Prevalence,Types, and Risk Factors of Birth Trauma Among Neonates atAl-Ramadi Maternity and Children Teaching Hospital, Western Iraq

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Abstract

Background: Birth traumacommonly occurs in the 2nd stage of labor due to forces of labor,contraction, twisting, traction of neonates through birth canalor as a sequel of obstetric intervention.The aim of current study was to assess the prevalence,types and risk factors predisposing for birth trauma among newborn babies atAl-Ramadi Maternity and Children Teaching Hospital,western Iraq. **Methods**: A case-control study conducted atAl Ramadi Maternity and Children Teaching Hospital, west of Iraq from October 2014 to February 2015. Neonates with birth trauma were involved and compared with other normal neonates as controls. Collected data included gender of neonate, birth weight, gestational age, occipito-Frontal Circumference, maternal age, residence, antenatal care maternalHypertension, Diabetes Mellitus, parity, plurality and mode of delivery.**Results**: The prevalence rate of birth trauma was 17.47 per 1000 live births. Male sex, LBW, overweight, prematurity, post-term babies, macrocephaly, maternal age, primigravida, irregular ANC, twin pregnancy, maternal diabetic, instrumental deliveries were significantly correlated with birth trauma. However, residence and maternal hypertensionwere found to be not associated with birth trauma. Cephalohematoma, Intraventricular Haemorrhage, subdural hematoma, soft tissue injuries, Erb's palsy were also causes of birth trauma. **Conclusion:** Birth trauma had remarkably high prevalence among newborn babies in our population. Early identification of fetal and maternal predisposing factors, enhancement of practical skills of birth attendants with elective caesarian deliveries for high risk pregnancies can reduce birth trauma.

Keywords: Birth trauma, neonates, macrocephaly, subdural hematoma.

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Introduction

Labor is a complex condition that is associated with a number of variables and events that can complicate the process of birth and may cause some injuries in the form of structural destruction or impairment of function of neonatal bodies(1).Birth Trauma (BT),commonly occurs in the 2nd stage of labor(2)as a result of normal forces of labor,contraction, twisting, traction of neonates through birth canal or as a sequel of obstetric intervention (3).Birth injuries vary fromself-limitingminor injuries to so severe, major life threatening injuries that require early detection and intervention (4).Despite the advances in obstetric care

and prenatal diagnosisthat play a pronounced role in decreasing the frequency of BT among newborn babies, BT is still recorded even in uncomplicated deliveries with the presence of optimal diagnostic tools[5,6].The incidence of BT ranged from 0.2-41.2 per1000 live births depending on type of deliveries, fetal presentationas well as associated risk factors[7,8].Different factors were considered as predisposing factors forBT,some of these were fetal related factors, fetal weight, low birth weight,overweight,extreme prematurity and postdate. Maternal related factorsare maternal age (too young), old age, poor maternal health and/ or pelvic anomalies.Labor-related factors are prolonged labor, mal-presentation and forceps applications [1, 9, 10].Since no previous study was conducted to assess such problem in Al-Ramadi city,west of Iraq, this study was conducted to estimate the prevalence,types as well as risk factors predisposing for birth trauma among newborn babies atAl-Ramadi maternity and children teaching hospital,western Iraq.

Methodology

A case-control study conducted atAl-Ramadi Maternity and ChildrenTeachingHospital, west of Iraqfrom October 2014 to February 2015.All newborn babies delivered during the study period were examined clinically by a pediatrician. Those withsigns or symptoms suggestingBT were included in this study andconsideredas Birth trauma group(BTG).For those with suspension of visceral, skull injuries or bone fractures,radiological investigations were done for them like X ray,MRI,CT scan or Ultrasound of skull or abdomen for definitive diagnosis. Osteogenesis imperfect cases were excluded.The control group was represented by newborn babies delivered bynormal vaginal delivery (NVD),or caesarian section(CS) during the same period without birth trauma and considered as Non birth trauma group (NBTG). Controls were collected randomly and included in our study for comparison purposes.Data collected from BTG and NBTG included gender, birth weight, gestational age, occipito-frontal circumference (OFC).Data collected from mothers of both groupswere age,residence,antenatal careANC (regular or irregular),medicaland obstetric diseaseslike diabetes mellitus(DM), hypertension (HT),parity (primigravida, multipara),plurality (singleton or member of twin),mode of delivery (normal vaginal delivery;NVD, instrumental vaginal deliveries; CS) and fetal presentation. The results were statistically analyzed using SPSS version 22.0, *Pvalue*<0.05 was considered significant.

