

Fetal and Maternal Risk Factors Associated With Birth Trauma

Intisir A.Alghafoor^{a*}, Ghusoon Saadoon.Hasan^b

Abstract

Background Birth traumas contribute significantly to the perinatal morbidity and mortality, sometimes with long term sequelae in developing countries. The objective of this Case-control study is to identify the main risk factors associated with birth trauma. There were 136 cases and 136 controls in Maternity Teaching Hospital/Baby Care Unit /mosul. The following variables were recorded in the study: a) maternal variable: age and parity, delivery. Study variables were spontaneous vaginal deliveries, assisted instrumental vacuum or forceps deliveries, deliveries by cesarean section; b) newborn variable: type of injury, site of injury, birth weight, gestational age, fetal presentation.

The results show that the Mode of delivery, primiparous, maternal age <35 years, delivery by cesarean section were the main risk factors associated to birth injuries. Regarding fetal variables term pregnancy with cephalic presentation and fetal weight >3.5kg were found to be highly associated with birth trauma.

As conclusion we can say that risk factors associated with birth injuries identified in this study involved maternal conditions, neonatal conditions and mechanism of delivery.

Keywords: birth trauma; maternal variable; gestational age.

* Corresponding author.

1. Introduction

Majority of birth injuries are minor & self-limiting, some birth injuries may be so severe as to be fatal or leave the child with a permanent disability. Overall 5-8, newborn infants/1000 live births die of mechanical injuries, while about 25/1000 die of hypoxic injuries [1]. Birth injuries occur due to avoidable and unavoidable mechanical force sustained on the fetus at labor and delivery, it may occur because of inappropriate or deficient medical skills but also can occur despite skilled and competent obstetrical care [2, 3].

The causes of birth injuries are multifactorial and may follow normal or abnormal vaginal and operative abdominal deliveries due to mechanical impact on the fetus during birth, and pressure in birth canal. Beside traction and pressure, produced by progress of labor & manipulation during delivery. There are several factors predispose fetuses to birth traumas including an abnormally large body, a disproportionately large head, a difficult labor, breech presentation and poor instrumental technique [4]. The improvements in obstetric practice have resulted in a reduced incidence of birth trauma cases especially in this study was under taken to search the main risk factors associated with birth trauma amongst live births at the Al-batool Teaching Hospital.

2. Methodology

Case-control study was designed to study the main risk factors associated with birth traumas at maternity Teaching Hospital from 1st January 2016 to 30 December 2017. The study groups composed of 136 deliveries with birth trauma, where the control group 136 selected randomly amongst the deliveries without birth traumas. The data collection; birth registry records of the obstetrics department, registry records of the NICU (Neonatal Intensive Care Units) were reviewed. Data such as fetal presentation, mode of delivery, maternal age, birth weight, and parity were collected from these records. For all the newborns included in this study, the newborn examination files were reviewed. The data regarding any newborn with birth traumas were recorded. Birth trauma was coded in this study with the same coding numbers of International Classification of Diseases, Tenth Revision, chapter 16. Certain conditions originating in the perinatal period coded from (P00-P96). The ICD-10-CM was the official system of assigning codes to diagnoses and procedures associated with hospital utilization worldwide since 1993. Birth trauma was further classified by specific type of birth trauma (P10-P15), including intracranial laceration & hemorrhage (P10), other injuries to central nervous system (P11), birth injuries to scalp including cephalhematoma (P12), birth injury to skeleton excluding injury to spine (P13), birth injury to peripheral nervous system (P14) & other birth injury (P15). **Statistical Analysis** Statistical calculations were performed with Graph Pad Prisma V.3 program for Windows. In addition, standard descriptive statistical calculations (mean, standard deviation, median, frequency distribution) for continuous random variable unpaired t-test (according to Levine's test criteria) were used to compare the control and study groups. Chi-square test and odds ratio (OR) were performed during the evaluation of qualitative data. Statistical significance level was established at $p < 0.05$.

