PREVALENCE AND OUTCOME OF THE MACROSOMIC INFANTS

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Abstract- The birth weight is one of the important factors affecting the perinatal morbidity and mortality. Fetal macrosomia is associated with increased risks of cesarean section and trauma. To determine prevalence and outcome of the macrosomic infants, this case-control, prospective study is performed in the two university hospitals in Tehran during a 36- month period between 2002 through 2004. 1000 neonates with birth weight of at least 4000g (<90th centile) constituted the case group. Another 2000 Cases amongst the newborns delivered in the same period between 2500 and 3999g (10th-90th centile) formed the control group. A total of 17236 deliveries occurred during the study period. The prevalence of macrosomic deliveries was 5.8 and prevalence of the deliveries (>4500g or heavier) was 0.84%. The mean birth weight of study group was 4254±215 and 3245±310g of control group (P<0.001).While the cesarean section rate was 35.2% for study group and it was 18.5% for the control group (P<0.001) in the study group. 16 cases of clavicular fracture (1.6%), 13 cases of brachial plexus palsy (1.3%), (p<0.001). No perinatal mortality was recorded in two groups. There were 12 cases (1.2%) of asphyxia related to delivery in the study group (p<0.01). The rate of maternal complication, were significantly higher in the study group (p<0.01). The macrosomic infants are in increased risk for birth trauma and asphyxia. The risk of birth trauma for the infants weighing 4500g or more is even greater. The majority of factors which lead to the delivery of macrosomic infants are preventable.

Acta Medica Iranica, 45(6): 505-509; 2007

Key words: Prevalence, outcome, macrosomic infant, birth trauma

INTRODUCTION

The birth weight is one of the important factors affecting the perinatal morbidity and mortality. The "heavy body" is defined as the one that is heavier than 90% of the estimated birth weight (1). The birth weight is the main criteria for macrosomia. For practical reasons, the newborn weighing 4000g or heavier are defined as macrosomic (2, 3). The incidence of macrosomia was reported in 9% in general hospital population (4-6).

A number of risk factors for fetal macrosomia have been recognized. The strongest risk factors are maternal diabetes, which results in a two folds increase in the incidence of macrosomia. Many of risk factors (e.g., prolonged gestation, obesity and multiparity) are highly prevalent among parturient, limiting their utility. Even when two or more of these risk factors are present, the risk of macrosomia is only 32 percent. Furthermore, 34 percent of macrosomic infants are born to mothers without any risk factors and 38 percent of pregnant women have at least one risk factors (7,8).

Macrosomia may result in perinatal mortality and irreversible sequels because of fetal asphyxia and birth trauma perinatal mortality is still five times higher in macrosomic infant (9).

Macrosomic births may cause maternal mortality and morbidity as a result of genital tract trauma and postpartum bleeding. This study was performed to determine the prevalence and outcome of the macrosomic infants.

Received: 22 Jan. 2007, Revised: 17 Feb. 2007, Accepted: 15 Apr. 2007

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MATERIALS AND METHODS

This case-control study was performed in two university hospital in Tehran from January 2002 to December 2004. The study group was formed of newborns 4000g or heavier and mothers of these babies (n=1000). During the same period, concurrent birth between 2500 and 3999 g, formed the control group (n=2000). The selection criteria for the control group were singleton pregnancy with birth occurring between 37 and 42 weeks. Twin pregnancies and the pregnancies complicated with growth retardation were excluded from the control group. We obtained informed consent from parents of all participents.

The data about parity and maternal age were obtained from the maternal history. The gestational age was determined according to the first day of the last menstrual period if the menstruation was regular. If it was unknown, the gestational age was determined with respect to the evidence in the first or second trimester ultrasonography. The maternal complications were classified into three groups: genital laceration, uterine atony, and infection.

All of the newborns were examined in the first hour following delivery. The data of the newborns were obtained from the neonatal care unit records. Metabolic complications of newborns were classified into two groups: hypoglycemia, hypocalcemia.

