



Factors associated with birth injuries in neonates admitted to the neonatal intensive care unit: a retrospective study in a Ghanaian tertiary care setting

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Abstract

Background: A birth injury is structural damage or functional deterioration of the neonate's body due to a traumatic incident at birth. The prevalence and the type of birth injury vary from place to place. There is paucity of data on the prevalence of birth injuries in Ghana.

Objective: The study aimed to determine the prevalence and factors associated with birth injury in neonates admitted in a tertiary institution in Northern Ghana.

Methods: This was a quantitative retrospective study carried out on neonates admitted to the neonatal intensive care unit (NICU) of the Tamale Teaching Hospital between January 2018 through December 2019.

Results: Out of 5590 neonates admitted to the NICU, 205 were noted to have various forms of birth injury corresponding to a prevalence of 3.66% (37 per 1000 neonates admitted to our unit). Majority were male (n = 123/205, 60.0%), most deliveries occurred in the study hospital (n = 143/205, 69.75%), and spontaneous vaginal delivery accounted for 70.73% (n = 145/205). Extracranial injuries (n = 146/221, 66.06%) were the most common form of birth injury. Next was musculoskeletal injuries (n = 41/221, 18.55%) with humeral fractures (n = 15/221, 6.78%) being the most frequent in this category. Among the neonates with birth injuries there were 23 deaths recorded (11.22%) all but one of whom had associated birth asphyxia. Birth injuries were significantly associated with place of delivery (p = 0.029). Out-born babies were more likely to have extracranial injuries (adjusted odds ratio, 5.10; 95% CI: 1.53 - 16.94; p = 0.008).

Conclusion: Extracranial injuries were the most common in this study. Place of delivery was significantly associated with birth injuries. Building the capacity of health care professionals is essential to reduce incidence of birth injuries. Some of these injuries can be avoided if high risk pregnancies are referred early to institutions that have the resources and skill to deliver such babies.

Keywords: Birth injury, extracranial injury, neonatal intensive care unit, Tamale, Ghana

INTRODUCTION

Birth injuries are generally impairment of neonatal body function due to avoidable or unavoidable adverse events that occur during birth [1]. Akangire and Carter in 2016 described birth injuries as structural destruction or deterioration of function of the neonate's

body due to a traumatic effect at birth [2]. These injuries commonly occur during the second stage of labor when the fetus is descending through the birth canal and is more common in difficult and prolonged deliveries [3]. Birth injuries occur in about 2 - 7% of all deliveries [4]. The incidence may have decreased due to improvements in obstetric care in many parts of the world, but variations do exist. Studies in North-Eastern Nigeria in 2016 showed an overall incidence of 5.7 per 1000 live births. However, there was variation based on the mode of delivery with cesarean

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sections (C/S) having an incidence of 1.4/1000, compared with 4.3/1000 live births in vaginal deliveries [5]. Another study in South-East Nigeria reported an incidence of 11/1000 live births and an incidence of 18/1000 was reported in a study in Cameroun [6,7]. Overall, cephalhematoma is the commonest birth injury seen in a number of studies [6,8,9]. Birth weight, instrumental delivery, fetal head circumference, premature rupture of membranes, induction of labor and male gender have been implicated as risk factors for birth injuries. In addition, primiparity has been reported to be associated with birth injuries [10]. Vaginal delivery is a documented risk factor for both specific and all-cause of birth injuries [2,9]. Linder et al. found that C/S was associated with low incidence of birth injuries compared with vaginal delivery [11].

Varied outcomes of birth injuries have been reported from different studies. Emeka et al. [6] in their work reported only 1 death out of 19 birth injury cases in one year, giving a case fatality of 5.3% with a mean duration of stay at the hospital of 8 days. A mortality rate of 6.6% and 3.2% were respectively reported by Pius et al. [5] and Warke et al. [12]. However, Sauber-Schatz et al. [13] found out that neonates

with birth injuries have a reduced rate of death during their hospitalization. A few studies from Ghana have reported the incidence of brachial plexus injuries in pediatric patients attending physiotherapy centers. These studies have documented incidence of 27.2% and 14.7% in Accra [14] and Ho [15] respectively. There is paucity of literature on studies documenting details of the causes of birth injuries in Ghana which we believe if known can help health workers and caregivers put in measures to avoid or reduce these birth injuries with attendant mortality, morbidity and disability in the immediate and long term. Therefore, this study sought to document the types of birth injuries and associated risk factors in a tertiary hospital in Northern Ghana.

