East African Medical Journal Vol. 95 No. 6 June 2018
SPECTRUM OF BIRTH TRAUMA AND PREDISPOSING FACTORS; EXPERIENCE IN TWO NIGERIAN TERTIARY HEALTH FACILITIES
Dr. Philemon E. Okoro MBBS Nig, FWACS, FICS, FACS Senior Lecturer and Consultant Pediatric Surgeon, Pediatric Surgery Unit, Department of Surgery, University of Port Harcourt, & University of Port Harcourt Teaching Hospital, Nigeria. Dr. V. K. Oriji MBBS, FWACS, FICS Senior Lecturer and Consultant Obstetrician & Gynecologist, Department of Obstetrics and Gynecology, University of Port Harcourt, & University of Port Harcourt Teaching Hospital, Nigeria.

Corresponding author: Dr. Philemon E Okoro. Department of Surgery, University of Port Harcourt Teaching Hospital, PMB 6173 Port Harcourt, Nigeria, Email: philemon.okoro@uniport.edu.ng, phileokoro@yahoo.com.

SPECTRUM OF BIRTH TRAUMA AND PREDISPOSING FACTORS; EXPERIENCE IN TWO NIGERIAN TERTIARY HEALTH FACILITIES

P. E. Okoro and V. K. Oriji

ABSTRACT

Objectives: **To highlight the spectrum of birth trauma encountered in our practice, identify the risk factors, and the management outcome in two tertiary health facilities in Nigeria.**

Design: **A five-year prospective case control observational study carried out between June 2013 and May 2018.**

Setting: **The Departments of Obstetrics and Gynaecology, Paediatrics, Surgery and Family Medicine of: Federal Medical Centre, Owerri, Imo State Nigeria and University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria**

Subjects: **Consecutive cases of birth trauma in infants seen within six weeks of life, and a control group of randomly selected similar infants without birth trauma. Factors investigated in this study were gestational age at birth, type of health facility, mode of delivery, presentation of baby during delivery, status of birth attendant, birth weight and maternal parity.**

Results: **There were 128 cases of birth trauma seen in 107 patients (BT group) during the study period. Forty six of these BT were delivered in our institutions giving hospital incidence of 3.1/1000 live births. Breech presentation, vaginal delivery, congenital malformation, instrument-assisted delivery, and birth weight above 3.5Kg were significantly associated with birth trauma.**

Conclusion: **A wide spectrum of birth trauma is encountered in our region and it is slightly different from those reported from other regions. Traumatized or ruptured congenital body swellings have been identified as a major predictor of mortality in patients with birth trauma in our region.**

Conflicts of interest: **The authors have no conflicts of interest in carrying out this study. The entire study was funded by the authors themselves.**

INTRODUCTION

Birth injury is any condition that affects the foetus adversely during delivery. It comprises injuries resulting from asphyxia on the one hand, and those from mechanical forces on the other (1,2). Birth trauma (BT) is any form of mechanical or physical injury which a new borne baby sustains in the course of being delivered from its mother's womb. This study is limited to mechanical and physical injuries to the foetus in the course of delivery of the baby and does not include non-mechanical injuries related to asphyxia or hypoxic injury during the course of delivery. BT is one of the causes of morbidity and sometimes mortality in the new borne babies. The incidence of the various types of BT has been put at 2-7.5/1000 singleton full term live births (3,4). The incidence of BT is not documented in most parts of Sub Saharan Africa. However, it is expected to be higher than what is reported from the advanced countries due to the lower quality of obstetric services in most parts of Sub Saharan Africa. Apart from accounting for some of the cases of infant mortality, BT can leave the patient with long term deformity and disability (5,6). Despite being a common occurrence, reports on the spectrum of birth trauma and the predisposing factors are scanty in our region. Predisposing factors to BT have been reported by researchers from other regions of the world (7,8,9). However, these may not be a true reflection of the scenario in our region. This study therefore seeks to investigate the spectrum of the birth traumas in babies, predisposing factors and outcome in our region.

