

## Important Risk Factors and Outcome of Birth Asphyxia in a Population of North-East India.

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### **ABSTRACT:**

**BACKGROUND:** Birth asphyxia is one of the leading causes of neonatal mortality. Several maternal and neonatal risk factors are associated with it.

**AIMS&OBJECTIVES:** to look for important risk factors leading to birth asphyxia and its outcome in a resource limited setting.

**METHODS:** The study was conducted in the Neonatal Unit of a tertiary Medical college of North East India. It was a hospital based observational study. Babies were enrolled at birth. Resuscitation was done according to standard neonatal unit protocol. Maternal and neonatal factors were studied in babies having birth asphyxia as well as healthy babies. Outcome was observed in babies having birth asphyxia.

**RESULT:-:** It was found that among the neonatal factors - gestational age, presentation, meconium stained amniotic fluid and among the maternal factors - APH, prolonged labour, multiple pregnancy, premature rupture of membrane are significant risk factors for birth asphyxia. Birth asphyxia was more in term babies. Recovery occurred in significant number of cases (83.3 %) whereas death occurred in 15.6% cases. Major attributable cause of death was HIE III. Majority of patients with birth asphyxia had no HIE (59.3%).

**CONCLUSION:** Our study shows that proper antenatal care and early referral of mothers with conditions like antepartum hemorrhage, multiple pregnancy and prompt management of such mothers will help to decrease birth asphyxia in neonates. Neonatal conditions which were found to be associated with birth asphyxia like prematurity, low birth weight, meconium stained liquor etc can also be reduced with appropriate case management by obstetrician.

**Keywords:** Birth asphyxia, risk-factors, outcome

### **I. INTRODUCTION:**

Birth asphyxia is one of the leading causes of neonatal mortality. The incidence is higher in developing countries. As per the latest estimates, birth asphyxia accounts for 9% (i.e., 0.8 million) of total under -5 mortality (i.e., 8.8 million) worldwide, being one of the three most common causes of neonatal deaths along with prematurity and bacterial infections<sup>[1]</sup>. Of a total of 2.7 million still births globally, approximately 1.2 million occur during intrapartum period, largely owing to asphyxia<sup>[2]</sup>. National Neonatal-Perinatal Database, NNPD (2002-03) reported birth asphyxia to be the commonest cause of still births accounting for 45.1% of all such cases. As reported in NNPD (2002-03), Apgar score <7 was found at 1min in 8.4 % while 2.4% had scores <7 at 5mins of life of all births at 18 neonatal units in India<sup>[3]</sup>

Definition of birth asphyxia has remained controversial. According to **WHO**, birth asphyxia is defined as *failure to initiate and sustain breathing*<sup>[4]</sup>.

According to the American Academy of Pediatrics and the American College of Obstetrics and Gynecology, presence of all the following criteria is required in order to call it as birth asphyxia<sup>[5]</sup> -

- 1) Profound metabolic or mixed acidemia ( pH <7) in umbilical cord blood
- 2) Persistence of low Apgar scores less than 3 for more than 5 mins
- 3) Signs of neonatal neurological dysfunction ( eg.- seizures, encephalopathy, tone abnormalities)
- 4) Evidence of multiple organ involvement( such as that of kidneys, lung, liver, heart and intestine)

Birth asphyxia is more common in high risk groups (such as mother with no antenatal care, multiple pregnancy, breech presentation, Pregnancy Induced Hypertension, etc.). Treatment of birth asphyxia, especially with moderate to severe Hypoxic Ischaemic Encephalopathy(HIE), has been tried with hypothermia in areas with resources and the results have been found to be encouraging. Many of the neonatal deaths due to birth asphyxia are preventable if the cause can be taken care of.

**Aims & objectives:**

- 1) to look for important risk factors leading to birth asphyxia in patients attending the obstetrics unit of the institution
- 2) to look for the outcome of birth asphyxia in a resource limited setting

**II. MATERIALS & METHOD:**

**Place of study:** the study was conducted in the neonatal unit of a tertiary medical college in Assam

**Study design:** hospital based observational study

**Duration of study:** 1 year

**Method of study:** Babies were enrolled at birth. Resuscitation was done according to standard neonatal unit protocol. Babies were grouped into two categories—cases and controls.