Results

Out of 2174 live births delivered during the study period,38 cases were recorded to have BTwith a prevalence rate of 17.47 per 1000 live births or 1.74 %.Table (1) showed that the proportion of male caseswith BT(68.4%) wassignificantly higher than that of females (31.6%) at *P*<0.05.Comparison of the variables listed in Table (1) with respect to the considered groups of this study (BTG and NBTG) showed that neonatal weight ≥2500gm and neonatal OFC ≥32cm weresignificant risk factors for BT. Gestational age of BT groups was always significantly different from that of NBT groups which mightindicate that the

whole gestational age could be a risk factor for BT, that is to say, BT may be developed during any period of gestational ages.

In regard to data inTable 920, residential place was not significantly different between BT and NBT groups. Comparison of percentages of women at the three levels of maternal age showed that a significant difference was obtained for every level with higher proportion recorded for neonates of mothers aged less than 19 years and those aged more than 35 years in BTG when compared to NBTG. It can be thought that women with maternal age ranged from 19 to 32 years are less likely to give neonates with BT.The percentage of neonates of a primigravida mothers with BT was significantly higher than that of NBTG(73.7% vs.17.1%, respectively, P<0.001); whereas the percentage of multigravida mothers with BT neonate was significantly lower than that of the NBTG. Primigravida may be considered a risk factor for having neonates with BT in the community of the study.Neonates of mothers with irregular antenatal care had significantly higher percentage of BT when compared with NBTG(81.6 % vs.55.7%, respectively, P= 0.0064).DM occurred in both groups but it was significantly higher in the BTG than in the NBTG. DM can be considered as a risk factor for having neonates with BT.Percentages of women with maternal hypertension were found to be not significantly different in the two groups, and that, one may say that maternal hypertension does not contribute to the incidence of BT which mightalso mean that it is not a risk factor for the occurrence of BT.The proportion of neonates as a member of twin with BT was significantly higher than thatinthe NBTG (P<0.002. As a result, plurality can also be considered a risk factor for having neonate with BT.With regard to mode of delivery; the proportion of IVD was significantly higher in the BT group than that of NBTG.

On the other hand, the proportion of Cesarean section in the BTG was remarkably less than that INthe NBTG which mightindicate that Cesarean section may help avoid risky delivery of having neonate with BT.Regarding information inTable (3), head circumference of a neonate was the most dominant (94.7% of the cases) part to have BT that consisted of cephalohematoma (39.8%),intraventricular hemorrhage (IVH; 15.8%),subdural hematoma(10.5%),sub-conjunctival hemorrhage(5.3%) and soft tissue injuries of scalp and face(23.6%). Brachial plexus injuries-Erb Duchene palsy-was seen in only 2(5.3%) cases.No cases of peripheral or cranial injuries, fractures or intra-abdominal injuries had been recorded.

Discussion

Recognition of birth trauma at labour necessitates carful physical and neurological examinations of the infants to prevent or even to decrease sequel or disability.Our study revealed that the prevalence of birth trauma was 17.47 per 1000 live births or 1.74%, which was lower than 41.16per1000 live births recorded by [8], 29 per1000 recorded by [11],22.22per1000 live births recorded by [12], 22 per 1000 live birthsby[13],1.84% reported by [14]. On other hand, it was higher than the 15.4 per1000reported inEastern India by [15], 6.7per 1000 reported by [16] and 0.2-2 per 1000 by [7].

These variations in the results of various studies could berelated to the variations in studied sample size,duration of studies,obstetric skills, facilities and technologic advancements in different health centers.It isnoteworthy that even in the absence of risk factors for BTand the presence of smooth uncomplicated vaginal deliveriesas well as improvement of obstetric care and perinatal diagnosis,BT is still recorded but to lesser extent as the baby can be exposed to certain forces when he/she passes through the birth canal. As a result, the floor opened to investigate different hypotheses regarding BT. Concerning gender,our study showed that male neonatespredominantly have more birth injuries than females (P= 0.002),which wassimilar to the results of other researchers[11,13,17]. It was generally noticed that males were more affected by birth injuries than females,but the explanation of this is not clear. It is also observed that babiesfrom BTG with birth weight more than 2.5kg significantly had more birth injuries when compared to their counterparts from NBTGand that such a result was consistent with others[18-21].It has been reported that in spite the availability of highly skilled obstetric care, macrosomia could be associated with difficult labor,an increased risk of BT like brachial plexus injuries,clavicle fractures and asphyxia as a result of cephalo-pelvic disproportion and shoulder dystocia[22,23].Our study showed that,LBW less than 2.5kg was not significantly associatedwith birth trauma(P>0.05)which didnot agreewith results of other researchers[24,25] who found that LBW babies have ahigh risk for preterm delivery and mal-presentation when comparedto average birth weightbabies that makes them more likely to have birth related injuries such as intracranial hemorrhage(IVH).Regarding gestational age, we found that both premature babies less than 37 weeks and post mature babies (more than40 weeks)had significantly higher rate of birth trauma when compared to term babies (P<0.05).Moreover, [20,26]concluded that prematurity isone of the risk factorsfor BT.The association between the two variables could be related to an increased susceptibility for brain bleeding, especially IVH, subduralhematoma, cephalohematoma as a result of immature fragile blood vessels and brain blood flow instability[27].On the other hand,postdate babies may be associated with macrosomia, shoulder dystocia that may be contributedto a difficult prolong labor[28].

