MACROSOMIA: A CASE-CONTROL STUDY OF RISK FACTORS AND OUTCOME

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Summary

Background: Macrosomia is associated with increased risk of maternal and perinatal morbidity. The aim of this study was to identify risk factors and assess impact of macrosomia on maternal and perinatal outcome.

Methods: A five-year retrospective case-control study was undertaken at a referral centre. Macrosomia was defined as a birth weight greater than or equal to 4.0kg.

Results: The incidence of macrosomia was 5.2%. Macrosomia was associated with multiparity, excessive maternal weight or body mass index at the end of pregnancy, increased maternal height, longer duration of pregnancy and infant of male sex. Increasing maternal age was not a risk factor. Maternal and perinatal complications associated with macrosomia were postpartum haemorrhage, shoulder dystocia, birth asphyxia and stillbirths. Macrosomic babies were also more likely to be delivered by caesarean section.

Conclusion: Macrosomia is associated with recognizable risk factors but these are not sufficient to recommend recourse to elective caesarean section. Close monitoring in labour and early recourse to caesarean section would improve perinatal outcome.

INTRODUCTION

Macrosomia is a term used to describe a very large fetus or newborn. Considerable interest in macrosomia has arisen on account of its association with increased risk of maternal and perinatal morbidity. Many authors have investigated risk factors for macrosomia,[1-4] while a number of studies have focused on other aspects of fetal macrosomia.[5-7]

In Nigeria, a number of studies have investigated various aspects of macrosomia. One

study investigated obstetric complications of macrosomia and another maternal mortality and perinatal outcome.[8,9] Two others examined risk factors for macrosomia.[10,11]

This study was undertaken to determine the incidence of, and risk factors for macrosomia as well as maternal and perinatal morbidity and mortality associated with it, at the Federal Medical Centre, Umuahia, Abia State.

MATERIALS AND METHODS

The clinical records of women who delivered babies weighing at least 4.00kg from 1st January, 1994 to 31st December, 1998, were reviewed. This weight corresponded to the 90th percentile of the population studied. Data extracted included maternal age, parity, height, weight at the end of pregnancy, mode of delivery, fetal sex, weight, Apgar score and perinatal mortality. These parameters were compared with those of a randomly selected control group consisting of 350 women who had delivered babies weighing 3.00kg to 3.50kg during the same period. All babies were singletons.

Statistical analysis was performed using SPSS statistical software and EPI-INFO version 6.02 epidemiological software. Values of p less than 0.05 were regarded as statistically significant. Odds ratio (OR) and 95% confidence intervals (CI) were calculated. The results are also displayed as figures and tables.

RESULTS

Incidence

There were 139 babies weighing 4.00kg or more at birth out of 2,676 deliveries during the period reviewed. This gave an incidence of 5.19%.

Maternal age

The mean age of 133 mothers with macrosomic babies was 28.9 ± 4.8 years. This was similar to that of the control group which was 28.4 ± 4.4 years ($p > 0.05$). Figure 1 shows the age distribution of mothers in study and control groups. Although a larger proportion of women with macrosomia were at least 35 years of age, the difference was not statistically significant ($p > 0.05$).

Maternal parity

Figure 2 displays the parity distribution of both groups of women. The only statistically significant finding was that women with large babies were more likely to have had at least one

previous baby (X^2 = 5.06, p < 0.05; OR = 1.74, 95% CI = 1.07 – 2.82).

Body mass index

Table 1 shows that the mean weight and body mass index of mothers in the study group was significantly greater than that of the control group (p < 0.05). Women with macrosomic babies were also significantly taller (p < 0.05). Macrosomia was associated with maternal weight ≥ 80kg (X^2 = 9.15, p < 0.05; OR = 2.13, 95% CI = 1.30-3.51) and body mass index ≥ 30 (X^2 = 12.08, p < 0.05; OR = 2.31, 95% CI = 1.43-3.74). Only women who gave birth within two weeks of their last antenatal visit were included in this analysis. This was to reduce the disparity between the last recorded maternal weight and maternal weight at birth.

Duration of pregnancy

The calculation of duration of pregnancy was based on Naegele's rule. The last menstrual period was recorded for 127 mothers in the study group and 336 controls. Forty-nine pregnancies involving macrosomic babies (38.6%) lasted more than 41 weeks compared to 43 pregnancies in the control group (12.8%). This difference was statistically significant (X^2 = 38.49, p < 0.05; OR = 4.28, 95% CI = 2.65-6.92). Post-term pregnancies (lasting longer than 42 weeks) were uncommon because of a policy of terminating pregnancy 10-14 days after the calculated expected date of delivery.

Mode of delivery

The caesarean section rate in the study group was 28.8% and 18.9% in the control group. Thus, macrosomia was associated with increased odds for caesarean delivery (X^2 = 5.77, p < 0.05; OR = 1.74, 95% CI = 1.10 – 2.74).

Table 2 shows that macrosomic babies of nulliparous women were more likely to have been delivered by caesarean section than those of women with one or more previous deliveries (X^2 = 4.71, p < 0.05; OR = 2.60, 95% CI = 1.08-6.28). They were also at increased odds for caesarean delivery compared to babies of nulliparous controls (X^2 = 5.52, p < 0.05; OR = 2.76, 95% CI = 1.06-6.60).

