ORIGINAL ARTICLE

Risk Factors and incidence of Birth Trauma in Tertiary Care Hospital of Karachi

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ABSTRACT

Aim: To determine the incidence of birth trauma and risk factors related to fetal injury. Birth trauma at delivery is a rare but significant prenatal complication.

Methods: Birth trauma was evaluated in singleton fetuses with no major anomalies and with vertex presentations over a 3-year period from 2010 to 2012. One hundred and forty-eight neonates, who experienced birth trauma, were prospectively identified and compared with 280 normal neonates. Both groups were delivered vaginally. Maternal and infant characteristics were evaluated as possible risk factors for fetal injury.

Results: Among the 148 infants with birth trauma, nine had multiple injuries. The most common injury was cephalohematoma (n=77). Other injuries included clavicle fractures (n=56), brachial plexus paralysis (n=13), asphyxia (n=7), facial lacerations (n=4), brain hemorrhage (n=1), and skin hematoma (n=2). Multiple regression analysis identified premature rupture of membranes, instrumental delivery, birth weight, gestational age, induction of labor, and academic degree of attendant physician at delivery as the most significant risk factors for birth trauma.

Conclusion: The incidence of birth trauma was 41.16 per 1,000 vaginal deliveries. Induction of labor, premature rupture of membranes, academic degree of attendant physician at delivery, higher birth weight, and gestational age were associated with fetal injuries.

Keywords: Birth trauma, clavicle fracture, fetal injuries, instrumental delivery.

INTRODUCTION

Injuries to infants as a result of mechanical forces (compression, traction) during the birth process are categorizedas birth trauma. Maternal and fetal factors, such as preexisting diabetes, breech presentation and birth weight, have been associated with fetal trauma. Shoulder dystocia, which is most likely to occur at term, is also known to be a significant risk factor for trauma, such as brachial plexus palsy[1,2,3]. Factors responsible for mechanical injury may coexist with hypoxic-ischemic insult. In general, larger infants are more susceptible to birth trauma. Higher rates have been reported in infants weighing more than 4,500g. Factors such as macrosomia, shoulder dystocia, abnormal presentation of the fetus and the use of instruments during delivery significantly increase the occurrence of birth trauma[1,2,3]. Severe birth trauma can be life threatening, but early diagnosis and treatment increase the rate of survival. The aim of the present study was to determine the incidence of fetal injury at delivery, classify the types of injury and analyze the relationship between birth injury and risk factors.

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MATERIALS AND METHODS

This prospective cohort study included all vaginal deliveries at a teaching hospital KVSS Site Hospital (between January 1, 2010 and December 31, 2012). The study was approved by the ethics committee of the hospital. Only singleton live fetuses with no major anomalies and with vertex presentations were included in this study. The attending staff in the delivery suite examined all newborns. The diagnosis of birth trauma was established by physical examination and confirmed radiologically. Abnormal signs and symptoms, such as seizures, hypotonia, and edema and swelling in the region of the clavicles, were indications for further radiologic examinations. A total of 3,596 deliveries from January 2010 to December 2013 were included in the study, of which 148 infants had birth injuries. Fetal injuries included skin lacerations, cephalohematoma, intracranial hemorrhage, clavicular fracture, brachial plexus injury, and facial nerve palsy.

For each case with a birth injury, the next uncomplicated vaginal delivery was included as a control, to obtain a 1:2 case-control ratio. The control group included 280 normal infants. The maternal and neonatal records of the cases and controls were retrieved for review. Type of birth injury, maternal characteristics, and characteristics of labor, gestational age, neonatal measurements, infant sex,

and academic degree of attendant physician at delivery were analyzed.

Statistical analyses were performed using SPSS version 15.0 software. Chisquare or Fisher exact tests were used to analyze qualitative data and Student *t* tests were used for quantitative data. Stepwise multiple logistic regression analysis was performed to determine the adjusted odds ratio for each risk factor. Odds ratios and 95% confidence intervals were calculated from the regression. A *p* value < 0.05 was considered significant.

