IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 16, Issue 6 Ver. XI (June. 2017), PP 24-29
www.iosrjournals.org

Hearing Assessment In Asphyxiated Term Neonates in a Tertiary Care Hospital

[1]Dr.D.Suchitra, [2]Dr.P.Nagaveni, [3]Dr.C.Rukesh Chary
[1,2],Assistant Professor, Department Of Paediatrics, Osmania Medical College, Hyderabad.
[3,]Resident, Department Of Paediatrics, Osmania Medical College,Hyderabad.

Corresponding Author : Dr.P.Nagaveni, H.No:18-8-254/A/1/38, Bharata Ratna Colony, Kanchanbagh, Hyderabad – 500058, Telangana. E-mail naga.veni@yahoo.com

***Abstract* :**
Background: *Hearing is a vital part of a newborn's contact with his environment. Hearing loss can be considered as the most common birth defect. Early detection of hearing loss by screening at, or shortly after, birth and appropriate intervention are critical to speech, language and cognitive development.*
Aims and Objectives of the study: *The aim of this study was to evaluate hearing loss in asphyxiated term neonates and to study the correlation between the severity of perinatal asphyxia and hearing loss.*
Study design: *Observational Study.*
Materials and methods: *The study included 200 neonates admitted in a tertiary care hospital NICU with moderate to severe birth asphyxia. Birth asphyxia was defined according to NNF and NNPD guidelines. Neonates with congenital anomalies and syndromic babies, maternal history of ototoxic drug intake, family history of hearing loss were excluded.*
Duration of study*: March 2016 to August2016.*
Results*: Out of 200 neonates, 48(24%) neonates were with severe asphyxia and 152(76%) neonates were with moderate asphyxia. Abnormal OAE was noted in 20 neonates of severe asphyxia and 2 neonates with moderate asphyxia.*
Conclusion*: Severe birth asphyxia is significantly associated with hearing loss. Further, any degree of asphyxia is not an independent risk factor for permanent hearing loss*
Keywords: *Perinatal Asphyxia, Hearing Loss, APGAR, Otoaccoustic Emission (OAE), Brain Stem Evoked Response Audiometry (BERA).*

I. Introduction

Hearing impairment in children across the world constitutes a particularly serious obstacle to their optimal development and education, including language acquisition. According to a range of studies and surveys conducted in different countries, around 0.5 to 5 in every 1000 neonates and infants have congenital or early childhood onset sensorineural deafness or severe-to-profound hearing impairment. Deaf and hearing-impaired children often experience delayed development of speech, language and cognitive skills, which may result in slow learning and difficulty progressing in school[11].

In our country an estimated 5.82 persons have congenital hearing loss per lakh of population at one point of time; two deaf babies are born per hour which amounts to 1/2000 to 1/10000 live births, 18000 deaf babies are added to our population every year, 5% of Indian population have speech and hearing problem due to congenital sensorineural hearing loss (SNHL) with delayed development of speech and language . The incidence of the later is 0.9/1000 in ENT OPD cases. Thus, at least 10,000 of genetically deaf children are added to our population[12].

Approximately 50% of all cases of congenital hearing loss are attributable to environmental factors such as congenital hyper-bilirubinemia, ototoxic medication exposure, neonatal hypoxia, viral infections, and meningitis. The other 50% of cases are thought to be inherited, that is of genetic causes. Of these hereditary cases, approximately 30% are classified as syndromic[12].

Children with impaired hearing, present delay in language learning and general development. This problem can only be prevented by early diagnosis and management. Some methods are available for screening of hearing: Otoacoustic emission (OAE) and auditory brainstem response (BERA) are two methods of choice for determining/detecting hearing impairment, besides being fast, non-invasive, sensitive, and easy to use in neonates, although BERA is more expensive. OAE test is generally appropriate for screening neonates hearing. Babies who are diagnosed and rehabilitated sooner, demonstrate better language and behavioral skills at the age of five rather than children diagnosed later. Otoacoustic emissions are the most sensitive tests for screening although it may have to be combined with other tests for complete diagnosis.