Two macrosomic babies (1.4%) were delivered by forceps. There were no instrumental deliveries in the control group.

There were two cases of shoulder dystocia in the study group. Both resulted in fresh still births. Shoulder dystocia did not occur in the control group. Birth injuries were not

reported in either macrosomic or control groups.

Postpartum haemorrhage

There were 10 cases of postpartum haemorrhage among women with macrosomic babies (7.2%) compared to 8 cases among controls (2.3%). This difference was statistically significant ($X^2 = 6.76$, $p < 0.05$; OR = 3.31, 95% CI = 1.28-8.58).

Sex ratio

Ninety-one babies (65.5%) in the study group were males compared to 153 (43.7%) among the controls. Hence, male sex was associated with increased odds for macrosomia ($X^2 = 18.49$, $p < 0.05$; OR = 2.44, 95% CI = 1.62 – 3.68). The ratio of males to females was 1.9:1 in the study group compared to 0.8:1 in the control group.

Apgar score

Table 3 compares the Apgar scores of both groups. Still births ($X^2 = 9.81$, $p < 0.05$; OR = 4.21, 95% CI = 1.60 – 11.10) and birth asphyxia ($X^2 = 4.09$, $p < 0.05$; OR = 1.68, 95% CI = 1.01 – 2.77) were significantly commoner among macrosomic babies.

Apgar scores were significantly lower ($p < 0.05$) among babies delivered by caesarean section in both groups (Table 4).

Maternal and perinatal mortality

There were 17 perinatal deaths among macrosomic babies (122 per 1000 births) compared to 26 deaths among controls (74 per 1000 births). This difference was not statistically significant ($p > 0.05$). However, as presented above, still births were significantly more likely among macrosomic babies.

There was no maternal death.

Figure 1: Age distribution of study and control groups

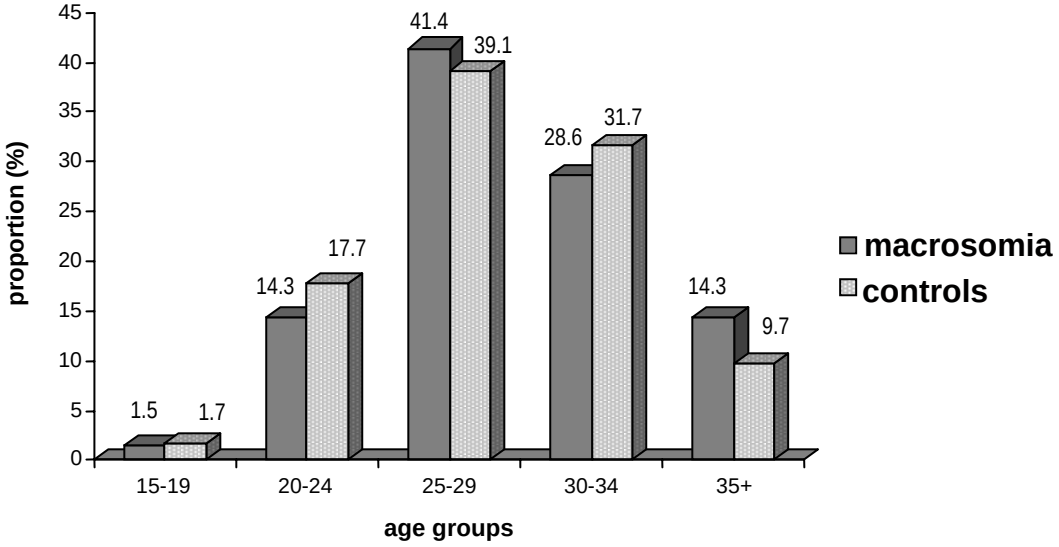

Figure 2: Parity distribution of study and control groups

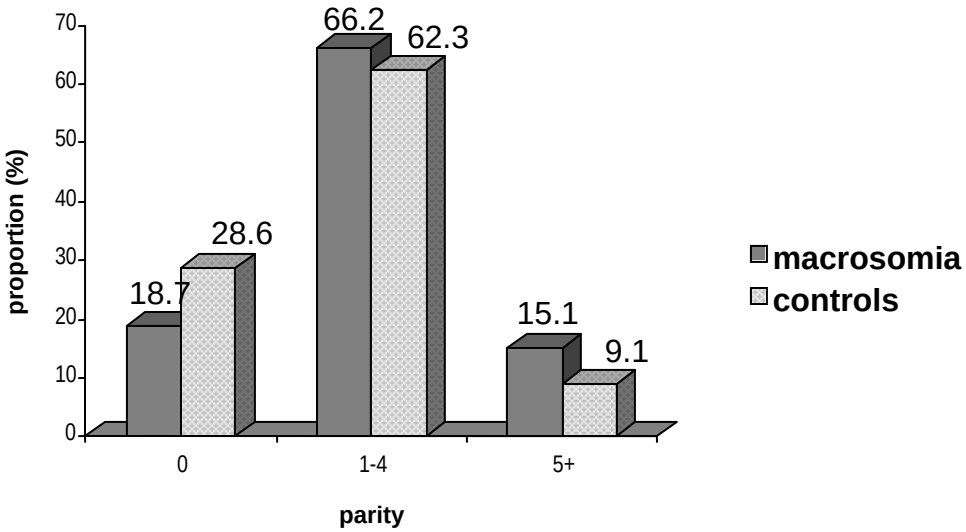

Table 1: Physical characteristics of women in study and control groups.

