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PREVALENCE AND PREDICTORS OF BIRTH ASPHYXIA AMONG NEONATES IN BANGLADESH: A CROSS-SECTIONAL STUDY

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Abstract: *Birth asphyxia is a critical clinical problem worldwide that contributes to neonatal mortality and morbidity. Therefore, this study aimed to determine the status of birth asphyxia and its associated risk factors among neonates attending a Bangladeshi tertiary-level public hospital. This descriptive cross-sectional study was conducted at Shaheed Suhrawardy Medical College & Hospital, Dhaka, from January to December 2019. A systematic sampling technique was applied in order to collect the data. The validated APGAR score measured neonates$_+$' health status. Among the 377 neonates, 11.93% had birth asphyxia. This study explored a significant association (p=0.039) between neonate's health/asphyxia status and the young age (15 to 20 years) of mothers. In addition, term period (p=0.03), low birth weight (p= 0.007), Caesarean section ((C-section) (p= 0.017)), abortion, and prolonged labor duration (>12 hours) were strongly associated with birth asphyxia in neonates. The study concludes that the young age of mothers, term period, low birth weight, C-section delivery, abortion, and longer labor duration were significantly associated with the birth asphyxia.*

Keywords: *Birth Asphyxia, Neonates, Prevalence, Predictors, Neonatal Mortality, Maternal Health, Bangladesh.*

Introduction

Perinatal asphyxia (PA) or neonatal hypoxia- ischemia (HI) is defined as an interim status of the interruption of oxygen availability that refers to a perilous metabolic challenge, even when the situation does not head to a fatal result[1,2]. Different parameters set by the clinicians are used in order to investigate and foretell the prognosis for the state of perinatal asphyxia, including non-reassuring fetal heart rate patterns, prolonged labour, meconium-stained fluid, low 1-minute Apgar score, and mild to moderate acidemia, defined as arterial blood pH less than 7 or base excess greater than 12 mmol/L[3]. Globally, it has become a serious clinical problem worldwide that contributes to significant neonatal mortality and morbidity[4] which is one of the prime reasons of neonatal deaths within the first week of life[5]. As per the data revealed by WHO, birth asphyxia accounts for 4 million deaths yearly, representing 38% of all deaths of children under 5 years of age. It was estimated that 3% of all infants (3.6 million) suffer from moderate to severe birth asphyxia in developing countries, of which 23% (840,000) die, and approximately the same number develop serious sequelae[6,7].

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Notably, it is strongly associated with 1.1 million intrapartum stillbirths[8]. In effect of having asphyxia at birth, the survivors may have the possibility to generate neurological complications like mental disorders, cerebral palsy, epilepsy, and developmental delay[9]. In Bangladesh, the neonatal mortality rate (NMR) is estimated as 32 per 1000 live births where the leading causes of neonatal death e.g., birth asphyxia (21%), low birth weight (11%), and severe infection (34%)[10]. It was evident that an increased level of incidence of birth asphyxia from 29% to 36%, with a mortality of around 25% was explored in the annual reports of Dhaka Medical College & Hospital, a tertiary-level hospital in Bangladesh located in the capital city, from 2001 to 2007[11,12]. Additionally, another study conducted in the context of Dhaka found an incidence of birth asphyxia to be 9.76 per 1000 live births[13]. Each year, Birth Asphyxia was responsible for 16% of the total under-five years children mortality[14].

There are very few clinical studies available in terms of birth asphyxia in Bangladesh. Several studies conducted on the basis of hospital data mentioned that neonatal deaths are caused by different factors including birth asphyxia which is one of the prime predictors[15-16]. To the best level of knowledge among the authors, no study has yet to conduct on exploring the predictors and the prevalence on birth asphyxia in the context of Bangladesh. On that ground, the aim of this study was to assess the prevalence and predictors of birth asphyxia status among neonates attending a public tertiary hospital in Bangladesh.

Materials and Methods

The present descriptive cross-sectional study was conducted at Shaheed Suhrawardy Medical College & Hospital, Dhaka, Bangladesh, from January to December 2019. The study population were all neonates delivered through normal delivery or surgery diagnosed with or without perinatal asphyxia during data collection. Considering 56.9%[18] prevalence of perinatal asphyxia, 5% margin of error, and a 95% confidence interval, our ultimate sample size was 377. A systematic sampling technique was selected for the study sample. Firstly, a list of babies was collected from the hospital record book. Then, every 2nd participant from the serial of the list was considered for an interview until the desired calculated sample size of 377 was obtained. The inclusion criteria were the mothers whose delivery was done at the hospital during the data collection period. Exclusion criteria were seriously sick mothers admitted at ICU and who were not interested in participating to the study.

