

Fetal and Maternal Outcomes in Pregnancies Complicated with Fetal Macrosomia

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Abstract

Background: Fetal macrosomia remains a considerable challenge in current obstetrics due to the fetal and maternal complications associated with this condition. **Aim:** This study was designed to determine the prevalence of fetal macrosomia and associated fetal and maternal morbidity and mortality in the Al Qassim Region of Saudi Arabia. **Materials and Methods:** This register-based study was conducted from January 1, 2011 through December 30, 2011 at the Maternity and Child Hospital, Qassim, Saudi Arabia. Macrosomia was defined as birth weight of 4 kg or greater. Malformed babies and those born dead were excluded. **Results:** The total number of babies delivered was 9241; of these, 418 were macrosomic. Thus, the prevalence of fetal macrosomia was 4.5%. The most common maternal complications were postpartum hemorrhage (5 cases, 1.2%), perineal tear (7 cases, 1.7%), cervical lacerations (3 cases, 0.7%), and shoulder dystocia (40 cases, 9.6%) that resulted in 4 cases of Erb's palsy (0.96%), and 6 cases of bone fractures (1.4%). The rate of cesarean section among women delivering macrosomic babies was 47.6% (199), while 52.4% (219) delivered vaginally. **Conclusion:** Despite extensive efforts to reduce fetal and maternal complications associated with macrosomia, considerable fetal and maternal morbidity remain associated with this condition.

Keywords: Diabetes, Gestational, Macrosomia, Morbidity, Pregnancy outcome, Saudi Arabia

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Introduction

Fetal macrosomia has been defined in different ways. There are considerable variations of the minimum weight that defines macrosomia.^[1-3] The most satisfactory definition is a birth weight above the 90th percentile corrected for gestational age and sex.^[4] Macrosomia is recognized as a cause of fetal and maternal morbidity and mortality. Ethnic factors, gestational diabetes, prolonged pregnancy, high parity, and obesity have been shown to play a role in determining fetal weight.^[2,5,6] Macrosomia has been found to be associated with many complications, including shoulder dystocia, traumatic birth injuries, and asphyxia.^[6] The aim of this study

was to determine the prevalence of fetal macrosomia and macrosomia-associated maternal morbidity and mortality during a 1-year study in the Qassim Region of Saudi Arabia.

Materials and Methods

In this retrospective study, 9241 deliveries were performed at the Maternity and Children Hospital (MCH), Buraidah, Al-Qassim Region, Kingdom of Saudi Arabia, from January 1, 2011 through December 30, 2011. The Qassim Region is located in the center of the Arabian Peninsula, with a population of 1.08 million.^[7] In this study, macrosomia was defined as a birth weight of at least 4 kg.^[8] 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. Gestational age was determined by the duration of amenorrhea and was confirmed by an early ultrasound scan during pregnancy. A total of 418 macrosomic newborn babies met the inclusion criteria. All women in this study were receiving regular antenatal care at the Maternity and

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Children Hospital, where random blood sugar testing was performed at the booking visit. Furthermore, gestational diabetes screening was performed between 24 and 28 weeks' gestation using an oral glucose tolerance test. The diagnostic criteria for gestational diabetes mellitus (GDM) were based on American Diabetes Association threshold.^[9] The department policy for management of diabetic patients is induction of labor at the completion of 38 weeks' gestation. Demographic data including age, parity, and weight were recorded. The outcomes of interest were fetal and maternal complications. Maternal complications that were assessed included the mode of delivery, shoulder dystocia (defined as delayed head-to-body delivery time, and the use of obstetrical maneuvers), postpartum hemorrhage (PPH), perineal lacerations, and cervical tears. The record-reported fetal complications were Erb's palsy and bone fractures. This study was approved by the Ethics Committee of the College of Medicine, Qassim University.

Statistical study

The statistical package for the social sciences (SPSS 15 for Windows) was used for data recording and statistical analyses. The descriptive analyses used included the mean, standard deviation, and frequency distribution.

Results

The total number of deliveries during the study period was 9241. Of these, 418 mothers gave birth to macrosomic babies. Thus, the prevalence of fetal macrosomia was 4.5%. The mean maternal age was 29.7 ± 6.9 years (range, 16 to 42 years). The mean birth parity was 4.1 ± 2.7 . Most women in the study group were multiparous (81.1%, $n = 339$), whereas 18.9% ($n=74$) were primigravida. The mean fetal birth weight was 4.59 ± 0.56 kg (range, 4.12-5.4 kg). The mean gestational age at delivery was 40.3 ± 1.2 weeks.

Based on the criteria for diabetes established by American Diabetes Association, the total number of mothers with diabetes in this study was 403. Thus, the incidence of diabetes (gestational and pre-existing) was 4.4% ($n = 403$). Of these 403 patients, 66.3% ($n = 267$) had GDM, and 33.7% had pre-existing diabetes ($n = 136$). Of the macrosomic infants, 40.4% ($n = 169$) were born to mothers with diabetes.

The adverse outcomes of pregnancy in this study were as follows: 47.6% ($n = 199$) of the macrosomic babies were delivered by cesarean section (CS) whereas 52.4% ($n = 219$) were delivered vaginally, 2.3% of which ($n = 5$) were delivered by forceps.

In this study, the frequency of shoulder dystocia was

9.6% ($n = 40$). Common fetal complications encountered were Erb's palsy (0.96%, $n = 4$) and fractures (1.4%, $n = 6$), mainly of the clavicle and humerus. Recorded maternal complications included perineal tear, postpartum hemorrhage, and cervical lacerations, which occurred in 1.7% ($n = 7$), 1.2% ($n = 5$), and 0.7% ($n = 3$) of the study population, respectively. During the study period, the prevalence of CS was 31.3% ($n = 2895$). Macrosomia was the indication for CS in 6.9% ($n = 199$) of these cases.

