RESEARCH ARTICLE

OTOACOUSTIC EMISSION- TO ASSESS RISK FACTORS AND FREQUENCY OF HEARING LOSS IN NEONATES

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ARTICLE INFO	**ABSTRACT**

Objective: To find out the risk factors of hearing loss and its frequency in neonates
Type of study: Descriptive study
Study centre: Sree gokulam medical college and research foundation
Inclusion criteria: Neonates born in sree gokulam medical college and research foundation from january 2015 to january 2016
Exclusion Criteria: Neonates with unilateral oae refer and those failed to get parental consent
Method of study: Neonates born in sree gokulam medical college and research foundation from january 2015 to january 2016 were selected. Detailed history taken and examination done. Neonates with risk factors such as respiratory distress, low birth weight, congenital anomalies, preterm, born through cesarean section, with maternal gestational diabetes mellitus and pregnancy induced hypertension and neonates without risk factors were subjected to otoacoustic emission on both ears. Two category were made, category 1 – neonates with risk factors and category2- – neonates without risk factors. Results were statistically analysed.
Results: All the risk factors assessed in the study which include, prematurity (p=0.003), low birth weight (p<0.001), cranio-facial anomalies (p<0.001), maternal diabetes mellitus (p<0.001), pregnancy induced hypertension(p<0.001) and caesarian delivery (p<0.001) were found to be statistically significant for neonatal hearing loss
Conclusion: This study confirms that neonates with risk factors are found to have greater percentage of hearing abnormality when compared with neonates without risk factors when screened with oae.

INTRODUCTION

Hearing loss is one of the commonly seen congenital disorders in children. The prevalence of hearing loss range from 1.3 to 6 per 1000 live births (White, 1993). The sense of hearing is very important for speech and language development and can determine their communication and learning skills. Early identification of hearing loss and early intervention before 6 months of age can improve the language development (Yoshinaga-itano, 1998). Universal newborn screening is promoted as early detection strategy for hearing loss. OAE is used as first level of newborn screening. Otoacoustic emissions are generated from outer hair cells of cochlea and can be measured in response to auditory stimuli. It was first described by David Kemp in 1940s, and developed the screening test in 1978 based on it (Pumphrey, 1947).

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A lot of factors have been contributed as etiology for hearing loss. The prevalence of hearing loss in neonates with hearing loss ranges from 0.3% to 14.1% in neonates with high risk factors (Roth, 2006). In this study, we are assessing the risk factors of hearing loss and it's frequency in neonates.

MATERIALS AND METHODS

A descriptive study was done in neonates born in Sree gokulam medical college and research foundation from January 2015 to January 2016. Detailed history including antenatal and postnatal period, maternal comorbidities, perinatal complications were taken. A thorough physical examination and otoscopic examination was done. Neonates with risk factors such as respiratory distress, low birth weight, congenital anomalies, preterm, born through caesarean section, with maternal gestational diabetes mellitus and pregnancy induced hypertension and neonates without risk factors were subjected to otoacoustic emission on both ears . Two

categories were made, category 1 – neonates with risk factors and category 2- – neonates without risk factors. Device used was portable GSI CORTI OAE instrument. Test conducted in sound proof room and done in a calm child. Probe were inserted into external auditory canals, loud speakers generates brief acoustic stimuli, or clicks, 32 to 60 seconds in TEOAE and 2 to 4 seconds in DPOAE. Microphone measures resulting OAE produced within cochlea and which is transmitted back via middle ear into external auditory canal. Results analyzed and displayed on screen. Each ears screened separately. Results were taken as pass and refer. Pass- ear test passed, refer- ear test failed. Neonate with persistently failed for test were taken as refer. All personal data, risk factors and OAE test results were recorded. Data was analyzed statistically.
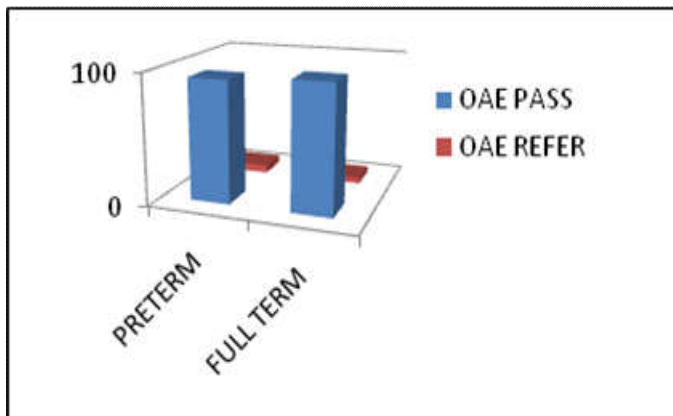
RESULTS