1.1 Types Of Screening Test

Oto Acoustic Emissions (OAE) are a non-invasive and inexpensive test that can be done in the nursery setting with little expertise and a shorter time as compared to BERA. Different studies have revealed OAE sensitivity as high as 95% - 98% and a specificity of 80% - 85%. Therefore, OAE cannot completely replace BERA as a screening modality, but can only complement it. In locations where getting infants to return for outpatient screening and testing is very difficult, and the substantially lower failure rate that will likely be achieved by using both OAE and BERA at the same sitting has significant advantages.

Brainstem Evoked Response Audiometry (BERA**)**, though highly reliable, requires high technical expertise, which is more expensive as opposed to OAE. Also BERA makes use of a cumbersome machine whilst the OAE screener is a portable machine. It also requires sedating the infant because of the lengthy procedure. OAE, on the other hand does not assess the cortical pathway for hearing. It may also give false results in neonates with auditory neuropathy. However, it is an excellent tool as an initial screening method. The relative advantages and disadvantages of a two- stage (OAE/BERA) protocol for newborn hearing screening need to be considered carefully for individual circumstances.

II. Aims And Objectives

1. To evaluate hearing loss in asphyxiated term neonates .
2. To study the correlation between the severity of perinatal asphyxia and hearing loss.

III. Material And Methods

A prospective observational study was proposed and conducted at a tertiary care teaching hospital. 200 term new borns with history of birthasphyxia were enrolled during March 2015 to Feb 2016. 3.1 INCLUSION CRITERIA : Neonates with moderate to severe birth asphyxia .Birth asphyxia was defined according to NNF and NNPD guidelines as: Moderate asphyxia: APGAR score of 4-6 at 1 min of life or slow gasping breathing at birth. Severe asphyxia: APGAR score of 0-3 at 1 min of life or no breathing at birth.. Inborn and outborn newborns. Maternal age between 22-26 years.

3.2 Exclusion Criteria: Neonates with congenital anomalies (syndromic babies), neonates diagnosed to have meningitis, maternal history of torch infections, ototoxic drug intake , family history of congenital hearing loss. Written consent was taken from parents for OAE (otoacoustic emission). Details of birth events and relevant history was taken by the attending resident on data collection sheet. Screening test was performed on 3rd day of life. OAE screening was performed by Echo Screen TE machine (Madsen Electronic, Copenhagen, Denmark) that uses transient-evoked otoacoustic emission. At the end of the test, the result was given as "PASS" when there was OAE response (response to the stimulus at > 35 dBHL (decibels Hearing Level)), and "FAIL" when there was no response to the stimulus . Babies with a normal OAE were discharged, but in cases with abnormal OAE (unilateral or bilateral) were reffered to a Pediatric Ear, Nose and Throat (ENT) specialists for further evaluation. Data entry was done using MICROSFT EXCEL 2013. Data analysis was done using SPSS 19.0 version.

IV. Results

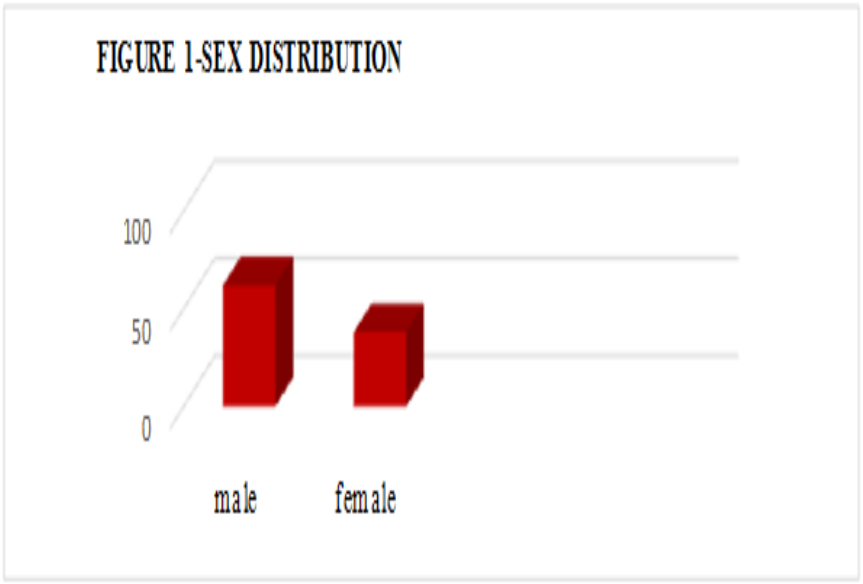
During the study period, a total of 200 neonates were included, according to the inclusion criteria of perinatal asphyxia by NNF and NNDP.

