



**ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE,
DEPARTMENT OF PUBLIC HEALTH**

**MAGNITUDE AND ASSOCIATED FACTORS OF BIRTH
INJURIES AMONG NEONATES ADMITTED TO SAINT PAUL'S
HOSPITAL NEONATAL CARE UNIT from 2009- 2010 E.C**

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(Assistant professor of obstetrics and gynecology)

**STUDENT RESEARCH SUBMITTED TO DEPARTMENT OF PUBLIC
HEALTH, SPHMMC AS A PARTIAL FULFILLMENT FOR THE
REQUIREMENT OF DEGREE OF DOCTOR OF MEDICINE**

July, 2018

ADDIS ABABA, ETHIOPIA.

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Acronyms and abbreviations

AOR: Adjusted odds ratio

BT: Birth trauma

CS: Caesarean section

FHR: Fetal heart rate

HMIS: Health management information system

ICH: Intracranial hemorrhage

NICU: Neonatal intensive care unit

PROM: Premature rupture of membrane

SPHMMC: St. Paul's hospital millennium medical college

SFN: Subcutaneous fat necrosis

SGH: Subgaleal hemorrhage

SPSS: Statistical package for social science

Acknowledgment

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Abstract

Background: Birth injuries are impairment of neonatal body function or structure due to adverse event that occur during delivery or at any point during the entire process of birth. There is a wide spectrum of birth injuries ranging from minor and self-limited problems to severe injuries that may result in significant neonatal morbidity and mortality. The occurrence of birth injuries varies based on type of delivery, fetal presentation and type of injury.

Methodology: This study was conducted in SPHMMC NICU. Hospital based retrospective documentary review study were conducted. Sample size was calculated by using single population proportion sample formula. Study subject were selected using systematic random sampling method, and adopted data collection tool were used. Data was checked for completeness and clarity and analysis was made using statistical package for social sciences (SPSS) version 23. Descriptive statistics, binary and multiple logistic regressions were performed. The degree of association was calculated using odds ratio with 95% CI. P-value less than 0.05 were considered as significance level for associations between dependent and independent variables.

Objective: This study aimed to assess the prevalence and associated factors of neonatal birth injuries.

Result: Prevalence of neonatal birth injuries was 9.9% from total admission of 3750 neonates in the past two years. Operative interventions [AOR = 4.0; 95% CI 1.04-15.5; p-value= 0.043] and vertex fetal presentation [AOR = 11.12; 95% CI 1.25-99.16; p-value= 0.031] were identified as a possible risk factors for subgaleal hemorrhage compared to other birth injuries.

Conclusion: The prevalence of neonatal birth injuries detected in this study turned out to be significantly higher compared to other studies. It is also pointed out that instrumental delivery or any operative interventions as major factors for birth injury especially subgaleal hemorrhage. Therefore measures that can optimize the use of operative intervention need to be taken to reduce the possible preventable birth injuries.

Key words: Birth injuries, Neonate, incidence, Prevalence, factors, neonatal care unit

1. Introduction

1.1 Background of the study

Birth injuries are defined as structural destruction or functional deterioration of neonate's body due to traumatic event at birth. Injury may occur during labor, delivery, or after delivery, especially in neonates who require resuscitation in the delivery room. These injuries usually occur as a result of mechanical forces like compression and traction during the transit through birth canal. Procedures such as amniocentesis and intrauterine transfusions can cause injuries before birth, and these and any injuries that occur following neonatal resuscitation procedures are not considered birth injuries. However, injuries occurring from fetal scalp electrodes and intrapartum heart rate monitoring reconsidered birth injuries. Some of these injuries are avoidable when appropriate care is available and others are part of the delivery process that can occur even when clinicians practice extreme caution. ⁽¹⁾

There is a wide spectrum of birth injuries ranging from minor and self-limited problems to severe injuries that may result in significant neonatal morbidity or mortality. Among the birth injuries soft-tissue injuries including bruising, petechiae, subcutaneous fat necrosis, and lacerations are reported to be the most common. Bruising and petechiae are usually self-limiting and are often seen on the presenting portion of the newborn's body. Subcutaneous fat necrosis (SFN) is firm indurated nodule and plaques, uncommon and usually occurs in the first few weeks of life as a result of ischemia to the adipose tissue following a traumatic delivery. Typically, it is self-limiting, with resolution usually occurring by six to eight weeks of age. Fetal laceration, the most common birth injury associated with caesarean delivery, occurs most often on the presenting part of the fetus most of it occurring when the caesarean delivery was performed emergently. The majority of lacerations are mild, requiring repair with sterile strips only and few require plastic surgery for repair. ^(1, 2)

In addition extracranial injuries which occur due to edema or bleeding in to various potential spaces within scalp and skull are also fairly common. These extracranial injuries are cephalohematoma, caput succedaneum, and subgaleal hemorrhage. One of the extracranial injuries is caput succedaneum which is an edematous swelling of the scalp above the periosteum, which is occasionally hemorrhagic. It presents at birth after prolonged engagement of the fetal head in the

birth canal or after vacuum extraction. It extends across the suture lines. It is generally a benign condition usually resolving within a few days and it does not requires treatment. ⁽²⁾