Case:

- 1) Neonates requiring bag and mask ventilation or any further resuscitation according to NALS protocol.
- 2) Neonates having Apgar score of less than 3 at 1 min

Control:

- 1) Gestational age matched neonates not requiring resuscitation

**Exclusion criteria:** Neonates with life threatening congenital malformation.

Mothers were informed and counselled regarding the study as soon as they were admitted into labor ward. Neonates were enrolled at birth after verbal consent was obtained from mothers after stabilization of baby after birth. Institutional ethics committee clearance was obtained. After initial stabilization after birth, neonates were divided into cases or control according to eligibility criteria. Gestational age was calculated from maternal LMP or New Ballard score was done if it was not available. Birth weight was taken in an electronic weighing scale with an accuracy of  $\pm 5$  gm and appropriateness of weight, small for gestational age or large for gestational age was determined by plotting weight in Fenton's chart. The neonates identified as cases were shifted to Neonatal Intensive care for observation and management according to unit protocol while those identified as control were taken care of in postnatal ward unless some indication became apparent for transfer to NICU. Neonates were followed up till discharge and all data recorded in a predesigned proforma.

**Variables studied included:**

- 1) **Maternal factors:** maternal factors studied in cases and controls were

- a. Maternal age
- b. Ethnicity
- c. Severe maternal anemia
- d. Maternal educational status
- e. Parity
- f. Number of antenatal visits
- g. Antepartum haemorrhage (APH)
- h. Prolonged labor
- i. Premature Rupture Of Membrane (PROM) positive
- j. Preterm PROM positive
- k. Multiple pregnancy
- l. Cord prolapsed

- 2) **Neonatal factors:** neonatal factors studied in cases and control were

- a. Gestational age
- b. Presentation
- c. Mode of delivery
- d. Birth weight
- e. Sex
- f. Meconium stained amniotic fluid

**Outcome** was studied among the babies who had birth asphyxia under the following headings.

- 1) Death/ recovery
- 2) Duration of the hospital stay among the survivors
- 3) Stage of Hypoxic Ischemic Encephalopathy (HIE)

**STATISTICAL METHODS:** The data obtained was tabulated and analyzed statistically using social science system version SPSS.16 and quantpsy.org

### III. RESULTS AND OBSERVATIONS:

Analysis of the data showed the following

**TABLE 1: COMPARISON OF MATERNAL DEMOGRAPHIC PROFILE IN CASES AND CONTROLS**

VARIABLES	SUBGROUPS	CASES,n=96 (%)	CONTROL,n=96 (%)	p-value
MATERNAL AGE GROUP	15-20 YRS	32(33.3%)	25(26%)	0.457
	21-25 YRS	38(39.5%)	35(36.4%)	
	26-30 YRS	19(19.7%)	26(27%)	
	>30 YRS	7(7.2%)	10(10.5%)	
EDUCATIONAL STATUS	ILLITERATE	33(34.3%)	25(26%)	0.428
	CLASS 1-5	13(13.5%)	13(13.5%)	
	>CLASS 5	50(52%)	58(60.4%)	
PIH		31(32.2%)	19(19.7%)	<b>0.048</b>
APH		6(6.25%)	0	<b>0.012</b>
PROLONGED LABOUR		8(8.3%)	0	<b>0.003</b>
PREMATURE RUPTURE OF MEMBRANES		14(14.5%)	3(3.1%)	<b>0.005</b>
	PRETERM PROM +VE	3(3.1%)	1(1.0%)	
CORDPROLAPSE		2(2.0%)	0	0.155
SEVERE ANEMIA		4(4.1%)	6(6.2%)	0.515
MULTIPLE PREGNANCY		5(5.2%)	0	<b>0.023</b>
ETHNICITY	TGL	37(38.5%)	24(25%)	0.071
	ASSAMESE	40(41.6%)	42(43.7%)	
	NON ASSAMESE	19(19.7%)	30(31.2%)	
PARITY	MULTIPARA	34(35.4%)	46(47.9%)	0.078
	PRIMIPARA	62(64.5%)	50(52%)	
NO OF ANTENATAL VISITS	≥ 3	77(80.2%)	66(68.7%)	0.068
	<3	19(19.7%)	30(31.2%)	
MATERNAL BLOOD GROUP	A+	24(25%)	31(32.6%)	0.055
	B+	28(29.1%)	36(37.5%)	
	AB+	5(5.2%)	9(9.3%)	
	O+	3(3.1%)	20(20.8%)	
	B-VE	1(1.0%)	0	

