THE PREVALENCE OF MACROSOMIA IN NEWBORNS AND ITS ASSOCIATION WITH MATERNAL DIABETES

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ABSTRACT

Objective: To find out the prevalence of macrosomic births and its obstetric outcome in diabetic and non diabetic maternities of Saudi nationality of Al-Jouf Region.

Material and Methods: This one year study was carried out from January 2012 to December 2012 in Department of Obstetrics and Gynaecology at "Al-Jouf Maternity and Children Hospital", Sakakha, Al-Jouf Region. Kingdom of Saudi Arabia. All patients having given birth to a singleton newborn weighing 4000 g or more, and those having diabetes and delivered of a singleton neonate after 37 completed weeks of gestation were included in the study group. Mothers name, admission number, noted from labour and delivery register and the case files requested from the hospital's patient record section. Information was collected on performa and analyzed using SPSS version 16.

Results: Out of 3820 singleton maternities of Saudi nationality, the frequency of macrosomia was (8.21%). The mean maternal age was 30.30 years ± 5.3 standard deviation. Out of the 314 mothers of macrosomic newborns, 157 (50%) were grand multi gravida and 76(24.2%) were postdate. Eighty six mothers were known diabetic at the time of delivery and of these, 26 (30.23%) had macrosomic births. The odds of having a macrosomic newborn were 5 times for mothers with diabetes compared to mothers without diabetes. The overall caesarean section rate in 314 maternities with macrosomic newborns was 38.9%. Diabetic mothers with macrosomic newborn, however had a higher chance of caesarean delivery 73% with no incidence of shoulder dystocia in this group. The frequency of shoulder dystocia was 2.08% in total macrosomic births compared to the rate of 0.155% seen in non-macrosomic newborns delivered vaginally in the same study period. Based on increasing birth weight, the macrosomic newborns were further divided into three groups and the difference in shoulder dystocia was noted to be statistically significant with increasing birth weight.

Conclusions: Diabetes puts an infant at higher risk of macrosomia and mothers at higher risk of caesarean section. Fetal macrosomia are increased 5 times by maternal diabetes.

Key Words: Macrosomia, shoulder dystocia, caesarean section, gestational diabetes.

INTRODUCTION

While the term "macrosomia" is widely used clinically and in literature, the precise definition of macrosomia is poorly characterized. With definitions varying from 4, 4.5, or 5 kg to a percentile of 90, 95 or 97.5%[1,2]. The most satisfactory definition is a birth weight above the 90th percentile corrected for gestational age and gender[3]. These birth affect 3 to 15 percent of all pregnancies[4]. Fetal complications are often related to shoulder dystocia, brachial plexus injury, and injuries due to traumatic birth and hypoxia[4,5]. Maternal complication of macrosomia are due to abnormalities of labor and its complications including higher caesarean section rate[4,6]. Maternal diabetes is a known risk factor for fetal macrosomia. Increased glucose levels, even those below the gestational diabetes, for example, are associated with continuous increase in risk of macrosomia and caesarean section as described by Semer et al[7] and by the (Hyperglycemia and Adverse Pregnancy Outcome) study[8]. Evidence on ultrasound scans of a rising abdominal circumference percentile in relation to head circumference or biparietal diameter is indicative of accelerated fetal growth. Most often an unpredictable and unpreventable obstetric emergency shoulder dystocia continue to evoke terror among health care providers[9,10]. Shoulder dystocia is defined as a delivery that requires additional obstetric maneuvers to release the shoulder after gentle downward traction has failed[11]. The aim of the study was to find the prevalence and obstetric outcome of macrosomic births in people of Al-Jouf region and its association with maternal diabetes.