MATERIALS AND METHODS

Study design and setting

This was a quantitative retrospective inpatient study conducted in the NICU of the Tamale Teaching Hospital (TTH), Tamale, Ghana. The hospital serves as the teaching hospital for the University for Development Studies School of Medicine and Health Sciences located in Tamale.

Table 1: Demographic and baseline characteristics of neonates with birth injuries

Variables	Birth injuries ^a n (%)	p value
Gender		0.340
Male	123 (60.0)	
Female	82 (40.0)	
Place of delivery		0.029
TTH	143 (69.75)	
Other peripheral facilities	52 (25.36)	
Home deliveries	10 (4.87)	
Mode of delivery		0.462
SVD	145 (70.73)	
C/S	60 (29.26)	
Birth weight (kg)		0.141
0 - 2.49	21 (11.05)	
2.5 - 4.0	159 (79.47)	
> 4.0	18 (9.47)	
Time of delivery		0.311
Morning (8:00 am - 2:00 pm)	44 (29.13)	
Afternoon (2:00 pm - 8:00 pm)	44 (29.13)	
Night (8:00 pm - 8:00 am)	63 (41.72)	
Maternal age		0.289
< 16 yr.	3 (1.95)	
16 - 35 yr.	132 (85.71)	
> 35 yr.	19 (12.34)	
Gestational age		0.137
Preterm	5 (2.73)	
Term	176 (96.17)	
Post-date	2 (1.09)	
Parity		0.933
Primiparity	25 (12.37)	
Multiparity	177 (87.62)	

^a Total number of cases = 205

Table 2: Types of birth injuries documented among neonates admitted to the NICU of Tamale Teaching Hospital

Birth Injury	Birth injuries ^a n (%)
Extracranial	146 (66.06)
Caput Succedaneum	79 (35.74)
Cephalhematoma	59 (26.69)
Subgaleal hematoma	8 (3.62)
Nerve Injury	24 (10.86)
Erbs palsy	22 (9.95)
Facial nerve paralysis	2 (0.90)
Musculoskeletal	41 (18.55)
Humeral fractures	15 (6.78)
Femoral fractures	12 (5.43)
Clavicular Fractures	6 (2.71)
Tibia and fibula fractures	3 (1.36)
Skull fracture	1 (0.45)
Shoulder dislocation	3 (1.36)
Knee dislocation	1 (0.45)
Soft tissue injury	10 (4.52)
Facial bruises	3 (1.36)
Subconjunctival hemorrhage	3 (1.36)
Vulval hematoma	2 (0.90)
Subcutaneous fat necrosis	1 (0.45)
Scalp laceration	1 (0.45)

NICU, neonatal intensive care unit; ^a Total number of cases = 221 as some babies had more than one injury type

The NICU is a 50-cot and incubator capacity unit with a Kangaroo Mother Care Unit attached to it. The unit receives and manages neonates with both surgical and medical conditions either born within or referred from other facilities within the catchment area. Referrals are especially common from primary and secondary health institutions from the Northern, North East, Savannah, Upper East and Upper West Regions of Ghana. The study included all neonates < 28 days born in TTH, referred from other facilities, or delivered at home and subsequently admitted to the NICU with diagnosis of birth injuries. Patients with significant missing data were excluded. In this retrospective study we used routinely collected data in an electronic format and there was no contact with patients or patient folders and no additional information was requested from legal guardians/parents of patients.

Study procedures

The NICU of the TTH keeps electronic record of all admissions and outcomes of babies admitted into the unit. This database was set up in 2018 to capture routine data at discharge. The study team designed a data collection sheet to include neonatal and maternal demographic information, birth records of baby, clinical information on admission and outcomes of the admission. The electronic data base from January 2018 to December 2019 was searched for all patients with admission diagnosis of birth injury/ trauma or a specific birth injury/trauma recorded in the diagnosis column of the patient records. The search also included both primary and secondary diagnoses. The aforementioned information of patients was extracted into an excel sheet and cleaned.

