

Neonatal Birth Traumas: Risk factors and types

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Summary:

Background: Birth trauma is defined as injury to neonates resulting from mechanical forces (such as compression or traction) during the process of birth. Birth injury is used to denote avoidable and unavoidable mechanical and hypoxic- ischemic injury incurred by neonates during labor and delivery. Maternal, labor and infant factors can predispose to birth traumas. Many types of birth traumas can be found including intra and extra cranial, spinal, peripheral nerves, fractures and visceral.

Patients and methods: A cross sectional study was done on 200 babies (100 babies for the study group and 100 babies for the control group), admitted to special care baby unit of Baghdad Teaching Hospital, during the period between 1st of October 2007 to the 30th of March 2008.

Results: There was an increased percentage of birth trauma in preterm babies, large birth weight, mothers who were primigravida, had history of contracted pelvis, diabetes mellitus, prolong second stage of labor, abnormal fetal presentation, and shoulder dystocia. Trauma of cranium was the most common type of birth trauma, of which caput succedaneum (68%) was the most common one.

Conclusions: Birth trauma is still a significant problem in this maternity ward causing some morbidity. The significant risk factors were macrosomia, prematurity and multiple pregnancies, primigravida, chronic maternal illness like diabetes mellitus, history of pelvic anomalies or contracted pelvis, prolonged labor especially the second stage, abnormal fetal presentation and shoulder dystocia. So we recommend assessment of the fetal weight, mother pelvis capacity and presentation before delivery, so that macrosomic fetus might be delivered by cesarean section, and prevent premature delivery, and better use of investigations like ultrasound, x-ray, CT scan for early diagnosis and further management of birth trauma.

Keywords: neonatal birth trauma, risk factors, birth injuries

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Introduction:

Birth trauma is defined as injury to infant resulting from mechanical forces (such as compression or traction) during the process of birth (1). Birth injury is used to denote avoidable and unavoidable mechanical and hypoxic- ischemic injury incurred by an infant during labour and delivery (2). Birth injuries are a significant cause of neonatal morbidity and mortality. (3) Factors predisposing to injury include the following: Infant related: very low birth weight infant or extreme prematurity, fetal macrosomia, fetal anomalies, twin (particularly the second one). Maternal related: primigravida, maternal pelvic anomalies, poor maternal health, maternal age (very young and old). Labor related : prolonged or extremely rapid labor, deep transverse arrest of descent of presenting part of fetus, abnormal presentation, use of mid cavity forceps or vacuum extraction, version and extraction. (1, 2, 4)

Instrumental vaginal delivery involves the use of the vacuum extractor or obstetric forceps to facilitate delivery of the fetus. It is associated with substantial risk of head injury, including hemorrhage, fractures, and, rarely, brain damage or fetal death. (5) Birth injury of the scalp, skull and central nervous system (CNS) is a well-recognized complication of a difficult delivery.

The rate of birth trauma has dropped precipitously and now accounts for less than 2% of neonatal deaths. (6) Obstetric brachial plexus lesions (OBPLs) are typically caused by traction to the brachial plexus during labor. The incidence of OBPL is about 2 per 1000 births. Most commonly, the C5 and C6 spinal nerves are affected. The prognosis is generally considered to be good, but the percentage of children who have residual deficits may be as high as 20% to 30%. (7) Types of birth trauma: 1. Extra-cranial: a. Caput succedaneum b. Erythema, abrasions, ecchymoses and subcutaneous fat necrosis c. Subconjunctival and retinal hemorrhage d. Cephalhematoma e. Subgaleal hematoma. 2. Intracranial hemorrhage: a. Epidural hemorrhage. b. Subdural hemorrhage. c. Subarachnoid hemorrhage. 3. Spine and spinal cord injury 4. Peripheral nerve injuries: a. Brachial plexus injury b. Phrenic nerve paralysis c. Cranial nerve injuries 5. Fractures: a. Clavicular fracture b. Long bone fractures c. Epiphysial displacement d. Fractures of the facial bones f. Fractures of the skull. 6. Visceral trauma. (1, 2, 4, 8) Recognition of trauma at birth necessitates a careful physical and neurologic examination of the infant to establish whether there are other injuries. Assess symmetry of structure and function, range of motion of individual joints, and scalp and integrity and perform cranial nerve examination (1). This study aimed to identify the risk factors, and types of neonatal birth trauma in the maternity ward-Baghdad Hospital – medical city.

