FULL TERM BABIES;
CORRELATION OF CLINICAL FINDINGS OF PERINATAL ASPHYXIA WITH CRANIAL SONOGRAPHY

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ABSTRACT… Introduction: Perinatal asphyxia is one of the most common causes of neonatal morbidity and mortality in most countries of the world. The objective of my study was to assess the correlation of clinical findings of perinatal asphyxia with cranial sonography in full term babies. **Study Design:** Retrospective study. **Setting:** Neonatal Intensive Care Unit of Children's Hospital Multan. **Period:** January 2016 to October 2016. **Material and Methods:** 100 full term babies having history of delayed cry were scanned within three days of birth in Neonatal Intensive Care Unit of Children's Hospital Multan. Clinically findings including full term babies, birth weight, grunting, cyanosis history of mode delivery, resuscitation history, delayed cry and hypoxic ischemic encephalopathy (HIE) grades were taken from baby's hospital file record and standard images including coronal and sagittal plans were taken by Ultrasound machine probe of frequency 3-5 MHz. Findings were recorded on data collection sheets and spread on EXEL sheets. Correlation was found by using SPSS software. **Result:** Out of 100 neonates 63 were male and 37 were female with birth weight (2.4-3.6) having mean ± SD 3.08 ± 0.53. HIE grades (mild, moderate and severe) were found in 12, 83, 5 babies respectively and ultrasound grades 0 (normal/ mild echogenic), grade 1 (moderate echogenic) and grade 2 (severe/generalized echogenic) were found in 32, 52, 16 neonates respectively with r= 0.37 and P-value < 0.05 showing moderate positive correlation. **Conclusion:** Cranial ultrasound is a good screening tool to evaluate asphyxiated neonatal brain. It has a moderate positive correlation with clinical findings.

Key words: Perinatal asphyxia, Full term, Delayed cry, Birth weight, HIE, Cranial sonography.

INTRODUCTION

Failure to initiate and maintain sustain respiration as long as 1 minute after birth is a criteria of perinatal asphyxia according to WHO. It happens at birth so it is also known as birth asphyxia.[1,2,3] Birth asphyxia occur due to lack of supply of oxygen to brain leading to ischemia. Various vital organs like kidneys, brain, lungs, liver etc are badly affected by asphyxia.[4] American College of Gynae and Obs and American Academy of Peadiatrics defined a baby is asphyxiated if arterial pH of umbilical cord is less than 7, Apgar score more than 5 minutes is between 0-3, multiple organs dysfunction and brain disturbance as coma and seizures. Perinatal asphyxia is a serious medical problem contributing to neonatal mortality and morbidity in whole world.[2,3]

Incidence of perinatal asphyxia in developed countries is 1-1.5% and in Pakistan is 3.3%.[5] According to WHO, each year 4 million newborns develop asphyxia in which 1.2 million die and same percentage develop severe neurological consequences.[2] According to previous research, in Pakistan, perinatal asphyxia is a leading cause of admission having high mortality rate because Pakistan is a poor and developing country and have low budget for health sector, thus leading to high perinatal mortality (95 per 1000 births).[6]

At the time of birth, perinatal asphyxia leads to cyanosis, slow heart rate, weak muscle tone, weak breathing, and meconium stained amniotic fluid.[7,8] Risk factors of perinatal asphyxia are antepartum, intrapartum and fetal. Antepartum factors includes advanced maternal age, pre-eclampsia,

gestational diabetes, maternal hypertension, anemia, hypertension. Intrapartum risk factors are cephalo-pelvic disproportion (CPD), prolonged labor, premature rupture of membrane, umbilical cord complications like umbilical cord prolapsed. Fetal risk factors include meconium sustained amniotic fluid, abnormal lie or presentation and cord compression or prolapsed.

