



Incidence and Associated Factors of Birth Asphyxia in Neonates Admitted at St. Patrick's Hospital, a District Hospital in Ghana

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How to cite this paper: Duopah Okyere, F.E. (2024) Incidence and Associated Factors of Birth Asphyxia in Neonates Admitted at St. Patrick's Hospital, a District Hospital in Ghana. *Open Access Library Journal*, 11: e12183.

<https://doi.org/10.4236/oalib.1112183>

Received: August 29, 2024

Accepted: October 14, 2024

Published: October 17, 2024

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Abstract

Research Background: Birth asphyxia is a significant contributor to the overall neonatal mortality in Ghana and across the world, as it accounts for 900,000 deaths each year globally and 28% of the neonatal deaths in Ghana. **Research Objectives:** To determine the incidence of birth asphyxia, the maternal and neonatal associated factors, the outcome of birth asphyxia and duration of hospital stay of asphyxiated babies at St. Patrick's Hospital, Offinso, Ghana. **Methods:** This cross-sectional, descriptive, prospective study was conducted in the neonatal unit of St. Patrick's Hospital, Offinso from June 10 to October 15, 2019. A signed or thumb-printed informed consent was obtained from mothers of babies with Apgar score of 1 - 6 in the 5th minute and enrolled in the study. The maternal and neonatal factors of birth asphyxia were assessed using their folders as well as one-on-one interviews with the mothers to answer a structured questionnaire. The data was entered into a database using Microsoft Excel and statistical analysis was done after data cleaning. **Results:** There were 1557 deliveries during the study period, with 52 cases of birth asphyxia. Out of this, 44 were inborn at St. Patrick's Hospital, Offinso, giving an incidence of 2.82% (28.2 per 1000 live births). The commonest maternal factor was pre-eclampsia, 5 (41.67%) and neonatal factors were cephalic presentation, 48 (92.32%), spontaneous vaginal delivery, 30 (57.69%), meconium-stained liquor, 30 (57.59%) and male sex (63.46%). The outcome of admission was 84.62% discharge and 15.38% deaths. Most babies had no early neurological outcome, 51 (97.62%) with only one baby having early neurological outcome of no cry at time of discharge. The average duration of stay at the hospital was 5.5 days. **Conclusion:** The incidence of birth asphyxia is still high. Early detection and management of maternal and neonatal-associated factors could lead to a reduction or prevention of birth asphyxia and reduce neonatal mortality and morbidity.

Subject Areas

Pediatrics

Keywords

Incidence, Birth Asphyxia, Neonates, St. Patrick's Hospital

1. Introduction

Birth asphyxia is a significant contributor to neonatal deaths as it is among the three top causes of neonatal mortality globally [1] and locally in Ghana [2]. It accounts for 900,000 deaths each year globally [3] and 28% of the neonatal deaths in Ghana [4].

Birth asphyxia is defined as the failure to establish breathing at birth [3]. It results from lack of oxygen to the brain before, during or soon after birth [5]. Symptoms of birth asphyxia include not breathing or very shallow breathing, cyanotic skin, low heart rate, poor muscle tone, no cry or weak cry and seizures [6]. The Apgar score is used to determine birth asphyxia in Ghana and most developing countries [7]. For this study, a 5-minute Apgar score of 1 - 6 was considered a sign of birth asphyxia, though diagnosis does not depend on Apgar score alone [8].

Data from St. Patrick's Hospital (SPH) in Offinso, Ashanti region of Ghana showed that the case fatality rate for birth asphyxia had increased from 77 deaths per 1000 live births in January 2018 to 142 deaths per 1000 live births in August 2018, despite regular annual training of midwives in neonatal resuscitation and the acquisition of a CTG machine (though not functioning at all times) to monitor women in labour and the use of the partograph.

This research therefore sought to find the incidence of birth asphyxia and the associated factors to help prevent birth asphyxia and reduce this high case fatality rate and neonatal deaths in general in Ghana. Advances in neonatal resuscitation and advanced treatment methods such as mechanical ventilation and respiratory therapy in the developed countries had resulted in the reduction of this condition to the barest minimum whilst it still remained a big problem in developing countries [9], like Ghana. The absence of these advanced treatments in most hospitals in Ghana makes prevention the key.

The implementation of the findings of this research would, therefore, help prevent or reduce birth asphyxia. Moreover, the complications of birth asphyxia such as cerebral palsy, epilepsy and mental retardation seen in surviving babies are devastating [10].