3. Results

Figure (1) show the distribution of birth trauma among study population : It include upper limbs fractures

(22.1%), Subgalial haematoma (16.9%), Erb's palsy (14.7%), gangrene of scrotal sac constituted (15.4%), Cephalous haematoma (8.1%), and fracture clavicle (5.1%) respectively. The main fetal variable associated with traumas shown in table (1): cephalic fetal presentation (P-value = 0.000, OR=3.177 and 95% CI 10.0112), fetal weight >3.5kg (P-value = 0.021, OR = 1.0960 and 95% CI 3.2449) and preterm pregnancy (P-value= 0.007, OR=2.04 and 95% CI 3.4182). For maternal variables, the main risk factor found to be associated with birth trauma are maternal age <35 years (P-value= 0.029, OR=1.71 & 95% CI =1.0554-2.7592) and maternal prim parity (P value =0.016, OR=1.85 & 95% CI =1.117-3.0601). For mode of delivery, delivery by cesarean section (P-value= 0.031, OR 1.74 and 95% CI 2.8840) was found to be highly associated with trauma as in table(3).

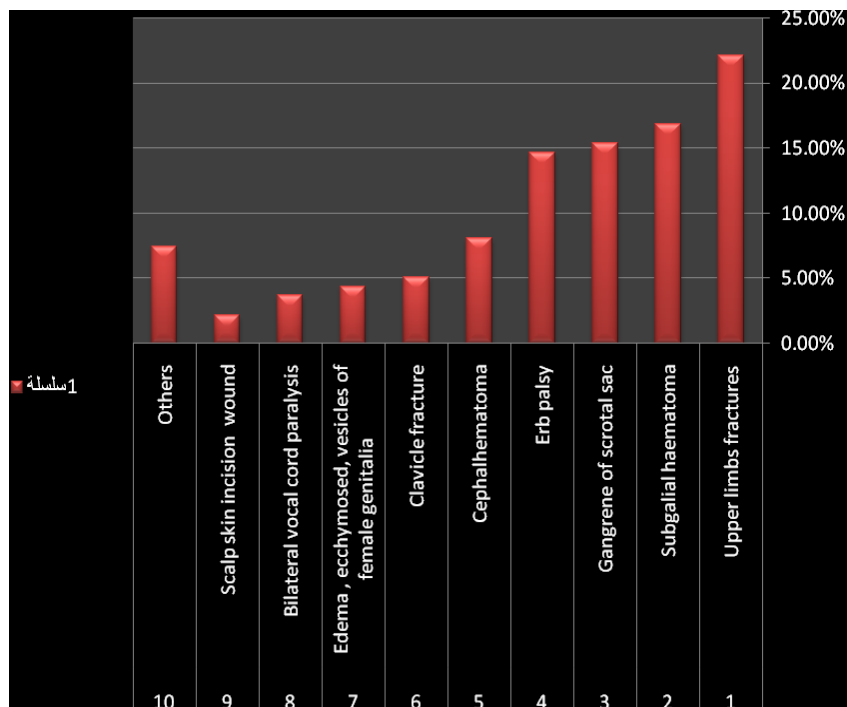


Figure 1: The distribution of birth trauma among study population

4. Discussion

In our study the main maternal risk factors for birth trauma are women <35 years old (P-value=0.029) and maternal prim parity (P-value =0.016), The result of this study go with Seth J. Scholer, 2008 in his study found advanced maternal age and fetus with vertex presentation (p=0.012) are regarded important risk factors for upper limb fracture and head trauma which is the same view of Sherman D and Halamish-Shani T studies were the reporting rate for Erb's palsy varied between 0.5-1.2 cases per 1,000 newborns. women in the study group were older, with higher parity and have diabetic traits [6,7]. our study result was disagree with a study in Academic tertiary care medical center in Nigeria by Anthony Hughes 2011, in spite the result of his study were highest risk infants for birth trauma were born to mothers who were younger than 20 years compared with older than 30 years (RR, 3.25; 95% CI, 2.92–3.63) those mother had more than 2 other children

compared with no other children (RR, 3.15; 95% CI, 2.88–3.45), were unmarried (RR, 1.67; 95% CI, 1.57–1.78 (6). J H Laing in his study recognized factors for birth injury: maternal prim parity, (odds ratio 1.34; 95% confidence intervals 0.61 to 2.97) 39.6% were born to primiparae compared to a national rate of 36.7% (1.13; 0.65 to 1.96) and only 18.9% Weight more than 3500 g at birth(0.37; 0.19 to 0.74) [8].