4.1 Sex distribution :

Of the 200 neonates studied 123(61.5%) were males and 77(38.5%) were females.

Table 1: Sex Distribution

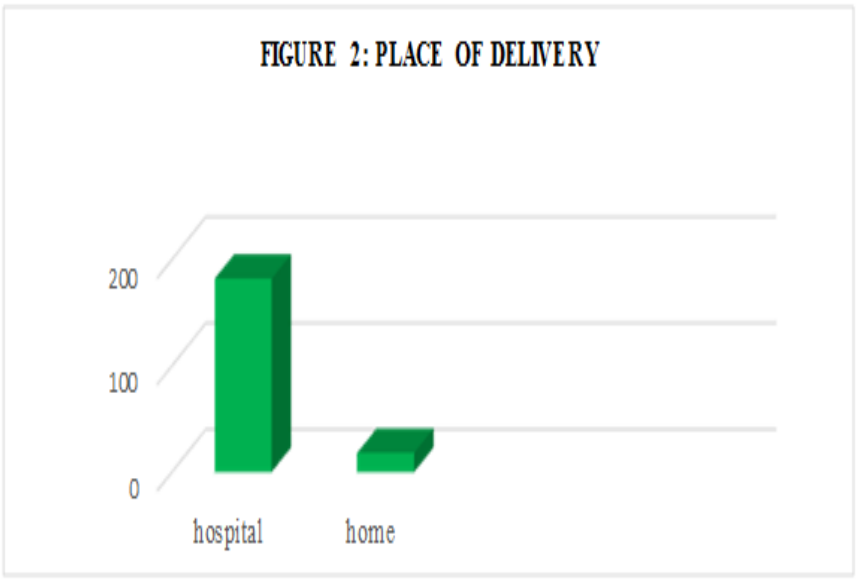
Sex	Frequency	Percent
Male	123	61.5
Female	77	38.5



4.2 **Place Of Delivery** : Of the 200 neonates registered for study 182 neonates were hospital born and 18 neonates were home delivered.

Table 2: Place Of Delivery

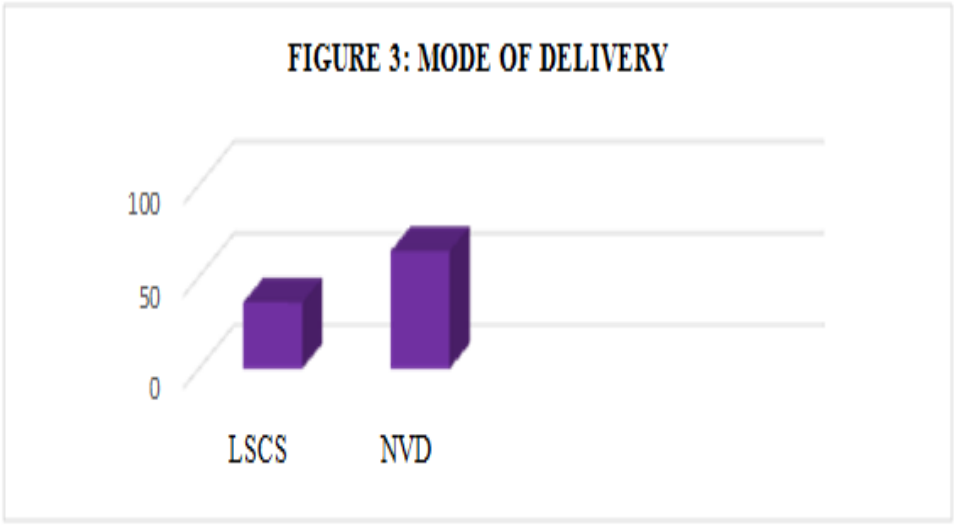
Place of delivery	Frequency	Percent
HOSPITAL	182	91
HOME	18	9



4.3 Mode Of Delivery : Of the 200 neonates 128 were born through normal vaginal delivery (of varying gravida) and 72 neonates were born through Lower segment Cesarian section (LSCS),48 neonates of LSCS were emergency LSCS and 24 were elective LSCS.