Table 3: Other diagnoses recorded among the neonates with birth injuries

Diagnosis	Diagnosis ^a n (%)
Birth asphyxia	100 (42.91)
Neonatal Sepsis	27 (11.58)
Low birth weight	21 (9.01)
Neonatal jaundice	19 (8.15)
Neonatal seizures	12 (5.15)
Impetigo	11 (4.72)
Meconium aspiration syndrome	10 (4.29)
Ophthalmia neonatorum	5 (2.15)
Fetal macrosomia	6 (2.58)
Prematurity	5 (2.10)
Respiratory distress syndrome	4 (1.72)
Anemia	4 (1.72)
Syndromic baby	3 (1.29)
Post date	2 (0.86)
Bronchopneumonia	2 (0.86)
Spina bifida	2 (0.86)

^aTotal number of cases = 233

Statistical analysis

We analyzed the data using the IBM SPSS Statistics for Windows Version 23.0 and STATA Statistical Software (Version 14, StataCorp LLC, College Station, TX).. Descriptive statistics of frequencies and percentages were used in the analysis of the demographic and baseline characteristics, outcomes and type of birth injuries and associated co-morbidities. Duration of hospital stay, was expressed as mean \pm standard deviation (SD). Pearson Chi-square test through descriptive statistics was used to determine the associations between the demographic and baseline characteristics and the birth injuries. Logistic regression analysis using Stata 12.1 was used to determine relationship between specific types of birth injuries and associated risk factors. For all statistical analyses $p < 0.05$ was deemed statistically significant.

RESULTS

Demographic characteristics

We admitted 5590 neonates into our NICU during the two years study period January 2018 to December 2019. Out of the total admissions, 226 (4.04%) were diagnosed with various types of birth injuries. Twenty-one of these cases ($n = 21/226$, 9.29%) were excluded due to significant missing data and 205 cases were included in the final analysis of the study. Hence the percentage of neonates admitted to our unit with birth injuries and included in the study was 3.66% ($n = 205/5590$).

From Table 1, the birth injuries were more in male neonates ($n = 123/205$, 60.0%) and in neonates delivered in the TTH ($n = 143/205$, 69.75%). In all, 145 (70.73%) of the birth injuries occurred in babies born through spontaneous vaginal delivery (SVD). Majority of the birth injuries was found among neonates with birth weights between 2.5 - 4.0 kg ($n = 151/190$, 79.47%). Regarding shifts of delivery, data was available for 151 neonates with birth injuries out of which 63 (41.72%) were delivered during the night shift (8:00 pm – 8:00 am) and 44 (29.1%) each were delivered in the morning and afternoon shifts, respectively. Majority of the neonates with birth injuries were born to multiparous mothers ($n = 177/202$, 87.62%). Out of the 183 neonates for which data was available for gestational age, 176 (96.17%) were term deliveries. In the bivariate analysis, place of delivery was the only factor significantly associated with birth injuries ($p = 0.029$).

Types of birth injuries and associated co-morbidities

Out of the 221 birth injuries, extracranial birth injuries ($n = 146$, 66.06%) were the most common type admitted in the unit during the study period. This was followed by musculoskeletal injuries ($n = 41$, 18.55%), brachial plexus and facial nerve injuries ($n = 24$, 10.85%), and soft tissue injuries ($n = 10$, 4.52%). Out of the 146 extracranial birth injuries, caput succedaneum ($n = 79$, 54.11%) was the most common, while humeral fractures ($n = 15$, 10.27%) were the most common type of musculoskeletal injuries (Table

2). Our study also revealed that some of the neonates had other co-morbidities aside the birth injuries (Table 3). Birth asphyxia ($n = 100/233$, 42.91%) was the commonest comorbidity.

Factors associated with specific birth injuries

We used logistic regression analysis to determine factors associated with specific types of birth injuries. Out-born babies were about five times more likely to have extracranial injuries ($p = 0.008$) compared to those born in TTH. No significant association was found for the other types of birth injuries documented in this study.