2. Research Objectives

2.1. Main Objective

- To determine the incidence of birth asphyxia and the associated factors at St. Patrick's Hospital, Offinso.

2.2. Specific Objectives

- 1) To determine the incidence of birth asphyxia.
- 2) To determine the maternal and neonatal factors associated with birth asphyxia.
- 3) To determine the outcome of admission.
- 4) To determine the duration of stay at the hospital.

3. Methodology

3.1. Setting

The study was conducted at the Neonatal unit of St. Patrick's Hospital, Offinso, a district hospital in Ghana.

3.2. Study Type

The study was a hospital-based cross-sectional, observational, prospective and descriptive study conducted from June 10 to October 15, 2019.

3.3. Design

A questionnaire was administered to mothers of babies admitted with 5-minute Apgar score of 1 - 6 after an informed consent was taken. Those who agreed to participate were requested to sign or thumb-print the informed consent form before recruitment. The questionnaire was filled using the maternal and neonatal folders and a face-to-face interview between the mother and the researcher. The mother was given a copy of the patient information leaflet to read and told to come back if she had any question after reading through. She was told she could withdraw from the study at any time without any consequences on the baby's treatment. Neurological outcome at time of discharge was assessed through history taking from mothers. I asked about the presence of crying, sucking and active movements. Neurological examination was done to assess the general activity, muscle tone, posture and presence of reflexes such as sucking, Moro and grasp reflexes of the babies. Duration of stay was determined from the date of admission to the date of discharge or death.

3.4. Ethical Clearance

Ethical clearance was sought from the Institutional Review Board (IRB) of Kwame Nkrumah University of Science and Technology (KNUST), Ghana with Ref ID CHRPE/AP/371/19. Permission was also sought from Management of St. Patrick's Hospital, Offinso. All babies admitted were given maximum care regardless of whether their parents gave consent or not. Mother of baby with neurological sequelae was counseled and referred to the Paediatric Outpatient Department (OPD) for follow-up.

3.5. Data Management

The data was entered into a database using Microsoft Excel and statistical analysis was done after data cleaning.

4. Results

A total of 52 cases of birth asphyxia were recorded during the study period. Out of these, 44 were delivered at SPH, Offinso. With 1557 deliveries recorded during the study period at the hospital, this gave an incidence of birth asphyxia as 2.82% or 28.2 per 1000 live births.

The mean age of mothers was 26 years and the majority of mothers were single at 24 (46.15%). Most mothers had educational level of Junior High School. The details of the maternal sociodemography are shown in **Table 1**.

Table 1. Maternal sociodemography.

Variable	Frequency (n = 52)	Percentage (%)
Age		
- Up to 25 years	24	46.15
- 26 - 35 years	26	50.00
- 36 years and above	2	3.85
Mean age	26	
Marital status		
- Married	8	15.38
- Single	24	46.15
- Co-habitation	20	38.46
Educational status		
- Primary	14	26.92
- JHS	23	44.23
- SHS	8	15.38
- Tertiary	2	3.85
- No formal education	5	9.62
Religion		
- Christian	37	71.15
- Muslim	12	23.08
- Traditionalist	2	3.85
- Others	1	1.92
Occupation		
- Employed (Government)	2	3.85
- Self-employed	40	76.92
- Unemployed	10	19.23
Parity		
- Para 1	19	36.54
- Para 2 - 4	26	50.00
- Para 5 and above	7	13.46

Of the 52 babies included in the study, majority 33 (63.46%) were males. The majority of the neonates had normal birth weight 46 (88.46%). **Table 2** is a summary of the demographic characteristics of babies included in this study. Age refers to age of baby on arrival at the Neonatal Unit.

Table 2. Demographic characteristics of babies.

Variable	Frequency (n = 52)	Percentage (%)
Child age (hours)		
- Up to 24 hours	43	82.69
- 25 - 48 hours	6	11.54
- 49 - 72 hours	3	5.76
Sex		
- Female	19	43.18
- Male	33	63.46
Weight (kg)		
- Less than 2.5	6	11.54
- 2.5 and above	46	88.46
Apgar score at 5 min		
- 3 and below	7	13.46
- 4 - 6	45	86.54

The majority of mothers were ANC attendants at 51 (98.08%) and delivered at St. Patrick's Hospital (SPH) at 44 (84.62%). Most mothers had no illness at 40 (76.92%). Out of the 12 with maternal illness, majority, 5 (41.67%), had pre-eclampsia. The details of the maternal factors are shown in **Table 3**.

Table 3. Maternal associated factors.

