

Original Article**Clinical Profile and Ultrasonographic Evaluation of Brain in Perinatal Asphyxia**F Noman¹, MI Islam², HA Khan³, R Sultana⁴**Abstract:**

This descriptive cross sectional study was carried out in the department of paediatrics, Mymensingh Medical College Hospital from March 2006 to December 2006. This study was performed on 100 consecutive asphyxiated newborns who were admitted in Mymensingh Medical College Hospital during the study period. Among them, 50 babies were preterm and 50 babies were full term with moderate to severe perinatal asphyxia. Full term (>37 weeks of gestation) and preterm (<37 weeks of gestation) newborn babies with perinatal asphyxia was taken as case in inclusion criteria. Among the preterm babies, highest number 23(46%) were in the age group of 34-36 weeks of gestational age and among the term babies, highest number 24(48%) were in the age group of 39-40 weeks of gestational age. This study shows that 39% mothers had prolonged obstructed labour, 21 % had premature rupture of membrane and 17% had pre-eclamptic toxemia during pregnancy. Convulsion 66%, poor primitive reflexes 52%, cyanosis 49%, pallor 32%, respiratory distress 32% and apnoic spells 26% were the common presentations of asphyxiated babies. Out of 50 preterm asphyxiated newborns, one showed periventricular leukomalacia, two IVH and two ventricular dilatation. In the present study abnormal sonogram were detected in ten term babies. Two cases showed features of cerebral oedema and eight cases showed mild to moderate ventriculomegaly together with several subcortical cystic lesions of varying size. In case of comparison, eight cases had ventricular dilatation in term babies while 2 cases had in preterm babies. None of the term babies had ventricular haemorrhage but 2 had in preterm babies. Only one preterm baby had periventricular

leukomalacia but none among the term babies. There were 2 cases of cerebral oedema in term babies but none in preterm babies. Thus ultrasonography helps early recognition of intracranial abnormalities in asphyxiated newborns. So prognosis may be assessed, complication may be anticipated and appropriate management plan can be designed.

Key words: perinatal asphyxia, ultrasonography of brain in perinatal asphyxia.

Introduction:

Bangladesh is one of the most populous countries in this world. Too many mothers and children are suffering and dying each year in this country. The infant mortality rate is 46 per 1000 live birth.¹ Neonatal mortality contributes a great deal to infant mortality rate.^{2,3} Among all the causes, 39% of the neonatal deaths occur due to perinatal asphyxia.⁴ Perinatal asphyxia is a leading cause of neonatal mortality and morbidity in many countries including Bangladesh. In our country neonatal mortality rate is 42/1000 live birth.^{3,5} Perinatal asphyxia is an insult to the fetus or newborn due to lack of oxygen (hypoxia) and/or lack of perfusion (ischemia) to various organs which will manifest as difficulty in establishing spontaneous respiration evident by a delayed cry after birth.^{6,7,8} The incidence of perinatal asphyxia ranges from 3.7/1000 to 9/1000 live birth infants. When the asphyxial insult is followed by clinical evidence of abnormal neonatal neural behaviour, the syndrome is described as hypoxic-ischemic encephalopathy (HIE).⁹ Hypoxic-ischemic brain injury is the most important consequence of perinatal asphyxia which ultimately results in immediate and delayed form of neuronal death.⁷ Asphyxia is associated with increment in neonatal mortality from two to twenty fold in preterm infants and with an extra-ordinary increment of nearly 200 fold in mature infants.¹⁰ Cranial ultrasound was first introduced in 1979 in neonatal intensive care units to detect intracranial pathology.^{11,12} The development of high resolution, real time sector together with increasing expertise in its use and interpretation of finding, has established the role of sonography in the analysis of neonatal brain. It can provide anatomical details about the brain parenchyma and ventricular system with high precision.¹³ Now a day it is widely used as a diagnostic tool. This technique is safe and convenient for study of various intracranial lesions e.g. intracranial hemorrhage of various types, ischaemic brain lesions etc.¹⁴ Early detection of intracranial lesions and its consequences will enhance timely intervention and better outcome.

Materials and Methods:

This study was carried out in the department of paediatrics, Mymensingh Medical College Hospital. From March 2006

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to December 2006. This study was performed on 100 consecutive asphyxiated newborns who were admitted in Mymensingh Medical College Hospital during the study period. Among the total study population, 50 babies were preterm and 50 babies were full term with moderate to severe perinatal asphyxia. Full term (>37 weeks of gestation) and preterm (<37 weeks of gestation) newborn babies with perinatal asphyxia was taken as case in inclusion criteria. The exclusion criteria's were full term and pre term babies who are normal and full term and pre term babies who are sick other than perinatal asphyxia.