Analysis of the data showed that maternal PIH(p=0.04), APH(p=0.012),prolonged labour(p=0.003),multiple pregnancy(p=0.023),premature rupture of membranes(p=0.005) are significant risk factors leading to birth asphyxia in the population studied as the p-value is <0.05 whereas maternal age group, maternal educational status, preterm PROM positive, cord prolapse, severe anemia, ethnicity, parity, no of antenatal visits, maternal blood group are not significant risk factors leading to birth asphyxia in the population studied.Amongst the babies having birth asphyxia 32.2% mothers had PIH, 6.25% had APH, 8.3% had prolongedlabour, 14.5% had premature rupture of membranes, 5.2% had multiple pregnancy.

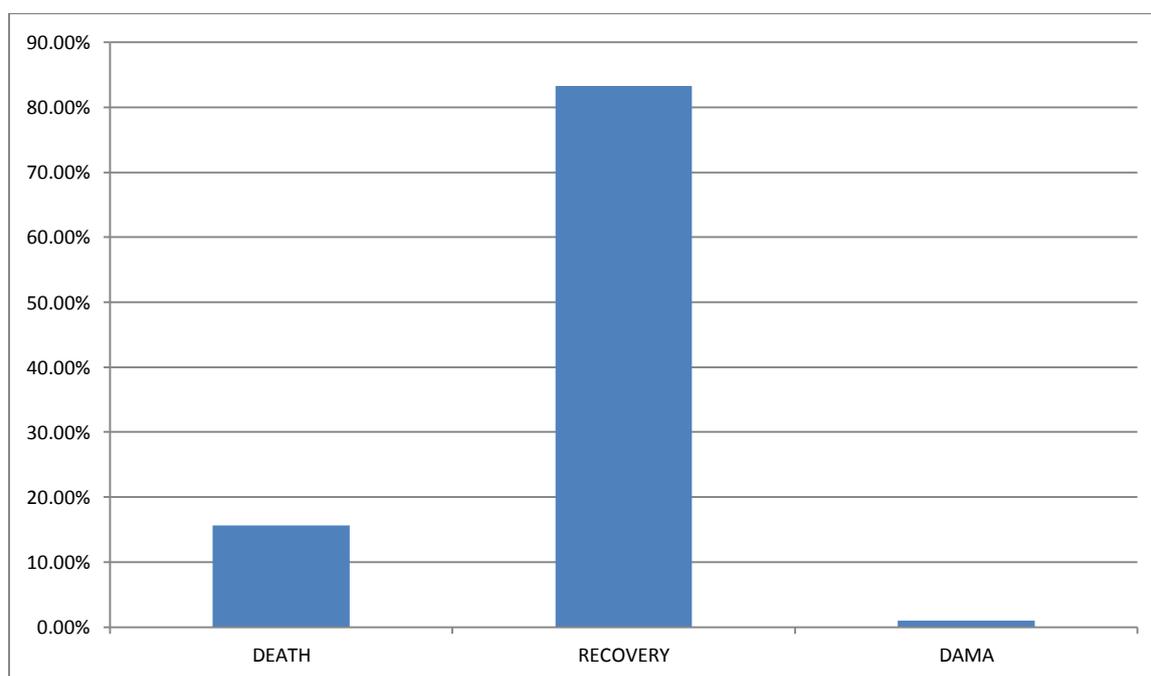