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Patients and Methods:

A cross sectional study was done on 200 babies (100 babies for the study group and 100 babies for the control group), admitted to SCBU of Baghdad Teaching Hospital. During the period between 1st of October 2007 to the 30th of March 2008 to look into maternal risk factors as: Maternal age [< 16 years, 16-35 year and > 35 years], parity and gravida [primi gravida, multi parous], chronic illness of the mother [hypertension, diabetes mellitus], and history of contracted pelvis. The neonatal risk factors including: Sex, birth weight, gestational age, number of gestation (single or being member of twin). The risk factors related to labor including: Type of delivery [normal vaginal delivery, caesarean section and instrumental delivery using vacuum or forceps], duration of second stage of labor, fetal presentation at labor and Shoulder dystocia at labor. All information about maternal risk factors was taken from mothers' record at obstetric unit. All information about labor was taken from Doctors in the obstetric unit. The study group include babies who were suspected to have birth trauma from the following: Gestational age < 37 weeks, macrosomic babies [birth weight > 4.5 kg], labor including one or more of the following: Instrumental delivery [using vacuum or forceps], Prolonged second stage of labour [more than half an hour in multiparous women and more than one an hour in primigravida], abnormal fetal presentation at labour [like breech or face presentation], History of shoulder dystocia at labour. The control group includes babies who were admitted to SCBU of the same hospital for other than birth trauma, i.e. babies born by C/S (elective or emergency) or by vaginal delivery for observation, Rh incompatibility, etc... All babies were examined physically to assess gestational age, sex and full systemic examination including birth weight, neurological examination with neonatal reflexes. Investigations which were done to the patients according to the type of birth trauma including the following: Skull x-ray, X-ray of the extremities, ray of the shoulder joint and clavicle, cerebral ultrasonography, CT scan of the brain. The results were the same whether as numbers or percentages as the number of both study and control groups were 100. The results were analyzed by statistical analysis using Chi square and was considered significant if P value < 0.05 .

Results:

During the period of this study, which extended to 7 months, the total number of deliveries in this hospital was 1628, from which 55 were still births. Regarding gender of neonates, males in patients and control groups (56, 57 respectively) were more affected by birth trauma in comparison to females patients and control (44, 43 respectively), but was not statistically significant (p value 1.4). Birth weight had a significant effect on the occurrence of birth trauma, and the incidence was more with increase in body weight. Table (1). There was increased percentage of birth trauma in preterm

babies in study group than in control group (25vs13) in comparison with full term study and control groups (75 vs. 87) (p value = 0.046). There was increased percentage of birth trauma in babies born as a member of twin in study than the control groups (11 vs. 5) in comparison with single babies in study and control groups (89 vs. 95) (p value = 0.0001). The influence of maternal risk factors on birth trauma was studied in details in table (2). Maternal age was not significantly reflected on babies who had birth trauma. It was found that the percentage of birth trauma was significantly increased in babies from mothers who were primigravida, table (2), (p = 0.0007). There was no relation between mother hypertension and pre-eclampsia and the occurrence of birth trauma. Table (2). There was increased percentage of birth trauma in babies born to diabetic mothers, (p = 0.03). Table (2) There was increased percentage of birth trauma in babies born to mothers having contracted pelvis, (p = 0.033). Table (2) The influence of labor risk factors on birth trauma was studied in details in table (3). There was increased percentage of birth trauma with normal vaginal delivery, (p < 0.0001). Table (3) there was increase in number of patients with birth trauma with prolonged labor in both primi and multipara mothers, (p < 0.0001). Table (3) Fetal presentation was considered significant in breech (p=0.031), face (p=0.034). Table (3). Shoulder dystocia at labor increase the percentage of birth trauma, (p = 0.014). Table (3) Table (4) shows the types of birth trauma and their percentage. Trauma of the cranium was the most common type, caput succedaneum (68%), cephalhematoma (12%), erythema-abrasions-ecchymosis of the head and neck (4%), subconjunctival and retinal Hg (5%), scalp wounds and lacerations (5%). Other birth traumas include fracture of femur (2%), Erb-Duchenne paralysis (3%), Klumpke-paralysis (1%). Investigations with findings include: X-ray of the extremities which showed fracture femur in two cases, X-ray of skull for cephalhematoma in 8 cases (normal) and ultrasound of the brain in 8 cases of cephal hematoma (normal).

