ORIGINAL ARTICLE

Fetal macrosomia: Obstetric outcome of 311 cases in UNTH, Enugu, Nigeria

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Abstract

Background: In modern obstetrics, fetal macrosomia is a major contributor to obstetric morbidity. It is an important cause of perinatal morbidity and mortality.

Aim: This study aims to determine the maternal characteristics, fetal and neonatal complications associated with fetal macrosomia, and its contribution to obstetric morbidity in Enugu, Nigeria.

Materials and Methods: This was a 3-year retrospective study carried out from 1st January 2005 to 31st December 2007.

Results: There were a total of 434 cases of fetal macrosomia out of 5,365 deliveries. The incidence of fetal macrosomia was 8.1%. Only 311 case notes (71.6%) were available for analysis. Statistical analysis showed that mothers of macrosomic newborns were older (30.6 ± 5.6 vs. 27.4 ± 4.74; *P* = 0.001), higher parity (4.1 ± 2.7 vs. 2.5 ± 1.07; *P* = 0.001), and weighed more at term (89.13 ± 6.17 kg vs. 71.43 ± 5.27 kg; *P* = 0.002). The study group had more mothers with previous history of macrosomic babies (39.5% vs. 12.5%), diabetes (3.2% vs. 1%), significant higher cesarian section rate (27.3% vs. 11.9%, *P* = 0.001), and operative vaginal delivery (3.6% vs. 1%; *P* = 0.001) compared with the control. There was male dominance in the study group compared with the control (63% vs. 56.3%; *P* = 0.001), higher risk of fetal asphyxia (*P* = 0.001), and greater mean birth weight (3.6 ± 1.2 kg vs. 3.2 ± 0.6 kg; *P* = 0.002). There were 7 (2.3%) cases of shoulder dystocia in the macrosomic group and none in the non-macrosomic group. The stillbirth rate (3.2/1000) was the same in both study group and control. This was not statistically significant (*P* = 0.124).

Conclusion: The precise determination of fetal weight is only done at delivery. Clinical and ultrasound determination of fetal weight are highly imprecise especially at the third trimester. The route of delivery should therefore be individualized.

Key words: Fetal macrosomia, obstetric morbidity, outcome

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Introduction

Excessive fetal weight has attracted immense attention because of the associated increase in perinatal morbidity and mortality. It also results in maternal morbidity as a result of genital tract trauma and postpartum bleeding.[1] There is evidence that being born macrosomic is also associated with future health risks.[2]

Although there is no general agreement on the definition of the term macrosomia, most obstetricians agree that a baby heavier than 90% of the estimated birth weight or birth weight 4000-4500 g is macrosomic.[3]

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Due to the variation of the minimum weight that defines macrosomia, the incidence varies depending on the cutoff value. It, however, occurs in 1–10% of all deliveries.[4]

Racial, ethnic, and genetic factors such as parental height and weight play a role in determining new born birth weight.[2] Other risk factors include multiparity,[5] maternal obesity, diabetes mellitus, and postdatism.[6] However, none of these factors can adequately identify women at risk of

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delivering macrosomic babies.[7] Male fetuses typically weigh more than female fetuses at any gestational age and therefore constitute a greater proportion of infant with birth weight exceeding 4.5 kg.[8]

Attempts at perinatal diagnosis of macrosomia have proven difficult and are often inaccurate. An accurate diagnosis of macrosomia can be made only by measuring birth weight after delivery.[2]

Methods used to predict birth weight *in utero* include assessment of maternal risks, clinical examination, and ultrasound examination.[9] However, assessment of fetal weight by ultrasound has an inherent 10–15% margin of error.

Maternal risks associated with fetal macrosomia include an increased risk operative delivery. The macrosomic fetuses are at an increased risk of shoulder dystocia, traumatic injury, depressed Apgar score at birth, and increased rate of admission into the newborn care unit.[10]

To avoid these complications, there is a tendency to intervene either with early induction of labor[11] or Cesarean delivery[12] if the fetus is suspected of being macrosomic.