**TABLE 2 : COMPARISON OF NEONATAL FACTORS IN CASES AND CONTROL**

VARIABLES	SUBGROUPS	CASES,n=96 (%)	CONTROL,n=96 (%)	p-value
GESTATIONAL AGE	36 WKS	13(13.5%)	6(6.2%)	<b>0.00002</b>
	37 WKS	2(2%)	6(6.2%)	
	38 WKS	76(79.1%)	54(56.25%)	
	40 WKS	5(5.2%)	26(27%)	
	42 WKS	0	4(4.16%)	
PRESENTATION	BREECH	12(12.5%)	3(3.1%)	<b>0.030</b>
	CEPHALIC	83(86.4%)	93(96.8%).	

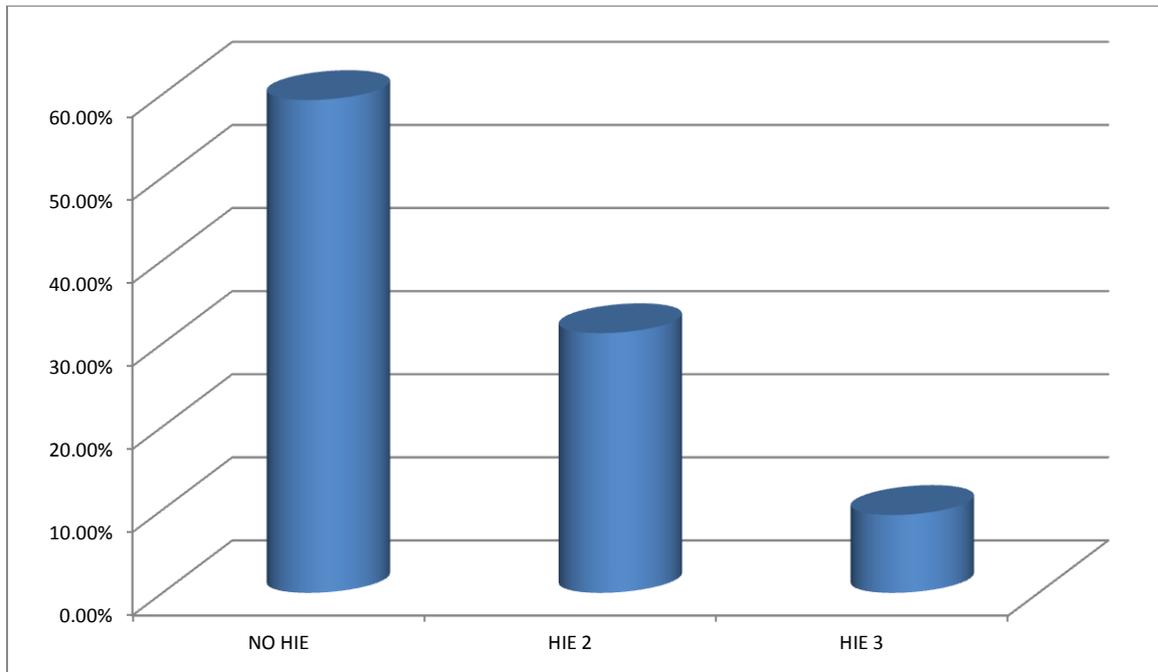
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	COMPOUND	1(1.0%)	0	
MODE OF DELIVERY	AVD	7(7.2%)	5(5.2%)	0.202
	NVD	61(63.5%)	54(56.2%)	
	LSCS	1(1.0%)	6(6.25%)	
	PTVD	27(28.1%)	31(32.2%)	
BIRTH WEIGHT	<1.5 KG	1(1.0%)	3(3.1%)	0.149
	1.5- 2.5 KG	41(42.7%)	29(30.2%)	
	>2.5 KG	54(56.2%)	64(66.6%)	
SEX	MALE	44(45.8%)	46(47.9%)	0.771
	FEMALE	52(54.1%)	50(52%)	
MECONIUM STAINED AMNIOTIC FLUID		61(63.5%)	5(5.2%)	<b>0.000</b>