RESULTS

Birth trauma occurred in 148 of 3,596 births (41.16 per 1,000 births). Nine infants had multiple injuries. The injuries are summarized in Table 1. The most common injury was cephalohematoma (77 of 3,596). The data for the case and control groups were similar with respect to maternal age, primiparity and multiparity, and maternal weight before and after pregnancy. Demographic characteristics are shown in Table 2. Maternal delivery outcome was compared between the two groups. The mean duration of first-stage labor was 5.02 hours in the case group, compared with 4.88 hours in the control group (*p*=0.62). The mean duration of second-stage labor was 34 minutes in the case group, compared with 30 minutes in the control group (*p*=0.10). Labor was induced in 17 cases in the case group and in 59 cases in the control group (*p*=0.03). Premature rupture of membranes (PROM) occurred in 36 cases in the case group and 28 cases in the control group (*p*=0.05).

Neonatal measurements were compared between those with birth injuries and controls. The mean gestational ages were 39.27 weeks in the case group and 38.80 weeks in the control group (*p*=0.001). Mean birth weights were 3,404.35 g in the case group and3,229.17g in the control group (*p*=0.001). Mean birth heights were 50.38 cm in the case group and 49.77 cm in the control group (*p*<0.001). Mean head circumferences were 34.93 cm in the case group and 34.45 cm in the control group (*p*=0.001). Delivery by intern was performed in 30 cases in the case group and 28 cases in the control group (*p*=0.001). Delivery by an obstetrician was performed in 118 cases in the case group and 152 cases in the control group (*p*=0.20; Table 2).

Multiple regression analysis identified PROM, instrumental delivery, birth weight, gestational age, induction of labor, and academic degree of the attendant physician at delivery as the most significant risk factors for fetal injury. Adjusted odds ratios are presented in Table 3.

Table 1.Incidence and type of fetal injury in 3,596 deliveries

	n (incidence per 1,000 live births)
Total number of injuries*	157 (43.66)
Cephalohematoma	77 (21.41)
Clavicle fracture	56 (15.57)
Erb-Duchenne paralysis	13 (3.62)
Asphyxia	7 (1.95)
Intracranial hemorrhage	1 (0.28)
Skin hematoma	2 (0.56)
Facial nerve palsy	1 (0.28)

Nine of the 148 infants with birth injuries had two fetal injuries

Table 2.Maternal and neonatal characteristics in case and control groups

Variable Cases	**(*n* = 148)**	**Controls (*n* = 280)**	***p****
Maternal age, mean ± SD (yr)	25.8±4.3	26.1 ± 4.5	0.77
Maternal weight before pregnancy, mean±SD (kg) 12.65	70.95 ±	69.3 ± 14.43	0.23
Maternal weight at delivery, mean ± SD (kg) 15.43	82.11±	81.87±15.38	0.50
Primiparous, *n* (%)	86 (58.1)	154 (55.0)	0.14
Multiparous, *n* (%)	62 (41.9)	126 (45.0)	0.27
Gestational age at delivery week, mean ± SD	39.27±1.21	38.80 ± 1.13	0.001
Birth weight, mean ± SD (g) 422.00	3,404.35 ±	3,229.17 ± 416.00	0.001
Birth height, mean ± SD (cm)	50.38 ± 1.68	49.77 ± 1.69	0.001
Head circumference, mean ± SD (cm)	34.93 ± 1.41	34.45 ± 1.45	0.001
Male infant sex, *n* (%)	77 (52.0)	178 (63.6)	0.001
PROM, *n*	36	28	0.05
Duration of rupture of membrane, mean ± SD (hr) 18.69	8.90 ±	4.70 ± 5.04	0.03
First stage of labor, mean ± SD (hr)	5.02 ± 2.19	4.88 ± 3.10	0.62
Second stage of Instrumental delivery, *n*	23	6	0.001
Induction of labor, *n*	17	59	0.03
Delivery by intern, *n*	30	28	0.001
Delivery by obstetrician, *n*	118	152	0.20