Current evidence from systematic review[13] does not support the policy of early induction in patients with fetal macrosomia because it has been shown to double risk of Cesarean section without reducing shoulder dystocia or newborn morbidities. Similarly, analysis of cost implications of elective Cesarean delivery especially in low resource settings shows that this option is undesirable.[14]

This study was undertaken to estimate the incidence of fetal macrosomia in Enugu, Nigeria: determine the characteristics and possible predictive factors of the mothers of such infants; evaluate the contribution of macrosomia to obstetric morbidity such as operative delivery; and define the fetal characteristics and neonatal complications.

Materials and Methods

This study was carried out at the obstetric unit of the University of Nigeria Teaching Hospital, Enugu, Nigeria, from 1st January 2005 to 31st December 2007.

During this period, a total of 5,365 deliveries occurred. Any normal singleton baby delivered at term that weighed 4,000 g or more was classified as macrosomic.

All cases of intrauterine death on admission were excluded.

The maternal characteristics, labor/delivery events, and outcome in these macrosomic babies were compared with an equal number of fetuses with normal birth weight (2,500–3,999 g) selected randomly from the birth register. For any macrosomic baby, the next normal sized fetus in the delivery register was selected. The later served as control.

Maternal records were reviewed for demographic, medical (diabetes mellitus), and obstetric characteristics such as age, parity, weight of mother at term, gestational age at delivery, and previous macrosomia.

Labor and delivery events noted include mode of delivery (vaginal birth, Cesarean section, or operative vaginal delivery), indication for Cesarean section, shoulder dystocia, and newborn condition at birth.

Gestational age at delivery was calculated from the last menstrual period or ultrasonic estimations carried out before the 20 weeks of gestation where available.

Any mother whose parity was 5 and above was classified as grandmultiparous.

The newborn condition was determined by the Apgar score which was considered low when below 7 in the first or fifth minute. Gender and the presence of any birth injury were noted.

The data were analyzed using standard descriptive statistical calculations (mean, standard deviation, median, and frequency distribution). Chi-square test was performed with statistical significance level determined by a P value < 0.05.

Results

Out of a total of 5,365 deliveries during the study period, 434 babies weighed 4.0 kg and above. The incidence of macrosomia was 8.1%. Only 311 case notes (71.6%) were available for analysis. Table 1 shows the maternal characteristics.

The mean maternal age of the study group was 30.6 ± 5.6 years (range: 16–43, median: 27 years) and 27.4 ± 4.74 years (range: 16–40, median: 24 years) in the control group. A comparison of the two groups revealed a significant difference ($P = 0.001$) with respect to maternal age. The mothers of the macrosomic babies were older.

The mean birth parity in the study and control groups were 4.1 ± 2.7 (median: 3) and 2.5 ± 1.07 (median: 2) respectively. The difference between the two group was statistically significant ($P = 0.001$). The risk of macrosomic deliveries increased with parity. Mothers with a previous history of fetal macrosomia in the study group accounted for 39.5% compared with 12.5% in the control. This was also statistically significant ($P = 0.002$). Mothers with previous history of macrosomia were more in the study group. The mean maternal weight at term in the macrosomic group

was 89.13 ± 6.17 kg (range: 60–115 kg, median: 71 kg) and in the non-macrosomic group 71.43 ± 5.27 kg (range: 58–99 kg, median: 67 kg). A comparison of the two group revealed a significant difference ($P = 0.001$) with respect to maternal weight at term. The mothers in the macrosomic group weighed more at term.

The difference between the mean gestational age at delivery for the study group 41.2 ± 2.5 weeks (range 38–44, median: 41 weeks) and 37.5 ± 2.1 weeks (range 37–42, median: 40 weeks) for the control was statistically significant ($P = 0.003$). The mothers in the macrosomic group had prolonged pregnancies (>41 weeks). There were 10 (3.2%) diabetic mothers in the study group and 3 (1%) in the control. Table 2 shows the mode of delivery.

In the study group (macrosomic), 85 (27.3%) were delivered by Cesarean section, while (215 spontaneous + 11 operative) 72.7% achieved vaginal delivery. In the control group (non-macrosomic), 37 (11.9%) ended by Cesarean section (271 spontaneous + 3 operative) and 88.1% achieved vaginal delivery. There was statistically significant higher Cesarean section and operative vaginal delivery rates in the study group ($P = 0.001$). The commonest indication for Cesarean section in the study group was cephalo-pelvic disproportion 20.8% compared with 5.1% in the control. Table 3 shows the fetal outcome.