MATERIALS AND METHODS

This is a 5 year case control study of infants diagnosed with birth trauma and those without birth trauma in two tertiary health facilities in southern Nigeria between June 2013 and May 2018. We defined birth trauma as any form of mechanical injury or deformity traceable to the process of birth and that is clinically observable in the baby within six weeks of life. A proforma was designed to capture the following data: Gestational age at birth, type of health facility, mode of delivery, presentation of baby during delivery, status of birth attendant, birth weight and mother's parity, type and severity of trauma demonstrable within 48 hours of birth and or at 6 weeks, treatment given, duration of follow up. Consent was obtained from the parents of the babies after due explanation of the study. Consecutive cases of birth trauma seen in the labour room, obstetric theatre, post-natal ward and special care baby unit of the two institutions, as well as cases referred from other health facilities and seen within 48 hours of birth were included. Patients whose birth traumas were recognized at 6 weeks immunization visit were also included. These patients with birth trauma were categorized as the BT group. Patients in whom no evidence of birth trauma was found both within 48 hours and at six weeks were randomly selected to form the control nBT group. Exclusion criteria were- non birth related trauma, cases first seen beyond 48 hours of birth, incomplete data, or refusal to consent. Data was analysed using the SPSS version 20. Test of statistical significance was set at $p<0.05$.

RESULTS

There were 14,814 live births during the study period in the two locations of this study; 8,111 were vaginal deliveries while 6,703 were caesarean. There were 128 cases of birth trauma seen in 107 patients (BT group) during the study period. Forty six of these BT were delivered in our institutions giving hospital incidence of 3.1/1000 live births, whereas 61 (57%) were delivered in

other institutions. They comprised 49 males and 58 females. There were also 107 controls (nBT group) who did not have any evidence of BT. One hundred and three (80.5%) of the BT cases were diagnosed at birth, but 25 (19.5%) were recognized at six weeks. For the participants without BT (nBT group), 52 (48.6%) were delivered in our centre, and 55 (51.4%) were delivered in other health institutions (p<0.16). The status of the birth attendants was not significantly different between the two groups (Fig 1). The types of birth trauma encountered are shown in table 1. For the BT group, 98(91.6%) were delivered by vaginal route while 9 (8.4%) were by caesarean section whereas for the nBT group 68(63.6%) were by vaginal route and 39(36.5%) by caesarean section. P<0.05. Of the 68 patients who were delivered vaginally in the nBT group, 65(95.6%) were of cephalic presentation while 3(4.4%) were breech presentation. For the BT group, 66 (67.3%) were cephalic presentation and 32(32.7%) were breech presentation. P<0.05. The mothers whose babies were in the BT group were nullipara 39(36.4%) and multipara 68 (63.6%), whereas for the nBT group, it was nullipara 12(11.2%) and multipara 95(88.8%). P<0.10 in terms of the GA at birth, there was no significant difference between the BT and the nBT group. (Table 2). Use of instruments during childbirth significantly increased risk of trauma (Table 3). The birth weights of participants in the BT group were 3.5kg or less in 49(45.8%) participants, and greater than 3.5kg in 58(54.2%) participants. The birth weights in the nBT group were 3.5Kg or less in 67(62.6%) participants, and greater than 3.5Kg in 40 (37.4) (p<0.05). There was presence of a congenital swelling in 18(16.8%) of the BT group and in 5(4.7%) of the nBT group (p<0.05). The correlation coefficient for maternal parity, status of the birth attendant, and level of health institution were low. The treatment given and the outcome are as shown in Figures 2 and 3. Eight of the patients in the BT group died; of these, 5 had ruptured omphalocoele, 2 had hydrocephalus with scalp and brain contusion, and 1 had ruptured meningomyelocoele.