In this study, large size head with OFC more than32cm had a significant impact on prevalence of BTs P<0.05. Similar results were recorded by other reports [8,19], it wasbelieved to be associated with cephalo-pelvic disproportion and prolong labor.

Residence and hypertension were found to be not significantly associated with BTG when compared to NBTG. Similar results were obtained by other researchers [20].In this study maternal age less than19 years and age≥35 years was significantly associated with birth traumawhich wasinconsistent with the results of others [20]. It was generally reported that too young or too old mothers were associated with an increased chances of cephalo-pelvic disproportion, poor fetal growth, low birth weight and preterm birth[29,30]. Others reported that advanced maternal age correlated with large babies [31].Primigravida was significantly associated with birth trauma, which agreed with other studies [12,18,20,26].Birth trauma was significantly more in neonates of mothers with irregular antenatal care which wasconsistent with other reports[12].Regular

antenatal care, it can help in the detection of any potential predisposing factors that play role in prevention of BT[18]. Twin pregnancy was implicated in the occurrenceofBT in the current study (P<0.01) whichwascomparable tothe results obtained by [20,26].In multiple gestations,limitation of intrauterine fetal movement can predispose to malpresentation and preterm delivery[26].Similar to other reports[20,26,30],we found a significant association between maternal DMand birth traumas. Macrosomia as a result of poorly controlled DM,could be one of factors implicated in occurrence of BT among neonates of DM.Instrumental vaginal deliveries wereaccounted for the highest number of neonates with BT which wassimilarto the finding reportedby[8,12].In the present study,most of BT cases were related to head (94.7%),distributed in form of bleeds(71.1%), soft tissue injuries(23.6%)and neurological injuries (5.3%).Also, [12]found that 88% of BT was related to head, 6% to skin and soft tissue injuries while 5% and1% were related to nerve andbone injuries, respectively. Cephalohematoma was the predominant cause of BTs recorded as recorded in our study (0.69% per total live births) which waslower than that of[13]who recorded 1.28 % per total live birthsand 2.14% per live births (21.41 per 1000 live births) reported by [19].It was seen thatforcefully or wrongly applied instruments during delivery were important predisposing factors for cephalohematoma[33]. Inour study, 57.9%of BTG were product of instrumental deliveries (forceps and vacuum extraction).Intracranial bleeding due to intraventricular hemorrhage and subdural hematomas found in 0.22 and 0.18 per 1000 live births, respectively. In addition, [8] found that 0.28 per 1000 live births had intracranial bleedings while[13] reported that 0.04 of the studied population had intracranial hemorrhage.On the other hand, [34]reported thatIVH was more frequent in premature babies while subdural hematoma was more predominant in term babies as aresult of prolong labor and instrumental deliveries[35].Subconjunctival hemorrhage can occur even with normal vaginal delivery as passed through birth canal.Regarding Soft tissue injuries, we found that ecchymosis andskin laceration with cuts were 0.22%and 0.18%, respectively. Moreover, [12] reported that out of12735 live birth babies, 0.18% had skin and soft tissue injuries; whereas [19] found that 0.56 of BT was in form of skin hematoma (0.56per1000 live births).

No peripheral or cranial nerve injuries apart from Erb Duchene palsy in 2 cases (0.09%per live births) were documented in current study. Higher percent was reported by[19]as 3.62 per 1000 live births. Erb's Duchene palsy could be associated with macrosomic babies [19,36].In our study, birth injuries of cranium were more predominant than peripheral nerve injuries similar to [21,26].No bone fractures,intra-abdominal injuries and mortality were recorded among BTGin the current study. Furthermore, [19]found that 15.57 per1000 live birth had clavicle fracture.Our study showed that 36.8 % of deliveries among BTG were product of CS,which mostly selected for those babies with shoulder dystocia or macrosomia, that in turn might be helped to limit some types of BT like fractures and visceral injuries.However, it was concluded that CS delivery was associated with less chance of BT [37].Head-related injuries were the predominant causes of BT, including cephalohematoma,intracranial bleeding(IVH, subdural hematoma)followed by soft tissue injuries and Erb Duchene palsy,no fractures orintra-abdominal injuries.