Table 3: Mode Of Delivery

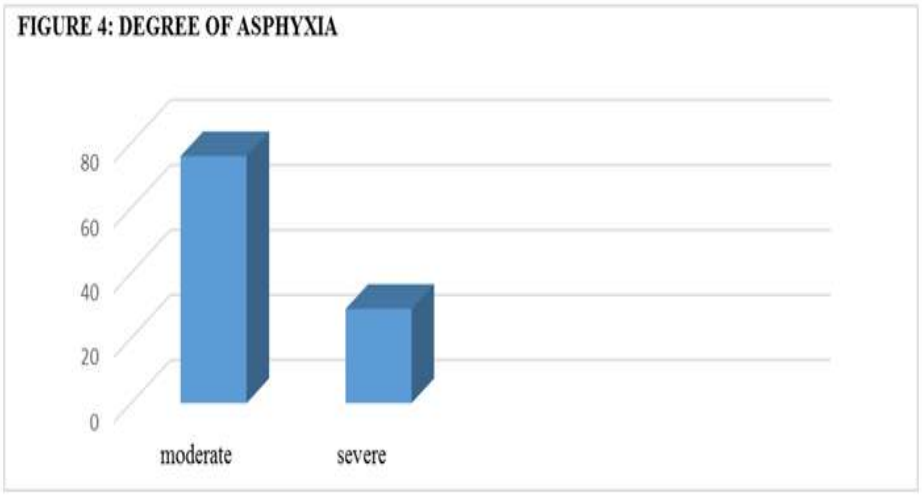
Mode of delivery	Frequency	Percent %
LSCS	72	36
NVD	128	64



4.4 Degree Of Asphyxia : Out of 200 neonates studied 152(76%) suffered with moderate asphyxia as per the APGAR score and 48 (24%) had severe asphyxia.

Table 4: Degree Of Asphyxia

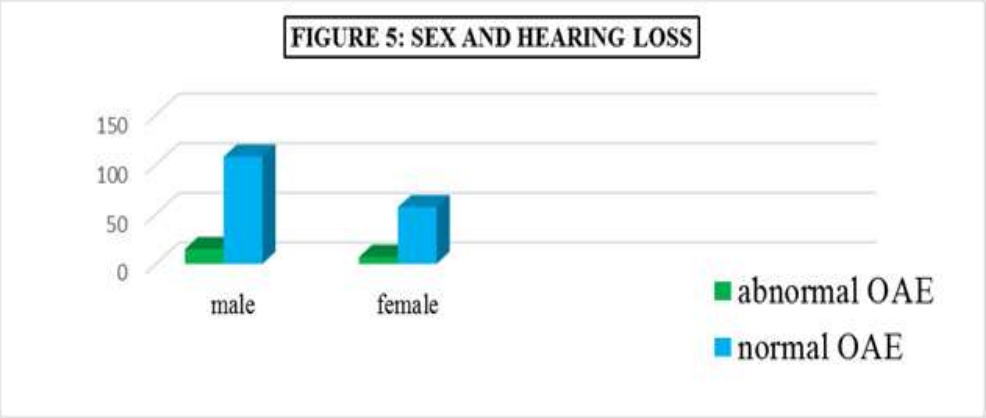
Degree Of Asphyxia	Frequency	Percent
Moderate Asphyxia	152	76
Severe Asphyxia	48	24