Variable	Frequency (n = 52)	Percentage (%)
Place of delivery		
- Afrancho H/C	2	3.85
- Kyekyewere H/C	2	3.85
- Namong	3	5.77
- SPH	44	84.62
- Tetrem H/C	1	1.92
Booking status		
- Attendant	51	98.08
- Non-attendant	1	1.92

Continued

Type of pregnancy			
-	Singleton	52	100.00
Maternal illness			
-	Yes	12	23.08
-	No	40	76.92
Specific maternal illness			
-	PIH	1	8.33
-	Pre-eclampsia	5	41.67
-	Chronic hypertension	1	8.33
-	Antepartum haemorrhage	1	8.33
-	SCD	1	8.33
-	Others	3	25.00
History of still birth			
-	Yes	4	7.69
-	No	48	92.31
Partograph usage			
-	Yes	41	78.85
-	No	11	21.15
CTG usage			
-	Yes	35	67.31
-	No	17	32.69
Prolonged labour			
-	Yes	19	36.54
-	No	33	63.46
Herbal enema usage			
-	Yes	8	15.38
-	No	44	84.62
PROM			
-	Yes	3	5.77
-	No	49	94.33

Out of the 52 babies with birth asphyxia, 30 (57.69%) were delivered by SVD with 22 (42.31%) delivered by Caesarean section. Majority of the babies had cephalic presentation in 48 (92.31%), with breech presentation seen in 4 (7.69%). More than half of the babies had meconium-stained liquor, 30 (57.59%), with none having a history of cord prolapse. The details of the neonatal-associated factors are shown in **Table 4**.

Table 4. Neonatal associated factors.

Variable	Frequency (n = 52)	Percentage (%)
Mode of delivery		
- SVD	30	57.69
- Caesarean section	22	42.31
Presentation		
- Cephalic	48	92.31
- Breech	4	7.69
State of liquor		
- Clear	22	42.31
- Meconium stained	30	57.59
Cord prolapse		
- No	52	100.00

The outcome of admission consisted of 44 (84.62%) discharges and 8 (15.38%) deaths. Out of those discharged, only 1 had early neurological outcome of no cry at time of discharge. More than half of the babies, 27 (51.92%), spent about 5 days at the hospital with an average stay of 5.5 days. The details of the outcome and duration of stay are shown in **Table 5**.

Table 5. Outcome and duration of stay.

Outcome and duration of hospital stay of babies	Frequency (n = 52)	Percentage (%)
Outcome of admission		
- Discharged	44	84.62
- Died	8	15.38
Discharged with early neurological outcome		
- Yes	1	1.92
- No	51	98.07
If yes, describe neurological outcome		
- Child did not cry	1	100.00
Duration of admission(days)		
- Up to 5 days	27	51.92
- 6 - 10 days	22	42.31
- 11 - 15 days	2	3.85
- 16 days and above	1	1.92
Average duration of stay		5.58
Incidence of asphyxia		2.82

Statistical Analysis

Data collected was entered into a database designed with EPI Info version 7.2.3 and cleaned with Microsoft Office Excel. The data was further exported to STATA (version 14) standard edition for statistical analysis. Descriptive statistics frequencies and percentages were done and results were presented in tables.

5. Discussion

Birth Asphyxia is the failure to establish breathing at birth. It results from oxygen deprivation to the fetal brain before, during or immediately after birth. The incidence of birth asphyxia is influenced by a number of factors including booking status as antenatal care provided by skilled personnel might result in early detection of high-risk pregnancies for proper management to ensure a good outcome of the pregnancy. Proper monitoring of the progress of labour through the use of the partograph is recommended by WHO to reduce maternal and fetal morbidity and death. Other equipment such as Cardiotocography (CTG) is also used to monitor the fetus in utero during labour for early detection of fetal distress. This allows early institution of appropriate management such as caesarean delivery to prevent birth asphyxia and death.

The St. Patrick's Hospital in Offinso institutional data showed the case fatality rate for birth asphyxia had reduced marginally from 142 deaths per 1000 live births in August 2018 to 139 deaths per 1000 live births in 2019. The incidence of birth asphyxia recorded during this study period was 2.82% (28.2 per 1000 live births). The reduction in the case fatality rate for birth asphyxia in 2019 and the seemingly low incidence recorded in this study could be attributed to the improved staff strength at the beginning of 2019 due to the employment of new midwives, presence of rotational midwives, increased numbers of doctors in the maternity unit and a constantly functioning CTG machine at the labour ward. There was also the continual training of old and new midwives in neonatal resuscitation. These might be linked to the high rate of partograph and CTG usage in more than half of all labour cases. The timely use of CTG was necessary in the prevention of birth asphyxia. The incidence recorded in this study was lower than that recorded in other studies in Africa, 5.1% in Kenya [11], 11.5% in Tanzania [12], 17.3% in Nepal [13] and 83.8% in Nigeria [14].