**Student t and c2 tests were used for comparison, and a p value<0.05 was considered significant. SD=standard deviation; PROM=premature rupture of membranes.*

Table 3.Adjusted odds ratios for predictors of fetal injury

Predictor	*p*	Adjusted odds ratio (95% CI)
PROM	0.05	0.952 (0.247–2.59)
Induction of labor	0.03	1.114 (0.355–3.13)
Instrumental delivery	0.001	2.145 (0.559–8.55)
Delivery by intern	0.001	0.875 (0.226–2.35)
Birth weight>3,500 g	0.001	0.001 (0.00028–1.001)
Gestational age	0.005	0.295 (0.105–1.343)

CI=confidence intervals; PROM=premature rupture of membranes.

DISCUSSION

Birth injuries account for fewer than 2% of neonatal deaths. Infant mortality as a result of birth trauma has fallen. This decrease partially reflects the technologic advancements that allow obstetricians to recognize birth trauma risk factors using ultrasonography and fetal monitoring prior to attempting vaginal delivery.

The reported incidences of birth trauma vary[2,4], but show a decrease in comparison with historical references. Recent studies[2–4] have reported that major birth trauma occurs in 3% of all live-born infants, accounts for 2% of all neonatal mortality, and accounts for 10% of all neonatal deaths in full-term infants. The current study demonstrated an incidence of birth trauma of 41.16 per 1,000 live births, which was not consistent with the results of previous series[5,6,7]. Salonen and Uusitalo[3] assessed 14,265 live-born infants in Finland and found an incidence of major birth trauma of 3.16%. The most common birth traumas in this study were clavicular fracture, brachial plexus injury, fracture of the long bones, and facial nerve injury. Cephalohematoma has been reported to occur in 0.4–2.49% of all live births[2], in accordance with the incidence of cephalohematoma in our study of 2.14%. The incidence of clavicle fracture has been reported at 2.7–5.7 per 1,000 live births[2,7], while the incidence in this study was much higher, at 15.57 per 1,000 live births. Brachial plexus paralysis is more common than facial paralysis, and has a reported incidence of 0.42–5.1 per 1,000 live births[8]. The reported incidence of facial paralysis ranges from 1.8 to 7.5 per 1,000 live births, compared with an incidence in our study of only 0.28 per 1,000 live births[9]. Previous studies have reported fetal macrosomia, malpresentation, prolonged labor, forceps delivery, academic degree of the attendant physician at delivery and primiparity as predisposing factors for birth injuries[4–9]. Macrosomia usually occurs in neonates with a birth weight of more than 3,500g and is associated with an increased incidence of birth trauma.

Predisposing factors for birth injuries identified in our study included birth weight (*p*=0.001), gestational age at delivery week (*p*=0.001), instrumental delivery (*p*=0.001), head circumference (*p*=0.001), PROM (*p*=0.05), induction of labor (*p*=0.03), and male infant sex (*p*=0.001). Hughes et al[9] found that birth injuries were more common in males, as is also found in the current study. The predisposing factors for birth injuries identified in our study were similar to those in previous studies[3–10]. Logistic regression analysis showed that PROM, instrumental delivery, birth weight, induction of labor, and academic degree of the attendant physician at delivery significantly affected the likelihood of fetal injury.

CONCLUSION

The frequency of birth trauma has fallen considerably in recent years. This decline reflects an increased tendency to perform cesarean sections when potential delivery difficulties are identified. However, although the frequency of cesarean sections in Pakistan and in our center has increased considerably in recent years, the frequency of birth trauma in our series has not decreased. Our data showed that induction of labor, PROM, academic degree of the attendant physician at delivery, higher birth weight and gestational age were associated with fetal injury. These results suggest that inappropriate medical skills in obstetric/delivery practice and induction of labor significantly increase the chances of fetal injury. Obstetric/delivery practices should be regularly evaluated to reduce birth trauma morbidity. Adequate provision of high-quality prenatal and perinatal care reduces the incidence and severity of birth trauma.

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