Original Article

Macrosomic Births in Abuja: A Case–Control Study of Predisposing Factors and Early Neonatal Outcome

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Abstract

Background: Although research has shown that having a macrosomic fetus could be predictive of a negative pregnancy outcome, the factors that control its incidence and the outcome of delivery management have been less well characterized in Africa. The aim of this study was to identify specific predispositions and the factors that influence the early neonatal outcome of macrosomic infants in Abuja. **Methods:** Data from 120 mother and macrosomic (weighing ≥4000 g) newborn pairs, and an equal number of mother and normal weight (2500–3999 g) matched controls, delivered over a 5-month period at three large hospitals in Abuja, Nigeria, were analyzed. Chi-square and logistic regression analyses were performed for various predisposing factors and neonatal outcomes of macrosomic births. **Results:** The incidence of macrosomia was 77 per 1000 births. Independent predictors of macrosomia were parental high social class (P = 0.000), gestational weight gain of ≥15 kg (P = 0.000), and previous history of macrosomia (P = 0.002). The most frequent route of delivery was emergency cesarean section accounting for 51 (42%) births. Macrosomia was significantly associated with higher rates of birth injuries (P = 0.030), perinatal asphyxia (P = 0.015), admissions into the special care newborn unit (P = 0.000), and hypoglycemia (P = 0.000). Although the difference in the early neonatal mortality rates between the macrosomic group (2.5%) and the control group (0.8%) was not statistically significant, nearly 70% of deaths in the macrosomic group were associated with severe perinatal asphyxia. **Conclusion:** Our findings highlight the need for improved anticipatory care of the macrosomic fetus at delivery, in Africa.

Keywords: *Africa, delivery complications, early neonatal outcome, macrosomia, predisposing factors*

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Introduction

Macrosomia, generally defined as a birth weight of more than 4000 g affects 3–20% of all pregnancies with higher rates reported in developed countries.[1,2] Macrosomic newborns have not been uniquely studied in Africa partly because their low incidence contributes insignificantly to overall neonatal mortality. However, their large sizes, which often result in delivery complications, can be a cause of significant morbidity and mortality if not properly managed.[2,3]

This study aimed to document; the incidence of macrosomic newborns in Abuja, their maternal socio-biologic predictors, the neonatal complications attributable to the mode of delivery, and their early neonatal outcome.

Materials and Methods

This was a case–control study of predisposing factors, delivery, and early neonatal outcomes for 120 macrosomic and 120 normal weight infants delivered at three major public hospitals in Abuja city. Abuja is the political nerve center of the Federal Capital Territory, the administrative capital of Nigeria. Because of its central location, Abuja has easy access from all other parts of the country. It has a population of approximately 1.5 million (2006 Census) and the inhabitants are multi-ethnic with diverse vocations. Although majority are senior government

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officials, political office holders, and civil servants, others are professionals with practices both in the public and private sectors.[4] Abuja also has an extensive public sector network for prenatal and postnatal services such that there is a secondary care center within the reach of city dwellers in every major District.

Of all the women who delivered at the three hospitals between July 1, 2009 and November 30, 2009, those who delivered a baby with a birth weight of ≥4000 g formed the case group. The next consecutive birth of a normal weight baby between 2500 and 3999 g matched for sex and mode of delivery was recruited as a control. Babies whose mothers did not have antenatal records with pertinent information on gestational diabetes screening and maternal anthropometry, multiple pregnancies, major congenital abnormalities and babies whose mothers did not give consent were excluded from the study. Ethical clearance was obtained from the Ethics Review Committee of the three hospitals.

