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# PREVALENCE AND PREDISPOSING FACTORS TO BIRTH FRACTURES AND BRACHIAL PLEXUS INJURIES SEEN IN A TERTIARY HOSPITAL IN CALABAR, NIGERIA

Asuquo JE, Abang IE, Urom SE, Anisi CO, Eyong ME, Agweye PU  
Department of Orthopaedics & Traumatology,  
University of Calabar, PMB 1114, Calabar, Nigeria.

## ABSTRACT

**INTRODUCTION:** Birth injuries may occur even with the best standard of care, and even more in the presence of certain fetal, maternal and delivery related factors. In this study we sought to determine the prevalence of birth injuries and investigate the predisposing factors of birth fractures and nerve palsies.

**METHOD:** This was a hospital-based Epidemiological study conducted between January 2014 – December 2016 and all patients with birth injuries were recruited into the study. Structured questionnaires were administered to parents or guardians after giving informed consent. Relevant data regarding maternal morbidity, birth weight, parity and mode of delivery was collected and analyzed using IBM SPSS version 22. Significant statistical inference was set at 0.05. Ethical approval was given by the institutional ethics and research committee.

**RESULTS:** Forty-six patients were recruited into the study. Seventy six percent were referred within a week after birth. Male to female ratio was 1:1.1. Thirty-two (60.9%) had fractures while 14 (39.1%) had brachial plexus injuries. Twenty-seven (58.7%) were delivered by a midwife and one was delivered by a traditional birth attendant. Fourteen of the mothers (30.4%) were primipara while 13 were grandmultipara. Seventeen of the patients (37%) had a birth weight >4kg. Most mothers delivered in a secondary health facility (43.5%) while 5 (10.9%) delivered at home. Only 8 (17.4%) had cesarean section. Birth through cesarean section was significantly associated with lower risk of fractures and peripheral nerve palsy ( $p=0.04$ ).

**CONCLUSION:** Fractures were the commonest injury seen. Cesarean section had the lowest rate of birth fractures and nerve palsies.

**KEYWORDS:** Birth injury, Trauma, Orthopedic related, Birth fractures, Birth palsy.

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## INTRODUCTION

Birth injuries can be described as injuries sustained by the neonate due to adverse events occurring during the entire process of delivery. The mechanisms of injury are mechanical and hypoxic – ischemic injury, but injuries sustained during resuscitation of the neonate are not included. It can be preventable or on the other hand inevitable. It can be considered a significant cause of neonatal morbidity and mortality. They are often under reported for fear of harsh critique and its unpleasant consequences. Despite improvement in obstetric care and perinatal diagnosis, birth injuries still occur but its incidence has

decreased over time. The global incidence of birth related injury varies between climes and depends on the mode of delivery with or without attendant complications. Reported incidences ranges from 0.2 - 41.5 per 1000 live birth. Normal vaginal delivery (NVD) has been reported to have a higher rate than cesarean section (C/S).<sup>1-8</sup>

Birth injuries include cephalohaematoma, caput succedaneum, spontaneous intracranial hemorrhage, brachial plexus injuries like Erbs and Klumpke paralysis, fractures (clavicular, humeral and femoral), torticollis and spinal cord injury etc. Cephalohaematoma and clavicular injuries are the most reported by majority of the literatures. "For their successful management great expertise and empathy is required by all care givers".<sup>2-4</sup>

Risk factors associated with birth injuries

**Correspondence to:** Asuquo J. E  
Department of Orthopaedics & Traumatology,  
University of Calabar, PMB 1115 Calabar, Nigeria.  
E-mail: itansuq@gmail.com

include, gestational age, instrumental deliveries, malpresentations, large babies, complications of labor and experience of birth attendant. Some consider it a reflection of the regions or country's perinatal care especially in developing countries.<sup>3-6</sup>

In Nigeria literatures reporting birth fractures and peripheral nerve palsies are scarce.<sup>5-7</sup> In Calabar located in southern Nigeria no study has reported these injuries. In this study we aimed at investigating the predisposing factors and determine the prevalence of birth fractures and nerve palsies.

## METHOD

This was a descriptive hospital based epidemiological study, conducted from January 2014 - December 2016. The University of Calabar Teaching Hospital is a referral center for the state and its environs. It offers specialist services amongst which is paediatric orthopedic specialty. Calabar is located in the south-south part of Southern Nigeria with Cameroun as one of its borders. The sample size was determined by convenience sampling method. Semi-structured questionnaires were administered to parents or guardians of patients who presented with birth fractures and birth palsies at the paediatric orthopaedic clinic by the leading author, co-authors and research assistants. All parents or guardians were required to give informed consent before being enrolled into the study. Patients who did not meet these criteria were excluded but all newborns seen at the period were documented.