Physical characteristics	**Study group** (n = 93)	**Control group** (n = 274)
Height (cm)	162 ± 62	160 ± 70
Mean weight (kg)	80.5 ± 9.5	73.8 ± 10.1
Proportion ≥ 80kg	40.9%	24.5%
Mean body mass index (kg/m^2)	31.0 ± 4.3	28.8 ± 4.1
Proportion ≥ 30 kg/m^2	52.7%	32.5%

Table 2: Relationship between parity and mode of delivery

Parity	**Study group**		**Control group**	
	Number	**caesarean section (%)**	**number**	**caesarean section (%)**
0	26	12 (46.2%)	100	31 (31%)
≥ 1	113	28 (24.8%)	250	35 (14%)

Table 3: Apgar scores in study and control groups.

Apgar score	**Study group**		**Control group**	
0	11	7.9%	7	17.4%
1-6	30	21.6%	53	30.4%
≥ 7	98	70.5%	290	52.2%

Table 4: Relationship between mode of delivery and Apgar scores.

Apgar score	**Study group (%)**		**Control group (%)**	
	Caesarean section (n = 40)	Vaginal delivery (n = 99)	Caesarean section (n = 66)	Vaginal delivery (n = 284)
0	10	7.1	4.5	1.4
1-6	47.5	11.1	40.9	9.2
≥ 7	42.5	81.1	54.5	89.4

DISCUSSION

The incidence of macrosomia of 5.2% in this review is higher than the 2.9% reported from Ilorin,[9] 2.6% in Northern Nigeria,[11] 3.4% among South African Blacks[1] and 3.8% in an Asian obstetric population.[3] Among Caucasians, the incidence may be as high as 15.1%.[2] Thus, the incidence of macrosomia varies from population to population.

Excessive maternal weight gain is a recognized risk factor for macrosomia.[2] Since most women in this review booked for antenatal care in the second trimester, pregnancy weight gain could not be accurately assessed. However, maternal weight greater than 80 kg and a body mass index greater than 30 kg/m^2, at the end of pregnancy, were significant risk factors. Other risk factors, in agreement with various studies, were increased maternal height,[10,11] longer duration of pregnancy[2,3] and male sex of the infant.[1,10]

Gestational diabetes mellitus was not a factor in the aetiology of macrosomia. This contrasts with other studies[2-7] and may contribute in part to the lower incidence of macrosomia in our population compared to Caucasian populations. Although increasing maternal age has been associated with macrosomia in some studies,[1,3,10] this was not so in all studies including this one.[12] Considering that half of the genetic constitution of each baby is paternal, evaluation of the contribution of paternal characteristics such as age and body mass index would be of interest.

Various complications are associated with macrosomia. There was an increased risk for birth asphyxia and still births essentially due to prolonged/obstructed labour. Shoulder dystocia and birth trauma are more likely to involve macrosomic babies.[2,3] Shoulder dystocia occurred only in the macrosomic group, both cases resulting in fresh still births. On the other hand, however, neither macrosomic nor normal birth weight infants were noted to have sustained birth injury.

Macrosomic babies were more likely to be delivered by caesarean section than controls.[1-3,10] The frequency of perinatal morbidity following the vaginal delivery of high birth weight babies gave rise to

recommendations for elective caesarean section on suspicion of macrosomia.[13] Our findings were that caesarean section was associated with lower apgar scores than vaginal delivery. However, this did not necessarily imply that vaginal delivery was preferable, rather, that caesarean section, which was usually indicated by prolonged labour secondary to cephalo-pelvic disproportion, was performed when intra-uterine asphyxia had already set in. Since a large proportion of women achieved vaginal delivery satisfactorily, we do not recommend routine caesarean section on suspicion of macrosomia. Rather, in the absence of obvious dystocia, these women should be allowed to attempt vaginal delivery.[14,15] Caesarean section should then be carried out early, if the progress of labour is unsatisfactory or fetal distress sets in.

In addition to caesarean section, women with macrosomic babies had increased risk for postpartum haemorrhage. This was due to uterine atony, probably the result of excessive distention of the uterus and prolonged labour.

Macrosomia constitutes a significant obstetric problem in our population. The main maternal consequences of macrosomia were increased odds for caesarean delivery and postpartum haemorrhage while birth asphyxia and still births were the main perinatal consequences. Successful management requires close monitoring in labour, especially of nulliparous women, with early recourse to caesarean section when indicated. Although, shoulder dystocia is difficult to predict, the presence of personnel experienced in its management, may improve perinatal outcome should it occur.

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