4.5 Correlation Of Sex And Hearing Loss : P value >0.05. hence no significant correlation between sex and hearing loss.

Table 5: Correlation Of Sex And Hearing Loss

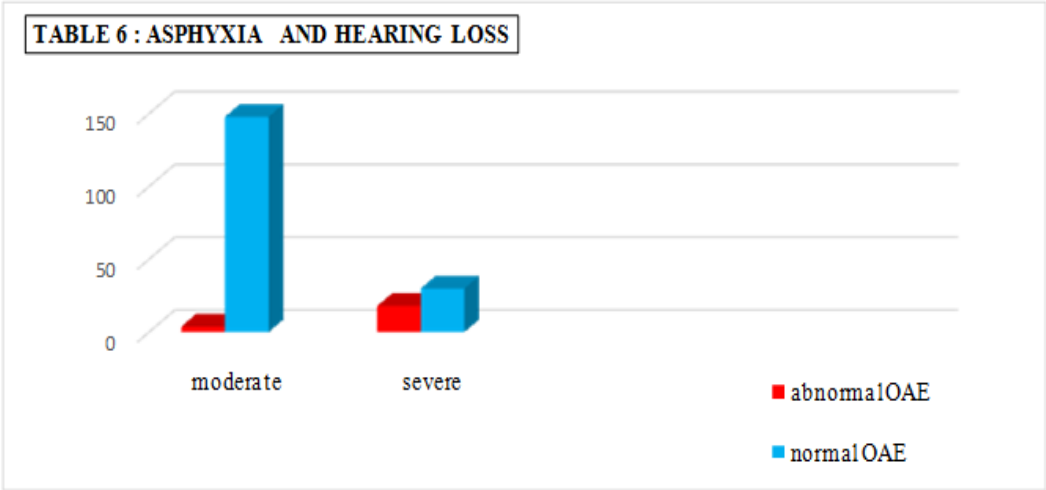
SEX	ABNORMAL	NORMAL
MALE	15	108
FEMALE	7	70



4.6 Correlation Between Degree Of Asphyxia And Hearing Loss : P value<0.05. There is significant correlation between severe birth asphyxia and hearing loss.

Table 6: Correlation Between Degree Of Asphyxia And Hearing Loss

Degree of asphyxia	Abnormal OAE	Normal OAE
Moderate	4	148
severe	18	30



V. Discussion

Hearing loss can be considered as one of the most important birth defects. Birth asphyxia and ischemia have often been thought to be major causes of early hearing loss or deafness. Experiments have confirmed/shown that hypoxia induces the ABR elevation threshold in rat and cat neonates. Several studies have confirmed that the incidence of hearing loss among babies in NICU with low Apgar scores in the first and 5th minutes of birth is much higher than the general population. They can have a high rate of middle ear pathology, which would potentially affect their OAEs. Early detection of hearing loss especially in high-risk babies by screening at, or shortly after birth, is imperative to prevent problems related to speech, language, social life and schooling from occurring at a later stage in life.

Of 200 neonates in our study, 22 (11%) neonates had abnormal OAE. Our finding was more than the incidence of hearing loss at birth, 1/500 – 1/1000. However, in another study[1] the rate of abnormal OAE at high-risk newborns was reported approximately 2%. Furthermore Ohl et al[2] in 2009 found that 3-5% of at-risk neonates suffer hearing loss. Another study from Saudi Arabia by Olusanya et al[3], reported this rate of prevalence about 1.3%. It seems that in our complicated neonates, large number of causative factors might be involved affecting the incidence of hearing loss. Olusanya et al. in 2004 reported some risk factors for hearing impairment such as young maternal age, prolonged and obstructed labor, prematurity and prolonged rupture of membranes.

