Original Article

Prevalence of Perinatal Asphyxia with Evaluation of Associated Risk Factors in a Rural Tertiary Level Hospital

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Abstract

Background: *Perinatal asphyxia (PNA) is one of the most important causes of perinatal mortality and morbidity which can be preventable and managable.* ***Objectives:*** *The purpose of the study was to determine the prevalence of perinatal asphyxia and to explore the factors influencing or related to the development of the PNA.* ***Materials and Methods:*** *It is a cross-sectional study conducted in the neonatal unit of department of pediatrics, KYAMC hospital from January 2015 to December 2016. Two hundred eleven neonates admitted in neonatal unit including SCABU were enrolled in the study considering inclusion criteria. Necessary information about sociodemography, peri-natal history (including antepartum, intrapartum and fetal risk factors) were collected by detailed history taking on a pre-designed questionnaire. Clinical examinations and outcomes were also recorded. We used Student's t-test and χ^2-test to determine the association of PNA with various risk factors.* ***Results:*** *The male to female ratio was 1.6:1. The mean age of the neonates during admission time was 3.66 (±5.506) days (in PNA 1.8±2.803 days and in normal group 6.11±7.047 days). The overall prevalence of PNA was 56.9% (120); male 60.8% (73) and female 39.2% (47). Identified significant materno-fetal risk factors were maternal young age (p= .038), low socioeconomic condition (p = .000,) primiparity (p = .003), muconium stained amniotic fluid (p = .004), obstructed labour (p = .019), low birth weight (p = .009) and home vaginal delivery by local dai and midwives (p = .017). Serious neonatal complications noted among the asphyxiated babies were hypoxic ischemic encephalopathy with convulsion, neonatal jaundice, septicemia, transient tachypnoea of neonate, hypoglycemia, respiratory distress syndrome, caput succedaneum and feeding problem.* ***Conclusions:*** *Findings of this study highlight the need for the better obstetrical care and awareness of the possible presence of the risk factors of PNA among mothers and fetus, so that the occurrence and worsening of PNA could be prevented or at least appropriately managed. It can reduce the high incidence of morbidity and mortality due to birth asphyxia.*

Key words: *Perinatal asphyxia, Risk factors, Complications.*

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Introduction

Perinatal asphyxia, neonatal asphyxia or birth asphyxia is a serious clinical problem worldwide and contributes greatly to neonatal mortality and morbidity[1]. It is a condition of the fetus or newborn due to failure to breath or breathing poorly leading to decrease oxygen perfusion to various organs[2]. It happens in 2 to 10 cases per 1000 newborns that are born at term, and more of those that are born prematurely[3]. It is one of the leading causes of neonatal deaths within first week of life[4].

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According to WHO, 4 millions deaths yearly occurred due to birth asphyxia, representing 38% of all deaths of children under 5 years of age. In the developing countries 3% of all infants (3.6 millions) suffer from moderate to severe birth asphyxia, of which 23% (840,000) die and approximately the same number develop serious sequelae[2,5]. It is strongly associated with 1.1 million intrapartum stillbirths[6]. Those who survive after asphyxia at birth may have chance to develop neurological complications including epilepsy, cerebral palsy and developmental delay[7]. This creates a great burden for the family, as well as for the society. Since the condition could have been preventable, in a developing country like Bangladesh an urgent need to develop a clearer understanding of pathophysiology and risk factors of birth asphyxia is thus obvious. Various materno-fetal risk factors are involved in PNA. Singh et al had found the association of one or more high risk materno-fetal factors of birth asphyxia[8]. Various study showed age of mother, inappropriate antenatal care, preeclampsia, intake of diuretics and adrenergic drugs were reported as maternal risk factors. Significant Intra-partum risk factors were home delivery by midwives, breech presentation, prolapsed umbilical cord, cephalopelvic disproportion and fever. Significant Fetal risk factors were oligohydromnios, meconium stained amniotic fluid, pre-mature delivery and low birth weight[9-13]. To the best of our knowledge, in Bangladesh there are a very few clinical studies in this direction. Studies primarily based on hospital data, indicate that birth asphyxia is one of the three leading cause of newborn death. The other two being infection (sepsis, pneumonia, diarrhoea and tetanus), and complications of prematurity[14-16]. Annual reports of Dhaka Medical College Hospital from 2001 through 2007 showed incidence of birth asphyxia to be from 29% to 36% and mortality among them were around 25%[17,18]. Another study showed incidence of birth asphyxia to be 9.76 per 1000 live birth[19]. Considering these facts, we attempted to do a clinical study in this regard. Our aim was to gain new insights into how different maternal and fetal risk factors affect birth asphyxia and also to see the short term outcomes of the affected babies.