The principal investigator developed the questionnaire, which other authors reviewed. The questionnaire was finalized after pre-testing. Pretesting was undertaken to check for the validity, appropriateness, and consistency of the variables used in the study. The questionnaire was initially prepared in English and then translated into Bengali, and again back-translated to English to check the appropriateness of translation. The Bengali version of the questionnaire was pre-tested in the eight mothers attended Dhaka Medical College Hospital, Dhaka to get feedback on the questions' suitability, appropriateness, and sequencing. After the pretesting done, some minor amendments were done. Data were collected by the assigned enumerators through face-to-face interviews by using a semi-structured questionnaire. The baby's health status was measured by the validated APGAR score, which quantifies the health state from Medical Records. The APGAR score is based on a total score of 1 to 10, with scores of 7- 9 denoting normal and good health in newborns19.

The study protocol was approved by the research ethics committee of the faculty of allied health sciences of Daffodil International University. The survey involved collecting very personal information. So, the reason and significance of the study was explained to the respondents and written consent was taken from them before interview. They were assured that the information obtained would be used for research purpose only. They were assured of the secrecy of information obtained and ambiguity of the study subjects.

The completeness and accuracy of the data were checked thoroughly. Data were entered, cleaned, and analyzed using Statistical Package for Social Sciences (SPSS) (version 22.0). Descriptive statistics, like frequencies and proportions, were used to summarize the data. The statistical significance (p-value) of < 0.05 was set. The statistical measurements like chi-square test was performed in order to figure out the degrees of association between the outcome (neonate's asphyxia status using APGAR scores), and the independent variable (sociodemographic factors, neonates characteristics, obstetric history).

Results

Health status by using APGAR score

The pie chart (figure 1) visualizes the neonate's health status distribution using the APGAR score. The findings revealed that 88.07% of neonates were healthy with no asphyxia according to their APGAR score, and the rest of the 11.93% had it.

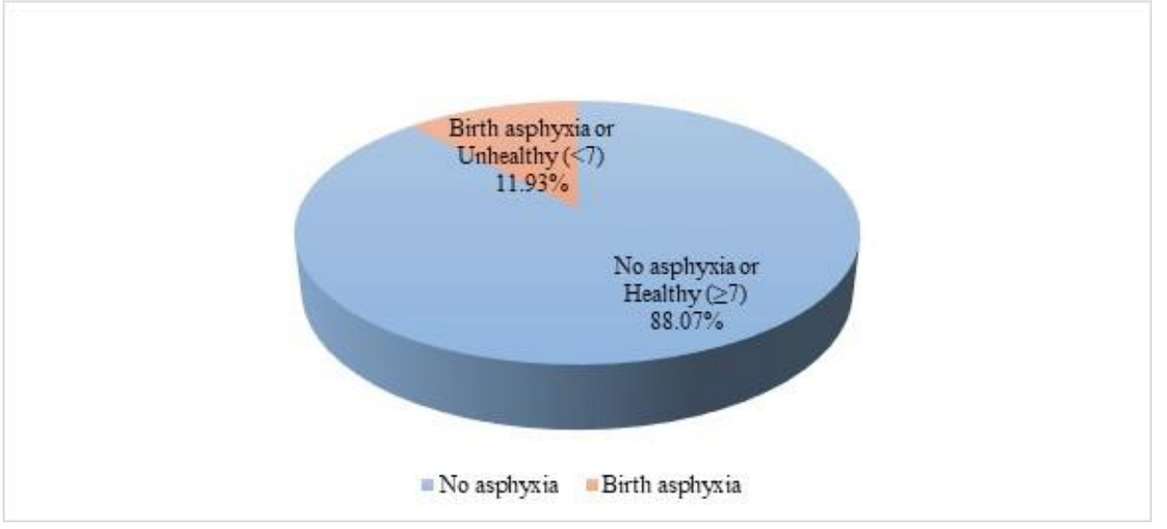

Figure 1: Health status by using the APGAR score

Association of the neonate's health/asphyxia status by using APGAR scores with the mother's socio-demographic factors

Table 1 illustrates a significant association between neonate health/asphyxia status and the young age group (15 to 20 years) in mothers. For the other socio-demographic factors, no associations were significant.

Table 1: Association of the neonate's health/asphyxia status by using APGAR scores with mother's socio-demographic factors (n=377)

Variables	Healthy/No asphyxia (332)	Unhealthy/Birth asphyxia (45)	P value
Age group (Years)			
15-20	21	13	0.039
21-25	51	9	
26-30	65	7	
31-35	91	7	
35-40	81	2	
>40	23	7	
Mean	24.03 years		
Educational status			
No education	48	9	0.635
Up to primary	92	6	
Up to SSC	64	4	
Up to HSC	35	14	
Graduate and above	93	12	
Residence			
Rural	96	21	0.432
Urban	236	24	
Place of delivery			
Home	49	19	0.235
Hospital	283	26	

Association of the neonate's health/asphyxia status by using APGAR scores with characteristics of neonates

Table 2 illustrates that there is a strong significant association of health/asphyxia status with gestation period (term), birth weight (<2500g), and mode of delivery (C-section), while no significant association was found with the sex of neonates.