Table 1: Distribution of birth trauma according to fetal variables

Fetal variable	Case (n =136)	Control (n =136)	P- value	OR	95%CI	
	No %	No % No			Upper	Lower
Fetal presentation						
Vertex presentation	67(49.26)	115(84.56)	0.000	5.64	10.0112	3.1770
Breech presentation	69(50.74)	21(15.44)				
Fetal weight						
>3.5kg	29 (21.2)	22(16.18)	0.277	0.71	1.31542	0.3854
2.5-3.5kg	78(57.36)	68(50.00)	0.224	0.74	1.1993	0.4611
<3.5kg	29(21.32)	46(33.82)	0.021	1.89	2449 3.	1.0960
Gestational age						
Preterm	81(59.56)	102(75.00)	0.007	2.04	3.4182	1.2140
Term	55(40.44)	34(25.00)				
Total	136	136				

Table 2: Distribution of birth trauma according to maternal variables .

Maternal variable	Case (n=136)	Control (n =136)	P- value	OR	95%CI	
	No(%)	No(%)			Upper	Lower
Age						
>35	115(84.56)	67(49.26)	0.029	1.71	11.0554	2.7592
<35	21(15.44)	69(50.74)				
parity						
Primaries	58(42.65)	39(28.68)	0.016	1.85	3.0601	1.1177
Multiparous	43(31.62)	51(22.79)	0.102	0.64	1.0953	0.3723
Grand multiparous	35(39.70)	46(34.56)	0.380	0.80	1.3127	0.4899

Table 3: Distribution of birth trauma according to the mode of delivery

Mode of deliveries	Cases (n=136)	Controls (n=136)	OR	P P- value	95%C.I	
	No.(%)	No.(%)			Lower	Upper
Vaginal	32(23.53)	38(27.94)	0.79	0.405	0.4600	1.3688
Emergency	56(41.18)	39(28.68)	1.74	0.031	1.0510	2.8840
Elective	12(8.82)	20(14.70)	0.56	0.132	0.2627	1.1992
Instrument	36(26.47)	39(28.68)	0.89	0.684	0.5259	1.5245

In our study deliveries of fetuses with vertex presentation($p= 0.000$) are highly associated with trauma than fetuses with breech deliveries. The results of our studies vary considerably from other researchers results [9, 10, 11, 12, 13, 14] which predict unfavorable out come for breech delivery . The rate of birth injury with breech deliveries in most of the studies varies from 13.6% -14.3% of the birth injured babies ,this result disagrees with our study result were head and upper limb trauma highly significant with vertex presentation than in breech presentation The explanation of this variation because our small sample of cases with breech deliveries included in the study were (115cases with cephalic presentation versus 21 cases of vaginal breech deliveries ,because the protocol used for breech deliveries in primiparous and multiparous in our center is by C/S. In our study fetal birth weight $>3.5\text{kg}$ is found to be highly associated with birth trauma (P-value 0.021) .Our stud's result agrees almost all studies [13,15,16,17, 18,19] which reported that macrocosmic infants are at risk for birth traumas such as Erbs palsy and clavicle fracture. Al-Hamaq A [20] in Qatar found birth weight is the most significant risk factors for birth trauma, it is (8% in macrocosmic fetus vs. 3% in average weight; $P < 0.001$) and deliveries of macrocosmic infant had a two-fold risk for birth injuries and it is similar to the opinion of Borna H. in Iran how believed that fetal birth weight is a predictor of brachial plexus injuries [21]. Alok Kumar found 1 in 5 infants in the United States can be identified at birth as having a >10 -fold increased risk of injury mortality compared with infants in lowest risk group. The high risk group include high birth weight ,high parity ,and young age group [22] .While the study of Vishnu Bha 2012 is against our study were fetal with weights $\leq 1500\text{ g}$ at high risk for birth trauma compared with $>2500\text{ g}$ (RR, 3.36; 95% CI, 2.94–3.84) [23]. Term pregnancy is another risk factors associated with birth trauma (P=value.007) , Although, the majority of the Erbs cases followed vaginal deliveries at term, 3% of the cases followed cesarean sections, the majority of which were either elective or in early labor. A quarter of the Erbs cases followed instrument delivery, while the rate of instrumental deliveries in the general population averaged only 5% throughout the study period [24]. Asymptomatic ICH following vaginal birth in full-term neonates appears to be common, with a prevalence of 26% and P= value 0.021. Mothers of neonates with ICH were not more likely to have had assisted vaginal delivery or vaginal, labial, or perineal lacerations [25]. Seth J. Scholer found vaginal delivery of term pregnancy is important risk factor for birth trauma ($P =0 .001$) were vaginal deliveries of term pregnancy is the only significant risk factors for genitalia birth trauma [26]. Regarding mode of delivery , delivery by emergency C/S (P-value=0.031) in our study is highly associated with birth trauma . It is comparable to the findings of a prospective study done in Iran in which the most common birth traumas reported were associated with caesarean section. While the highest rate of injuries from caesarean deliveries, after failure of forceps or vacuum attempts [27]. In tertiary maternity units in Nigeria the highest reported birth traumas was due to delivery by vacuum extraction (2.6%) followed by forceps delivery(0.9%) .One out of every 907 infants delivered by emergency C-Section was associated with fetal birth trauma. Moczygamba and his colleagues comparing vaginal delivery birth traumas, with cesarean section traumas, C/S delivery was associated with increased odds of birth traumas (odds ratio 1.71),primarily due to an increased risk for "other specified birth trauma" (OR 2.61) [28].Conversely cesarean delivery was associated with decreased odds of all birth traumas (OR 0.55), due to decreased odds of clavicle fractures (OR 0.07), brachial plexus (OR 0.10) and scalp injuries (OR 0.55) [28,29]. The high figure of the traumas associated with emergency caesarean sections, or after instrumental delivery, explained by incorrect selection of time for interference with the fetal hypoxia. The neonate exposed to several forces as it passes through the birth canal during an uncomplicated natural