Table 1

Types of birth trauma encountered in this study

Type of trauma	**No of cases**	**Percentage**
Bracheal plexus injury	22	17.2
Hip dislocation	3	2.3
Clavicular fracture	16	12.5
Cephalhaematoma	10	7.8
Intracranial haemorrhage	2	1.6
Scalp laceration	9	7.0
Scalp bruising/ echymosis	26	20.3
Subconjunctival haemorrhage	19	14.8
Subgaleal haematoma	3	2.3
Ruptured omphalocoele	9	7.0
Ruptured/ bruised sacrococcygeal tumour	7	5.5
Ruptured meningocoele	2	1.6
Total	**128**	**100**

Table 2

Gestational age at birth

Gestational age (Weeks)	Birth Trauma (BT)	Non Birth Trauma (nBT)
<36 (Premature)	-	2
36 – 38 (Preterm)	32	16
38 – 42 (Term)	73	84
42 (Post term)	2	5

P<0.26

Table 3

Use of instruments in deliveries

Instruments used for vaginal delivery	Birth Trauma (BT) (n=98)	Non Birth Trauma (n=68)
None	48	59
Ventous vacuum extractor	37	7
Forceps	13	2

P<0.05

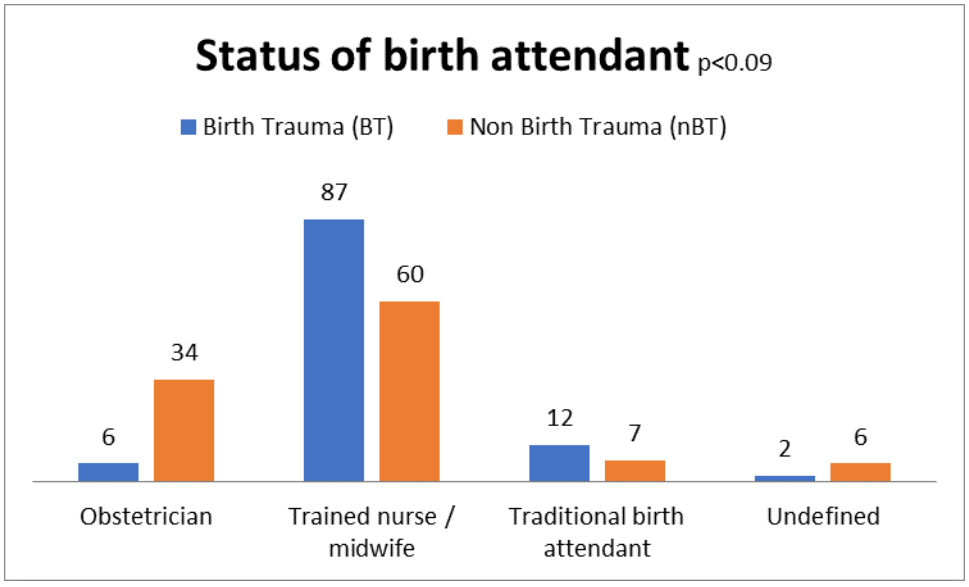

Figure 1: Status of birth attendants

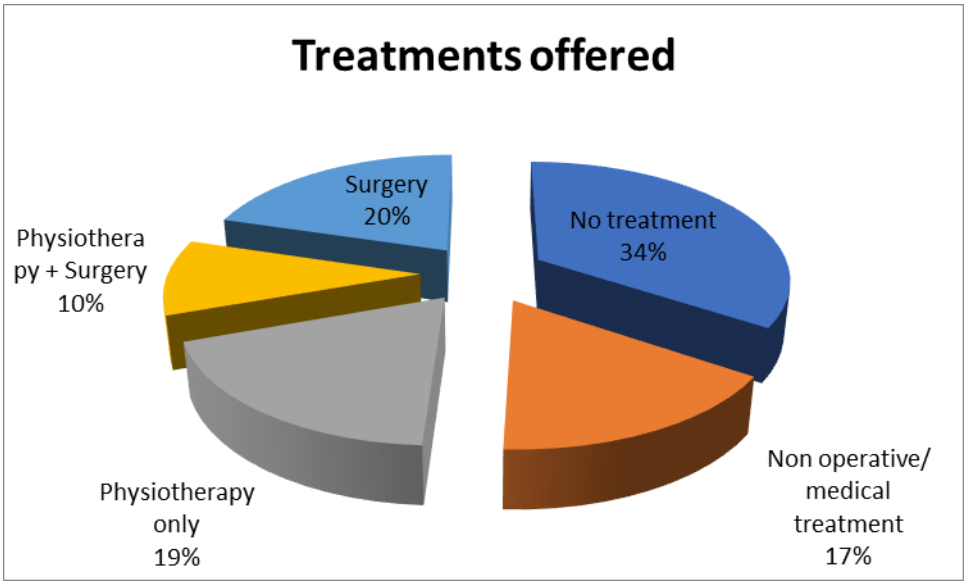

Figure 2: Treatments offered