There was significantly higher risk of Apgar score below seven in the first and in the fifth minute when the macrosomic babies were compared with the normal birth weight babies ($P = 0.001$). The proportion of newborns with low Apgar score in the first minute in the study group was 6.8% ($n = 21/311$) and in the control 3.9% ($n = 12/311$). In the fifth minute it was 4.8% ($n = 15/311$) for the study group and 2.6% ($n = 8/311$) for the control.

In all, 196 (63%) of macrosomic neonates were males. The male/female ratio in this group was 1.7. Among the control, 175 (56.3%) neonates were males and 136 (43.7%) were females. The male to female ratio was 1.3. When both groups were compared, there was significant male dominance ($P = 0.001$) in the study group.

The mean birth weight of the macrosomic subjects was 3.6 ± 1.2 kg (range: 3.5–5.4 kg) and that of the non-macrosomic 3.2 ± 0.6 kg (range: 2.7–3.7 kg). The difference in birth weight between the control and study groups was statistically significant ($P = 0.002$).

There were 7 (2.3%) cases of shoulder dystocia in the macrosomic subjects and none in the non-macrosomic group. No fetal births injuries occurred.

There was one stillbirth each in either group. The difference in the stillbirth rate (3.2/1000) was not statistically significant ($P = 0.124$).

The commonest maternal complication in the macrosomic

Table 1: Maternal characteristics

Maternal characteristics	Study group (n= 311)	Control (n= 311)	*P* value
Mean maternal age (years)	30.6 ± 5.6	27.4 ± 4.74	0.001
Mean parity	4.1 ± 2.7	2.5 ± 1.07	0.001
Previous history of fetal macrosomia	39.5%	12.5%	0.002
Mean maternal weight at term (kg)	89.13 ± 6.17	71.43 ± 5.27	0.002
Mean gestational age at delivery (weeks)	41.2 ± 2.5	37.5 ± 2.1	0.003
Diabetes mellitus	10 (3.2%)	3 (1%)	
Cesarean section rate	85 (27.3%)	37 (11.9%)	0.001
Operative vaginal delivery	11 (3.6%)	3 (1.0%)	0.001

Table 2: Mode of delivery

	Spontaneous vaginal, *n* (%)	Cesarean section, *n* (%)	Operative vaginal, *n* (%)	Total , *n* (%)
Macrosomic (study)	215 (69.1)	85 (27.3)	11 (3.6)	311 (100)
Non-macrosomic (control)	271 (87.1)	37 (11.9)	3 (1.0)	311 (100)

Table 3: Fetal outcome

Fetal characteristics	Study group, *n* (%)	Control, *n* (%)	*P* value
Apgar score 1st minute (<7)	21 (6.8)	12 (3.9)	0.001
Apgar score 5th minute (<7)	15 (4.8)	8 (2.6)	0.001
Sex (males)	196 (63)	175 (56.3)	0.001
Mean birth weight (kg)	3.6 ± 1.2	3.2 ± 0.6	0.002
Shoulder dystocia	7 (2.3)	Nil	Significant
Stillbirth rate	3.2/1000	3.2/1000	0.143

group was perineal laceration 6 (1.9%). They were mainly first- and second-degree laceration. This was followed by primary postpartum hemorrhage 5 (1.6%).

Discussion

The incidence of macrosomia in this study was 8.1%. The incidence in various places is influenced by race and presence of local factors.[15] In the Nordic countries reputed to have the highest prevalence, the proportion of newborns with birth weight >4,000 g is 20%.[2] In Aba Nigeria, Kamanu *et al.*[16] recorded an incidence of 2.5%, whereas in the United States, an incidence of 1.5% of all neonates that had birth weight ≥4,500 g was noted.[4]

This review showed that mothers of macrosomic neonates were significantly older. This agrees with other reports.[15,17] However, Adesina *et al.*[18] in Ibadan, Nigeria, did not find any significant difference in maternal age and height.

Grandmultiparity was found to be strongly associated with fetal macrosomia in this environment. This was comparable to the findings of Mutihir *et al.*[5] although Yasmeen *et al.*[19] expressed a contrary opinion.