The other extracranial injury is cephalohematoma. It is a subperiosteal collection of blood caused by rupture of vessels beneath the periosteum usually over the parietal or occipital bone, which presents as swelling that does not cross suture lines. It is estimated to occur in 1 to 2 percent of all deliveries and is much more common when forceps or vacuum delivery is performed. In majority of cases it will resolve spontaneously over the course of a few weeks without any intervention. However, calcification of the hematoma can occur with a subsequent bony swelling that may persist for months some causing significant deformities of the skull. ^(2, 3)

Subgaleal hemorrhage (SGH) caused by bleeding of the emissary veins between the scalp and dural sinuses when sheared or severed as a result of traction on the scalp during delivery occurring more in vacuum assisted delivery. The potential for massive blood loss into the subgaleal space which extends from orbital ridges to the nape of the neck and level of the ears laterally contributes to the high mortality rate associated with this lesion. It presents as a diffuse, fluctuant swelling of the head that may shift with movement. Early recognition of this injury is crucial for survival. Besides scalp and skull, facial injuries like nasal septal dislocation and ocular injuries are also one of the birth injuries that occur in the head region. Intracranial hemorrhages (ICH) as a consequence of birth injury include subdural, subarachnoid, epidural, intraventricular hemorrhages, and less frequently, intracerebral and intracerebellar hemorrhages. The risk of ICH increases with operative delivery. ⁽²⁾

The other injuries are fractures among which clavicular fractures being the most common followed by humeral, femoral and skull bone fractures. Besides fractures the other musculoskeletal birth injuries are dislocation which are relatively rare. Moreover there are also neurologic birth injuries such as brachial plexus injuries (Erb's palsy and Klumpke's paralysis), facial, phrenic and laryngeal nerve injuries. The severe type of neurologic birth injuries are spinal cord injuries which are said to be with poor prognosis and high mortality rate in cases of lesions at high cervical and brain stem regions. There are also some rare type of birth injuries like abdominal injuries. ^(1, 2)

1.2 Statement of the problem

The reported incidence of birth injuries varies based on the type of delivery, fetal presentation and the type of injury ranging from 0.2 and 41.2 per 1000 live birth. The rate of birth injuries is about 2% in singleton vaginal deliveries of fetuses in cephalic position and 1.1% in caesarean deliveries. It is stated that the overall incidence of birth injuries has declined with improvements in obstetrical care and prenatal diagnosis. However it appears that the rate of neonatal birth injuries will never be zero because it will occur in an optimal condition, best obstetrical care and diagnosis and despite the absence of any risk factors. ^(2, 3)

The factors that are related to rate of birth injuries may be fetal, maternal, obstetrical factors including instrumentation during delivery and other miscellaneous factors. The fetal factors are neonatal birth weight, height, head circumference, gestational age at delivery and presentation. From the fetal factors macrosomia, prematurity and presentation other than vertex are said to be risk factors for birth injury. The maternal factors include maternal stature, parity, age and weight. The risk factors among maternal factors are short stature, Primiparity, young age, pelvic anomalies and obesity leading to cephalopelvic disproportion and dystocia. The obstetric risk factors associated with birth injuries are premature rupture of membrane (PROM), induction of labor, prolonged labor, breech delivery, shoulder dystocia and usage of instrument like forceps and vacuum during delivery. Caesarean delivery is generally found to have a lower risk of birth trauma compared to vaginal deliveries. ^(2, 3)

Although the majority of birth injuries are minor and often unreported, occasionally birth injuries may be so severe as to be fatal or leave the child with a permanent disability or even death. The reported prevalence of birth injury is 1.2%. ⁽¹⁴⁾

1.3. Significance of the study

It is of utmost importance that the causes of birth injury within any given geographic areas be regularly reviewed so as to clearly define preventive measures. This study will provide insight on the burden and types of neonatal birth injuries encountered in our NICU, the factors associated with the types of these injuries. Because of the scarcity of data in our set up the ability to predict birth trauma according to recognized risk factors is limited. This study will contribute in filling knowledge gap in the magnitude of the problem in our set up.

By this study the neonates will be benefited because of the information which is specific to our set up generated by this research will enable the teams taking care of neonates to be more knowledgeable on the patterns of the birth injuries and the factors predisposing to these injuries. This study will also provide baseline data for future studies to be done to explore more on birth injuries preventive measures which are cost effective and suited to a developing country set up like ours. It might also give insight on the quality of labor and delivery care of the hospital.