The statistical analysis was performed with chi-squared and t-test and the results were considered statistically significant when the *P* value was less than 0.05.

RESULTS

A total 17236 deliveries had been recorded during the study period. The rate of macrosomic deliveries (4000g and higher) was 5.8 (1000/17236). The rate of the deliveries with 4500 g and heavier was 8.4 (145/17236) and 5000 g or heavier was 0.087 (15/17236). The mean birth weight was 4254±215 (4000-5750g) and 3245±310 g (2500-3960) in the study and control group respectively ($P < 0.001$). The heaviest newborn of the study group was 5750, the third baby of a 34-years-old woman and whose previous babies weighted 4800g. The mean age of the mothers was 27.6±5.2 (16-43) and 25.1±4.5 (16-40) in the study and control groups, respectively ($p<0.001$). Those 35 years and older formed 7.1% of the study group and 2.5% of the control group ($P < 0.001$). The analysis of the parity distribution revealed that the rate of nulliparity was significantly higher in control group than study group ($P<0.001$). However, the rate of grandmultiparity was higher in the study group than the control group ($P=0.002$).

The macrosomic delivery history was recorded 25.2% in the study group and 5% in the control group ($P<0.001$). The rate of previous delivery with 4500g or heavier was significantly more common in the study group (7.2%), than the control group (0.7%), ($P < 0.001$). Gestational diabetes was diagnosed in 2.3% of the study groups there was no gestational diabetes detected in the control group. The rate of cesarean delivery was found to be 35.2% (6072) in the study group and 18.5% in the control group ($P<0.001$). The observed birth traumas were summarized in Table 1.

Table 1-The distribution of birth traumas according to birth weight between 4000-4499 and the ≥ 4500g groups

	Macrosomia (n=1000)		≥4500		Total		Control	
	4000-4499 (n=855)		(n=145)				(n=2000)	
	N	%	N	%	N	%	N	%
Trauma Positive	26	3.04	21	14.48	47	4.7	32	1.6
Fracture	9	1.05	8	5.51	17	1.7	11	0.55
Clavicle	9	1.05	7	4.82	16			
Femur	0		1	0.68	1			
Brachial/paralysis	6	0.7	8	5.51	14	1.4	8	0.4
Cephalohematoma	11	1.28	5	3.44	16	1.6	13	0.65

Table 2-The distribution of perinatal complications between the groups

	Macrosomia (n=1000)		Control (n=2000)		
Complication	**N**	**%**	**N**	**%**	***P***
Perinatal asphyxia	12	1.2	6	0.3	<0.01
Meconium aspiration	8	0.8	5	0.25	>0.05
Infection	2	0.2	6	0.3	>0.05
Septicemia	1		2		
Pneumonia	1		4		

The incidence of birth trauma was 4.7% in this group and 1.6% in the control group (p<0.001). Clavicular fracture was the most common birth trauma in the study group, followed by brachial plexus paralysis. The rate of traumatic delivery excluding cephalohematoma was 1.75% for the cases 4499g or Lower and 11.02% for the cases 4500g or heavier (p<0.001). Hypoglycemia was noted significantly more frequent in the study group (10%) than the control group (2.6%), (p<0.001).

There was a positive correlation between frequency of hypoglycemia and the birth weight. There was no difference between the groups with respect to the incidence of hypocalcemia (p>0.05). The incidence of perinatal morbidity was determined to be more frequent in the study group; perinatal asphyxia was 4 times more frequent in the study group (Table 2). All of the complications like atony and genital lacerations were significantly common in the study group (Table 3).

DISCUSSION

The cutoff range between 4000 and 4500g is generally accepted to define the macrosomia in the literature (10). ACOG reported 4500g as the cutoff value for macrosomia in 1991 (10). Spellacy *et al.*, classified macrosomia by dividing the newborns into two groups as a mild form in the range of 4000-4500g and a sever form 5000g and heavier (11). In our study, the most accepted cutoff value of 4000g was used as the macrosomia criteria.