Data Collection

All participants were recruited consecutively at birth. Demographic and clinical data obtained from each neonate and mother, including chart reviews, were recorded on a structured study proforma. Information collected from antenatal records were as follows: maternal sociodemographics including age, geographic origin, weight, body mass index (BMI; pre-pregnancy and at term or last antenatal visit), obstetric history including parity, history of macrosomia, diabetes, shoulder dystocia, obstetric surgeries, and any evidence of antenatal diagnosis of macrosomia or estimation of fetal weight. Also included were labor and delivery events. Pre-pregnancy weight was self-reported. Although this is prone to some degree of inaccuracy, it has been used in many studies.[5,6] However, to further ascertain the reliability of this information, the reported weight was compared with weight at booking in early mid-trimester because weight gain in pregnancy occurs largely in the third trimester.[7] Where information could not be ascertained, such participants were excluded from the study. Pre-pregnancy BMI was calculated from self-reported pre-pregnancy weight and height obtained from antenatal records. Gestational age was calculated from last regular menstrual period; if this was unknown, evidence of gestational age in the first or second trimester ultrasonography was used. Social class was determined using the socioeconomic classification scoring system suggested by Olusanya *et al*.[8] (I: high; II: high; intermediate; III: middle; IV: low intermediate; V: low) and BMI was classified on the basis of the WHO criteria (underweight: <18.5 kg/m^2; normal-weight: 18.5–24.9 kg/m^2; overweight: 25.0–29.9 kg/m^2; obese: ≥30 kg/m^2).[9] Data collected from neonatal records include gestational age, apgar scores, birth weight, blood glucose measurements within the first 2 h of birth, birth injuries, neonatal morbidities, and deaths following delivery or while on admission in the newborn unit in the early neonatal period (first week of life).

Outcome information

Primary outcome variables were the incidence of macrosomia and neonatal complications. All deliveries during the study period were recorded in order to provide a denominator for the calculation of the incidence of macrosomic newborns. Neonatal complications include perinatal asphyxia (defined as Apgar score of ≤6 at 1 min of life whereas severe perinatal asphyxia was defined as Apgar score of ≤3 at 5 min), birth injuries (international classification of diseases; ICD 10 specification), admission into special care baby unit, other morbidities, and in-hospital deaths in the first week of life.[10,11]

Statistical analysis

Data were analyzed using the statistical package for social sciences (SPSS) version 22. The significance level was set at $P < 0.05$. Bivariate analysis was performed to examine the association of macrosomia with each of the predisposing factors and the association between macrosomia and each neonatal outcome variable. A logistic regression table was constructed to determine the independent relationship of each explanatory predictor on macrosomia.

Results

A total of 2220 term babies were delivered during the study period, 170 of them were macrosomic giving an incidence rate of 77/1000 births. Only 120 mother and baby pairs who had antenatal records and gave consent were available for study. The mean birth weight of the study group was 4360 ± 278 g whereas that that of the controls was 3250 ± 337 g (P = 0.000). The largest newborn in the study group weighed 5500 g. Seventy (58.3%) were males and 50 (41.7%) were females. The difference in mean birth weight between males and females was not statistically significant across the study and control groups.

In the unadjusted bivariate analyses of the predisposing factors for macrosomia, maternal age of ≥28 years (odds ratio [OR] = 2.54; 95% confidence interval [CI], 1.39-4.64), multiparity (OR = 2.34; 95% CI, 1.25-4.00), previous macrosomic delivery (OR = 6.70; 95% CI, 3.09-14.55), gestational diabetes mellitus (OR = 9.08; 95% CI, 2.04-40.41), pre-pregnancy weight of ≥78 kg (OR = 3.40; 95% CI, 1.95–5.91), pregnancy weight gain of ≥15 kg (OR = 8.11; 95% CI, 3.96–16.60), maternal BMI of ≥30 kg/m^2 (OR = 3.04; 95% CI, 1.67–5.51),

and parents in social classes I and II (OR = 7.24; 95% CI, 3.97–13.23) were significantly associated with macrosomic delivery [Table 1]. Other significant predictors of macrosomia were maternal weight at term of ≥90 kg (OR = 4.5; 95% CI, 2.59–7.81), and maternal height of ≥1.70 m (OR = 2.10; 95% CI, 1.14–3.87). Gestational age of greater than 40 completed weeks was not predictive of macrosomic delivery [Table 1]. After adjusting for the effect of cofounding, only the main effects of high social class (OR = 7.90; 95% CI, 3.49–17.92), gestational weight gain of ≥15 kg (OR = 10.73; 95% CI, 3.14–36.60), and previous macrosomic delivery (OR = 4.16; 95% CI, 1.70–10.21) remained statistically significant [Table 2].