A total of 1310 patients were included in the study. The study population included 604 males and 706 females. OAE was done for all neonates and total 2.9% had OAE refer. This study showed that 44% of OAE referred neonates were females and 56% of OAE referred neonates were males. 94% of neonates born by cesarean section had OAE pass and 6% had OAE refer. 98% of neonates born by normal delivery had OAE pass and only 2% had OAE refer. The p value was 0.001 and chi square value was 14.76
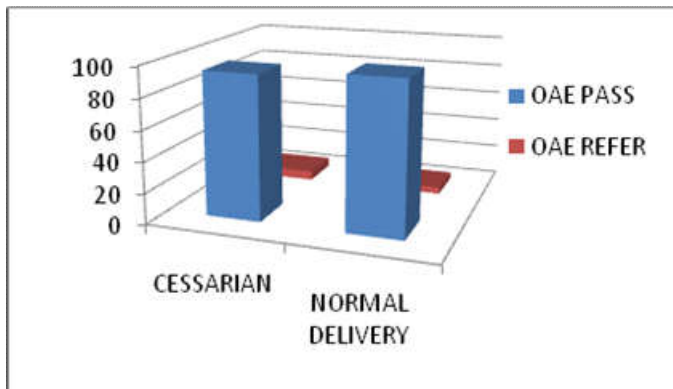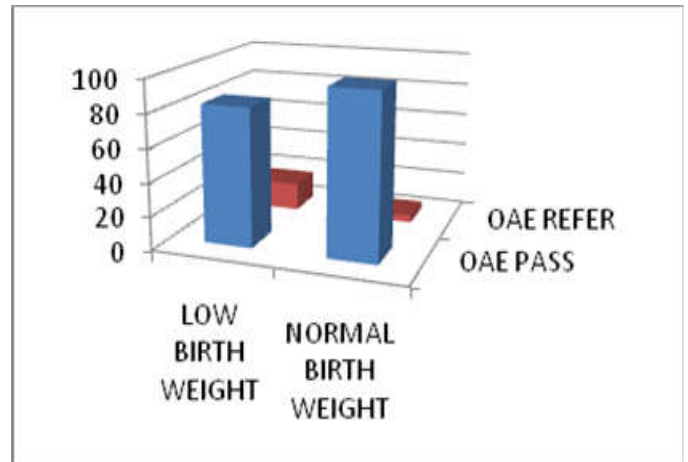

Graph 1. Comparison of OAE result between neonates born by cessarian section and normal delivery

Preterm neonates were compared with full term birth .94% of preterm neonates   had OAE pass and 6% had OAE refer. 98% of full term neonates had OAE pass and only 2% had OAE refer. p value was 0.0032 and chi square value was 8.710

Graph 2. Comparison of OAE result between neonates born preterm and full term

Low birth weight neonates were compared with normal birth weight. 83% of neonates with low birth weight had OAE pass and 17% had OAE refer. 98% of neonates with normal birth weight had OAE   pass and 2% had OAE refer. The p value was < 0.001 and chi square value was 38.971.