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MATERIAL AND METHODS

This one year retrospective study was performed at the women and Children Hospital, Sakakah, Al-Jouf Region, Kingdom of Saudi Arabia, from January 2012 to December 2012. In this study, macrosomia was defined as a birth weight of at least 4 kg[12]. Permission was granted by Hospital director and ethical committee to carry out the study by giving access to the patients case files in record section. Mothers name, serial number, and admission number noted from labour and delivery register and the case files requested from the patient record section. Record keeping was systematic, containing details of patients hospital visits, investigations and their admissions in index and past pregnancies. In all patients detailed history, a thorough examination, and investigations were carried out. Relevant findings were noted on Performa. All maternities with normal looking live singleton macrosomic newborns delivered at or greater than 37 weeks' gestation were included. Patients with documented diabetes at delivery at 37 weeks and beyond were also recruited in the study. Gestational age was determined by the duration of amenorrhea and was confirmed by an early ultrasound scan during pregnancy. A total of 314 maternities met the inclusion criteria. Not all of these patients had received antenatal care at the same hospital and referrals were always accepted from other hospitals and primary health care clinics of Al-Jouf Region. Selective, gestational diabetes screening was performed between 24 and 28 weeks' gestation using an oral glucose tolerance test. However, universal srceening was not practiced. The diagnostic criteria for gestational diabetes mellitus (GDM) were based on American Diabetes Association threshold[10] out of 86 diabetic maternities, 26 fulfilled criteria of macrosomia. The department policy for management of diabetic patients was admission for planned delivery at the completion of 38 weeks' gestation. Demographic data was recorded. Relevant findings were noted on Performa. Maternal variables studied included age, parity, presence of diabetes, mode of delivery and shoulder dystocia (defined as delayed head-to-body delivery time. The analysis was performed by SPSS version 16.0. Frequency and percentages were computed for presentation of all categorical variables.

RESULTS

During one year study period, out of 3820 singleton maternities of Saudi nationality, the frequency of macrosomia was 314 (8.21%). The mean maternal age was 30.30 years ± SD 5.30. Out of these 314 mothers of macrosomic newborns, 157 (50%) were grand multi gravida and 76(24.2%) were postdate. Eighty six mothers were known diabetic at the time of delivery and of these, 26 (30.23%) had macrosomic births. In our study the frequency of macrosomia with diabetes in pregnancy was 30.23% and the odds of having a macrosomic newborn were 5 times for mothers with diabetes compared to mothers without diabetes. The overall caesarean section rate in 314 maternities with macrosomic newborns was 38.9% (n=122). The frequency of shoulder dystocia was 2.08% in macrosomic births delivered vaginally compared to the rate of 0.155% seen in non-macrosomic newborns delivered vaginally in the same study period.

The frequencies of macrosomia, caesarean section and shoulder dystocia in diabetic patients were compared with non diabetic patients, results given in Table 1, 2, 3 respectively. Based on increasing weight, the macrosomic newborns were further divided into three and the difference in shoulder dystocia was noted to be statistically significant with increasing birth weight, (Table 3).

DISCUSSION

Macrosomia has been found to affect 3 to 15 percent of all pregnancies[4]. This is comparable to our study in which the frequency of macrosomia was 8.30%. In our study over one year period the overall frequency of shoulder dystocia was 04 (2.08%) out of 192 macrosomic newborns delivered vaginally, which is lower than the rate of 10.5% reported by Esakoff et al[13] however it is higher than the rate of 0.155% seen in non-macrosomic newborns delivered vaginally in our study period. Shoulder dystocia continue to evoke fear among health care provider[9,10], as it is regarded as unpredictable. Shoulder dystocia occurs when either the anterior or less commonly the posterior fetal shoulder impacts on maternal symphysis or sacral promontory[11]. Sponge and collegues proposed defining shoulder dystocia as a prolong head to body delivery time (more than 60 seconds)[14]. The reported incidence range from

Table 1: Mode of Delivery in Diabetic versus non diabetic mothers of Macrosomic newborns

Variables	Diabetic mothers patients No. with percentages	Non Diabetic mother patients No. with percentages
Caesarean Section	19(73 %)	103(35.76%)
Vaginal Deliveries	7(26.92%)	185(64.23%)
Total	26	288