Materials & Methods

This is a cross-sectional study conducted on 211 neonates of both gender in the neonatal unit of department of pediatrics, KYAMC hospital from January 2015 to December 2016. One hundred twenty neonates with birth asphyxia admitted to the special care baby unit (SCABU) of neonatal unit and at the same time period 91 newborns admitted in the neonatal unit who had no asphyxia. Birth asphyxia was considered when there was a history of failure or delayed onset of spontaneous respiration after birth or when a baby needed positive pressure ventilation for more than 1 minute or delayed cry with or without cyanosis (for newborns born other than our hospital). Those with congenital anomalies, Rh incompatibility or birth weight less than 1000 gm were excluded from the study. Enrollment was done within 12 hours of admission, after informed verbal consent from the mother or the attendant of each case. In this study we collected data about maternal age, working status, social status, past medical and obstetric history, parity, history of present pregnancy including hypertension, fever, Antepartum haemorrhage (APH), jaundice, convulsion; whether antenatal checkup was taken or not. Information about place and mode of delivery, conducting person, duration of labour, use of any drug, colour of liquor, babies condition at birth, need for any form of resuscitation, with specification were also included. Complete clinical examination was performed in each neonate with special emphasis on the neurological examinations. Any evidence of birth injury or anomaly was noted. Gestational age in completed weeks was assessed by an accurate menstrual history. Neonates were divided as pretermed (<37 weeks), termed (37-<40 weeks) and post termed (≥ 40 weeks). According to birth weight they were divided as low birth weight (LBW, <2.5 kg), normal (2.5-<4 kg) and overweight (≥ 4 kg) group. Presence of complications among the neonates were also recorded.

Analysis has been performed by using SPSS (version 21). The prevalence rate of perinatal asphyxia among neonates was determined by simple percentages. For comparison of different variables among the groups we used Chi-square test for categorical data and Independent Student's t-test for quantitative data. All statistical tests were considered significant at a level of $p < 0.05$.

Results

Among the neonates 61.6% (130) were male and 38.4% (81) were female. The male to female ratio was 1.6:1 (in PNA group 1.5:1). The mean age of the neonates during admission time was 3.66 (±5.506) days (in PNA 1.8±2.803 days and in normal group 6.11±7.047 days). The overall prevalence of PNA was 56.9% (120); male 60.8% (73) and female 39.2% (47).

Table-I: Sociodemographic characteristics of mothers of the study

Variables	With PNA (n=120) n (%)	Without PNA (n=91) n (%)	*p* value
Age group (years)			
<20 years	17 (14.2)	19 (20.9)	**.038**
20 -25 years	71 (59.2)	36 (39.6)	
26 -30 years	27 (22.5)	28 (30.8)	
>30 years	5 (4.2)	8 (8.8)	
Educational status			
No education	49 (40.8)	30 (33.0)	.639
Upto primary	39 (32.5)	35 (38.5)	
Upto SSC	24 (20.0)	18 (19.8)	
Above SSC	8 (6.7)	8 (8.8)	
Residence			
Urban	5 (4.2)	6 (6.6)	.432
Rural	115 (95.8)	85 (93.4)	
Socioeconomic status			
Low class	82 (68.3)	18 (19.8)	**.000**
Middle class	34 (28.3)	66 (72.5)	
High class	4 (3.3)	7 (7.7)	
Place of delivery			
Home	106 (88.3)	75 (82.4)	.238
Hospital	14 (11.7)	16 (17.6)	

Mean maternal age in asphyxia group was 23.73 ± 4.15 years while mean maternal age of normal group was 24.12 ± 4.82 years. Mothers at age of 20-25 years were significantly associated with PNA as compare to younger or elder mothers (<20 or >25) (p = .038). The mothers who were of low socioeconomic status demonstrated higher PNA than the mothers of middle or high socioeconomic status and the difference was significant (p = .000). Home delivery was frequent in both asphyxiated 88.3% (106) and normal group 82.4% (75). Educational status of mothers and place of delivery did not show any significant association with PNA (Table I). Infants of primiparous women carried a significant association with birth asphyxia as compared to multiparous (p = .003). Normal vaginal delivery was frequent in both asphyxia 115 (95.8%) and control group 79 (86.8%). Vaginal delivery showed significant association with PNA than caesarian section (p = .017). Maternal diabetes mellitus was not related to an increase risk of birth asphyxia. Prolonged and obstructed labor (p = .019) were significantly associated with development of birth asphyxia (Table II).