Conclusion

With respect to the community of the study, male neonateswerefound to be more likely to have BT than females. Incidence of BT is mostly associated with birth weights greater than or equals to 2500gm. Neonateswith OFC greater than or equals to 32cm are more likely to have BT. Gestational age over 40 years is less likely to give births with BT. Residential place (Rural/Urban) does not contribute significantly to the problem of BT. BT most likely occurrs at maternal age below 19 years. Primigravida can be considered as a risk factor for having neonates with BT. Irregular antenatal care may significantly contribute to the BT. Diabetes mellitus may contribute to BT since the percentage of those women in the BTG is significantly higher than that inthe NBTG. Nevertheless, the percentage of mothers with BT that showed no DM is remarkably higher than that of DM in the BTG. Plurality (singleton) may be considered a risk factor for having neonates with BT since their percentage in BTG is essentially higher than that of the twin.Cesarean section may be considered as a good way to avoid BT particularly for women classified as primigravida.

Ethical Clearance

The Research Ethical Committee at scientific research by ethical approval of both environmental and health and higher education and scientific research ministries in Iraq

Conflict of Interest

The authors declare that they have no conflict of interest

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Table (1) Neonatal Characteristics in BTG(cases) and NBTG(controls)

Variable		**BTG(cases) No.=38**	**NBTG(controls) No. =88**	***P* value**
Neonatal Gender	MalesNo.(%)	26(68.4)	47(53.4)	N.S.
	Females No.(%)	12(31.6)	41(46.6)	N.S.
Neonatal weight(gm)	<2500 No.(%)	9(23.7)	19(21.6)	N.S.
	2500-3500No.(%)	21(55.3)	67(76.1)	0.0212
	>3500 No.(%)	8(21.1)	2(2.3)	0.0005
Gestational Age (weeks)	<37	12(31.6)	7(7.9)	0.0009
	37-40	19(50)	78(88.6)	0.0001
	> 40	7(18.4)	3(3.4)	0.0050
Neonatal Occipito-frontal circumference (cm)	< 32	2(5.3)	7(7.9)	N.S.
	32-36	14(36.8)	77(87.5)	0.0026
	> 36	22(57.9)	4(4.5)	0.0001

Table (2) Maternal characteristics in BTG(cases) and NBTG(controls)

Variable		BTG(cases) No. =38	NBTG(controls) No. =88	*P* value
Residence No.(%)	Rural	28(73.7)	52(59.1)	N.S.
	Urban	10(26.3)	36(40.9)	N.S.
Maternal age(years)	<19	16(42.1)	8(9.1)	<0.001
	19-<35	12(31.6)	71(80.7)	0.0001
	≥35	10(26.3)	9(10.2)	0.023
Parity(%)	Primigravida	28(73.7)	15(17.1)	<0.001
	Multigravida	10(26.3)	73(82.9)	0.0001
Antenatal care (ANC)	Irregular	31(81.6)	49(55.7)	0.0064
	Regular	7(18.2)	39(44.3)	0.0060
Maternal diabetes mellitus	Yes	7(18.2)	3(3.4)	0.0054
	No	31(81.6)	85(96.5)	0.0054
Maternal hypertension	Yes	6(15.8)	10(11.4)	N.S.
	No	32(84.2)	78(88.6)	N.S.
Plurality	Twin	10(26.3)	3(3.4)	<0.002
	Singleton	28(73.7)	85(96.5)	0.0002
Mode of delivery	Instrumental vaginal delivery	22(57.9)	4(4.5)	< 0.002
	Non Instrumental VD	2(5.3)	7(7.9)	0.153
	Cesarean section	14(36.8)	77(87.5)	0.142

Table (3) Distribution of Birth Traumas among BTG (cases)

Types of birth traumas		No.(%) per total birth traumas	(%) per total live births*
Bleeds	Cephalohematoma	15(39.5)	(0.69)
	Intra-ventricular hemorrhage	6(15.8)	(0.28)
	Subdural hematoma	4(10.5)	(0.18)
	Sub-conjunctival hemorrhage	2(5.3)	(0.09)
Soft tissue injuries of scalp and face	Contusion and ecchymosis	5(13.1)	(0.23)
	Skin Laceration andcuts	4(10.5)	(0.18)
Neurological injuries	Brachial plexus injuries (Erb Duchene palsy)	2(5.3)	(0.09)
	Cranial nerve injuries	-	-
	Peripheral nerve injuries	-	-
Fractures	Clavicle	-	-
	Long bones	-	-
	Others	-	-
Intra-abdominal injuries	Liver,spleen,others	-	-
Total		38	

*total live births 2174

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