Procedure of the study

After taking verbal consent, proper history was taken from the mother or the person attending the baby. The obstetric history was collected from them and also from the written information available from the attending physician conducting the labour. Clinical examination was done in all the babies. Gestational age in completed weeks was determined by maternal date of last menstrual period and in Newballoria scoring system. Birth weight and other parameters were recorded. Examination findings were documented on a pre formed questionnaire. Cranial ultrasound scans were performed with real time sector scanner using 3.5 MHz /7.5 MHz transducer, which is available in department of Nuclear Medicine Centre in MMCH. It was done in various coronal and sagittal planes using the anterior fontanelle as an acoustic window by the same person. Ultrasound brain scan was obtained in all these neonates within 28 days of postnatal age after the baby became clinically stable. The scan was evaluated with special attention to the size of the ventricles, presence of haemorrhage within the ventricles and the extent of parenchymal abnormalities. Height of the body of the lateral ventricle was measured for detecting ventricular dilatation. Ultrasonography was done once in each case by the some qualified sonologist. All the clinical data and the findings of cranial sonographic studies were recorded in a specially designed neonatal case, taking sheet (Appendix). All information and data was collected and then statistical analysis was done.

Results

One hundred newborn comprised the study group, of them 50 babies were preterm low-birth weight with perinatal asphyxia. Rest 50 babies were term with perinatal asphyxia.

Table-I: Distribution of preterm newborn and term newborn as per gestational age.

Gestational Age in weeks	No. of the respondents	Percentage
Pre term newborn(n=50)		
28-30	10	20.0
31-33	17	34.0
34-36	23	46.0
Gestational Age in weeks term newborn(n=50)		
37-38	18	36.0
39-40	24	48.0
41-42	8	16.0

Among the preterm babies, highest number 23(46%) were in the age group of 34-36 weeks of gestational age and among the term babies, highest number 24(48%) were in the age group of 39-40 weeks of gestational age.

Table-II: Distribution of babies of preterm term and term as per birth weight (n=100)

Birth weight	No. of the respondents	Percentage
Preterm baby (n=50)		
<1.5	8	16.0
1.5-2 kg	14	28.0
>2-<2.5 kg	28	56.0
Term baby (n=50)		
2.5-3.5 kg	32	64.0
>3.5-4 kg	18	36.0

Table II shows that babies birth weight <1.5 kg was in 8(16%) cases, between 1.5-2 kg was in 14(28%) cases and between >2-2.5 kg was in 28(56%) of cases. In term babies, birth weight between 2.5-3.5 kg was 32(64%) cases and between >3.5-4 kg was 18(36%) cases.

Table-III: Preterm OFC in different gestational age groups (Preterm & Term).

Different gestational age	Range (cm)	Mean±SD
Preterm (group-A)		
28-30	26.50 - 28.50	27.85±1.10
31-33	29.00 - 32.50	29.82±0.87
34-36	31.00 - 33.50	31.73±1.07
Term (group-B)		
37-38	32.10 - 34.50	32.64±0.66
39-40	33.50 - 35.50	34.15±0.66
41-42	34.80 - 35.90	35.15±0.38

Table III shows that the mean head circumference in 28-36 weeks group-A was 31.7±1.07 cm and 37-42 weeks group-B was 35.2±0.38 cm.

Table-IV: Risk factors in the asphyxiated newborns.

Risk factors	Number	Percentage
1. Prolong labour	39	39%
2. Premature rupture membrane (PROM)	21	21%
3. Pre-eclamptic toxemia (PET)/Eclampsia	17	17%
4. Hypertension	10	10%
5. Diabetes mellitus	5	5%
6. APH (Antepartum hemorrhage)	5	5%
7. Oligohydramnious	3	3%

This table IV shows that 39% mothers had prolonged obstructed labour, 21% had premature rupture membrane and 17% had pre-eclamptic toxemia during pregnancy.

Table-V: Distribution of clinical presentation of the asphyxiated newborns.

Clinical features	No. of patient	Percentage
Convulsion	66	66%
Cyanosis	49	49%
Pallor	32	32%
Respiratory distress	32	32%
Apnoic spells	26	26%
Birth injury	5	5%
Primitive reflexes		
Absent	14	14%
Poor	52	52%
Normal	34	34%

Table V shows convulsion 66%, poor primitive reflexes 52%, cyanosis 49%, pallor 32%, respiratory distress 32% and apnoic spells 26% were the common presentations of asphyxiated babies.

Table-VI: USG findings in Preterm (n=50)

Cranial USG finding	No. of patient	Percentage
IVH (intraventricular leukomalacia)	2	4%
Ventricular dilatation	2	4%
PVL (periventricular leukomalacia)	1	2%
Cerebral oedema	0	0
Normal finding	45	90%

Out of 50 preterm asphyxiated newborn, one showed periventricular leukomalacia, two IVH and two ventricular dilatation.