HIE is a severe complication that badly effects brain in perinatal asphyxia. Grading's of HIE is assessed by Sarnat staging.[2,9]

		Mild	Moderate	Severe
1	Duration	<24 hours	2-14 days	Weeks
2	Respiration	Regular	Periodic	Apnea
3	Pupils	Dilated, reactive	Small, reactive	Variable, fixed
4	Muscle tone	Normal or increase	Hypotonic	Flaccid
5	Alertness	Hyper alert	Lethargic	Coma
6	Seizures	None	Frequent	Decerebrate/decorticate posture
7	EEG	Normal	Low voltage	Burst suppression
8	Moro reflex	Exaggerated	Weak	Absent

Sarnat staging[2,9,10]

Assessment of APGAR score is the main criteria. Total score is 0-10. More the score, better will the baby. If score is between 8 and 10 then it means no asphyxia, baby is normal. But if it is between 5 and 8 then it is mild asphyxia. If score is 3-5 then moderate asphyxia and if 0-3 then it means severe asphyxia.[2,10,11]

Imaging is also done in case of perinatal asphyxia for the assessment of neurological condition of a newborn. Imaging study includes cranial ultrasonography, cranial CT, cranial MRI. Cranial ultrasonography is a simple tool, in addition to free of radiation, it is also non-invasive, fast and cost effective technique as compared to others. Due to its portable quality it can be performed easily at bedside in NICU unit. Echogenicity changes in brain WM (white matter) is scored according to the classification by van Wezel-meijler et al. In this Grade 0 show normal echogenicity of the periventricular WM. Grade 1 show moderately increased periventricular WM echogenicity. Grade 2 show severely increased generalized echogenicity, in which the affected region being brighter than the choroid plexus.[13]

The purpose of my study is to correlate clinical findings of perinatal asphyxia with cranial sonographic findings in full term babies within 3 days of life. It is a safe technique and easily approachable by a common person.

OBJECTIVE

To correlate of clinical findings of perinatal asphyxia with cranial sonography in full term babies.

MATERIAL AND METHODS

Study was conducted after approval from Institutional Review Board. Written informed consent was taken from the baby's parents or guardian.

Study was carried out in the Neonatal Intensive Care Unit of Children's hospital Multan. Full term newborns with the history of delayed cry and clinical findings of asphyxia at the time of birth were taken. While babies having other abnormalities like hydrops, congenital infections, chromosomal malformations, cyanotic congenital heart defects were excluded. 100 babies were scanned by Ultrasound machine having frequency 3-5 MHz in supine position. Cranial Ultrasound was done by expert radiologist within three days of birth. Standard images in sagittal and coronal planes were obtained through the anterior fontanelle. Clinical findings were taken from patient's hospital files. Sonographic findings of echogenicity were correlated with clinically grades of asphyxia given by doctor. The collected data was stored as excel sheets and EXCEL and SPSS software's was used to apply relevant test for the statistical analysis.

RESULTS

Total 100 neonates were included in this study, 63% were male and 37% were female Table-I. 19% babies were in their first day of life, 45% were of two days and 36% of three days Table-II. Birth weight of 100 babies were maximum and minimum 3.6 and 2.4 respectively. The mean ± S.D of birth weight of 100 babies were 3.08 ± 0.54 Table-III. All of 100 babies had history of delayed cry Table-IV. Grades of hypoxic ischemic encephalopathy were assigned by the doctors to neonates according to their condition. 12% were of grade 1 (mild), 83% and 5% were of grade 2 (moderate) and grade 3 (severe) respectively Table-V. Ultrasound grades were suggested according to their findings during scan. Out of 100 babies, 32, 52 and 16 were given grade 0 (mild), 1 (moderate) and 2 (severe) respectively Table-VI. There is a moderate positive correlation observed between HIE grades and ultrasound grades with r = 0.470 with P-value < 0.05 which is statistically significant. Table-VII.

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	37	37.0	37.0	37.0
Male	63	63.0	63.0	100.0
Total	100	100.0	100.0	
Table-I. Gender				

	Frequency	Percent	Valid Percent	Cumulative Percent
One	19	19.0	19.0	19.0
Two	45	45.0	45.0	64.0
Three	36	36.0	36.0	100.0
Total	100	100.0	100.0	
Table-II. Baby age in days				

	N	Range	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Birth Weight	100	1.20	2.40	3.60	3.0860	.05382	.53824
Valid N (listwise)	100						
Table-III. Descriptive statistics of birth weight							

H/O Delayed Cry	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	100	100.0	100.0	100.0
Table-IV. History of delayed cry				

	Frequency	Percent	Valid Percent	Cumulative Percent
Grade I	12	12.0	12.0	12.0
Grade II	83	83.0	83.0	95.0
Grade III	5	5.0	5.0	100.0
Total	100	100.0	100.0	
Table-V. HIE Grades				

Grades	Frequency	Percent	Valid Percent	Cumulative Percent
0	32	32.0	32.0	32.0
1	52	52.0	52.0	84.0
2	16	16.0	16.0	100.0
Total	100	100.0	100.0	
Table-VI. Ultrasound grades				

		G	U
HIE Grade	Pearson Correlation	1	.470**
	Sig. (2-tailed)		.000
	N	100	100
Ultrasound Grade	Pearson Correlation	.470**	1
	Sig. (2-tailed)	.000	
	N	100	100
Table-VII. Correlation between HIE and ultrasound grades			
**. Correlation is significant at the 0.01 level (2-tailed).			