Fetal macrosomia was prenatally detected either by clinical method, USS diagnosis, or by both methods in 74 (61.7%) macrosomic infants. Overall, 39 (32.5%) macrosomic infants were delivered by spontaneous

Table 1: Bivariate Analysis of Maternal Socio-biologic Predictors of Macrosomia

Parameter	Study Group (%) n= 120	Controls (%) n= 120	Odds ratio(95% CI)	*p*- value
Maternal Age(yrs)				
≥28	99(82.5)	78(65.0)	2.54(1.39-4.64)	0.003 *
<28	21(17.5)	42(35.0)		
Parity				
≥2	96(80.0)	77(64.2)	2.34(1.25-4.00)	0.009 *
1	24(20.0)	43(35.8)		
Gestational Age(wks)				
>40	22(18.3)	13(10.8)	1.85(0.88-3.87)	0.143
37-40	98(81.7)	107(89.2)		
Previous Macrosomic delivery	(n=96)	(n=77)		
Yes	48(50.0)	10(13.0)	6.70(3.09-14.55)	0.000 *
No	48(50.0)	67(87.0)		
Pre-pregnancy Wt(kg)				
≥ 78	61(50.8)	28(23.3)	3.40(1.95-5.91)	0.000 *
< 78	59(49.2)	92(76.7)		
Wt at Term				
≥90	72(60.0)	30(25.0)	4.5(2.59-7.81)	0.000 *
<90	48(40.0)	90(75.0)		
Pregnancy Wt gain(kg)				
≥15	54(45.0)	11(9.2)	8.11(3.96-16.60)	0.000 *
<15	66(55.0)	109(90.8)		
Height(m)				
≥1.70	37(30.8)	21(17.5)	2.10(1.14-3.87)	0.023 *
<1.70	83(69.2)	99(82.5)		
BMI(kg/m^2)				
≥ 30	47(39.2)	21(17.5)	3.04(1.67-5.51)	0.000 *
<30	73(60.8)	99(82.5)		
Gestational Diabetes Mellitus				
Yes	16(13.3)	2(1.7)	9.08(2.04-40.41)	0.001#*
No	104(86.7)	118(98.3)		
Social Class				
I & II	88(73.3)	53(44.2)	7.24(3.97-13.23)	0.000 *
III,IV,V	32(26.7)	67(55.8)		
Geographic Origin				
South	96(80.0)	82(68.3)	1.85(1.03-3.34)	0.050
North	24(20.0)	38(31.7)		

*Fisher's exact test, #Significant

Table 2: Logistic Regression Analysis of Predictors of Macrosomia

Parameter	WALD Chi Square	Adjusted Odds Ratio(95% CI)	*p*- Value
Age ≥28yrs	0.022	0.93(0.34-2.53)	0.882
Multiparity	0.227	1.84(0.15-22.82)	0.634
Pre-pregnancy weight(≥78kg)	0.291	1.35(0.47-4.64)	0.510
Pregnancy weight gain(≥15kg)	14.362	10.73(3.14-36.60	0.000*
Height (≥1.70m)	0.092	0.85(0.30-2.42)	0.762
Pre-pregnancy BMI(≥30kg/m^2)	0.052	0.87(0.28-2.74)	0.819
Previous Macrosomic delivery	9.185	4.34(1.68-11.23)	0.002*
Gestational Diabetes Mellitus	2.838	5.10(0.77-33.90)	0.092
Social Classes I & II	18.251	6.62(2.78-15.75)	0.000*

* Significant

Table 3: Indications for Caesarean (CS) Delivery

Indication for CS	Study group (%) n= 81	Controls(%) n= 81
Suspected Macrosomia	32(39.5)	8(9.9)
Obstructed Labor	16(19.8)	2(2.5)
Other Elective Indications α	10(12.3)	29(35.8)
Failed Induction	6(7.4)	7(8.6)
Fetal Distress	8(9.9)	14(17.3)
Others*	9(11.1)	21(25.9)

Fisher's exact test=42.451, *p*-value= 0.000

α 2 previous CS, elderly primigravida, assisted conception-pregnancy, breech presentation, PMTCT(HIV)

* antepartum haemorrhage, failed trial of (CS) scar, umbilical cord accidents, cervical dystocia, abnormal presentation in labour, poor progress and 2 previous CS in labour.

vaginal delivery (SVD) and 81(67.5%) were delivered by cesarean section. Of these, 50 (41.7%) and 31(25.8%) were delivered by EMCS and elective cesarean (ELCS) sections, respectively. There were no instrumental deliveries during the study period. The most frequent indication for cesarean section in the study group was suspected macrosomia (39.5%) followed by obstructed labor (19.8%), whereas in the control group, elective indication (35.8%) was the most frequent indication for cesarean section (X^2 = 42.4551, P = 0.000; [Table 3]).

