Foetal macrosomia: risk factors, maternal and foetal outcomes in N'Djamena Mother and Child Hospital, Chad

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Background: Macrosomia is a birth weight above the 90th percentile corrected for gestational age and sex, or a birth weight of 4000-4500 g.

Objective: To determine the incidence of foetal macrosomia and macrosomia-associated maternal and perinatal morbidity and mortality.

Method: This was a cross-sectional study covering a period of six months, from January to June 2016 in N'Djamena Mother and Child Hospital, Chad. The sample consisted of two groups: mothers who gave birth to macrosomic babies (the study group) and an equal number of mothers who gave birth to normosomic babies (the control group).

Results: Out of a total of 5,284 deliveries, 403 babies weighed 4.0 kg or more giving an incidence of macrosomia of 7.6%. The mean maternal age and mean birth parity of the study group were significantly greater than in the control group. There were significantly more mothers with a previous history of macrosomia in the study group than in the control group. Ninety three babies (23.1%) in the study group were delivered by Caesarean Section, and 76.9% by vaginal delivery. The commonest maternal complications were: postpartum haemorrhage (15.9%), prolonged labour (13.9%) and perineal laceration (4.4%). There were significantly more babies with a poor Apgar score in the first and the fifth minute in the study group than in the control group (P= 0.0009). Other complications among the macrosomic babies were: shoulder dystocia (1.3%), stillbirths (0.7%) and hypoglycaemia (8.4%).

Conclusion: Macrosomic neonates are more often delivered by Caesarean Section than normosomic babies. There is a clear need during prenatal care and delivery to minimise maternal and perinatal complications.

Keys words: Caesarean Section, foetal macrosomia, complications, N'Djamena Mother and Child Hospital

INTRODUCTION

A macrosomic baby has been defined in different ways with considerable variations of the minimum weight that defines macrosomia [1–3]. The most satisfactory definitions are a birth weight above the 90th percentile corrected for gestational age and sex or a birth weight over 4000g. Due to the variation of the minimum weight that defines macrosomia, reports of its incidence vary from 3% to 15% [4]. The incidence also varies with ethnicity. Studies have shown that Chinese and South Asian infants are smaller for their gestational age [5]. Differences in birth weight distribution are probably due to the genetic and anthropometric factors [6]. Macrosomia is recognized as a cause of perinatal and maternal morbidity and mortality [4].

Risk factors for macrosomia include high maternal body mass index and weight gain, advanced maternal age, multiparity, diabetes mellitus, and gestational age >41 weeks [7]. However, it is well known that clinical risk factors alone have a very low positive predictive value [7].

The aim of this study was to determine the incidence of macrosomia and macrosomia-associated maternal and perinatal morbidity and mortality during a 6-months study at N'Djamena Mother and Child Hospital.

PATIENTS AND METHOD

This was a cross-sectional study covering the six months from January to June 2016. Our sample consisted of two groups:

- The study group were mothers who delivered macrosomic babies. We included all live newborn singleton macrosomic babies who were delivered at or greater than 37 weeks gestation and who had no clinical evidence of congenital malformations.

Table 1. Maternal characteristics

Maternal characteristics	Study group (n = 403)	Control group (n = 403)	P value
Maternal age (years):			
mean	3.4 ± 32.3	26.7± 4.1	0.02
range	43-18	44-16	
Mean parity	4.5 ± 2.8	2.3± 1.7	0.04
Previous history of macrosomia	31.2	14.3	0.001
Gestational age at delivery (weeks):			
mean	41.7 ± 2.5	37.9± 2.9	0.003
range	37- 43	37- 42	
Diabetes mellitus*	27 (6.7%)	5 (1.2%)	0.0001

- The control group were mothers who delivered a baby with a normal weight (ranging between 10th – 90th percentiles). These births were recorded after every macrosomia birth so there were an equal number of mothers in each group.

Age, parity, and birth weight were recorded. The outcomes of interest were perinatal and maternal complications. Data analysis was done by Epi info 6.0 French. Chi-square (X2) test ($p<0.05$) was used to compare variables.

RESULTS

Out of 5,284 deliveries during the study period, 403 babies weighed 4.0 kg and above. So the incidence of macrosomia was 7.6%.

Maternal characteristics

Table 1 shows that the mean maternal age and mean birth parity of the study group were significantly greater than in the control group. There were significantly more mothers with a previous history of macrosomia in the study group than in the control group.

Delivery mode

Table 2 shows that 23.1% of mothers in the study group had delivered by Caesarean Section versus 8.7% in the control group. In the study group, 73 out of 93 (78.5%) Caesarean Sections were done as emergencies. The main indication was the foeto-pelvic disproportion. Operative vaginal are deliveries done by the vaginal route using episiotomy.

Maternal complications

The commonest maternal complication in the macrosomic group was postpartum haemorrhage, followed by prolonged labour and perineal laceration - mainly first- and second-degree laceration – see Table 3.

Perinatal outcome

Table 4 shows that the male/female ratio of the neonates was significantly higher among the macrosomic group than the control group ($p=0.037$). There was a significantly higher proportion of macrosomic babies with an Apgar score below seven in the first and in the fifth minute compared to normosomic babies ($p=0.0009$). There were 5 (1.3%) cases of shoulder dystocia in patients with macrosomic babies and none in the control group. No births injuries occurred.

There were 34 (8.4%) cases of hypoglycaemia in the macrosomic neonates and 11 (2.7%) in the control group. Among babies with hypoglycaemia 8 babies (23.5%) had mothers with a history of diabetes mellitus.