DISCUSSION

Perinatal asphyxia is defined as delayed cry after birth or respiratory failure due to lack of oxygen and is a leading cause of mortality and morbidity in Pakistan. It develop severe neurological consequences in which hypoxic ischemic encephalopathy (HIE) is most studied and complicated condition. Cranial ultrasound is a preferred and immediately available imaging modality and a reliable technique for evaluation of neonatal brain to demonstrate cerebral injuries. It is a safe and routine tool in neonatology department for newborn babies who suffered in different problems like perinatal asphyxia to review normal anatomy, ventricle size, focal or diffuse increased echogenicity in cerebral hemispheres and cortex and basal ganglia lesions. Other modalities are CT and MRI. MRI is considered as a gold standard tool to evaluate cerebral injuries. But it is expensive, require sedation, take time and in very ill patients it cannot be easily perform as compared to the ultrasound.

In previous study of Pilvi Ilves (sonographic changes in HIE) ultrasound is considered as an excellent technique in screening asphyxiated infants with HIE. He said that although having some limitations, ultrasound illustrated parenchymal abnormalities in neonate's brain and its finding also have good correlation with MRI.[9] In my research only ultrasound is used as screening tool for asphyxiated neonates with HIE.

APGAR scoring classification is considered as a predictor of perinatal asphyxia in both preterm and tem babies.[11] But in my research Apgar score is not mentioned. Because babies admitted in hospital were referred from others places. APGAR score was not mentioned in their medical records

file and their relatives were unaware about Apgar score. So history of delayed cry is taken by them. In previous research van Wezel-meijler et al performed a study in preterm babies and presence of echogenicity changes in brain WM was scored according to his own classification known as van Wezel-meijler et al classification on cranial ultrasound and then compared with MRI.[13] In my study clinical findings including full term babies, birth weight, history of delayed cry and most important HIE grades were taken from the hospital records files, given by doctor according to the condition of the patients and ultrasound was done within first 3 days of life in full term babies and given grades according to findings. My grading on ultrasound was done according to van Wezel-meijler et al classification. In this grading grade 0 showed normal parenchymal echogenicity, grade 1 showed moderately increased echogenicity and grade 2 showed severely increased parenchymal echogenicity. HIE grades were given by doctors according to Sarnat stages/grades. In my study 63 were male and 37 were female neonates out of 100. In these 19 babies were in their first day of life. 45 babies of second day of life and 36 in their third day of life. Mean birth weight was 2.4 – 3.6 (minimum to maximum) having mean 3.08 and standard deviation 0.53. According to HIE grading 12 babies were mild (grade 1), 83 were moderate (grade 2) and 5 were severe (grade 3). On ultrasound 32 babies showed normal or mild increased parenchymal echogenicity (grade 0), 52 showed moderate (grade 1) and 16 showed severe or generalized increased parenchymal echogenicity (grade 2). After collecting all data correlation was find out by using SPSS software. I found that there is a moderate positive correlation between clinical findings (HIE grades 1, 2, 3) and sonographic findings (Ultrasound grades 0, 1,

2) with r = + 0.47 and P-value < 0.05 which is statistically significant.

CONCLUSION

Ultrasound is a good screening tool to evaluate parenchymal echogenicity of an asphyxiated neonate brain in first 3 days of life. Due to non-invasive modality it is a safe technique for neonates. Ultrasound has a moderate correlation with clinical findings including HIE grades.

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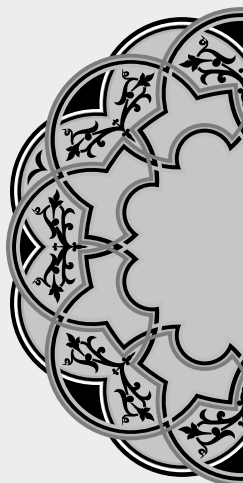
"The most important thing in communication is to hear what isn't being said."

Peter Drucker

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