2. Literature review

World wide

Two year retrospective study done in tertiary care referral center NICU in Bombay India to review the incidence, perinatal risk factors and outcome of birth injuries the incidence was 3.26/1000 live births, extracranial bleedings being the most common with 51.6% (38.7% cephalohematoma, 12.9 % SGH). The following were fractures (19.3%) clavicular fracture being the most common (9.6%). Neurological injuries were 16% of which facial palsy 9.6% and Erb's palsy 6.4%. Superficial injuries were 12.8%. Birth injuries were more frequent in vaginal deliveries compared to deliveries through CS, 25.8% of birth injuries were associated with instrumental delivery. In neonates born by CS with birth injury most of the mothers had failed trial of vaginal delivery. The predisposing factors were prolonged labor, instrumental delivery, difficult breech extraction, macrosomia, shoulder dystocia and maternal pelvic anomalies. There was no risk factor identified in 32.3% of all birth trauma cases. ⁽⁴⁾

In eight months prospective study carried out in tertiary care teaching maternity hospital in India in 2014 on neonatal birth trauma the incidence was 15.4/1000 livebirths. Soft tissue injuries were 28% followed by scalp and skull injury 24%, eye injury 8%, nerve injury 7% and bone injury 6%. Univariate comparison showed instrumental delivery, difficult presentation, prolonged and obstructed labor to be more frequent in birth trauma group. The incidence of birth trauma was higher during early morning hours. Primigravidity, history of abortion pregnancy induced hypertension, diabetes and antepartum hemorrhage did not have significant difference between the group with or without birth trauma. In multivariate analysis increasing maternal age and weight, higher birth weight, prolonged labor (which is strongly associated with instrumental delivery), breech presentation, and unfavorable time of delivery (2:00–8:00 am) were significant risk factors. Gestational age, mode of delivery and obstructed labor were not significant. The three strongest predictors were birth weight, prolonged labor, and time of delivery. Increasing maternal height and baby's head circumference appeared to be protective. ⁽⁵⁾

In a one year prospective cross sectional study done in Kashan Iran during 2012 – 2013 to assess the incidence and related factors of neonatal birth injuries the incidence was 2.2 %/ 22 per 1000 delivery, 3.6% in normal vaginal delivery and 1.2% in CS. The most common birth trauma was cephalohematoma 57.2% followed by soft tissues injuries 13%, fractures 6.1% and neurologic

trauma 4.4%. Birth traumas occurred more frequently in teaching hospitals, nulliparous, with usage of fundal pressure, shoulder dystocia, with decreased FHR, induction of labor, PROM, vaginal deliveries, residents attending delivery, male sex of neonate, Apgar score of 4-6, maternal age of 22- 30 years, maternal weight of 72-79 kg. After logistic regression was done predictors for birth trauma were decreased FHR, fundal pressure, shoulder dystocia, vaginal delivery, delivery by residents, induction of labor and delivery in teaching hospital.⁽³⁾

In Two year prospective cohort study done in tertiary care hospital in Karachi between 2010 and 2012 to assess risk factors and incidence of birth trauma for each case with birth injury the next uncomplicated vaginal delivery was taken as a control group. The incidence of birth injuries was found to be 41.16 per 1000 births. The most common injury was cephalohematoma (49%) followed by clavicular fracture, Erb's palsy, asphyxia, intracranial hemorrhage, skin hematoma and facial nerve palsy. Multiple regression analysis identified PROM, instrumental delivery, birth weight >3500 g, gestational age, induction of labor, and academic degree of the attendant physician at delivery as the most significant risk factors for fetal injury. Predisposing factors for birth injuries identified included birth weight, gestational age at delivery week, instrumental delivery, head circumference, PROM, induction of labor, and male infant sex. ⁽⁶⁾

In a thirteen years retrospective cohort study done to assess risk factors and short term neonatal outcome of all cases of birth trauma in a single tertiary center for 1986-2009 the incidence of birth trauma was found to be 24.3 per 1000 live birth. The most frequent type of BT were scalp injuries (63.9%) and clavicular fracture (32.1%). Instrumental delivery, birth weight, delivery during risky hours, parity, maternal age and neonatal head circumference were found to be independent risk factors for BT. Caesarean delivery was found to be the only protective factor. ⁽¹¹⁾

In one year cross sectional study done to generate descriptive epidemiology of BT in US in 2003 incidence of BT was estimated to occur in 29 per 1000 births. The three most frequently diagnosed birth traumas were injuries to the scalp, other injuries to the skeleton and fracture of the clavicle. Significant univariate predictors for birth trauma included male gender, Asian or Pacific Islander race, living in urban or wealthy areas, being born in Western, urban and/or teaching hospital, a co-diagnosis of high birthweight, instrument delivery, malpresentation and other complications during labor and delivery.⁽¹²⁾

Africa

In a three year prospective descriptive study done in Wesley Guilds hospital, Ilesha Nigeria to assess predictive factors for birth trauma there was a total of 121 neonatal admission with birth injuries. There was M: F ratio of 1.4:1 among the neonates. Fractures were the most common injuries of 41.3% followed by Cephalohematoma 24.8%, Erb's palsy 25.6%. Antenatal care, level of birth attendants, mode of delivery, fetal distress and emergency CS were factors that determined birth trauma. ⁽⁹⁾