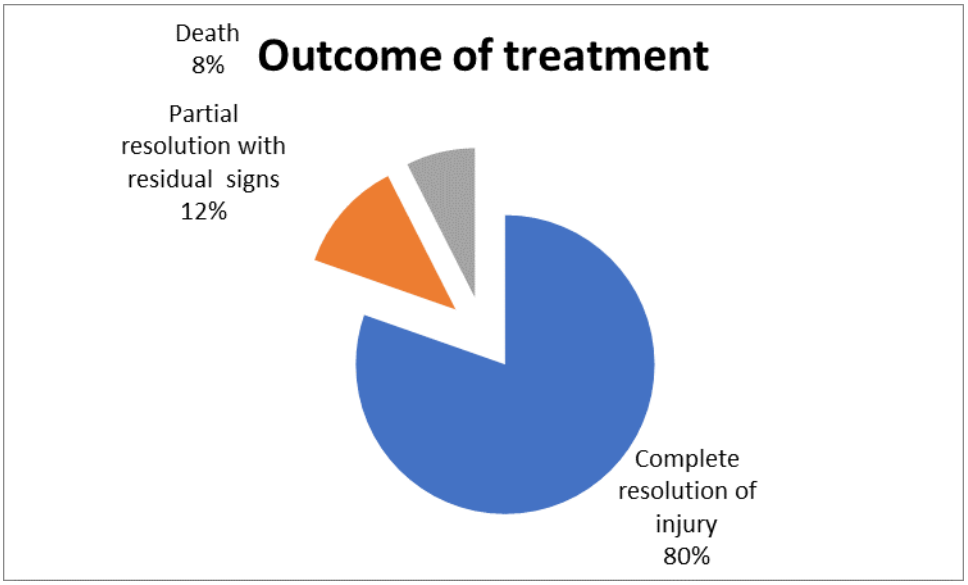

Figure 3: Outcome of treatment

DISCUSSION

Birth trauma is among the causes of morbidity and mortality in neonates in our region. The incidence in our series is within the range reported from other parts of the world. However, the calculated incidence excluded cases from outside the institutions of this study and may therefore not be the true incidence. The range of birth injuries encountered in our region is quite wide and of varied severity. The head and neck regions are the most commonly affected regions. Scalp bruises and ecchymosis are the commonest forms we encountered in the head and neck region. This differs from the report by Hughes et al which identified cephalohematoma as the commonest BT in the head and neck region (10). On the other hand, Linder et al reported scalp injuries and clavicular fractures as the commonest injuries in their series (11). The spectrum of birth trauma in our series appears slightly different from that reported by Hughes.