Table (1): The relation between birth weights of the study and control groups.

Birth weight/ kg	Study group	Control group	Significant
< 2.5	17	13	P = 0.03
2.5 – 4	73	85	
> 4	10	2	

Table (2): The influence of maternal risk factors on birth trauma.

Maternal risk factors	Category	Study group	Control group	Significance
Mother age in years	<16	0	1	P = 0.4
	16 – 35	95	90	
	>35	5	9	
Gravida	primi	52	30	P = 0.0024
	Multi	48	70	
hypertension	Yes	6	10	P = 0.43
	No	94	90	
Diabetes mellitus	Yes	10	2	P = 0.03
	No	90	98	
History of contracted pelvis	Yes	10	2	P = 0.033
	No	90	98	

Table (3): The influence of labor risk factors on birth trauma.

Labor risk factors	Category	Study group	Control group	Significance	
Type of delivery	NVD	70	32	P < 0.0001	
	CS	30	68		
Duration of second stage of labor in hours	Multi	< 1/2	26	66	P < 0.0001
		≥ 1/2	22	4	
	Primi	< 1	20	28	
		≥ 1	32	2	
Fetal presentation at labor	Cephalic	77	90	P = 0.21	
	Breech	15	5	P = 0.031	
	Face	8	1	P = 0.034	
	Others	0	4	P = 0.12	
Shoulder dystocia at labor	Yes	7	-	P = 0.014	
	No	93	100		

Table (4): The types of birth trauma and their percentage.

Types of birth trauma	Category	No. of patients	%
Cranium	Caput succedaneum	68	68
	Erythema, abrasion, ecchymoses of the head and neck	4	4
	cephalhematoma	12	12
	Subconjunctival and retinal Hg.	5	5
	Scalp wounds and laceration	5	5
	Fracture of the skull	-	-
Intracranial hemorrhage	IVH	-	-
Fractures	Extremities (Femur)	2	2
	Clavicle	-	-
	Nose	-	-
Peripheral nerve injury	Erb-Duchenne paralysis	3	3
	Klumpke-paralysis	1	1
	Facial N. palsy	-	-
	Phrenic N. paralysis	-	-
Viscera	Liver, rupture spleen & adrenal Hg	-	-

Discussion:

In this study, there was no reported neonatal death related to birth traumas, while in Tsuji study the neonatal mortality was 3.7/100,000. (1) Regarding neonatal risk factors, this study shows that males (56%) were more often affected by birth trauma than females (44%), similar to Sameera.T.S. (9) Regarding birth weight, this study shows its significant influence in the occurrence of birth trauma, especially those babies with birth weight more than 4kg (macrosomic babies) which is similar to Ghorashi,et.al(10),Sameera.(9), Stoll BJ in 2007 (2), Mcintosh in 1998(4), Tsuji in 1997⁽¹⁾, Overland in 2009 .(11) This study showed that there was increased percentage of birth trauma in preterm babies, similar to that found by Sameera (9), Dennen in 1999.(12) In multiple gestation (i.e. those being member of twin), there was increase in the percentage of birth trauma in this study, (p = 0.0001), which is similar to the fact reported by Mcintosh in 2003(4),and similar to Sameera.(9)This could be due to decrease in the available fetal movable space, which increase the likelihood of malpresentation.(4) Regarding maternal risk factors, maternal age showed no significant effect on occurrence of birth trauma, similar to that found by Elizabeth (13), and Sameera (9).This could be either due to small sample size or less common marriage in very young females. Reproductive history of the mother (primigravida) (p = 0.0024), similar to that found by Sameera (9), and Elizabeth (13). Maternal fitness and expectations will have an impact on mother's strength and endurance for delivery. (14) Regarding chronic illness of the mother, hypertension showed no significant effect on the occurrence of the birth trauma. Diabetes mellitus has significant effect (p = 0.03) on increase in the incidence of birth trauma, this may be related to the poor control of our diabetic patients which results in delivery of a large for gestational age babies (macrosomia) and traumatic birth injury (e.g. brachial N. injury and shoulder dystocia), similar to Sameera.(9) There was increased percentage of birth trauma in babies born to mothers having history of pelvic anomalies or history of contracted pelvis (p = 0.033), as maternal pelvis size and type (android, anthropoid and platypelloid) will have an effect on the birth canal size and shape and the forces encountered on the emerging head and spine. (15) Regarding risk factors related to labor, this study showed that the percentage of birth trauma increase with normal vaginal deliveries (70%),although there was no use of instruments and vacuums in the delivery in this study(not used by obstetrician in Baghdad teaching hospital). In this study, prolonged second stage of labour, significantly increase the incidence of birth trauma (p < 0.0001). Abnormal fetal presentation at labor (like breech or face presentation) significantly increase the percentage of birth trauma as found by this study. This is similar to that found in Sameera (9); Elizabeth (13).This can be explained by the abnormal fetal presentation which will prolong the

second stage of labour. (16-18) The percentage of shoulder dystocia at labor in this study was (7%), which is similar to Sameera (9), and differs from that reported by Johanson in 1999 (19), who found the percentage of shoulder dystocia as (2%). The presence of shoulder dystocia at labor increase the percentage of birth trauma in this study ($p = 0.014$). Erb's palsy is the commonest brachial plexus injury due to shoulder dystocia, other injuries in the form of fractured clavicle or humerus can also happen. (19) Regarding the types of birth trauma, this study showed that trauma of the head was the most common type (94%), of which caput succedaneum (68%), These results agrees with many other studies (1,2,4,8). In this study, no case with fracture of the skull. This may be attributed to not using vacuum extraction and instrumental delivery. There was no IVH in this study, this is may be due to underuse of ultrasound of the brain especially in preterm babies. Fractures including fractures of the extremities (femur) (2%), similar to Sameera.(9) Fractures of the extremities more common than fracture of the clavicle as found by this study, which differ from others (Stoll BJ in 2007(2), Tsuji in 1997 (1)), who found that fracture of the clavicle is more common than fractures of the extremities. This may be due to inadequate experience of house officers, rapid discharge of patients and underuse of x-ray for diagnosis. Peripheral nerves injuries (4%) were less common than trauma to the cranium as found by this study, which is similar to Elizabeth (13), Sameera (9), Ghorashi (10),and differ from Rosenberg in 2001(20), who said that most common birth trauma are soft tissue bruising, fractures (clavicle, humerus, or femur), cervical plexus palsies. In this study, no case reported with visceral trauma. This could be due to misdiagnosis as the visceral trauma requires early suspicion by mean of ultrasonographic examination as mentioned by Stoll BJ in 2007. (2) We concluded that birth trauma is still a significant problem in this maternity ward causing some morbidity. The most common type of birth trauma was the trauma of cranium of which caput succedaneum was the most common type. The significant neonatal risk factors were macrosomia, prematurity and multiple pregnancies. Regarding the maternal factors, the primigravida, chronic maternal illness like diabetes mellitus, history of pelvic anomalies or contracted pelvis were significant. Risk factors related to labor were prolonged labor especially the second stage, abnormal fetal presentation and shoulder dystocia. So we recommend proper surveillance at antenatal clinics to pick out high risk mothers and infants who are likely to suffer from birth injuries like macrosomic infant of diabetic mothers, premature infants, and better use of investigations like ultrasound,x-ray,CT scan for early diagnosis and further management of birth trauma.

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