vaginal delivery that can cause birth trauma. Most of instrumental deliveries in this study, were performed by junior resident doctors, with variable skills, instrumental deliveries performed by resident doctors with variable skills may increase the figure of birth traumas. There is however, a consensus that inadequate skill, in the use of these instruments, is a vital factor for increased morbidity [30].

Reference

- [1]. C. Anthony Hughes, Earl H. Harley, Gregory Milmo, Rupa Bala. Birth Trauma in the Head and Neck... Arch Otolaryngol Head Neck Surg. 2005;125:193-199.
- [2]. Batool Azra Haider and Zulfiqar A. Bhutta. Birth Asphyxia in Developing Countries .Curr Probl Pediatr Adolesc Health Care 2006; 123:191-199.
- [3]. Presler JL. Classification of major newborn birth injuries. J Perinat Neonat Nurs 2008; 22:60-67.
- [4]. Looney et al., Brain hemorrhage after vaginal delivery. Radiology 2007;242:535-541.
- [5]. Elizabeth Disu; Oluwarotimi Akinola. Birth Trauma In A Tertiary Maternity Unit In South Western Nigeria. Journal of Pediatrics and Neonatology 2007; (7):
- [6]. Martin JA, Hamilton BE, Sutton Pd, Ventura SJ, Menacker F, Kirmeyer S. Births: final data for 2004. Natl Vital Stat Rep 2006; 55: 1-101.
- [7]. Fabamwo, E. Disu, O. Akinola, L. Adewale & L. Adewole : Birth Trauma In A Tertiary Maternity Unit In South Western Nigeria . The Internet Journal of Pediatrics and Neonatology. 2007 Volume 7 Number 2.
- [8]. Yasemin Akin, Serdar Cömert, Cem Turan, Ağzıkuru, Berrin Telatar Macrosomic newborn: a 3 years review . The Turkish Journal of Pediatrics 2006; 55: 1-101.
- [9]. Di Renzo GC, Rosati A, Sarti RD, Cruciani L, Cutuli AM. Does fetal sex affect pregnancy outcome? Gend Med 2007; 4: 19- 27
- [10]. Mathew M, Machado L, Al-Ghabshi R, Al-Haddabi R. Fetal macrosomia. Risk factor and outcome. Saudi Med J 2005; 26: 96-100.
- [11]. R.L Goldenberg, E.McClur, M.Nalumbah .still birth in developing countries. International Journal of Gynecology & Obstetrics Volume 94, Issue 2 , Pages 82-90, August 2006
- [12]. B.Visnu Bhat, Alok Kumar. Bone injuries during delivery. Indian Journal of Pediatrics Volume 61, Number 4, 401-405, 2008 .
- [13]. Seth J. Scholer, Gerald B. Hickson, Wayne A. Ray. Sociodemographic Factors Identify US Infants at High Risk of Injury Mortality. Paediatr Child Health 29:136-140 .
- [14]. Al Hadi M, Geary M, Byrne P, McKenna P. Shoulder dystocia: risk factors and maternal and perinatal outcome. J Obstet Gynaecol. 2009 Jul;21(4):352-4.
- [15]. JH. Laing , D H.Hamison. B M Jones , G J Laing. Is permanent congenital facial palsy caused by birth trauma. Arch Dis Child. 2008 January; 74(1): 56-58.
- [16]. Lindsay CA. Pregnancy complicated by diabetes mellitus. In: Martin RJ, Fanaroff AA, Walsh MC (eds). Fanaroff and Martin's Neonatal-Perinatal Medicine. Diseases of the Fetus and Infant (8th ed). Philadelphia: Mosby Elsevier; 2006: 326-327.
- [17]. Di Renzo GC, Rosati A, Sarti RD, Cruciani L, Cutuli AM. Does fetal sex affect pregnancy outcome?