Outcomes of birth injuries

Out of the 205 patients that were admitted for the various forms of birth injuries ($n = 182$, 88.78%) were discharged successfully and 23 died on admission giving a mortality rate of 11.22%. The main birth injury seen in babies that died was extracranial birth injury. All but one case of the mortalities seen had birth asphyxia, with a $p < 0.001$. The remaining one was born premature. The mean \pm SD duration of hospital stay was 5 ± 5.14 days, a range of 1 – 24 days.

DISCUSSION

This retrospective study was conducted to document burden of birth injuries and risk factors associated with them in our NICU, which serves as a referral center for babies born in TTH or referred from other facilities within the catchment area of the hospital. The prevalence of neonates admitted due to birth injuries during the study period was 3.66% or 37 per 1000 neonatal admissions. The prevalence was higher than the findings from a study in South- Eastern Nigeria [6], but lower than the figure reported by Borna et al. [16]. The high prevalence of birth injuries in our study could be due to delayed care-seeking [17] and the skill set of the healthcare professionals providing care during the peripartum period [5,18]. In addition, as the NICU serves as the referral center for the five regions in Northern Ghana, almost all babies born with birth injuries are referred to our unit.

Extracranial birth injuries were the most common form of birth injury in our study, occurring in over 65% of the babies with birth trauma. A similar finding was reported by Awari et al. [19]. Caput succedaneum was the commonest in this category, making it the most common single birth injury in our study. This finding was like other studies in the literature [20,21, 22]. Other studies have, however, reported cephalohematoma as the commonest birth injury [2,8,23,24]. In the studies that reported cephalohematoma as the commonest birth injury, caput succedaneum was reported as birth injury in two [2,23], whereas the other two studies did not report it as birth injury [8,24]. Musculoskeletal injuries (18.55%) were also common in our study and humeral fractures was the commonest in this category. This was lower than the 60.9% seen by Asuquo et al. [18]. Pious et al. reported femoral fractures as the

commonest musculoskeletal injury they saw [5]. Interestingly there was one case of knee dislocation in our study. Erb's palsy and facial nerve paralysis were the two types of nerve injuries seen in our study similar to what was reported by Warke et al. [12] and Borna et al. [16]. Facial bruising and subconjunctival hemorrhages were the most common soft tissue injuries, which was not surprising because of the high rate of head (extracranial) injuries recorded. Birth asphyxia was a common diagnosis seen in our study. This was not different from the findings of Pious et al. where birth asphyxia was seen in (39.1%) of cases [5].

Birth asphyxia normally results from difficult delivery putting the baby at risk for bodily injuries and death. Factors associated with birth injuries include hospital location or level. It is common for babies born in urban and teaching hospitals to have birth injuries than the reverse [8, 13, 18, 25]. Pious et al. reported a similar finding in their study where more birth injuries were seen in their study center (teaching hospital) compared to peripheral facilities [5]. This may be because most of the babies delivered at the teaching hospital were seen as referrals on account of complicated labor [5]. In our study, place of delivery was significantly associated with birth injuries ($p = 0.029$). Most of the cases were delivered in our facility, which is a tertiary facility, consistent with some of the studies. However, these studies contrast with the study by Mah et al. [7]. What we found differently was that the out-born babies were 5 times more likely to develop extracranial injuries (adjusted odds ratio, 5.10; 95% CI: 1.53 - 16.94; $p = 0.008$). This could be because most of them were born by SVD.

We did not find a significant association between gender, mode of delivery, birth weight and maternal age and birth injuries in our study. This is despite the higher preponderance of males (60%) and babies born by SVD (70.7%) among our cohort. Previous studies have found similarly higher proportions of birth injuries among males [7,8,21,23] and babies born by SVD [12,18]. Nasab et al. even opined that C/S should be preferred as the safe method of delivery for high-risk mothers and babies [26]. Previous studies have also documented a significant association between multiparity and birth injuries although our study did not find any association. The mortality rate of 11.22% seen in our study was higher compared to the finding by Warke et al. [12], who reported a mortality rate of 9.6%, with birth asphyxia been a common comorbidity in the babies who died, as was evident in our study. With respect to the length of hospital stay of patients, Emeka et al. reported a mean duration of stay at their hospital was 8 days, which was longer than the 5 days seen in our study. Sauber-Schatz et al. found that neonates with birth injuries have a reduced rate of death during their hospitalization [13]. This could imply that the comorbidities associated with birth injuries may be a determining factor regarding the outcomes at discharge. One key limitation of the study was the limited maternal information available. This is a common limitation of retrospective studies.