In a two year retrospective cross sectional study done to determine incidence and types of BT and their predisposing factors in a tertiary maternity unit in south western Nigeria the incidence was found to be 6 in 1000 live births. Lacerations and bruises to head and face were the most common 52.2% followed by cephalohematoma (22.7%), scrotal injury, Erb's palsy, subconjunctival hemorrhage and fractures. The risk factors were nulliparous mother, unbooked status, caesarean delivery, instrumental delivery, assisted breech delivery, normal birth weight neonates and male gender. ⁽¹³⁾

In a cross sectional study done in Lagos in 2016 to assess prevalence and predictive factors of birth trauma in neonates presenting to children emergency center of a tertiary center Nigeria 134 neonates were reviewed. Of which 67.2% of the neonates had birth trauma with caput succedaneum (22.2%) and subconjunctival hemorrhage (22.2%) were the most frequent injuries. Parity of the mother and presence of maternal medical history had significant association with the occurrence of birth traumas. Duration of labor, mode of delivery and grade of personnel present at the delivery were reported to have positive association with presence of birth injuries. ⁽¹⁰⁾

Ethiopia

In a two year retrospective case control study done at a referral hospital in Addis Ababa, Ethiopia from September 2000 – August 2002 to assess occurrence, risk factor and outcome of mechanical birth injuries among live born term neonates 150 cases and 358 controls were studied. Subgaleal hemorrhage was the commonest birth injury accounting for 61% of the cases. Primiparity, vacuum delivery, forceps delivery and birth weight > 3.5 kg were found to be strongly associated with birth trauma. ⁽⁷⁾

3. Objective of study

3.3.1 General objectives

To assess prevalence and related factors of birth injuries in neonates admitted to SPHMMC NICU in 2009-2010

3.3.2 Specific objective

- To determine prevalence of birth injuries among NICU admissions
- To describe the type of birth injuries
- To identify factors associated with birth injuries

4. Methodology

4.1 Study area

Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), AA has a total population of 3,384,569 and lies at an altitude of 7,546 feet (2,300 meters). The City has surface area of about 530.14 km². The study will be conducted in SPHMMC NICU, the area is selected because it is the second largest central referral hospital in Ethiopia next to BLH and the NICU is one of the few governmental NICU in the city. The Hospital was built by Emperor Haileselesie I in 1969 G.C as a source of medical care for underserved populations. The college has undergraduate programs in medicine of doctor since 2000. The post graduate programs were launched in 2012 with departments of OB-GYN, IESO (Integrated Emergency Surgery and Obstetrics) and general surgery. It currently has 492 beds, has an annual average of 200,000 patients and a catchment population of more than 5 million. There are over 1300 clinical and non-clinical staff in over 13 departments, most recently launched its new hemodialysis and transplant unit. Pediatric and child health department provides service for both rural and urban population and includes outpatient clinics, emergency department, pediatrics ward and ICU and NICU. The NICU was established more than 10 years back and serves as a tertiary and referral unit. It receives high risk babies delivered from within the institution, referrals from other health facilities and home deliveries. The number of annual admission varies from time to time reaching more than 2500. It has around 40 bed capacity. The NICU has three rooms one for preterm babies, one for term babies and one on the maternity ward side where relatively stable neonates and those who need kangaroo mother care are kept.

4.2 Study design

A hospital based retrospective cross sectional study design was employed

4.3. Study period

This study was conducted from May 2009 to May 2010 E.C.

4.4. Population and sampling

4.4.1 Source population

All neonates admitted to SPHMMC NICU

4.4.2 Study population

All neonates admitted to SPHMMC NICU with the diagnosis of any birth injuries delivered either in SPHMMC or other health facilities.

4.4.3 Study subject

All neonates admitted to SPHMMC with the diagnosis of one of the birth injuries who fulfilled the inclusion criteria

4.4.4 Inclusion criteria

The inclusion criteria was all neonates with any birth injuries admitted to NICU in the previous two years for whom the medical records were retrieved.

4.4.5 Exclusion criteria

The exclusion criteria's were neonates who were discharged against medical advice; neonates for whom medical records couldn't be retrieved and if the diagnosis was ruled out after admission and evaluation at NICU

4.4.6 Sample size determination

From the study done in Ethiopia prevalence of subgaleal hemorrhage was found to be 61%. With the above p value the sample size was be calculated using single population proportion formula for $N < 10,000$ with confidence level of 95% and margin of error 5%. Where

N= study population which is 370, the number of neonates admitted with birth injury during the study period

D= margin of error

P= proportion

α =degree of accuracy

n = sample size

z = standard normal distribution corresponding to significance level of α 0.05

$$n = \frac{\frac{Z^2 p(1-p)}{d^2}}{1 + \frac{1}{N} \left(\frac{Z^2 p(1-p)}{d^2} - 1 \right)} = 178$$

4.4.7 Sampling technique

Sampling frame for this study was patient record log books from years 2009-2010 EC. From which neonates with one of the birth injuries are sampled by systematic random sampling method. The first chart to be reviewed was chosen by lottery method. With $k = 2$. The study subjects was drawn.