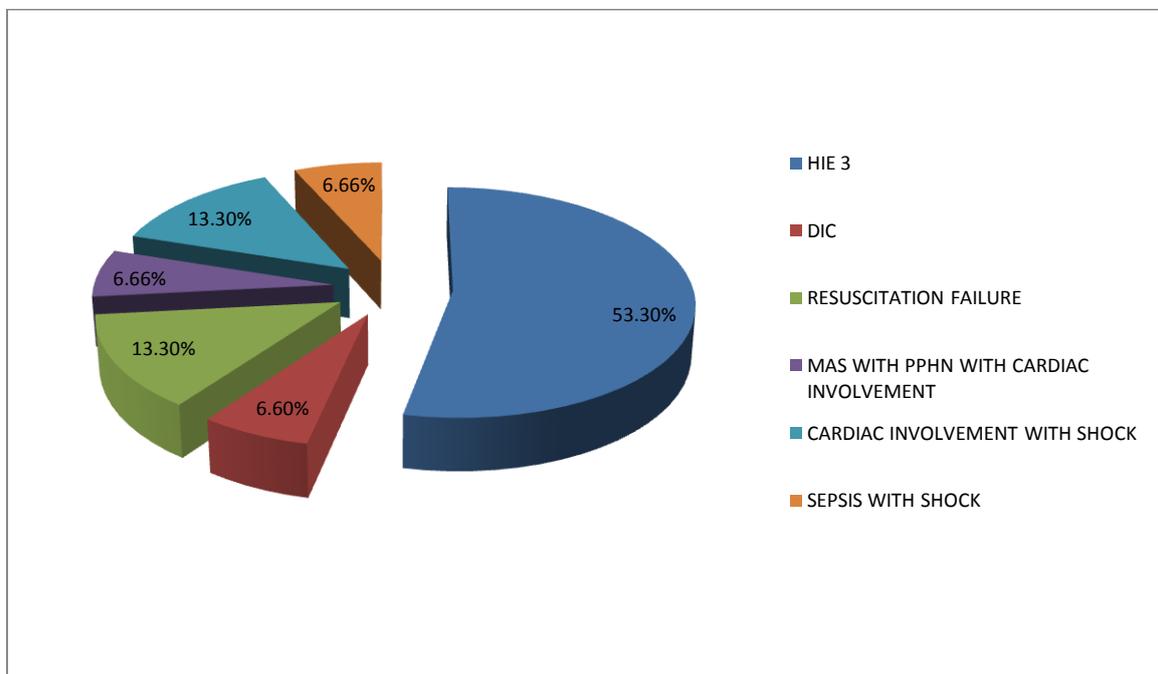
Analysis of the data showed that gestational age( $p=0.00$ ), presentation( $p=0.03$ ), meconium stained amniotic fluid( $p=0.00$ ) are significant risk factors leading to birth asphyxia as the  $p$ -value is  $< 0.05$  whereas, mode of delivery, birth weight,sex are not significant risk factors leading to birth asphyxia as  $p$ -value is  $>0.05$ . Amongst the babies having birth asphyxia 79.1% were 38 weeks of gestation. 86.5% were cephalic presentation and 12.5% were breech presentation. Among the babies having birth asphyxia 63.5% were meconium stained.



**Figure 1 FIGURE SHOWING OUTCOME AMONG THE BIRTH ASPHYXIA PATIENTS**



**Figure 2 FIGURE SHOWING STAGES OF HIE AMONG THE BIRTH ASPHYXIA PATIENTS**



**Figure 3 FIGURE SHOWING CAUSES OF DEATH AMONG THE BIRTH ASPHYXIA PATIENTS**

Among the babies who had birth asphyxia, death occurred in 15.6% and recovery in 83.3% cases. 59.3% had no HIE. Average duration of hospital stay was 5.49 ( $\pm$  1.34) days. Main cause of death among the birth asphyxia patients was found to be HIE III ( 53.3%) while other causes of death were -resuscitation failure, cardiac involvement manifested by shock, sepsis with cardiac involvement, MAS with PPHN with shock, DIC.