Table-VII: USG findings in Term babies (n=50)

Cranial USG finding	No. of patient	Percentage
Ventricular dilatation	8	16%
Cerebral oedema	2	4%
IVH	0	0%
PVL	0	0%
Normal finding	40	80%

In the present study abnormal sonogram were detected in ten term babies. Two cases showed features of cerebral oedema and eight cases showed mild to moderate ventriculomegaly together with several subcortical cystic lesions of varying size.

Table-VIII: Comparison of USG finding in term and preterm.

USG finding	Preterm	Term	Ratio
Ventricular dilatation	2	8	1:4
Ventricular haemorrhage	2	0	
Cerebral oedema	0	2	
PVL	1	0	
Normal finding	45	40	9:8

Table VIII shows that 8 cases had ventricular dilatation in term babies while 2 cases had in preterm babies. None of the term babies had ventricular haemorrhage but 2 had in preterm babies. Only one preterm baby had periventricular leukomalacia but none among the term babies. There were 2 cases of cerebral oedema in term babies but none in preterm babies.

Discussion:

Most of the studies showed that birth asphyxia is more common in full term rather than preterm babies. Levene showed in his study that 85.8% full term and 14.2% preterm infant had birth asphyxia.¹⁵ Goldberg et al showed 16.6% preterm, 41.66% term and 41.66% post term infants had perinatal asphyxia.¹⁶ This study shows that majority (56%) of the preterm babies were more than 2 kg to less than 2.5 kg weight group. On the other hand, majority (64%) of the term babies were of 2.5 to 3.5 kg weight group. This figures correlate with the studies of Barr and Dipietro et al.^{17,18} In this study, the progressive increase in head circumference with increasing gestational age has been shown. The mean head circumference in 28-36 weeks group-A was 31.7±1.07 cm and 37-42 weeks group-B was 35.2±0.38 cm showing a definite increase of head circumference with increasing gestational age and it is consistent with the finding of Thomson et al and Hill et al.^{19,20} We found a lot of risk factors in perinatal asphyxia in the study. These are pre-eclamptic toxemia (17%), hypertension (10%), diabetes mellitus (5%), prolong labour (39%), leaking and premature rupture membrane (21 %) and APH (5%). Martin et al had found PET in 20%, prolong labour in 38%, premature rupture membrane in 22% and APH in 10% cases.²¹ Chowdhury et al showed in this study PET 15%, hypertension in 5%, diabetes mellitus in 5% and prolong labour in 40% which is consistent with the present study.²²

Pallor (32%), convulsion (66%), cyanosis (49%), apnoic spells (26%), respiratory distress (32%) and abnormal primitive reflexes were the clinical presentation either singly or in various combinations in the study. Pallor was found in 32% cases of perinatal cases in this study which is near consistent with the findings of 20% in study of D Souza et al on perinatal asphyxia.²³ Cyanosis in this study was found in 49% cases which is consistent with other study^{21,19} Apnoeic spell is one of the presentation of perinatal asphyxia. In this study 26% cases showed apnoeic spell. Barr, Thompson et al and D. Souza et al showed that 23.1%, 20% and 23.8% asphyxiated babies developed apnoeic spell respectively.^{17,19,23} Convulsion is an important presentation of perinatal asphyxia. Thirty to 70% of all neonatal seizures are due to hypoxic ischemic brain insult. In this study convulsion was the most common presentation in 66% cases. Finer et al found convulsion in 68.4% of cases which is near consistent with this study.²⁴ Goldberg et al found 58.3% convulsion in his study.¹⁶ Respiratory distress and birth injuries were also important presentation in the study and it was found in 32% and 5% cases respectively. Martin et al found respiratory distress in 48.4% cases in his study.²¹

Conclusion:

In this study attempt has been made for ultrasonographic assessment of various intracranial lesions of both term and preterm asphyxiated babies. This study reveals that PVL occur only in case of preterm LBW babies. It also

highlights and established the role of real time sonography in the evaluation of neonatal brain. Sonography was done only once in each case and very sick asphyxiated newborns were excluded for lack of appropriate arrangement facilities. If the arrangement of ultrasonography was possible in the neonatal intensive care unit, then the study population would be less biased and more randomized. Serial ultrasound scanning of brain is much more helpful for early detection and follow up of cases. Thus ultrasonography helps early recognition of intracranial abnormalities in asphyxiated newborns. So prognosis may be assessed, complication may be anticipated and appropriate management plan can be designed. In our country more study is needed for further comment.

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