The semi-structured questionnaire contained questions (that were simple and easy to understand) on the sociodemographic characteristics as well as maternal and fetal factors predisposing to birth fractures and nerve palsies. These includes inquiry into the maternal parity, mode of delivery (spontaneous vaginal or cesarean), maternal co morbidity (like hypertension, diabetes and obesity), duration of labour, gestational age of

fetus at birth (was sonography used in determination at any point during pregnancy?), skill of birth attendant, multiple gestations if any, and facility of birth (primary, secondary or tertiary health facility, amongst others. These questions were explained to the parents in English. Those who were not literate were interviewed using their native dialect to facilitate better understanding, cooperation and reduce errors.

Patients with suspected fracture were diagnosed clinically (presenting with pain, deformity and pseudo paralysis of the affected limb) and plain radiographs were used to confirm the fractures (using protective shields on sensitive parts from radiation). Computed tomography was not done on any patient. Those with suspected brachial plexus or nerve injuries were diagnosed clinically (presenting with inability to move or abnormal positioning of the limb), none had magnetic resonance imaging and nerve conduction studies done. Those with fractures were managed non-operatively with Plaster of Paris (POP) immobilization while those with nerve palsies had gentle physiotherapy with or without nerve stimulation to avoid contractures. All patients have a minimum follow-up for six months.

Data was analyzed using the Statistical package for social sciences (SPSS) version 22 (registered trade mark of the International business machine IBM).The p-value of <0.05 was considered statistically significant inference.

Ethical clearance was obtained from our Institutional Ethics and Health Research committee.

## RESULTS

Forty-six patients were enrolled into the study. Twenty-four were females (52.2%). Male to female ratio was 1: 1.1. Thirty-five (76.1%) were seen within a week of delivery.

The point prevalence of birth fractures in our study is 24.6/1000 newborn. Thirty-two patients (60.9%) had fractures but there was a total of thirty-five fractures (there was a bilateral clavicular fracture, bilateral femoral fractures, also, ipsilateral humeral and clavicular fractures respectively). See Table 1. The prevalence of clavicular fracture is 13.8 / 1000 while that of femoral fracture is 5.4 / 1000 newborn respectively.

The point prevalence of brachial plexus or nerve palsy is 10.8 / 1000 newborn. Fourteen patients had nerve palsy. See Table 1. The prevalence of Erb's palsy in our study is 10 / 1000 newborn.

Twenty-seven (58.7%) mothers were delivered by a midwife (nurse) while 9 patients were delivered by a doctor (either an obstetrician or medical officer). Only one was delivered by a traditional birth attendant (untrained or unskilled birth attendant). See Table 2.

Regarding the parity of the mothers, 14 (30.4%) were primipara, while 26 (54.5%) were multiparous (2-4 children). Thirteen mothers (13.1%) were grandmultipara, >5 children. Twenty nine (63%) of the patients had a birth weight of  $\geq 2.5\text{kg}$  but  $\leq 3.9\text{kg}$  while 17(37%) weighed  $\geq 4\text{kg}$  at birth. All the mothers were Educated but 26 (56.5%) had Tertiary Education. None of the mothers had maternal diabetes but 2(4.3%) were moderately obese.

Most of the mothers (n=20, 43.5%) delivered at a secondary health care facility, fifteen (32.6%) delivered in a tertiary health care facility while 5(10.9%) delivered in a primary health care facility and at home respectively. See Table 2.

Thirty-eight mothers (82.6%) had spontaneous vaginal delivery (SVD) while 8 (17.4%) had cesarean section (C/S). Cesarean section was consistently related to lower incidence of birth trauma and was significant with a p-value of 0.04. See Table 2.

**Table 1: Showing the distribution of fractures and brachial plexus injuries**

<b>Variable</b>	<b>Frequency</b>
<b>Bone Fractured</b>	
Clavicle	18
Humerus	6
Femur	7
Tibia	1
<b>Brachial Plexus Injury</b>	<b>Frequency</b>
Erbs palsy	13
Klumpke Palsy	1