Neonatal complications by mode of delivery are presented in [Table 4]. No injuries were observed in babies delivered by ELCS. Among women who had a vaginal delivery, shoulder dystocia occurred in seven (17.9%) macrosomic newborns compared with one

Table 4: Delivery Complications in Study and Control Groups

Complications at Delivery	Study group n(%)	Controls n(%)	Odds Ratio(95% CI)	*p*-Value
SVD	(n=39)	(n= 39)		
Shoulder Dystocia				
Yes	7(17.9)	1(2.6)	8.09(0.94-69.35)	0.056#
No	32(82.1)	38(97.4)		
Birth Injury				
Yes	7(17.9)	1(2.6)	8.31(0.97-71.18)	0.056#
No	32(82.1)	38(97.4)		
Perinatal Asphyxia				
Yes	8(20.5)	3(7.7)	3.07(0.76-12.70)	0.192#
No	31(79.5)	36(92.3)		
Emergency CS	(n=50)	(n=50)		
Birth Injury				
Yes	5(10.0)	2(4.0)	2.67(0.49-14.44)	0.436#
No	45(90.0)	48(96.0)		
Perinatal Asphyxia				
Yes	7(14.0)	1(2.0)	7.98(0.94-67.46)	0.059#
No	43(86.0)	49(98.0)		

Fisher's exact test,

(2.6%) newborn in the control group. This difference was not statistically significant. There were also no significant associations between macrosomia and perinatal asphyxia or between macrosomia and birth injury by mode of delivery. However, when both SVD and EMCS were combined, macrosomic newborns were at increased odds of having birth injuries (OR = 4.33; 95% CI, 1.19–15.77) and perinatal asphyxia (OR = 4.14; 95% CI, 1.33–12.88) compared with the control group Table 5. Most of the injuries encountered were soft tissue injuries (caput succedaneum and subconjunctiva hemorrhage). There was a case of Erb's palsy in both study and control groups.

Table 5 shows morbidity outcomes in the early neonatal period. Hypoglycemia was the most frequent morbidity in the macrosomic group, occurring in 31 (25.8%) versus 3 (2.5%) newborns in the control group (OR = 13.58; 95% CI, 4.02–45.86). Admissions into the newborn unit were higher in the study group (43.3%) compared with the control group 16 (13.3%; OR = 13.58; 95% CI, 4.02–45.86). There was no statistically significant difference in the early NMR between the study (2.5%) and control (0.8%) groups [Table 6]. However, two out the three deaths in the study group were because of severe perinatal asphyxia.

Table 5. Morbidity Pattern in the Early Neonatal Period

Morbidities	Study group(%) n=120	Controls(%) n=120	Odds Ratio(95%CI)	*p*- Value
Perinatal Asphyxia				
Yes	15(12.5)	4(3.3)	4.14(1.33-12.88)	0.015 #*
No	105(87.5)	116(96.7)		
Birth Injuries				
Yes	12(10.0)	3(2.5)	4.33(1.19-15.77)	0.030 #*
No	108(90.0)	117(97.5)		
Hypoglycaemia (1st 2hrs of life)				
Yes	31(25.8)	3(2.5)	13.58(4.02-45.86)	0.000 #*
No	89(74.2)	117(97.5)		
Sepsis				
Yes	6(5.0)	7(5.8)	0.85(0.28-2.61)	1.000
No	114(95.0)	113(94.2)		
Meconium Aspiration				
Yes	4(3.3)	1(0.8)	4.10(0.45-37.26)	0.370 #
No	116(96.7)	119(99.2)		
Neonatal Jaundice				
Yes	9(7.5)	3(2.5)	3.16(0.83-11.98)	0.136 #
No	111(92.5)	117(97.5)		
Polycythaemia				
Yes	3(2.5)	0	1.03(0.10-1.06)	0.081 @
No	117(97.5)	120(100)		
Congenital Abnormality				
Yes	2(1.7)a,b	1(0.8)c	2.01(0.05-5.44)	1.000 #
No	118(98.3)	119(99.2)		

Fishers exact test, @ Yates correction, * Significant, a duodenal atresia, b congenital heart disease, c omphalocele.