Table 02: Association of the neonate's health/asphyxia status by using APGAR scores with characteristics of neonates (n=377)

Variables	Healthy/No asphyxia (332)	Unhealthy/Birth asphyxia (45)	P value
Sex			
Male	190	25	0.68
Female	142	20	
Gestation period			
Preterm	38	11	0.03
Term	271	27	
Post term	23	7	
Birth weight			
< 2500 g	97	33	0.007
≥ 2500 g	235	12	
Mode of delivery			
Vaginal	88	10	0.017
C-section	244	35	

Association of the neonate's health/asphyxia status by using APGAR scores with obstetric history

Table 3 illustrates that abortion is positively associated with neonate's asphyxia status. Likewise, a strong association exists between neonate's health/asphyxia status and labor duration exceeding 12 hours which is statistically significant. However, no significant association was observed between asphyxia status and obstetric history.

Table 3: Association of the neonate's health/asphyxia status by using APGAR scores with obstetric history (n=377)

Variables	Healthy/No asphyxia (332)	Unhealthy/Birth asphyxia (45)	P value
Abortion history			
None	319	17	0.032
Abortion	13	28	
Birth history			
Still birth	49	8	0.067
Live baby	283	37	
Gestation period			
>37-41 weeks	271	34	0.127
>41 weeks	61	11	
Medication during pregnancy			
Medicated	256	31	0.156
No medication	76	14	
Fetus presentation			
Cephalic	283	26	0.235
Breech	49	19	
Induction			
Syntocinon	40	13	0.157
None	292	32	
Labor duration			
≤12 hours	299	16	0.012
>12 hours	33	29	
Referral			
Referred	28	6	0.119
Not referred	304	39	

Discussion

About four to nine million newborn babies develop with birth asphyxia and acute effects like cerebral palsy, epilepsy and developmental delay[9]. In effect, the combination of hypoxia and ischemia of the brain and other vital organs, the key manifestations of asphyxia are created that occurs because of the combination of vasodilatation and vasoparalysis[9].

Basically, Birth asphyxia occurs when a baby is cut off from oxygen before, during, or right after birth. The objective of this descriptive cross-sectional study was to assess the status of birth asphyxia and associated predictors among neonates attending a public tertiary hospital in Dhaka. It is found in this study that the level of prevalence of perinatal asphyxia was 11.93%, which is higher than that of developed countries, the latter of which reduced it to less than 0.1%[20]. In Vietnam, the prevalence of

birth asphyxia was explored as 2%[21]. Similar to our findings, a high level of prevalence rate, 22.1%, was observed in the public hospitals in Tigray[22]. In the context of India, it was found as 6.6%23. A study conducted exploring the situation in the context of Tanzania was figured out as 11.5%24. The Nigerian context of birth asphyxia was 12.8%[25]. As per the findings of this study, young maternal age (15-20 years) was one of the leading predictors for developing birth asphyxia, as mentioned in a prior study[26]. Along with the issue of young maternal age, primigravida is considered as one of the key predictors of birth asphyxia[27-30]. No association between the variables like dwelling status, educational attainment, place of delivery and the status of birth asphyxia was figured out in the present study which is also the findings of the studies conducted in different context[18,31].

The findings of this study reported that no association between the sex of the neonates and their asphyxia status, which was similar to an earlier study performed[18]. It was found that birth asphyxia was significantly higher in the case of delivery than in pre-and post-term babies, which was mentioned in the studies conducted in different context[32,33]. The present study addressed that birth asphyxia was a result of one of the significant health conditions, low-birth-weight which is also consistent with other similar type of studies[4,26,34]. Additionally, the current study revealed that birth asphyxia was larger among the newborns whose mother had a history of having a prolonged duration of delivery. This result is similar with the findings figured out in different studies conducted in different hospitals namely, Dire Dawa, Tigray, Dessie; in the country of Ethiopia[22,35,36].

Limitation & Scope

In this study, the data was collected considering the issue of reliability. However, the conduction of this study was not free from the limitations. The findings of this study does not represent the scenario of whole Bangladesh as it was only confined to a tertiary level hospital based in the capital city, Dhaka. Additionally, the sample size was not large enough to cover the greater population with the ability to generalize the findings. This research recommends to conduct large-scale level study in order to figure out the more viable, more acceptable, and more representative findings.

Conclusion

In conclusion, it is said that 88.07% of neonates were healthy and had no asphyxia, and the rest, 11.93% were unhealthy and had birth asphyxia. The young age group of mothers was significantly associated with neonate's health/asphyxia status. There was a significant association between health/asphyxia status and the term period, low birth weight, and C-section delivery. No significant association was found with the sex of neonates. Last but not the least, abortion and prolonged labor duration were also risk factors revealed in this study.

Recommendations

This study recommends the following issues;

- To raise extensive community awareness regarding 'SAY NO' to early marriage.
- To make sure all the anti-natal follow-ups in the nearby hospitals or clinics.

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