4.5 Data collection

The data was retrieved from chart review of birth injuries that occurred in the previous two years. The tool that was used for data collection is structured questionnaire which was pretested to check for applicability on the study subjects prior to the main data collection. The data collectors were trained volunteer medical students.

4.6 Study variables

Dependent variables

- ✓ Neonatal birth injury

Independent variables

Neonatal and maternal demographics

- ✓ Maternal age
- ✓ Gestational age
- ✓ Gender of the neonate
- ✓ Birth weight, height and head circumference of the neonate

Reproductive and labor variables

- ✓ Type and place of delivery
- ✓ Antenatal care
- ✓ Parity
- ✓ Onset and duration of labor
- ✓ PROM and duration of ROM
- ✓ Fetal presentation

4.7 Operational definition/Standard definition

Neonate: from birth to 28 days of life

Neonatal period: time from 0-28 days of life

Low birth weight: birth weight neonate <2.5 kg

Prolonged labor: Duration of labor > 20 hours for primiparas and > 14 hours for multiparas

Preterm: birth before 37 weeks of gestation

Term: birth between gestational age of 37 and 42 weeks

Post term: birth after 42 weeks of gestation

4.8 Data processing, management and analysis

Following permission from authorized personals HMIS of charts was reviewed and from the selected charts the necessary data was filled on the questioners by the data collectors. Questionnaires were checked for completeness and accurateness to determine the validity by investigator. Data from the questionnaire were coded, entered and analyzed using Statistical package for Social Sciences (SPSS 23) software. Descriptive statistics was used to summarize variables by calculating percentages, mean, median, mode, and range. Bivariate analysis was done using cross tabulations, χ^2 test and binary logistic regression to look for associations between a single independent variable and the dependent variable. The final multivariable analysis outputs with p-values < 0.05 will be considered statistically significant. Odds Ratios with 95 percent confidence interval was used to quantify the magnitude of association between independent variables and the dependent variable.

4.9. Ethical consideration

The proposal was submitted to Approval from SPHMMC institutional review board (IRB) for ethical clearance. Permission from public health department, academic & research vice provost was also granted for this study prior to enrollment. A formal letter is written by the vice provost to the concerned office. Permission was asked from the responsible body of the unit. Each data collector was adequately informed about the purpose, methods, and anticipated benefits of the study. Questionnaires were filled by volunteer data collectors who were available at the time of

data collection. The information collected from the charts is kept private, that the names was not be shared.

4.10. Dissemination of findings

The finding will be first submitted to SPHMMC public health department for evaluation purpose and a copy of it will be given to SPHMMC NICU. Apart from this, I would like to share the contents of this research with available medical journals and research conferences.

5. RESULT AND DISCUSSION

5.1. Result

Socio demographics of the study participant

Charts of 178 neonates with birth injuries admitted to St. Paul's hospital neonatal care unit from May 2009 to May 2010 E.C were reviewed. The majority of the neonates (65.2%) were male and the majority of women were in age group was from 21-25 accounting for 44.4% with age range of 15yrs to 38yrs. The mean and median maternal age in years was 24.6 and 24 respectively.

Variables	Frequency	Percent
Maternal age in years		
15-20	28	15.7
21-25	79	44.4
26-30	58	32.6
31-35	11	6.2
>35	2	1.1
Neonatal sex		
Male	116	65.2
Female	62	34.8
Height in centimeters		
<45	11	6.2
45-50	63	35.4
51-55	98	55.1
>55	6	3.4
head circumference in centimeters		
<33	5	2.8
33-37	118	66.3
>37	55	30.9
Birth weight in kg		
<2.5	24	13.5
2.5-3.5	138	77.5
>3.5	16	9.0

Table 1 Distribution of neonatal and maternal socio demographics characteristics of neonates admitted with birth injures in NICU of SPHMMC, Addis Ababa, Ethiopia, 2009-2010 E.C

From total number of neonates enrolled in this study 77.5% were in the birth weight range of 2.5-3.5 kg. The mean height was 50.42 cm with a range of 38 cm to 58 cm. The mean head circumference was 36.48 with range of 27 cm to 42 cm. The most common APGAR first minute score was 7 and fifth minute was 8. The minimum and maximum first minute Apgar score being 2 and 9 respectively. The minimum and maximum fifth minute Apgar score was 4 and 10 respectively. The first and fifth minute Apgar score > 7 were 46% and 74.5% respectively.

Reproductive and labor variables

Term neonates were the majority with 86.5%. Thirty six percent of the neonates were delivered by SVD. Instrumental delivery accounted for 45.5% however; instrumentation was used in 54% of neonates alone or in sequential manner. Vacuum was applied in 44.9% while cesarean section was done in 18.5%. Majority (69.1%) of the neonates were born in St Paul's hospital labor wards and emergency gynecology OPD. Primi parous mothers are holding 77% of the total.