Table 6: Admission and Mortality Distribution in Early Neonatal Period.

Outcome	Study group(%) n=120	Controls(%) n=120	Odds Ratio(95%CI)	*p*- Value
Admissions				
Yes	52(43.3)	16(13.3)	4.97(2.63-9.41)	0.000#*
No	68(56.7)	104(86.7)		
Mortality				
Yes	3(2.5)	1(0.8)	3.05(0.31-29.76)	0.622#
No	117(97.3)	119(99.2)		

#Fishers exact test, * Significant

Discussion

The incidence of macrosomia in Abuja, as shown in this study (7.8%), agrees with the recent evidence of increasing macrosomic deliveries in Africa.[2,12] Historically, rates were as low as 2.5% in Aba and 3.5% in Jos.[13,14] As observed in more advanced countries,[2,15] the findings of this study might be indicative of improved ante-natal care services, changes in lifestyle and diet, and a higher clinic attendance rate among the more affluent who are attracted to the Nation's capital city compared with other parts of the country. Resultantly, high parental social class was the strongest independent predictor of macrosomia in this study, which is consistent with the previous findings of Fakeye[16] in Ilorin, North Central Nigeria, and Abubakari *et al*.[12] in the northern region of Ghana. Both studies reported that large infants occurred more frequently among high social class women who could pay for health services. According to Spencer,[17] social class differences in birth weight are determined by socially patterned health behavior in pregnancy and the effect of intergenerational and early childhood social circumstances on fetal and early childhood growth. Apart from being able to access and afford ante-natal services, women from high social classes tend to have better nutrition, more comfort, and less undue stress before and during pregnancy. Other independent predictors of macrosomia that were identified in this study include pregnancy weight gain of ≥15 kg and previous history of macrosomia. Although these findings agree with previous reports,[5,18] the association between macrosomia

and pregnancy weight gain is currently debated.[19] Leperq *et al*.[20] found that the correlation between birth weight and maternal weight gain during pregnancy decreased when corrected for pre-gravid weight, birth weight, and placental weight. Corrected weight gain in pregnancy might be a better estimate of the true increase in maternal weight during pregnancy. Reoccurrence of macrosomia in subsequent pregnancies possibly reflects an inherent genetic tendency in the mother to deliver macrosomic babies. This information would be useful for prenatal counseling of women with previous macrosomic infants. Although paternal contribution to macrosomia has been previously explored in the literature,[18] we were not able to report on this. Paternal and other unknown factors could be responsible for the 25% of deliveries that were not predicted by the study's regression model. Of note, a good percentage of macrosomic deliveries are unexplained in the literature. [21]

Furthermore, there is considerable variation in the literature regarding the strength of association between macrosomia and each predictor.[6,18,19] For instance, although gestational diabetes has been shown to be a strong predictor of macrosomia in many studies,[6,22] it was not strongly associated with macrosomia in our study. This is probably because of the low incidence of diabetes in the study population. Although not independently associated, the preponderance of maternal constitutional factors does underscore the important role genetic and environmental factors play in the etiology of fetal macrosomia.[22] In addition, maternal obesity has been shown to contribute to macrosomia via mechanisms, including insulin resistance, that give rise to increased fetal glucose and insulin levels, even in women who do not have diabetes.[23] Contrary to previous reports,[2,14,19] prolonged pregnancy was not predictive of macrosomia in our study. The policy of terminating pregnancies through induction of labor or caesarean section 10–14 days after the expected date of delivery for women who received ante-natal care likely contributes to this finding.