Out of 200 neonates, 123 were male babies and 77 were female babies. 15 male babies and 7 female babies had abnormal OAE. P value was >0.05 and hence no significant correlation was seen between gender and hearing loss. In a study by Jakubikova et al[4], male to female ratio of 1.2:1 was reported. One study[5] mentioned high frequency of unilateral hearing loss in boys and equally-distributed bilateral hearing loss between males and females. Of the 22 neonates with abnormal OAE, 18 babies had severe asphyxia and 4 babies had moderate asphyxia. P value was <0.05 and hence significant correlation between severe birth asphyxia and hearing loss. However, some studies[6] have pointed out that asphyxia and low Apgar score are the reasons for temporary hearing loss, not permanent status. Moreover, in another study[7] carried study carried out in Shanghay hospital, Japan, the effects of prolonged asphyxia during parturition on auditory brain stem were assessed. They did not find any tremendous impact of asphyxia on this neural part. Furthermore, Jiang et al. in 2004 reported that after 3 days hypoxic-ischemic damage to central nervous system, it tends toward recovery and after 1 week the system recovers significantly. Another study by Rhodes et al[8] in 1999 indicated that fetal hypoxia, of any degree and duration, is not a particular reason for permanent hearing loss. Finally , Bergman et al[9] in 1984 confirmed that Apgar scores, low PaO_2 and high $PaCO_2$ were not independent risk factors for hearing loss. Familial history of hearing loss could be one major cause of abnormal OAE[10], but we didn't study this factor in our investigation.

VI. Conclusion

Our study concluded that severe birth asphyxia is significantly associated with hearing loss, however moderate birth asphyxia did not show any correlation with hearing loss. Further, any degree of asphyxia is not an independent risk factor for permanent hearing loss.OAE is only a screening test and not a confirmatory test. All neonates should be followed up with BERA. The objective of hearing screening is to identify babies who have hearing loss and to provide necessary intervention as soon as possible.

References

[1]. Kenna M, Beherman RG, Kliegman R. Nelson Textbook of Pediatrics. 18th ed. Philadelphia, PA: Elsevier/Saunders: 2006

[2]. Ohl C, Dornier L, Czajka C, Chobaut JC, Tavernier L. Newborn hearing screening on infants at risk. Int J Pediatr Otorhinolaryngol. 2009;73(12):1691-5. doi: 10.1016/j.ijporl.2009.08.027. [PubMed] [Cross Ref]

[3]. Olusanya BO, Luxon LM, Wirz SL. Benefits and challenges of newborn hearing screening for developing countries. Int J Pediatr Otorhinolaryngol. 2004;68(3):287-305. [PubMed]

[4]. Jakubikova J, Kabatova Z, PavlovcinovaG, Profant M. Newborn hearing screening and strategy for early detection of hearing loss in infants. Int J Pediatr Otorhinolaryngol. 2009;73(4):607-12. Doi: 10.1016/j.ijporl.2008.12.006. [PubMed] [Cross Ref]

[5]. Stein LK. Factors influencing the efficacy of universal newborn hearing screening. Pediatr Clin North Am. 1999;46(1):95-105. [PubMed]

[6]. Jiang ZD. Long-term effect of perinatal and postnatal asphyxia on developing human auditory brainstem responses: peripheral hearing loss. Int J Pediatr Otorhinolaringol. 1995;33(3):225-38. [PubMed]

[7]. Jiang ZD, Yin R, Shao XM, Wilkinson AR. Brain-stem auditory impairment during the neonatal period in term infants after asphyxia: dynamic changes in brain-stem auditory evoked response to clicks of different rates. Clin Neurophysiol. 2004;115(7):1605-15. doi: 10.1016/j.clinph.2004.02.017. [PubMed] [Cross Ref]

[8]. Rhodes MC, Margolis RH, Hirsch JE, Napp AP. Hearing screening in the newborn intensive care nursery: comparison of methods. Otolaryngol Head Neck Surg. 1999;120(6):799-808. [PubMed]

[9]. Bergman I, Hirsch RP, Fria TJ, Shapiro SM, Holzman I, Painter MJ. Cause of hearing loss in the high-risk premature infant. J Pediatr. 1985;106(1):95-101. [PubMed]

[10]. Meyer C, Witte J, Hildmann A, Hennecke KH, Schunck KU, Maul K, et al. Neonatal screening for hearing disorders in infants at risk: incidence, risk factors, and follow-up. Pediatrics. 1999;104(4 Pt 1):900-4. [PubMed]

[11]. http://www.who.int/blindness/publications/Newborn_and_Infant_Hearing_Screening_Report.pdf .

[12]. Chaturvedi VN. Hearing impairment and deafness-magnitude of problem and strategy for prevention. Indian J Otolaryngol Head Neck Surg. 1999;51:3–6. [PMC free article] [PubMed]