Variables	Frequency	Percent
Types of delivery		
Vacuum assisted	61	34.3
SVD	59	33.1
CS	18	10.1
Forceps	16	9.0
Vacuum and CS	15	8.4
ABD	5	2.8
Vacuum and Forceps	4	2.2
Place of delivery		
SPHMMC	123	69.1
Health center	35	19.7
Other hospital	15	8.4
Home	5	2.8
Parity		
Primiparas	137	77
Multipara	41	23
Gestational age in weeks		
Preterm(<37)	16	9.0
Term(37-42)	154	86.5
Post term(>42)	8	4.5

Table 2 Distribution of reproductive and labor variables of neonates admitted with birth injuries to NICU of SPHMMC, Addis Ababa, Ethiopia, 2009-2010 Part 1 E.C

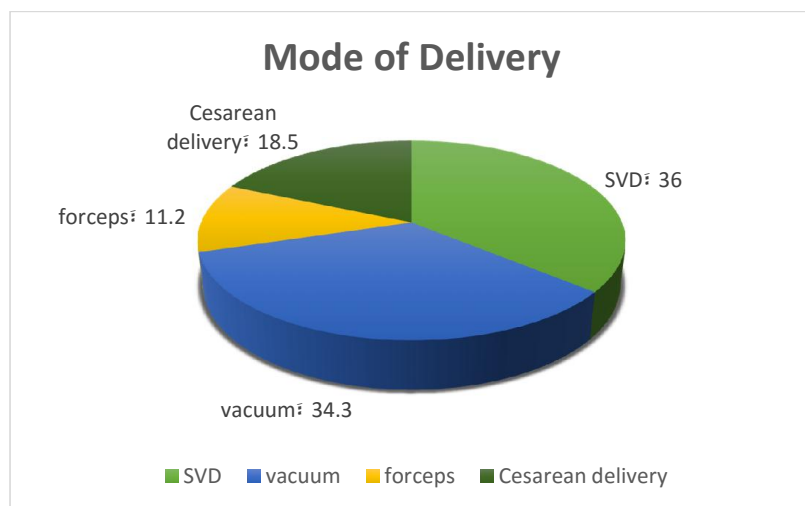


Figure 1 Distribution of types of delivery of neonates admitted with birth injuries in NICU of SPHMMC, Addis Ababa, Ethiopia, 2009-2010 E.C

Variables	Frequency	Percent
Duration of labor		
<4	8	4.5
4-12	45	25.3
12-20	69	38.8
>20	56	31.5
PROM		
Yes	37	20.8
No	141	79.2
Fetal Presentation		
Vertex	169	94.9
Breech	4	2.2
Face	3	1.7
Brow	2	1.1
Obstetric and Maternal illness		
No known maternal illness	139	78.1
Chorioamnionitis	23	12.9
Pregnancy induced hypertension	10	5.6
Others	6	3.4
Antenatal care		
Yes	176	98.9
No	2	1.1

Table 3 Distribution of reproductive and labor variables of neonates admitted with birth injuries to NICU of SPHMMC, Addis Ababa, Ethiopia, 2009-2010 Part 2 E.C

Onset of labor was spontaneous in 95.5%. The mean duration of labor and rupture of membrane was 16 hours and 13 hours respectively. Duration of labor ranged from minimum of 1 hour to maximum of 48 hours. Duration of rupture of membrane ranges from 1 hour to 216 hours with 20.8% premature rupture of membrane. In this study known maternal illness was found only in 21.9%. Almost all of the mothers had ANC follow up except two mothers.

There were total of 3750 admission during the study period from which there were 370 neonates admitted with the diagnosis of different types of birth injuries. Therefore period prevalence is 9.9%. The most common birth injury identified in this study was subgaleal hemorrhage (62.9%) followed by soft tissue injuries (14.6%) and cephalohematoma (13.5%).

Type of birth injury	Frequency	Percent
Extra cranial bleeding		
Subgaleal hemorrhage	112	62.9
Cephalohematoma	24	13.5
Soft tissue injuries	26	14.6
Neurologic injury		
Erb's palsy	4	2.3
Facial palsy	5	2.8
Wrist drop	1	0.6
Skull fracture	3	1.7
Intracranial hemorrhage	1	0.6

Table 4 Distribution of types of birth injuries in neonates admitted to NICU of SPHMMC, Addis Ababa, Ethiopia, 2009-2010 E.C

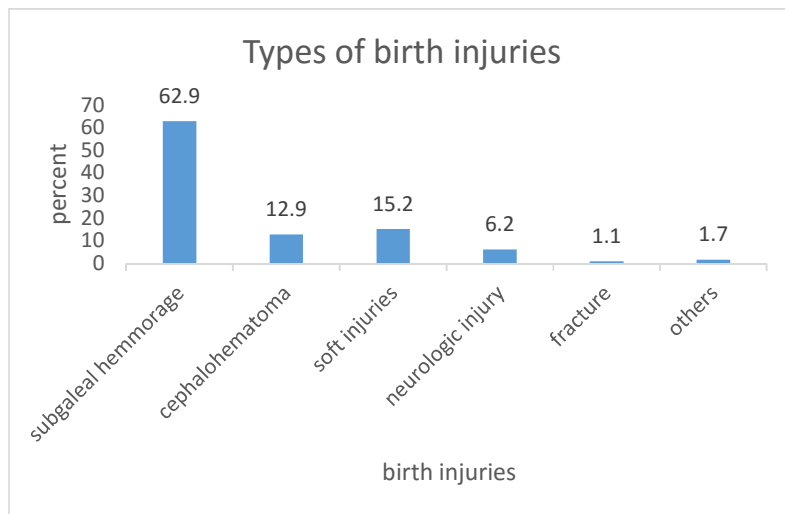


Figure 2 Distribution of types of birth injuries in neonates admitted to NICU of SPHMMC, Addis Ababa, Ethiopia, 2009-2010 E.C