Conclusion

Various birth injuries were recorded at the NICU of TTH during the study period with extracranial head injuries being the most common. Birth injuries were significantly associated with place of delivery. The prevalence of birth injury seems higher compared to similar studies done in other countries in the West African sub-region. Health workers especially midwives and obstetricians should have birth injuries in mind when taking care of high-risk pregnancies. Likewise, the general public especially pregnant women need education on birth injuries and the need for regular antenatal care which will allow early identification of high-risk pregnancies for the necessary precautions to be taken during delivery.

DECLARATIONS

Ethical considerations

Full ethical review was waived by the Ethical Review Committee of the TTH. Permission for this study was granted from the Research and Development Department of the Hospital.

Consent to publish

All authors agreed to the content of the final paper.

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Competing Interests

No potential conflict of interest was reported by the authors.

Author contributions

AAM conceived the study. AAM, KAB and EKC did data extraction, cleaning and analysis. AAM, KAB, EKC, AB and KAO drafted and revised the manuscript. All authors read and approved the final manuscript.

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Availability of data

The dataset used and analyzed during the current study is available from the corresponding author upon a reasonable request.

REFERENCES

1. Behrman A, Kliegman K, Jenson L (2011) Nelson text book of pediatrics 19th edition, Philadelphia: Elsevier/Saunders
2. Akangire G, Carter B (2016) Birth Injuries in Neonates. *Pediatr Rev* 37:451–460. <https://doi.org/10.1542/pir.2015-0125>
3. Leung W, Lam HSW, Lam KW, To M, Lee CP (2003) Unexpected reduction in the incidence of birth trauma and birth asphyxia related to instrumental deliveries during the study period: was this the Hawthorne effect? *BJOG An Int J*

Obstet Gynaecol 110:319–322. [https://doi.org/10.1016/s1470-0328\(03\)02948-3](https://doi.org/10.1016/s1470-0328(03)02948-3)

4. Parker LA (2005) Part 1: Early recognition and treatment of birth trauma: Injuries to the head and face. *Adv Neonatal Care* 5:288–297
5. Pius S, Ibrahim H, Ibrahim B, Farouk A, Machoko Y, Bello M (2018) Incidence and characteristics of neonatal birth injuries in Maiduguri North-Eastern Nigeria. *Niger J Paediatr* 45:99–105–105
6. Emeka KC, Uchenna E, Tochukwu JE, Chukwuebuka NO, Chikaodili ET, Chigozie IC (2019) Profile of Birth Injuries in a Tertiary Hospital in Enugu, Nigeria. *Am J Biomed Life Sci* 7:99. <https://doi.org/10.11648/j.ajbls.20190705.11>
7. Mah EM, Foumane P, Ngwanou DH, Nguefack S, Chiabi A, Dobit JS, Siyou H, Bogne JB, Mbonda E, Angwafo III F (2017) Birth Injuries in Neonates at a University Teaching Hospital in Cameroon: Epidemiological, Clinical and Therapeutic Aspects. *Open J Pediatr* 07:51–58. <https://doi.org/10.4236/ojped.2017.71008>
8. Abedzadeh-Kalahroudi M, Talebian A, Jahangiri M, Mesdaghinia E, Mohammadzadeh M (2014) Incidence of Neonatal Birth Injuries and Related Factors in Kashan, Iran. *Arch Trauma Res* 4:e22831. <https://doi.org/10.5812/atr.22831>
9. Mosavat SA, Zamani M (2008) The incidence of birth trauma among live born term neonates at a referral hospital in Rafsanjan, Iran. *J Matern Neonatal Med* 21:337–339. <https://doi.org/10.1080/14767050801927921>
10. Hailu D, Worku B (2006) Birth trauma among live born term neonates at a referral hospital in Addis Ababa, Ethiopia. *Ethioph Med J* 44:231–236
11. Linder N, Linder I, Fridman E, Kouadio F, Lubin D, Merlob P, Yogev Y, Melamed N (2013) Birth trauma-risk factors and short-term neonatal outcome. *J Matern Neonatal Med* 26:1491–1495. <https://doi.org/10.3109/14767058.2013.789850>
12. Warke C, Malik S, Chokhandre M, Saboo A (2012) Birth injuries-A review of incidence, perinatal risk factors and outcome. *Bombay Hosp J* 54(2), 202-208.
13. Sauber-Schatz EK, Markovic N, Weiss HB, Bodnar LM, Wilson JW, Pearlman MD (2010) Descriptive epidemiology of birth trauma in the United States in 2003. *Paediatr Perinat Epidemiol* 24:116–124. <https://doi.org/10.1111/j.1365-3016.2009.01077.x>
14. Hamzat TK, Carsamer S, Wiredu EK (2008) Prevalence of newborn brachial plexus palsy in Accra, Ghana. *J Pediatr Neurol* 6:133–138. <https://doi.org/10.1055/s-0035-1557453>
15. Yarfi C, Elekusi C, Banson AN, Angmorterh SK, Kortei NK, Ofori EK (2019) Prevalence and predisposing factors of brachial plexus birth palsy in a regional hospital in Ghana: A five year retrospective study. *Pan Afr Med J*. 32:211
16. Borna H, Rad SMBA, Borna S, Mohseni SM (2010) Incidence of and risk factors for birth trauma in Iran. *Taiwan J Obstet Gynecol* 49:170–173. [https://doi.org/10.1016/S1028-4559\(10\)60036-8](https://doi.org/10.1016/S1028-4559(10)60036-8)
17. Wilmot E, Yotebieng M, Norris A, Ngabo F (2017) Missed Opportunities in Neonatal Deaths in Rwanda: Applying the Three Delays Model in a Cross-Sectional Analysis of Neonatal Death. *Matern Child Health J* 21:1121–1129. <https://doi.org/10.1007/s10995-016-2210-y>