**TABLE 2: Showing the distribution of risk factors and associated injuries with their statistical significance**

Risk factors	Brachial Plexus Injury	Fracture	Significance
<b>Place of Birth</b>			$X^2 = 0.24$ df = 1 P = 0.62
Urban	12 (29.3)	29 (70.7)	
Rural	2 (40.0)	3 (60.0)	
<b>Facility type</b>			$X^2 = 3.8$ df = 4 P = 0.43
Tertiary	5 (33.3)	10 (66.7)	
Secondary	4 (20.0)	16 (80.0)	
Primary	2 (40.0)	3 (60.0)	
Delivery homes	1 (100.0)	0 (0.00)	
Home	2 (40.0)	3 (60.0)	
<b>Gestational age</b>			$X^2 = 2.3$ df = 1 P = 0.12
Preterm	1 (100.0)	0 (0.0)	
Term	13 (28.9)	32 (71.1)	
<b>Booking status</b>			$X^2 = 0.37$ df = 1 P = 0.53
Booked	13 (29.5)	31 (70.5)	
Un-booked	1 (50.0)	1 (50.0)	
<b>Parity of mother</b>			$X^2 = 0.77$ df = 2 P = 0.67
" - "	3 (21.4)	11 (78.6)	
" - "	9 (34.6)	17 (65.4)	
" - "	2 (33.3)	4 (66.7)	
<b>Duration of labour</b>			$X^2 = 6.22$ df = 3 P = 0.10
Less than 4hrs	1 (20.0)	4 (80.0)	
4 – 12hrs	4 (20.0)	16 (80.0)	
12 – 24hrs	7 (36.8)	12 (63.2)	
> 24hrs	2 (100.0)	0 (0.00)	
<b>Birth weight(Kg)</b>			$X^2 = 1.4$ df = 1 P = 0.22
2.5 – 3.9kg	7 (41.2)	22 (75.9)	
" - "	7 (41.2)	10 (58.8)	
<b>Obesity</b>			$X^2 = 0.34$ df = 1 P = 0.55
Yes	1 (50.0)	1 (50.0)	
No	13 (30.2)	30 (69.8)	
<b>Mode of delivery</b>			$X^2 = 4.23$ df = 1 P = 0.04
Spontaneous vaginal delivery	14 (36.8)	24 (63.2)	
Caesarean section	0 (0.00)	8 (100.0)	
<b>Skill of birth attendant</b>			$X^2 = 2.6$ df = 3 P = 0.45
Traditional birth attendant	1 (100.0)	0 (0.0)	
Nurse midwife	8 (29.6)	19 (70.4)	
Medical officer	3 (33.3)	6 (66.7)	
Specialist	2 (22.2)	7 (77.8)	

## DISCUSSION

There were relatively more females than males in our study, these may be due to the small sample size and hospital based study. Our finding was similar to that reported by other studies.<sup>2, 7, 9, 13</sup> Gender has never been reported as a risk factor but some studies are of the opinion that it should be kept in view.<sup>3,12,14</sup>

The finding of clavicular fracture being the commonest is in tandem with most studies

and they usually present late in most instances when the fracture has already healed.<sup>1-3, 5-8, 10, 11,13</sup> Femoral fractures were commoner than humeral fracture in our study, these were similar findings in other studies in Nigeria.<sup>5-7</sup> The reason may be the fact that in developing countries like Nigeria, there is preference for vaginal delivery over C/S despite adequate medical counseling and obvious risk factors due to sociocultural beliefs. Some studies have different opinions

regarding femoral and humeral fractures with respect to which is most common.<sup>8,10,11,13</sup> In our hospital which is a tertiary center, the residents doctors and the midwives carry out normal deliveries. Birth fractures still occur despite the presence of this skilled manpower. There is no clear risk factor associated with this injury from our study but factors such as maternal obesity, vaginal delivery, skill of birth attendant and gestational age at delivery are a predisposing factor though not significant statistically.

There was a high prevalence of brachial plexus injuries in this study, with Erb's palsy being the commonest. This is similar to that reported by other studies. These studies reported a relatively low incidence, contrary to the findings in our study.<sup>1,8,10,12</sup>

Determinations of these epidemiological variables (incidence and prevalence) are not the same. This may be due to small sample size and the fact that it's a clinic based study. None of the studies in Nigeria has documented the prevalence of these injuries. In our study only seven deliveries were not within the three tiers of health care but the number of birth injuries recorded were few compared to that in the health facilities. The reason may be that they are gradually being faced out or people are increasingly becoming aware of their harmful practices.

In our study, cesarean section was associated with less fractures and brachial plexus injuries. This is in keeping with reported findings from other studies.<sup>1-4,8-11</sup>

However, there has been documentation from other studies with contrary views, especially if C/S was used in delivery of difficult or breech presentation or where a low segment vertical incision was used to decrease maternal morbidity could lead to high risk for birth fractures and brachial plexus injury.<sup>13,14</sup>

Other documented risk factors associated with various forms of birth injuries were not statistically significant in our study. These findings were similar to that reported by an Indian study.<sup>14</sup> This implies that birth fractures and brachial plexus injuries will occur despite improvement in obstetric care, presence or absence of risk factors and presence of preventive measures. This does not negate the importance of the risk factors which serves as red flags to the attending physician.

## CONCLUSION

Clavicular fracture was the commonest birth fracture while Erb's palsy was the commonest brachial plexus injury. Cesarean section was associated with less risk of developing these birth fractures and nerve injuries. Maternal obesity, preterm, unskilled birth attendant, birth weight and vaginal delivery are predisposing factors associated with these injuries. There is a need to improve upon the existing obstetric care and a general change in cultural or superstitious beliefs regarding pregnancy and delivery.<sup>15</sup>

## LIMITATIONS

1. This was a hospital based study, which may not be a true reflection of the general population.
2. Small sample size therefore strong statistical inference cannot be made.
3. Not a comparative study, making it difficult to make certain statistical conclusions.

There is need to conduct a large multicenter comparative cohort such that certain statistical inference can be made to reflect the entire population.

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