Factors associated with birth injuries

In bivariate analysis done using chi square test operative deliveries, birth weight, head circumference and fetal presentation were found to have statistically significant association with subgaleal hemorrhage. But with further multivariable logistic regression analysis only operative deliveries remained strong predictor of subgaleal hemorrhage [AOR=4.0(95%CI =1.04-15.53), P=0.043]. In addition, there was also positive association between fetal presentation and subgaleal hemorrhage. [AOR=11.12 (95%CI =1.25 - 99.16), P=0.031].

Variable	Subgaleal hemorrhage		C OR (95%CI)	P- value
	Yes	No		
Instrumentation Yes No	73 43	23 39	2.87(1.52-5.450)	0.001
Birth weight <2.5kg 2.5-3.5 kg >3.5	9 95 12	15 43 4	0.2(0.049-0.812)	0.024
Head circumference <33 33-37 >37	2 68 46	3 50 9	0.266(0.02-0.59)	0.001
Intervention Yes No	87 29	27 35	3.89(2.02-7.48)	<0.001
Fetal presentation Vertex Non vertex	115 1	54 8	17.03(2.07-139.6)	0.008

Table 5 Bivariate analysis showing association between different variables with subgaleal hemorrhage for neonates admitted with birth injuries to NICU of SPHMMC, Addis Ababa, Ethiopia, 2009-2010 E.C

Variable	Subgaleal hemorrhage		A OR (95%CI)	P- value
	Yes	No		
Intervention Yes No	87 29	27 35	4.0(1.04-15.53)	0.043
Fetal presentation Vertex Non vertex	115 1	54 8	11.12(1.25-99.16)	0.031

Table 6 Multivariate analysis showing association between different variables with subgaleal hemorrhage for neonates admitted with birth injuries to NICU of SPHMMC, Addis Ababa, Ethiopia, 2009-2010 E.C

5.2. Discussion

The period prevalence of birth injury in this study was 9.9% which is higher than the retrospective cross sectional study done in teaching hospital of Tamale Ghana where the prevalence of birth injury was 1.2% ⁽¹⁴⁾. It is also higher than retrospective cross sectional study conducted in secondary hospital in Pakistan where prevalence was <0.1%. ⁽¹⁵⁾ And university teaching hospital in Cameroon with prevalence of 1.84%.⁽¹⁶⁾ This gross difference can be explained by geographical difference; prevalent use of instrumentation in our set up and the lesser emphasis given to birth injury when there are comorbidities in other studies.

Majority of neonates in this study were male (65.2%) comparable to cross sectional study done in Nigeria and prospective cross sectional study done in Kashan in which 62.7% and 65.2% of the neonates with birth injuries were male respectively. ^(3, 13) The mean age of mothers was 24.66 ± 4.05 years which makes mothers in this study are younger than studies done in Nigeria, Kashan and a prospective cohort study done in Karachi in which the mean age was 29.6±5.5years, 26.8±4.8 years' and 25.8±4.3 respectively. This might be due to the overall difference between patterns of delivery. In this study most of the deliveries were term (86.5%) which is comparable to study in Kashan (70.4%) and Nigeria (88.9%). ^(3, 6, 13)

In this study majority (77%) were primiparas and it's comparable to Kashan's study which had 57% primiparas. Majority (78.1%) of the mothers did not have any medical or obstetric illness. Chorioamnionitis was the most common maternal illness (12.9%) identified. This finding is similar with Nigerian study where 76.1% of the mothers did not have any medical illness. Only two (1.1%) mothers didn't have ANC follow up in this study which is comparable to Nigerian study where only four (3.0%) mothers did not attend ANC follow up. ^(3, 13)

Most common presentation was vertex (94.9%) which is also comparable with Nigerian study where 92.5% was vertex. Prolonged labor shares 31.5% of the total. This rate is higher compared to Nigerian study where prolonged labor accounted for 19.4%. In this study vacuum was applied in 44.9% of the neonate either alone or followed by CS or forceps. Instrument was used in 54% of the neonates. This rate is significantly higher than other studies where they have instrument usage of 10.4% in Nigeria and 5.3% in Cameroon. Cesarean section was done in 18.5% which is lower than the CS done in Nigerian study which is 39.8% and also in Kashan 27.9%. ^(3, 13, 16)