18. Asuquo J, Abang I, Urom S, Anisi C, Eyong M, Agweye P (2018) Prevalence and predisposing factors to birth fractures and brachial plexus injuries seen in a tertiary hospital in Calabar, Nigeria. *Niger J Med* 27:78-83. <https://doi.org/10.4103/1115-2613.278234>
19. Awari BH, Al-Habdan I, Sadat-Ali M, Al-Mulhim A (2003) Birth associated trauma. *Saudi Med Journal* 24:672-674
20. Ghorashi Z, Ahari H, Okhchi R (2005) Birth injuries of neonates in Alzahra hospital of Tabriz, Iran. *Pak J Med Sci* 21:289-291
21. Osinaike B, Akinseye L, Akiyode O, Anyaebunam C, Kushimo O (2017) Prevalence and predictive factors of birth traumas in neonates presenting to the children emergency center of a tertiary center in Southwest, Nigeria. *J Clin Sci* 14:167. https://doi.org/10.4103/jcls.jcls_62_16
22. Rezaie M, Ghafarian Shirazi H, Balaghi Einanloo K, Hashemi H (2009) Birth Injuries and Related Risk Factors in Neonates Born in Emam Sajjad Hospital in Yasuj in 2005 to 2006. *Armaghane danesh* 14:122-129.
23. Mohammad A, Khattak AK, Hayat M, Mohammad L (2017) Patteren of birth trauma in newborn presenting to neonatology unit of a tertiary care hospital at peshawar. *KJMS* 10:331-336
24. Shabbir S, Younas M (2014) Risk factors and incidence of birth trauma in tertiary care hospital of Karachi. *Pakistan J Med Heal Sci* 8:481-483
25. Njokanma O, Kehinde O (2002) Mechanical Birth Trauma: An Evaluation of Predisposing Factors at the Ogun State University Teaching Hospital, Sagamu. *Niger J Paediatr* 29:61-65. <https://doi.org/10.4314/njp.v29i3.12024>
26. Nasab SAM, Vaziri S, Arti HR, Najafi R (2011) Incidence and associated risk factors of birth fractures in the newborns. *Pakistan J Med Sci* 27:142-144. <https://doi.org/10.12669/pjms.271.839>

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