This study's high caesarean section rate (67%) for macrosomic deliveries is noteworthy, especially as previous rates from Africa have been low.[2,13] Worldwide, there is no consensus protocol for the delivery management of the macrosomic fetus and clinicians are often faced with the challenge of defining the threshold of macrosomia that is associated with neonatal morbidity and mortality. This dilemma is worsened by the inaccuracies in the measurements for predicting actual birth weight and variations in outcome for the different routes of delivery. [19] Although it is universally accepted that ELCS does eliminate shoulder dystocia and brachial plexus injuries, there are divergent views on the appropriate estimated fetal weight for an elective caesarean section indication.[3] Both the American College of Obstetricians and Gynecologists (ACOG) and the Royal College of Obstetricians and Gynecologists (RCOG) agree on the recommendation of elective caesarean section in women with diabetes with a predicted birth weight of >4.5 kg. However, only the ACOG stipulates estimated fetal weight of ≥5 kg for elective caesarean section in nondiabetic pregnancies.[3] We detected a high rate of caesarean section within the macrosomic group that may have been partly because of increased prenatal detection by clinical and ultrasonic means. However, in spite of this, there was a high rate of EMCS (primarily for obstructed labor and/or fetal distress). Mild macrosomia, defined as a birth weight between 4000 and 4500 g, is more difficult to determine prenatally.[19] Even when detected, the likelihood of an attempt at vaginal delivery is higher.[19] For this and many other reasons, including maternal preferences, as reported by Kamanu *et al*.[13] it is possible that labor was allowed for some mothers of macrosomic babies which turned out to be unsuccessful. Delays in effecting delivery for these infants might have been responsible for the increased rates of perinatal asphyxia in the macrosomic group, as shown in this study. Prior studies from other parts of the country similarly reported increased incidence of severe perinatal asphyxia in macrosomic infants of unbooked mothers presenting very late in labor with established intrapartum asphyxia.[13,24,25] Contrastingly, Lipscomb and Gregory[26] in South California, USA, reported that no case of perinatal asphyxia was associated with the mode of delivery of macrosomic babies in their study. This was because all pelvic arrest disorders were treated promptly by caesarean section. If the aim of performing a cesarean section is to avoid the trauma (both maternal and neonatal), that is associated with vaginal delivery of a macrosomic infant, then, urgent intervention is crucial to the survival of the macrosomic infant trapped in the birth canal.

When compared with previous reports,[19] the incidence of birth injuries among macrosomic newborns in this study is twice as high. However, most of the injuries were soft tissue injuries such as scalp edemas and minor lacerations. The low incidence of clavicular fractures and brachial plexus injuries may have been because of the reduced incidence of SVD, the expert management of shoulder dystocia, or the absence of instrumental deliveries, which are reportedly, more frequently associated with nerve and bone injuries.[3]

The current study shows that hypoglycemia was the most frequently occurring morbidity in the macrosomic group. It is well known that hypoglycemia is more common in infants of diabetic mothers (IDM), and

particularly worse within the first 2–3 h of life when blood glucose reaches its nadir.[27] Yet, despite the study's low population of infants of diabetic mothers, the incidence of hypoglycemia among macrosomic infants is in keeping with the findings of other studies.[28] Kindly complete sentence. "Although in support of previous evidence that demonstrated hypoglycemia in macrosomic infants of non-diabetic mothers,[28,29] we observed that hypoglycemia occured more frequently among macrosomic babies delivered by caesarean section to mothers who had not fully recovered from anesthesia to commence exclusive breastfeeding. These babies were in-turn admitted into the special care newborn unit for parenteral correction of hypoglycemia. Consequently, there was an increased admission rate(43.3%) of macrosomic infants into the newborn units. in Mmbaga *et al*.[30] in Tanzania, Africa, also reported a high admission rate (69%) of macrosomic babies for hypoglycemia, injuries, and respiratory distress. These admission rates are much higher than the figures (2.7–9.3%) reported in more advanced countries.[19,29]

The early NMR for the macrosomic group is lower than previous findings from other parts of the country.[14,24] It is possible that having a supervised antenatal care could have led to a better neonatal outcome, unlike the other studies where majority of the early neonatal deaths were observed in unbooked mothers.[24,25] Nevertheless, the finding of nearly 70% of macrosomic deaths resulting from severe perinatal asphyxia following delivery, which also agrees with evidence from studies within the region, highlights the need for improved anticipatory care with prompt referral service in the management of macrosomic pregnancies.

Study limitations include the inability to perform secondary data analysis because of low incidence of some outcome variables, and lack of data on other probable predictors of macrosomia. In addition, our early neonatal deaths represent only intrahospital and reported deaths. It is possible that our figures are underestimated.

In summary, macrosomia was associated with increased incidence of emergency cesarean deliveries following obstructed labor accounting for an increased risk of perinatal asphyxia. Anticipatory care and prompt referral service should be key considerations in the delivery plan of suspected macrosomic pregnancies in Africa.

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Conflicts of interest

There are no conflicts of interest.

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