Gend Med 2007; 4: 19-30.

- [18]. Boyd ME, Usher RH, McLean FH. Maternal, fetal macrosomia prediction risks, proposed management. *Obstet Gynecol* 2007; 61: 715-722.
- [19]. Looney et al., Brain hemorrhage after vaginal delivery. *Radiology* 2007;242:535-541.
- [20]. Madan A, Hamrick SEG, Ferriero DM. Central nervous system. injury and protection. In: Taeush HW, Ballard RA, Gleason CA, eds. *Avery's Diseases of the Newborn*, 8th ed. Elsevier Saunders, 2005, Pp 965–992.
- [21]. Adetokunbo O. Classification of major newborn birth injuries. *J Perinat Neonat Nurs* 2010; 22:60–67.
- [22]. National Center for Health Statistics. *Classification of Diseases and Functioning, and Disability*. Anthony Hughes, MD: NCHS, 2008. <http://www.cdc.gov/nchs/icd9cm.htm> [last accessed 18 November 2009]. Stein W, Delfy A, Schmidt S . Cesarean section on request at 39 weeks: impact on shoulder dystocia, fetal trauma, neonatal encephalopathy, and intrauterine fetal demise. *Perinatology* 2009; 30:276–287.
- [23]. Hughes CA, Harley EH, Milmoie G, Bala R, Martorella A. Birth trauma in the head and neck. *Arch Otolaryngol Head Neck Surg*. 2009 Feb;125(2):193-9.
- [24]. Moczygemba CK, et al. Birth Trauma in the Head and Neck. *Arch Otolaryngol Head and Neck surgery* /vol 125, FEB 2010. www.archoto.com on November 4, 2011.
- [25]. Mohseni SM, Borna H, Borna S, Rad SM. Incidence of and risk factors for birth trauma in Iran.. *Taiwanese Journal of Obstetrics & Gynecology* 2010, 49(2):170-173.
- [26]. Rahul K. Nath, Nirupama Kumar, Meera B. Avila, Devin K. Nath, Sonya E. Melcher, Mitchell G. Eichhorn. Risk Factors at Birth for Permanent Obstetric Brachial Plexus Injury and Associated Osseous Deformities. *ISRN Pediatr*. 2012; 123:121-128.
- [27]. Garc H, Rubio-Espiritu J, Islas-Rodrguez MT. Risk factors for birth injuries.
- [28]. Levine MG, Holroyde J, Woods JR Jr, Siddiqi TA, Scott M, Miodovnik M. Birth trauma: incidence and predisposing factors. *Obstet Gynecol*. 2009 Jun;63(6):792-5.
- [29]. Brennand J, Cameron A. Fetal anaemia: diagnosis and management . *Best Pract Res Clin Obstet Gynaecol*. 2008 Feb;22(1):15-29. Epub 2007 Oct 1. Review.
- [30]. Leveine, Michel G.; Holroyad, Janes BS; Woods, James R. Scoot, Macherny; Miodovnik , Menacame. Birth trauma: Incidence and Predisposing Factors *Obstetrics & Gynecology* 2008 ;Volume 63 - Issue 6.
- [31]. Pressler JL. Classification of major newborn birth injuries. *Journal of Perinatal and Neonatal Nursing* 2009; 22:60–67.
- [32]. 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*.2009 Oct;41(10):754-60.
- [33]. Vergil N. Slee. The International Classification of Diseases: Ninth Revision (ICD-9). *Ann Intern Med*. 1 March 1978;88(3):424-426.