Whereas they encountered skull fractures, facial and laryngeal nerve injuries, and nasal injuries, we did not encounter those in our series (6). These differences may be related to differences in obstetric practices in the different regions. This study identified breech presentation, vaginal delivery, congenital malformations, instrument assisted deliveries, and birth weight above 3.5Kg, as factors predisposing to birth trauma. It also showed that the gestational age at delivery, the status of the institution, and the mothers parity do not affect the risk of birth trauma in our practice. This is at variance with findings by Levine et al which related gestational age and maternal parity to the occurrence of birth trauma (9). The issue of parity as a risk factor for BT remains a controversy. The tightness of the birth canal in nulliparous women has been shown to be associated with longer period of pushing during second stage of labour in nulliparous women (12). On the other hand, multiparous women are prone to precipitous labour. These factors seem to cancel themselves out and so exclude parity as a predisposing factor. These findings are very promising in assisting the obstetrician to recognize patients whose babies are at risk of birth trauma and enables him decide on the best option of mode of delivery. However, these findings as well as those by other researchers show that the presence of these risk factors cannot predict the occurrence of birth trauma (11,13). The nurses and midwives conducted the vast majority of the deliveries in this series. Accordingly, the majority of the BT cases were delivered by them. However, the percentages of BT cases versus the total number of cases delivered by each category of attendants were similar. However, the more severe cases tended to be those delivered by the less trained category of attendants. The injuries following caesarean delivery occurred more with the obstetricians, and its incidence depended on the experience of the obstetrician and the presence of other reported risk factors (14). On the other hand, another report identified nurse attendant as a risk factor to birth fractures (15). Despite being common, many of the cases of birth trauma in our series were mild and did not require any specific treatment. Some of the cases of brachial plexus injury resolved completely with physiotherapy. Some of our patients had both brachial plexus palsy and clavicular fracture due to dystocia. However, many others had clavicular fracture without brachial plexus. This makes it unlikely that clavicular fracture is an independent risk factor to brachial plexus injury. This is in line with the finding by Gandhi et al but at variance with report by Casellas et al (16,17). All the clavicular fractures in this study followed vaginal delivery, indicating that it is rare in Caesarean section. Choi et al in their report placed the incidence at clavicular fracture at 0.05% of the total livebirths in their centre (18). It was interesting that some of the cases of birth trauma were not apparent at birth but became obvious at the six weeks visit. This means that one cannot completely rule out birth trauma with the clinical examination of the new borne. The majority of the BTs in our series were minor. This is reflected in the fact that only 30% of the BT group required some form of surgical intervention. The rest either did not require any treatment, required only physiotherapy, or some medical treatment with oral or topical agents. The outcome in the patients was also good with about 80% of cases resolving completely within the one year period of follow up in our series. This is similar to what was reported by researchers in other parts of the world 19,20). Erbs palsy, and hip dislocation were among the conditions that had partial resolution as at one year follow up. All the cases of mortality we encountered were cases of injury to a congenital malformation. This points to the

fact that these congenital anomalies are not only predisposing factors to birth trauma but among the commonest indicators of mortality in BT in babies in our practice. It also highlights the problem of inadequacy of prenatal diagnosis in our region, which would ordinarily guide the choice of mode of delivery in those situations. We recognize the possible interaction of the various studied risk factors in this study in causing birth trauma; for instance, birth weight and route of delivery. We consider this a shortcoming of this study and vacuum to be filled by further studies on this subject.

CONCLUSION

A wide spectrum of birth trauma is encountered in our region and it is slightly different from those reported from other regions. The local incidence may be within the range reported in other regions of the world. Predisposing factors here include breech presentation, vaginal delivery, congenital malformations, instrumental vaginal deliveries, and birth weight above 3.5Kg. The presence of these factors should be considered indicators for extra caution in delivering babies. Traumatized or ruptured congenital body swellings have been identified as a major predictor of mortality in patients with birth trauma. This highlights the need for improvements in obstetric care in our region to ensure that such congenital malformation are looked out for and diagnosed prenatally. This will make for proper planning for the safest mode of delivery to avoid birth trauma in those situations.