This study demonstrated that a large population of women delivering macrosomic infants had previous history of delivering a macrosomic infant. Women who previously delivered macrosomic fetus are 5–10 times more likely to deliver a baby considered larger for gestational age in subsequent pregnancies.[15]

The mean maternal weight at term in the study group was significantly higher than the value observed in the control. Studies have demonstrated an association between fetal macrosomia, maternal obesity, and higher body mass index.[15] The determination of body mass index at the beginning of pregnancy in our environment is difficult because most of our women book in the second trimester or when the pregnancy is well advanced.

Maternal overweight is a risk factor for gestational diabetes.[20] Our review showed a greater proportion of diabetic mothers among the study group than in the control (3.2% vs. 1%). Fetal macrosomia in diabetic mothers has been attributed to poor glucose control.[15] These fetuses are at risk of stillbirth.

Macrosomia was strongly associated with prolonged pregnancy in the study. This was comparable to the findings of Mutihir *et al.*[5] Spellacy *et al.*[21] 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 at delivery by allowing the growth process to continue *in utero*.

There was preponderance of male babies in the study group. The male fetus has been shown to weigh more than the female fetus at any gestational age.[8,15] Fetal sex influences macrosomic potential.

The study showed a higher Cesarean section rate, 27.3% in mothers of macrosomic fetuses than in those of non-macrosomic infants 11.9%. The rate was also higher than for the general population (25.3%) in the same facility.[22] However, the proportion of macrosomic infants delivered by vaginal route (72.7%) far outnumbered those delivered by Cesarean section (27.3%). Hence, vaginal delivery should be attempted in suspected fetal macrosomia while reserving Cesarean delivery for other obstetric indications.[12,18] This is particularly true in women who have had previous uncomplicated vaginal deliveries of macrosomic infants. This will reduce the high prevalence of Cesarean delivery and its attendant risks in subsequent pregnancies and deliveries.

One of the dreadful complications of vaginal delivery in macrosomic fetus is shoulder dystocia. This is due to associated fetal and maternal injury, greater incidence of an Apgar score <7, and medico-legal liability.[10] The incidence of damage to the plexus brachialis is in case of a shoulder dystocia and a birth weight between 4,000 g and 4,499 g (25%).[10] The 2.3% incidence of shoulder dystocia noted in this study was low compared with the 15.5% incidence recorded by Nassar *et al.*[7] The obstetrician involved in the care of a macrosomic fetus must be familiar with procedures that release a shoulder dystocia at delivery. Mothers with risk factors for fetal macrosomia should be encouraged to book early in pregnancy and have supervised deliveries.

There was no fetal injury in this study. However, macrosomic infants are at risk for birth traumas such as Erbs palsy and clavicle fracture.[10] These risks are higher in infants of diabetic mothers than in infants of women without diabetes whose children have a similar birth weight.[15]

There was a higher risk of asphyxia in the macrosomic neonates in our study. This agrees with other reports.[15,16] However, other researchers found no statistical difference in the mean Apgar score at 1 and 5 min between macrosomic and normal birth weight infants.[17,23]

Perineal laceration (1.9%) and postpartum hemorrhage (1.6%) were the common maternal complications associated with macrosomic delivery in this review. In a review of 8,617 deliveries over a period of 11 years, Mulik *et al.*[9] observed that postpartum hemorrhage occurred in 3.1% of mothers with newborns weighing 4,500 g or more compared with 1.5% in mothers with newborns weighing less than 4,000 g. Postpartum hemorrhage may be related to uterine distention and large placental size.

The management of fetal macrosomia should be individualized because the precise weight of the fetus can only be determined at birth.

The fact that vaginal delivery was possible in a majority of women with macrosomic fetus in this review is very encouraging. Generally, vaginal delivery is still the safer mode of delivery for the mother in the absence of any contraindication. There is little evidence to support routine elective delivery (induction or Cesarean section) for the mere reason of suspected macrosomia.[2] Vaginal delivery of a macrosomic fetus should be conducted by an experienced obstetrician adequately prepared for operative delivery, shoulder dystocia, and neonatal asphyxia.

Clinical examination and ultrasonography will continue to serve as guides on the best modality for delivery although the sensitivity of ultrasound examination in predicting fetal macrosomia is limited.

Future research should focus on ways to develop more accurate methods of estimating fetal weight *in utero*.

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