sensorineural hearing loss in newborn. preeclamcy associated hearing impairment in all tests: first TEOAE (P Value: 0.000), second TEOAE (P Value: 0.033) and ABR (P Value : 0.028).

Finally, all risk factors examined together using Logistic Regression Analysis. preeclamsy, consanguinity and birth weight less than 1,500 grams were associated with neonatal SNHL. The Odd Ratio was 3.295 for preeclampsia, 2.979 for consanguinity, and 6.394 for birth weight less than 1,500.

DISCUSSION

One newborn every 500-1,000 births present hearing impairment, which are greater incidence than the other incidence of diseases seen at birth.¹

In a study the validity of the concept that pregnancy-induced hypertension (PIH—pre-eclampsia or toxemia of pregnancy) may cause sensorineural hearing loss was examined. Histopathological findings in temporal bones were assessed and finally suggest that PIH per se is unlikely to cause SNHL in the newborn.⁸but in our study there was statistically significant difference between infants suffered from maternal preeclampsia and infants who didn't (P>0.05).

In a recent study Emergency caesarean section, vaginal delivery, 5 min Apgar scores <5 and hyperbilirubinaemia requiring phototherapy were statistically significant risk factors in the occurrence of hearing loss. They found that the combination of low 5 min Apgar scores and hyperbilirubinaemia requiring phototherapy as possible pre-screening tools showed high specificity (90.7%) and negative predictive value (97.0%).⁹we had 5 infants requiring phototherapy for hyperbilirubinemia. But we found no correlation between hyperbilirubinemia and hearing loss.

Risk factor registers are used to determine which babies need to follow-up. The key point is that such Risk factors are only as useful as their predictive power. Many children have ototoxic medications while in neonatal intensive care, or a positive family history of hearing loss, but very few of them develop a hearing problem loss in follow-up.¹⁰

Risk factors are only as useful as their predictive power. Not enough is known about which risk factors are relevant, which babies have the risk factors, or which babies will fail to attend follow-up,

the effectiveness of targeted hearing loss testing is questionable at this point in time.¹¹

The effect of preeclampsia on neonatal hearing screening didn't study before. When this risk factor analyzed, there was a statistically significant difference between neonatas' suffered maternal preeclampsia in all tests including: first TEOAE (P Value: 0.000), second TEOAE (P Value: 0.033) and ABR (P Value : 0.028) .

The risk factors mentioned in our study are for the congenital hearing loss so infants with auditory neuropathy could be included in.

Limitation of this study was the absence of the automated ABR. Due to limited funding and the high cost of the TORCH study, only 8 cases out of 37 cases (21%) with sensorineural hearing loss did the TORCH study and all of them were negative.

Conclusions: the risk factors that are statistically significant in our study were Consanguinity, pre-eclampsia, NICU admission, ototoxic drugs, and mechanical ventilation more than 5 days, weight less than 1500 g at birth.

There was no statistically significant difference CPR, sex, family history of SNHL in, smoking during pregnancy, opium use during pregnancy, severe jaundice that lead to blood transfusions, and low Apgar score at birth.

Risk Factors associated with SNHL may have limited predictive value but they could guide primary prevention initiatives and serve as pre-screening tools.

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