REFERENCES

1. Potter EL. Pathology of the foetus and infant. 2nd ed. Chicago, Ill Year Book Medical Publishers Inc1961.
2. Gresham EL Birth trauma. *Pediatr Clin North Am*. 1975;22317- 328.
3. Levine MG, Holroyde J, Woods JR. Birth trauma: incidence and predisposing factors. *Obstet Gynecol*.1984;63792- 795.
4. Salonen IS, Uusitalo R. Birth injuries: incidence and predisposing factors. *Z Kinderchir*. 1990;45133- 135.
5. Iffy L, Varadi V, Papp Z. Epidemiologic aspects of shoulder dystocia-related neurological birth injuries. *Arch Gynecol Obstet.* 2015;291(4):769-77.
6. Gordon M, Rich H, Deutschberger J, Green M. The immediate and long-term outcome of obstetric birth trauma. I. Brachial plexus paralysis. *Am J Obstet Gynecol.* 1973; 117(1):51-6.
7. Donn SM, Faix RG. Long-term prognosis for the infant with severe birth trauma. *Clin Perinatol.* 1983;10507- 520.
8. Peleg D, Hasnin J, Shalev E. Fractured clavicle and Erb's palsy unrelated to birth trauma. *Am J Obstet Gynecol.* 1997;177(5):1038-1040.
9. Perlow JH, Wigton T, Hart J, Strassner HT, Nageotte MP, Wolk BM.Birth trauma. A five-year review of incidence and associated perinatal factors. *J Reprod Med.* 1996; 41(10):754-760.
10. Hughes CA, Harley EH, Milmoe G, Bala R, Martorella A.Birth trauma in the head and neck. *Arch Otolaryngol Head Neck Surg.* 1999;125(2):193-199. doi:10.1001/archotol.125.2.193.
11. Linder N, Linder I, Fridman E, Kouadio F, Lubin D, Merlob P et al. Birth trauma – risk factors and short-term neonatal outcome. *J Matern Fetal Neonat Med* 2013 ;26 (15):480.
12. Grobman WA, Bailit J, Lai Y, Reddy UM, Wapner RJ, Varner MW. Association of the duration of active pushing with obstetric outcomes. *Obstet Gynecol.* 2016 ;127(4):667-73.
13. Wang H, Luo B, Tong XM. A single-center study of the incidence of neonatal birth trauma and its risk factors. *Zhongguo Dang Dai Er Ke Za Zhi.* 2019;21(3):249-252.
14. Dolivet E, Delesalle C, Morello R, Blouet M, Bronfen C, Dreyfus M, et al. A case-control study about foetal trauma during caesarean delivery. *J Gynecol Obstet Hum Reprod.* 2018;47(7):325-329.

15. Ariyawatkul T, Worawuthangkul K, Chotigavanichaya C, Kaewpornsawan K, Chalayon O, Eamsobhana P. Potential risk factors for birth fractures: a case-control study. *Int Orthop.* 2017;41(11):2361-2364.
16. Casellas-García G, Cavanilles-Walker JM, Albertí-Fitó G. Clavicular fracture in the newborn: Is fracture location a risk factor for obstetric brachial palsy? *J Neonatal Perinatal Med.* 2018;11(1):61-64.
17. Gandhi RA, DeFrancesco CJ, Shah AS. The association of clavicle fracture with brachial plexus birth palsy. *J Hand Surg Am.* 2019; S0363-5023(18):30241-7.
18. Choi HA, Lee YK, Ko SY, Shin SM. Neonatal clavicle fracture in caesarean delivery: incidence and risk factors. *J Matern Fetal Neonatal Med.* 2017;30(14):1689-1692.
19. Michelow BJ, Clarke HM, Curtis CG. The natural history of obstetrical brachial plexus palsy. *Plast Reconstr Surg.* 1994: 93(4):675-80.
20. Haerle M, Gilbert A. Management of complete obstetric brachial plexus lesions. *J Pediatr Orthop*. 2004; 24(2):194-200.