Subgaleal hemorrhage is the most common type of birth injury accounting 62.9% followed by soft tissue injuries (14.6%) and cephalohematoma (13.5%). The least common was intracranial hemorrhage which occurred in one neonate. This is similar with retrospective case control study conducted in Addis Ababa referral hospitals where Subgaleal hemorrhage was the commonest birth injury accounting for 61% of the cases.⁽⁷⁾ It is also relatable with studies in Kashan, Karachi and Bombay where the most common type of birth injury was cephalohematoma the other extracranial bleeding.^(3,4,6) This result was significantly different from Nigerian and Indian study where soft tissue injuries were predominant.^(5,13)

Compared to the other types of birth injuries subgaleal hemorrhage has positive association with instrumentation, operative intervention, fetal presentation, head circumference and birth weight. With instrumentation the risk of subgaleal increases three fold which is comparable to other study, study in Karachi. With operative interventions which are instrumental delivery and cesarean section the risk of subgaleal increases four fold. Unlike other studies in this study the risk of subgaleal hemorrhage increased almost ten times with vertex presentation than non-vertex presentation. The risk of subgaleal hemorrhage decreased with decrease in birth weight and head circumference the protective effect of head circumference was also seen in Indian prospective study.^(5,6)

6. Strength and limitation

Strength

- ✓ It describes the recent pattern of birth injuries

Limitation

- ✓ As a retrospective study there were some unavailable and incomplete data for example delivery attending professional level of education could not be found so it was removed from the questionnaire
- ✓ Since the study participants were only the neonates diagnosed with birth injuries the factors affecting all of the birth injuries could not be computed.
- ✓ Because the study is retrospective the recommendations might not be well powered

7. Conclusion and recommendation

Conclusion

The prevalence of neonatal birth injuries detected in this study turned out to be significantly higher compared to other studies. It is also pointed out that instrumental delivery or any operative interventions as major factors for birth injury especially subgaleal hemorrhage. Therefore measures that can optimize the use of operative intervention need to be taken to reduce the possible preventable birth injuries.

Recommendation

- Careful documentation as a routine practice and larger multicenter studies of birth trauma are required in future in order to chalk out prevention and mitigation strategies in the overall interest of maternal and neonatal health.
- Issues of birth trauma should be a part of basic education since its successful management includes special training, teamwork, and individual approach.
- Caesarian sections and instrumental vaginal deliveries should be performed by undertaking great care according to the recommended procedural steps.

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Annex I: Consent sheet

St. Paul's Hospital Millennium Medical College

Department of Public Health

Hello. My name is Eyerusalem Bergene and I am a final year medical student in under graduate program in faculty of medicine at SPHMMC.

I am requesting your good office to give me permission to conduct the stated study in this hospital. Please read the following information for further understanding:

What the study is about: The purpose of this study is to assess the prevalence and associated factors of birth injuries among neonates admitted to neonatal intensive care unit.

What I will ask you to do: If you agree to do this study, I will conduct by using a check list to collect necessary data from the records and patient file. The checklist will include questions about socio demographics of neonate and mother; reproductive and labor variables; and types of birth injury.

I would like to thank you for your cooperation in this study.

Risks and benefits: The result of the study helps the college and other responsible body to plan necessary training for clinician who works in NICU to improve their knowledge regarding the problem as to reduce the neonatal morbidity and mortality.

Confidentiality; All information gathered from the log book and patient file will be kept confidential. Any of patient's personal information will not be registered.

Contact Address of the Principal Investigator

Name: Eyerusalem Bergene

Cell –Phone: +251932191031

E-Mail: monorovia@gmail.com

Annex II: Questionnaire

I- Neonatal and maternal Demographics

1. Maternal age in number
2. Gender of the neonate
 - ☐ Male
 - ☐ Female
3. Birth weight
 - ☐ < 2.5 kg
 - ☐ 2. 2.5-3.5kg
 - ☐ >3.5 kg
4. Height of the neonate in cms
5. Head circumference in cms
6. APGAR score 1st----- and 5th
7. Maternal history of medical illness
 - ☐ Diabetes
 - ☐ Hypertension
 - ☐ Others specify

II-Reproductive and labor variables

8. Type of delivery
 - ☐ Spontaneous vaginal delivery
 - ☐ Vacuum delivery
 - ☐ Forceps delivery
 - ☐ Cesarean section delivery
9. Antenatal care
 - ☐ Yes
 - ☐ No
10. Parity in number
11. Gestational age in weeks

12. Labor onset

☐ Spontaneous

☐ Induced

13. Duration of labor in hours

14. Duration of Rupture of membrane in hours

15. PROM

☐ Yes

☐ No

16. Fetal presentation

☐ Vertex

☐ Breech

☐ Shoulder

17. Place of delivery

☐ Home

☐ SPHMMC

☐ Other hospital

☐ Health center

18. Time of the day of delivery

19. Neonatal birth injury type

1. Cephalohematoma

2. Subgaleal hemorrhage

3. Erb's palsy

4. Facial palsy

5. Fracture specify

6. Soft tissue injury specify

7. Other neurologic injuries specify

8. Intracranial hemorrhage

9. Others specify