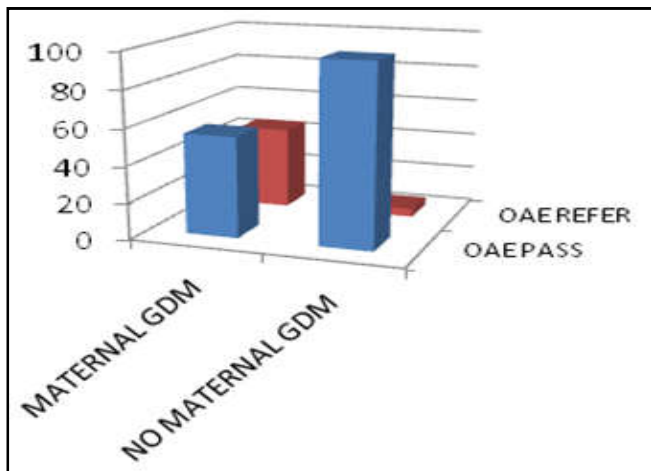**Graph 3. Comparison of OAE result between neonates with low birth weight and normal birth weight**

55% of neonates with mothers having gestational diabetes mellitus had OAE pass and 45% had OAE refer. 98% of neonates without maternal diabetes mellitus had OAE pass and 2% had OAE refer. The p value was < 0.001 and chi square value was 104.563

60% of neonates with mothers having pregnancy induced hypertension had OAE pass and 40% had OAE refer. 98% of neonates without maternal pregnancy induced hypertension had OAE pass and 2% had OAE refer. p value was < 0.001 and chi square value was 23.025
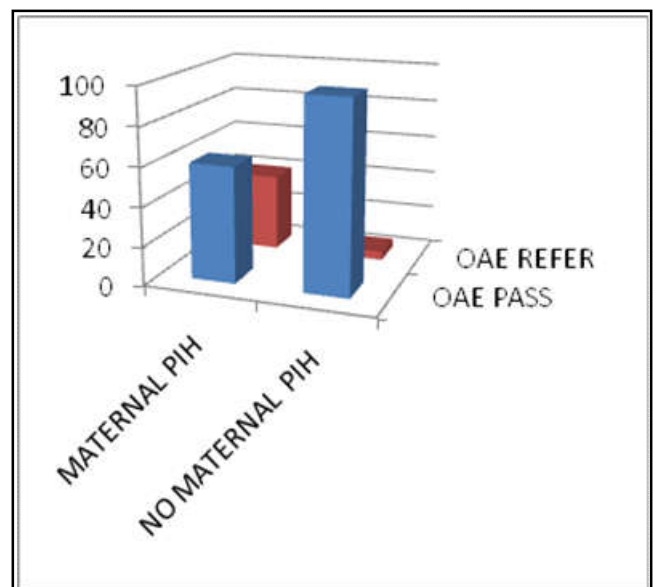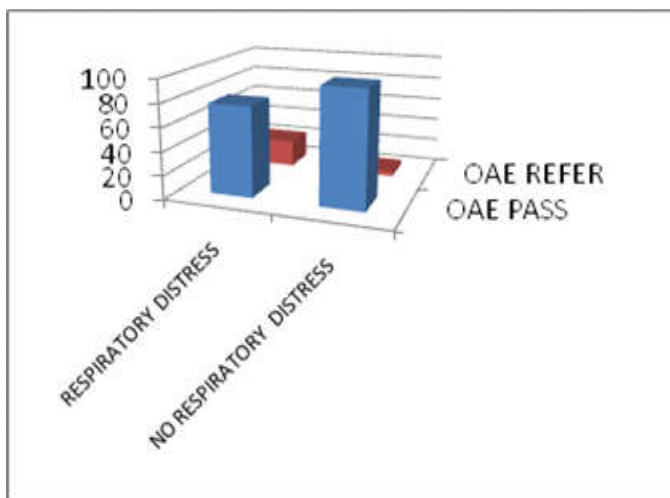