DISCUSSION

Incidence and risk factors

The incidence of macrosomia in this study was 7.6% similar to a Nigerian investigation reporting 8.1% [8]. The highest reported incidence is 20% in Nordic countries [9] while 1.5% of neonates in USA have a birth weight of 4.0kg [10]. These figures are influenced by race and local factors [8]. The pathophysiology of macrosomia is related to the associated maternal or foetal conditions of poorly controlled diabetes mellitus, maternal obesity, and excessive maternal weight gain. All of which have intermittent periods of hyperglycaemia.

Our study showed that mothers of macrosomic neonates were significantly older which agrees with other reports [8,11]. Grandmultiparity was found to be strongly associated with macrosomia. These findings are in keeping with those of Mutihir [12] and Ezegwui [8] who showed that there was a higher proportion of multiparity among mothers of macrosomic neonates.

This study demonstrated that a large proportion of women delivering macrosomic babies had previous histories of delivering macrosomic babies. Women who previously delivered macrosomic babies are 5–10 times more likely to deliver a baby considered large-for-gestational age in subsequent pregnancies [13].

Table 2. Mode of delivery

Mode of delivery	Spontaneous vaginal n (%)	Caesarean Section n (%)	Operative vaginal n (%)	Total
Macrosomic (study group)	285(70.7)	93(23.1)	25(6.2)	403(100)
Control group	324(80.4)	35(8.7)	44(10.9)	403(100)

Table 3. Maternal complications

Maternal outcome	Study group (n=403) n (%)	Control group (n=403) n (%)	P value
Postpartum haemorrhage	64 (15.9%)	35 (8.7%)	0.003
Perineal laceration	18(4.4%)	7 (1.7%)	0.027
Obstructed labour	56 (13.9%)	23 (5.7%)	0 .002

Table 4. Differences in perinatal outcome

Maternal outcome	Study group (n=403)	Control group (n=403)	P value
Sex: male	245 (60.8%)	201 (49.9%)	0.037
Apgar score 1st minute (<7)	26 (6.9%)	11 (2.7%)	0.01
Apgar score 5th minute (<7)	15(3.7%)	5(1.2)	0 .025
Stillbirth	3 (0.7%)	11(2.7%)	0.032
Shoulder dystocia	5 (1.2%)	0 (0%)	0.025
Hypoglycemia	34(8.4%)	11(2.7%)	0.0006

We found a greater proportion of diabetic mothers among the study group than in the control group. Foetal macrosomia in diabetic mothers has been attributed to poor glucose control based on using blood sugar test or HbA1c. Hyperglycaemia in the foetus results in the stimulation of the secretion of insulin, insulin like growth factors, growth hormone, and other growth factors, which in turn stimulate foetal growth and deposition of fat and glycogen.

Macrosomia is associated with a higher incidence of Caesarean Section delivery (double that among the control mothers) and with birth canal lacerations associated with vaginal delivery [14-15]. This was confirmed in this study with a Caesarean Section rate of 23.1% versus 8.7% in the control group. The risk of Caesarean Section rises with increasing birth weight, and the proportion of vaginal instrumental delivery decreases with increasing birth weight [16,17]. The increased Caesarean Section rate is a consistent finding in different countries and between ethnic groups, and the odds are particularly high for primiparous mothers [16]. In macrosomic births, the risk of shoulder dystocia is associated with the need for vaginal instrumental delivery [17].

Maternal complications

Macrosomia was strongly associated with prolonged pregnancy in this study. This was comparable to the findings of Mutihir [12] and Spellacy [14] who observed that macrosomic infants account for about 1% of term deliveries and 3-10% of post-term deliveries. Advanced gestational age results in a larger birth weight. This is to be expected as infants gain approximately 150-200g weekly near term. The duration of labour is more prolonged for women carrying macrosomic babies, and the risk is increased with increasing birth weight [16]. Both the first and second stages of labour are longer than for normosomic pregnancies, and arrest of descent in the second stage of labour is associated with macrosomia [16]. Our findings confirmed this with a higher rate of obstructed labour in the study group (19.9% versus 5.7% in the control group). Macrosomia had been reported as a risk factor for postpartum haemorrhage [17,18] - a fact confirmed in our study.

Perinatal outcomes

Male infants are more likely to be macrosomic than female infants. Male infants are generally 150 - 200 g larger than female infants of the same gestational age near term.

Although the literature frequently and consistently demonstrates an increase in perinatal morbidity and mortality with increasing birth weight, the overall incidence of neonatal complications remains low [19].

We noted a higher proportion of newborns with bad Apgar scores in the study group compared with the control group. Ezegwui [8] also reported a higher proportion of newborns with bad Apgar scores in their study group. The greater the birth weight, the higher the risk of low Apgar scores.

More newborns with hypoglycaemia were found in the study group. The risk of neonatal hypoglycaemia is higher in heavy babies [20]. Neonates with a birth weight >4,500 g had a seven-fold higher occurrence of hypoglycaemia, compared with those with an appropriate weight for gestation age [21]. Five cases of shoulder dystocia were noted in the study group versus none in the control group. It has been reported consistently in the literature that the risk of shoulder dystocia escalates with increasing birth weight [21]. However, the incidence of shoulder dystocia in different birth weight groups varies widely between studies [21].

CONCLUSION

This study shows that the delivery of macrosomic babies is unusual - at about 8% in our hospital. The risk factors are consistent with those reported in the literature. The commonest delivery mode is vaginal despite a high proportion of Caesarean Sections. The main maternal complications are postpartum haemorrhage, prolonged labour and perineal laceration. Perinatal outcomes are a bad Apgar score, hypoglycaemia, shoulder dystocia and stillbirth.

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