Table-II: Antenatal and perinatal factors associated with perinatal asphyxia

Variables	With PNA (n=120) n (%)	Without PNA (n=91) n (%)	*p* value
Gender			
Male	73 (60.8)	57 (62.6)	.790
Female	47 (39.2)	34 (37.4)	
IUGR	15 (12.5)	7 (7.7)	.363
Muconium stained	23 (19.2)	5 (5.5)	**.004**
amniotic fluid			
Obstructed labour	19 (15.8)	5 (5.5)	**.019**
Gestational age			
Preterm	10 (8.3)	23 (25.3)	**.003**
Term	102 (85.0)	62 (68.1)	
Post term	8 (6.7)	6 (6.6)	
Low birth weight	48 (40.0)	21 (23.1)	**.009**
Mode of delivery			
Vaginal	115 (95.8)	79 (86.8)	**.017**
Caesarian section	5 (4.2)	12 (13.2)	
Pregnancy status			
Primigravida	64 (53.3)	30 (33.0)	**.003**
Multigravida	56 (46.7)	61 (67.0)	
Maternal Diabetes	8 (6.7)	10 (11.0)	.193

In our study we found full term babies were frequent both in the asphyxiated (85%) and normal group (68.1%) and termed babies carried a significantly higher association with birth asphyxia, with gestational age 37-<40 weeks (p = .003) (Table II , Figure-1).

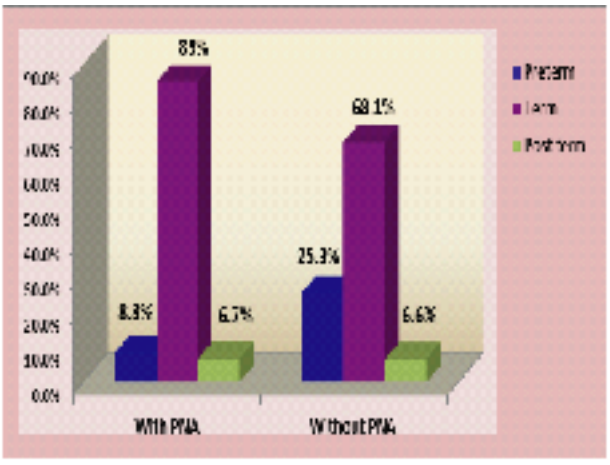

Figure-1: Distribution of neonates according to their gestational age

Mean birth weight of the asphyxiated babies was 2.65 kg (±.560) and in the control group it was 2.75 kg (±.604). About 59.2% of the asphyxiated baby had normal birth weight in comparison of 74.7% had normal birth weight in control group (Figure-2). PNA was significantly higher in infants of low birth weight (<2.5 kg) than the infant with weight ≥ 2.5 kg (p = .009). (Tables II, Figure-2).

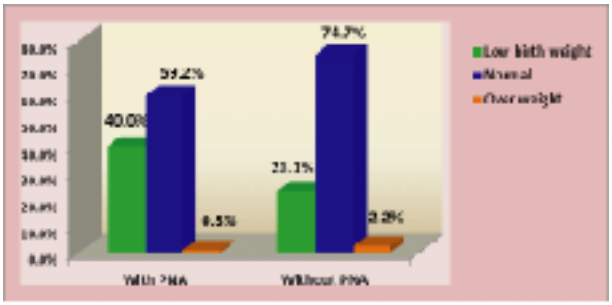

Figure-2: Distribution of birth weight among the neonates

Observed complications present in asphyxiated neonates were hypoxic ischemic encephalopathy (HIE) 41.7% (50), jaundice 6.7% (8), septicemia 6.7% (8), respiratory distress syndrome (RDS) 7.5% (9), feeding intolerance 5.8% (7), transient tachypnoea of neonate (TTN) 3.3% (4), hypoglycemia 1.7% (2) and caput succedaneum 10.8% (13) (Figure-3).

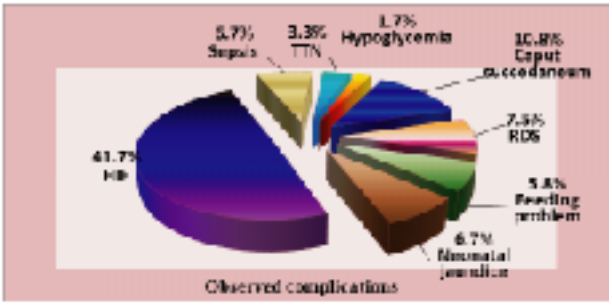

Figure-3: Complications seen among the asphyxiated babies

Discussion

The objective of this descriptive cross sectional study was to evaluate the prevalence and materno fetal risk factors of birth asphyxiated babies admitted in neonatal unit of KYAMC. In our study the male to female ratio was 1.6:1 (in PNA group 1.5:1) which is consistent with other studies[20-22]. The prevalence of PNA was 56.9%, with male 60.8% and female 39.2% while it varies from 9%20 to 22%23 in different studies. One study in India reported that the prevalence of PNA was 25% where male were (n=384; 64%) and (n=216; 36%) were females[21]. This variation was due to different operational definitions for birth asphyxia adopted by different researchers; apgar score at 1 minute or 5 minute apgar score, duration of resuscitation, breathing effort at 1 minute etc.