The incidence recorded in this study was also lower than what was recorded in two studies in Ghana in two tertiary hospitals by Samba, which reported an incidence of 61.8% [15] and a prevalence of 27.91% [16]. These were expected as all these studies were done in tertiary hospitals where most of the cases with birth asphyxia are likely to have been referred in critical condition.

The commonest maternal-associated factor found in this study was pre-eclampsia (41.67%). This finding was comparable to other studies in Africa, which also found pre-eclampsia as the commonest maternal risk factor [17] [18]. The high blood pressure seen in pre-eclampsia leads to poor placental function, resulting in impaired oxygen delivery to the fetal brain and hence birth asphyxia. Even though

the majority of women with gestational hypertension were ANC attendants, it was possible that there was poor compliance with medications and instructions since more than half of them had education up to the junior high level. This could lead to poor blood pressure control and subsequent development of pre-eclampsia.

Half of the mothers in this study (50%) were Para 2 - 4, which was similar to other studies which also found multigravida [13] [14] as a maternal risk factor for birth asphyxia. This was contrary to other studies that found primigravida [18] [19] as a maternal risk factor for birth asphyxia.

The neonatal risk factors identified in this study were male sex, cephalic presentation and meconium-stained liquor. More than half (63.46%) of the babies with birth asphyxia in this study were males. This was similar to a study in Pakistan, which also found more than half of the babies with birth asphyxia to be males [20]. Males are known to have decreased tolerance to hypoxia [21] and this might have accounted for the finding that the majority of neonates with birth asphyxia were males. The majority of fetal presentations in this study were cephalic. This was not surprising since the majority of all deliveries are through spontaneous vaginal delivery with cephalic presentation. However, other studies of birth asphyxia found breech presentation to be a risk factor [17] [18] [22]. More than half of the deliveries had meconium-stained liquor. This was similar to findings in other published studies [17] [23]. Meconium-stained liquor is usually related to fetal distress. Meconium, when aspirated into the lungs, could block the small airways, leading to reduced oxygen to the brain and other organs.

More than three quarters of all neonates admitted with birth asphyxia were discharged home with about a quarter death. This was similar to other studies done elsewhere in Ethiopia [24] [25]. The Ethiopian study in a tertiary hospital reported of 89% discharges and 11% deaths, while the South African study also in a tertiary hospital recorded 86.7% discharges and 13.3% deaths. This could be attributed to the availability of specialized care at SPH, through a district hospital. Over 87% of respondents recorded improved Apgar score at 5 minutes (Apgar score 4 - 6). This suggested that there was adequate resuscitation in the first few minutes after birth. This was further aided by the situation of the neonatal unit very close to the maternity unit. Only one baby had early neurological sequelae of inability to cry at the time of discharge. The majority of babies with birth asphyxia spent about five days at the hospital. This was similar to a study in Tanzania, which reported that babies with birth asphyxia spent seven days at the hospital [12]. This was because babies with very low Apgar scores are presumed to have bacterial infections as well and are given intravenous antibiotics for at least 5 days.

Limitations

1) A major limitation of this study was the small sample size and the fact that it was a single-center study. The limited time available for the study did not allow recruitment over a long period. However, recruitment of all cases that consented during the period means that the findings could be fairly representative.

2) Statistical associations between maternal and neonatal factors and birth asphyxia could not be determined in this study.

6. Conclusion

The incidence of birth asphyxia is still high in Ghana. Early detection of maternal and neonatal risk factors could lead to better management of labour to improve outcomes and reduce birth asphyxia.

7. Recommendation

1) Hospital management and the Ministry of Health must ensure adequate staffing of maternity units and the continuous use of partograph to monitor every labour.

2) CTG machines and regular training on how to use them should be provided for all Regional and District Hospitals. CTG machines should be available all year round.

3) There should be early detection of high-risk pregnancies during ANC.

4) There should be regular training of Maternity and Neonatal Staff on neonatal resuscitation.

5) A case-control study comprising neonates without and those with birth asphyxia with a bigger sample size could be done. Also, long-term outcome of birth asphyxia could be researched.

Funding

This research was totally funded by the author.

Conflicts of Interest

The author declares no conflicts of interest.

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