The incidence of macrosomia is reported to be approximately 7-10% (3). The newborns that are 4500g or heavier constituted 1-2% of all of the newborns (3). The incidence of macrosomia was reported as 9.8% in a study from turkey (12). However, this rate was determined as 5.8% in our study. The ratio of the newborns 4500g and heavier was 0.9%.

Table 3. The distribution of the maternal complications

	Macrosomia (N=1000)		Control (N=2000)		***P***
	N	**%**	**N**	**%**	
Complication positive	86	8.6	64	3.2	<0.001
Genital Laceration	41	4.1	34	1.7	0.002
Bladder injury	1	0.1			
Uterine atony	8	0.8			0.003
Infection	36	3.6	30	1.5	0.004
Incision	24				
Endometritis	6				
Urinary	5				
Pulmonary	1				

The macrosomia is reported significantly more frequent with grandmultiparity than nulliparity. The rate of grandmultiparity was three times higher in the study group.

There are many studies reporting that the history of pervious macrosomic baby to be the most common leading maternal factor to macrosomia (13).

Our study revealed that the history of previous macrosomic baby was ten times higher in the macrosomic birth group.

It is shown that maternal age older than 35 is a significant risk factor (14).It was also found that the ratio of woman elder than 35 in study group was three times higher. The incidence of gestational diabetes is about 1-3% in the population (15). In another study it was recorded as 1% (16). The incidence of gestational diabetes is reported 1-2% in the mothers of macrosomic babies. This incidence is about 5-7% with births of 4500g and heavier (3, 13). Gestational diabetes was diagnosed in 2.3% of the cases our studies. There has been an argument over the relation between asphyxia and macrosomia. Though there are many studies reporting that there is not an increased risk of asphyxia and meconium aspiration in macrosomic births, there are some studies claiming the opposite. Even though the incidence of asphyxia was significantly increased in the study group and meconium aspiration was common but the difference between groups was not statistically significant in our study (3, 13).

Our study pointed out that the incidence of birth trauma was increased 3 times in the study group. The newborns with birth weight 4500g or heavier carried six times higher risk. Cesarean delivery is suggested as the mode of delivery to minimize the risk of birth trauma but it is not always appropriate to perform cesarean delivery to all macrosomic pregnancies (17, 18).

If cesarean delivery is preferred, it results in 588 useless cesarean deliveries to avoid only one case of brachial plexus palsy (19).

Elective cesarean did not improve outcome in uncomplicated pregnancies, and elective induction of labor appears to increase rather than decrease the cesarean section rate(8).The rate of cesarean was about 35.2% in our study group. In the studies to define the risk factors for brachial paralysis, it was detected that the highest rate occurred in the births above 4500g (20). In a study completed in Parkland hospital, the rate of brachial paralysis was 4.737 in deliveries between 4000-4500g and 4.118 in the deliveries of 4500g and over in a total of 1162 macrosomic birth (18). These rates were determined as (6.855) and (8.145) in our study. Contrary to the literature, no relation was found between the birth traumas and the operative vaginal delivery (22). Facial nerve injuries were not detected in our study compared to the literature, which is probably related to the fact of less application of middle pelvis forceps in our hospitals.

The rate of neonatal hypoglycemia was 10% in the macrosomia group which is compatible with the data in the literature (23).

The risk of post partum bleeding and genital tract injury is about 3-5 times higher in macrosomic deliveries (24).

In our study, the risk of genital laceration and atony was observed to be significantly higher. In Conclusion, the macrosomic births have a higher frequency of birth traumas, genital laceration and atony. These complications are observed more frequently especially when the birth weight is 45oog or heavier.

The rate of perinatal and maternal morbidity and mortality can be reduced by the antenatal diagnosis. This risk factors leading to macrosomia must be thoroughly evaluated by the clinician. Since the majority of factors which lead to the delivery of macrosomic infants are preventable, it is hoped that with close cooperation of gynecologists and pediatricians along with training of mothers, the number of such incidences would be minimized.

Conflict of interests

The authors declare that they have no competing interests.

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