Graph 4. Comparison of OAE result between neonates with and without maternal PIH

77% of neonates with respiratory distress had OAE pass and 23% had OAE refer. 98% of neonates without respiratory distress had OAE pass and 2% had OAE refer. p value was < 0.001 and chi square value was 54.748.
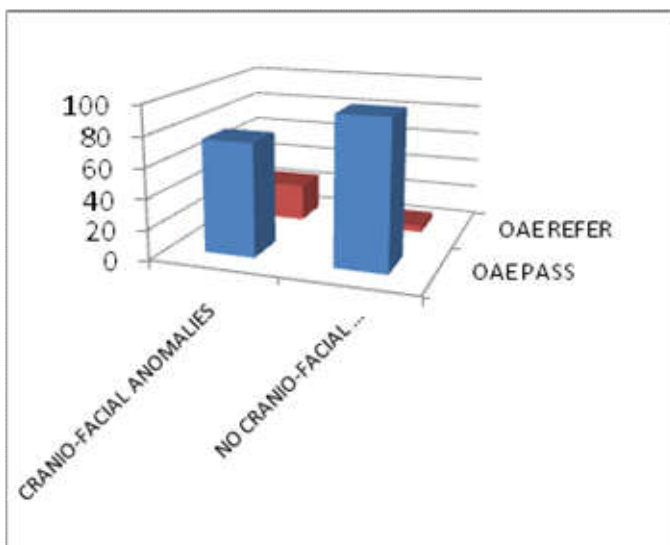
Graph 5. Comparison of OAE result between neonates with and without maternal GDM

Graph 6. Comparison of OAE result between neonates with and without respiratory distress

75% of neonates with cranio-facial anomalies had OAE pass and 25% had OAE refer. 97% of neonates without cranio-facial anomalies had OAE pass and 3% had OAE refer. p value was < 0.001 and chi square value was 19.234

Graph 7. Comparison of OAE result between neonates with and without cranio-facial anomalies

DISCUSSION

Hearing loss is the most common congenital sensory disorder in children which may result in delayed development of speech, language and cognitive skills. Early onset of hearing loss can adversely affect the later development of auditory neuropathway if adequate interventions are not given at critical period of time. Early detection of hearing loss plays an important role in proper development of linguistic skills. Universal newborn screening is promoted as early detection strategy and OAE is most widely used as first level of newborn screening. Various studies were done on risk factors for neonatal hearing loss. A study was done by Karaca *et al* on 2284 neonates showed that vaginal delivery (p=0.020), birth weight (p=0.010) were found to be the risk factors for hearing loss (Karaca, 2014). A study done by Gaurial *et al* showed that low Apgar score (p=0.001), fetal distress (p=0.009), family history of hearing loss (p=0.022) were the risk factors for hearing loss in infants (Gouri, 2015). A study done by Poonual *et al* showed that the risk factors associated with neonatal hearing loss were low birth weight, craniofacial anomalies, sepsis and exposure to ototoxic drugs (Poonual, 2016). In our study, both distortion product OAE and transient evoked OAE was used in our study as screening for hearing loss. The study showed that 4% of study population had hearing loss. Males (56%) were affected more than females (44%). Neonates with risk factors were compared that without risk factors. All the risk factors assessed in the study were shown to be statistically significant. The parameters included were prematurity (p=0.003), low birth weight (p<0.001), cranio-facial anomalies (p<0.001), maternal gestational diabetes (p<0.001), and pregnancy induced hypertension (p<0.001), and neonates born by caesarean delivery (p=0.001). Neonates with maternal gestational diabetes were found to be the greatest contributor. Maternal pregnancy induced hypertension, neonates with anomalies and respiratory distress were significant factors.

Conclusion

This study confirms that neonates with risk factors are found to have greater percentage of hearing abnormality when compared with neonates without risk factors when screened with OAE. Maternal gestational diabetes was found to be the greatest contributor in our study. Neonatal hearing screening should be made mandatory for neonates with risk factors for early detection of hearing loss and early intervention which may help in maximum linguistic competence.

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