To reduce the risk factors of causing birth asphyxia in low income and developing countries is not an easy task due to certain reasons. One of them was the delivery conducted by untrained traditional midwives in home as indicated in previous reports also[24,25]. In our study 88.3% of asphyxiated babies and 82.4% of the non asphyxiated babies were born in home. Regarding mode of delivery it showed that most of the asphyxiated (95.8%) and non asphyxiated (86.8%) babies were delivered by normal vaginal delivery which was very much similar with the findings of two studies conducted in Pakistan, 2012 on same issue[26,27]. On the contrary another studies showed 76%20 and 51%23 deliveries by caesarian section. The mean age of the PNA babies during the hospital admission was 1.8 ± 2.803 days and for the non-asphyxiated babies 6.11±.7047 days. In one study the mean age of babies on admission was 13.8 hours in asphyxiated group and 2.6 days in the control group, while an Indian study has shown that 71.6% babies arrived at <24 hours, 24% between 24 to 72 hours and rest >72 hours of age[22]. These all reflect our limited resources and uneducated rural settings where due to the lack of awareness and resources irrespective of social class or educational background, home vaginal births by untrained midwives were customary. This delays timely prediction of high risk pregnancies and leads to development of birth asphyxia as well as other perinatal problems and the delayed referral to tertiary care center. Etuk, in his study, also showed that birth asphyxia was more prevalent in the unbooked cases[28].

We could not find any association among the various educational levels of the mothers of both asphyxiated and non asphyxiated babies. But low socioeconomic status was significantly associated with PNA. In our study young maternal age (20-25 years) and primigravidity emerged as one of the main risk factors of developing birth asphyxia as mentioned in previous studies[1,12,24,29,30]. We found birth asphyxia was significantly high in termed delivery than preterm babies which was also reported in some past studies [13,21]. Like some other studies we found low birth weight was a significant factor for causing birth asphyxia[1,12]. In this study, meconium stained amniotic fluid was found

to be present as one of the risk factor, findings were comparable with previous study also[1,12]. In healthy, well oxygenated fetuses, this diluted meconium is readily cleared from the lungs by normal physiological mechanism, however in few cases meconium aspiration syndrome occurs[12]. Maternal diabetes was not emerged as a risk factor for PNA. Obstructed labour due to various causes exhibited a very significant association with PNA, results were similar to previous studies[1,12,13,15]. It may had higher risk of umbilical cord prolapse, head entrapment, birth trauma and perinatal mortality[14].

The study group showed various manifestations out of which hypoxic ischemic encephalopathy (HIE) with convulsion was commonest (41.7%). Other complications observed were neonatal jaundice (6.7%), septicemia (6.7%), transient tachypnoea of neonate (3.3%), hypoglycaemia (1.7%), respiratory distress syndrome (7.5%), caput succedaneum (10.8%) and feeding problem (5.8%). Finer, et. al. had observed convulsions in 68.4% of cases with severe birth asphyxia[31]. Kumar, et. al. had observed convulsions within 2 days of life in 100% of birth asphyxia in their study[32]. Mohan, et. al. showed neurological dysfunctions, including meconium aspiration syndrome (10%), hyperbilirubinemia (40%) respiratory distress (30%), feeding difficulties (65%), DIC (13%), NEC 7%) apnoea (23%) and ARF (7%)[11]. Batra, et. al. also recorded RDS meconium aspiration synchronic, hyperbilirubinemia DIC in their study of asphyxia neonatorum[33]. Serious neonatal complications were infrequent among the control group. Referring high risk pregnancies to tertiary care hospitals is not enough because these centers and neonatal units have their own limitations. It could be possible to reduce the occurrence of asphyxia and its complications by improving antenatal, intrapartum and neonatal care services in the community. More attention should be paid to the training of midwives and other community health workers for better obstetric and neonatal care in the community. Also the mother need to educate with not respect to just about her pregnancy but also with respect to the complications which may arise during and post deliveries.

Conclusion

In this study we found younger age of mother, primigravidity, low socioeconomic status are important maternal risk factors for PNA. Among the intrapartum risk factors home vaginal delivery by midwives, obstructed labour, muconium stained amniotic fluid and low birth weight were significant. This study also found birth asphyxia was more common in term babies than preterm babies. Among the different serious neonatal complications HIE was commonest. Majority of these factors may be manageable and we should be careful of the possible presence of these risk factors throughout the perinatal period. By this we can reduce the occurance of asphyxia and its complications within our limited resources.

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