#### **IV. DISCUSSION:**

From our study we found that among the neonatal factors gestational age, presentation, meconium stained amniotic fluid are significant risk factors leading to birth asphyxia and among the maternal factors PIH, APH, prolonged labour, multiple pregnancy, premature rupture of membrane are significant risk factors leading to birth asphyxia in the population studied. Ahmollah et al<sub>[6]</sub> and Kumar BK et al<sub>[7]</sub> in their study also found prolonged labour, PROM, PIH and APH as important risk factors of birth asphyxia.

In our study we did not find any significant relationship between maternal age, maternal educational level and parity with birth asphyxia. Ahmollah et al<sub>[6]</sub> in their study also found no significant association with maternal age. Bhuyan et al<sub>[8]</sub> and Crawford et al<sub>[9]</sub> in their study also found no association of birth asphyxia with maternal educational level

Most of them were booked cases. J Parkash et al<sub>[10]</sub> in their study also found similar result. Seventy nine percent of cases occurred at 38 weeks of gestation babies. Ahmollah et al<sub>[6]</sub>, Bhuyan et al<sub>[8]</sub> and Ergander et al<sub>[11]</sub> also found incidence high in term babies. Birth asphyxia is said to occur more in breech presentation (in several other studies including J Parkash et al<sub>[10]</sub>) but in our study 86.4% babies were cephalic presentation and 12.5 % were breech presentation. Meconium stained amniotic fluid is strongly associated with birth asphyxia. 63.5 % of babies having birth asphyxia had meconium stained amniotic fluid.

Birth asphyxia is thought to occur more in NVD (as found in many studies including J Parkash et al<sub>[10]</sub>) which reflect upon the judgement of the obstetrician regarding the mode of delivery of a healthy baby. But in our study we didn't find significant relationship between mode of delivery with occurrence of birth asphyxia.

Recovery occurred in a significant number of cases (83.3 %), whereas death in 15.6% cases. Death rate was found to be 16% in the study conducted by Ahmollah et al<sub>[6]</sub>, 20.8% in Etuk et al<sub>[12]</sub>. Similar results were found in African and other Indian studies. Major attributable cause of death was found to be HIE III. Ahmollah et al<sub>[6]</sub> in their study also found HIE III as the most serious complication. Majority of patients with birth asphyxia had no HIE (59.3%).

Birth asphyxia is one of the leading causes of neonatal mortality. Studies have been done in the past to see the causes and outcome of birth asphyxia but more studies are required from various geographical areas to understand the risk factors and its outcome properly so combined effort can be made to control this major threat to neonatal life. Also different studies show that the risk factors and outcome differ in different regions of the world. We found that proper antenatal care and early referral of mothers with conditions like antepartum hemorrhage, multiple pregnancy and their prompt management can decrease birth asphyxia in neonates and the associated morbidity and mortality associated with it. Neonatal conditions like prematurity, low birth weight, meconium stained liquor etc. associated with birth asphyxia can also be decreased with appropriate case management by obstetrician.

## V. CONCLUSION:

Our study shows that proper antenatal care and early referral of mothers with conditions like antepartum hemorrhage, multiple pregnancy and prompt management of such mothers will help massively to decrease birth asphyxia associated morbidity and mortality in neonates. Neonatal conditions which were found in our study to be associated with birth asphyxia like prematurity, low birth weight, meconium stained liquor etc. can also be reduced with appropriate antenatal care and appropriate case management by obstetrician to prevent perinatal asphyxia. It is very essential that a normally delivered baby should not have any cerebral injury during the last hours of perinatal period which can lead to life-long handicap or disability even if the baby survives. It is important to realize that birth asphyxia is one of the major determinants of infant mortality and morbidity. Proper antenatal care seems to be the key to prevent birth asphyxia related mortality and morbidity. However it is equally important that pediatricians trained at resuscitation should be present at all deliveries at risk for birth asphyxia.

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