Discussion

The prevalence of fetal macrosomia in this study was found to be 4.5%. The highest reported prevalence is 20% in Nordic countries,^[2] while 1.5% of neonates in the USA have a birth weight of ≥ 4.5 kg.^[10] A previous study conducted in KSA from 2004 through 2006 reported a prevalence of 5.6% using the same birth weight definition,^[11] which is greater than the rate in our report. A decline in the fetal macrosomia rate is supported by data from the National Vital Statistics; the USA has shown a significant, steady decline in the rate of fetal macrosomia using the same weight definition for macrosomia.^[12] This decline has been attributed to increases in the rates of preterm labor, labor induction, and twin pregnancies.^[12] This decline may also be explained by the increasing public health awareness about diabetes and the counseling of patients about the risks of hyperglycemia; these factors lead to good patient compliance and therefore good glycemic control. However, the rate of macrosomia in Saudi Arabia is expected to increase because of the increase in risk factors for macrosomia, including obesity^[13] and diabetes.^[14] The differences in the rates of macrosomia may be related to variations in ethnicity in addition to differences in fetal weight cutoffs used to define fetal macrosomia, as in the study conducted in the USA.^[11] Nevertheless, the exact causes of excessive fetal weight gain during pregnancy remain unexplained.

Despite good glycemic control in the mothers with diabetes included in this study (as indicated by the levels of HbA1c), there was a high incidence of macrosomia (40.4%, $n = 169$). A higher rate of macrosomia among controlled diabetic mothers (48.8%) was reported by Evers *et al.*^[15] In a Nigerian study, Ezegwui *et al.*^[16] demonstrated that the prevalence of macrosomia was 3.2% among mothers with diabetes, whereas Segregur *et al.*^[17] reported a prevalence of 2.4%. Moreover, Ju *et al.*^[18] stated that there was no significant relationship between macrosomia and diabetic pregnancy. The higher reported rates of macrosomia despite glycemic control may be due to constitutional factors that operate together with diabetes; such factors would be difficult to discern in this study. In most of these studies, diabetes is clearly

regarded as a cause of macrosomia, but the influence of genotype on this association was not considered. Thus, it is unclear whether there is a genetic predisposition toward greater birth weight among some women with diabetes.

In most pregnancies, the actual fetal weight is determined retrospectively, as the predictive power of both clinical measurements and ultrasound is limited, especially in diabetic patients. The overall rate of CS in this study was 31.3% ($n = 2895$), of which 6.9% ($n = 199$) of cases were due to macrosomia. Consistent with previous reports, nearly half of the macrosomic babies (47.6%) were delivered by CS. Higher rates were reported by Gyurkovits *et al.*^[19] and Akin *et al.*^[20], while Cheng *et al.*^[21] reported a rate of 40.9%. The high rate observed in our study was mainly due to elective delivery of macrosomic babies via CS rather than by induction of labor, in accordance with hospital policy and not due to fetopelvic disproportion or other abnormalities of labor cited in other studies. In addition, the use of Carpenter-Coustan criteria for the diagnosis of GDM was found to increase the risk for surgical delivery, macrosomia, and shoulder dystocia.^[22] Induction of labor at 38 weeks in mothers with diabetes significantly increases the risk for CS as compared with non-diabetic mothers.^[23]

One of the most serious complications of vaginal delivery in macrosomic babies is shoulder dystocia, due to its association with birth trauma. Current evidence shows that increasing birth weight heightens the risk of both shoulder dystocia and permanent brachial plexus injury. In this study, shoulder dystocia occurred in 9.6% (40) of the cases, which is comparable to the rate of 10.5% reported by Esakoff *et al.*^[24] The fetal sequelae for shoulder dystocia included 4 cases of Erb's palsy (0.96%) that recovered completely after 2 months and 6 cases of bone fractures (1.4%) related to shoulder dystocia. Langer *et al.* reported that 76% of cases of shoulder dystocia are preventable if the rate of CS is increased by 2.6%.^[25] However, this finding is difficult to put into practice because most macrosomic babies are diagnosed retrospectively. In our study, 52.4% of the cases of macrosomia were not diagnosed antenatally. The only way to decrease the incidence of shoulder dystocia related to macrosomy is by improving the ability to estimate fetal weight, either clinically or biometrically.

Maternal complications encountered perineal tear (7 cases, 1.7%), PPH (5 cases, 1.2%), and cervical lacerations (3 cases, 0.7%). All of these complications were managed effectively. Maternal complications related to macrosomia may arise after emergency CS, as macrosomia is most often diagnosed during abnormal labor; as a result, the fetal head is already deeply engaged

at the time of surgery. PPH complicating macrosomia is due to uterine atony and genital lacerations, which can be managed effectively if WHO guidelines are strictly followed. No fetal or maternal deaths occurred in this study.

The shortcomings of this study are its retrospective nature, the lack of a control group, and the gathering of data from a single center rather than multiple centers (the latter of which could be more representative of the general population).

Conclusion

Despite reasonable control of diabetes in pregnant mothers, there is still a high rate of macrosomia among this population. Further study is warranted to investigate the association of diabetes with macrosomia after the exclusion of genetic factors among patients with diabetes. Such studies would help to distinguish constitutional factors from diabetes itself in determining the causes of macrosomia. To reduce the morbidity associated with macrosomia, individuals supervising the labor ward should be properly trained in performing obstetric maneuvers for shoulder dystocia and second-stage CS. In addition, further prospective studies are required to improve antenatal determination of fetal weight.

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