Table 2: Shoulder dystocia in Diabetic versus non diabetic maternities

Shoulder dystocia complicating delivery	Diabetic maternities No. of patients and percentages	Non Diabetic maternities No. of patients and percentages
Yes	1(1.16%)	7(0.18%)
No	85(98.84)	3813(99.81%)
Total	86	3820

Table 3: Frequency of shoulder dystocia in macrosomic newborn with different weight groups

Shoulder dystocia complicating delivery	Number and %ages of macrosomic newborns in different weight groups			
	4 — 4.4 kg	4.5 — 4.9 kg	5 — 5.5 kg	Total
Yes	270(99.26%)	32(96.96%)	08(88.88%)	310
No	02(0.74%)	01(03.00%)	01(11.11%)	04
Total	272	33	09	314

0.6 to 3 percent among the vaginal deliveries of fetus in vertex presentation but there can be high perinatal mortality and morbidity even if shoulder dystocia is managed appropriately[15,16]. Factors associated with fetal macrosomia include genetics, duration of gestation, presence of gestational diabetes and class A, B, C diabetes mellitus, racial and ethnic factors influence birth weight and risk of macrosomia[17].

Ultrasound techniques do not have a high reliability in detection and prediction of macrosomia[17]. Recent studies have confirmed that appropriately performed abdominal circumference measurements by ultrasonography in third trimester is best way of predicting neonatal weight. Without doubt, the usefulness of this technique depends on the expertise of the operator, the quality of machine and the image obtained in late third trimester and the cut offs used to define the at risk neonates[18,19,20].

The reported incidence of macrosomia in pregnancies in diabetes ranges between 8% and 43%. In our study the incidence of macrosomia with diabetes in pregnancy was 30.23% and the odds of having a macrosomic newborn were 5 times for mothers with diabetes compared to mothers without diabetes. Alsammani MA and Ahmad SR in their study reported 40.4% incidence of macrosomia in mothers with diabetes[21]. A higher rate of macrosomia among controlled diabetic mothers (48.8%) was reported by Evers et al[22].

Diabetes complicating pregnancies is becoming more common worldwide. In countries where universal screening is practiced, reveals 3 to 5% of women with biochemically diagnosed diabetes. In our study period, selective approach to screening was applied, and 2.25% women had biochemically diagnosed diabetes. Ardawi MS, has quoted 12.5% prevalence of gestational diabetes using 50 gram glucose challenge test followed by 100 gram glucose tolerance test in those who were considered challenge test positive (using 7.2 mmol/l as cut off for glucose challenge)[23].

The major challenge regarding vaginal delivery in diabetic patients is the potential risk of shoulder dystocia and damage to brachial plexus. According to Gherman RB,[15,16] the increasing birth weight is positively associated with risk of shoulder dystocia, however, as many cases occur in babies weighing less than 4000gm at birth as those being classified macrosomic.

The odds of shoulder dystocia were 6 times in diabetic compared to nondiabetic mothers in our study. However, shoulder dystocia was not observed in diabetic mothers giving birth to macrosomic newborns, the single case of shoulder dystocia that occurred in our diabetic patients, was not associated with brachial plexus injury and the birth weight of newborn was less than 4000 g. The majority of "big babies" 73% in diabetic mothers were delivered by caesarean section, either due to previous deliveries by caesarean section or for early detection of failure in progress of labour. In a study by Alsammani-AM nearly half of the macrosomic babies (47.6%) were delivered by CS[21]. Higher rates were reported by Gyurkovits et al[24] and Akin et al[25], while Cheng et al[26] reported a rate of 40.9%. Cesarean delivery, however, places the mother and subsequent pregnancies at risk. Not all cases of brachial plexus injuries can be prevented by cesarean delivery, because as reported by Gherman RB, 50% of cases of brachial palsy occur in the absence of shoulder dystocia, suggesting aetiological role of some ante and intra partum factors in its genesis[27].

The findings of Semer et al and HAPO study are supported by the International Association of Diabetes and Pregnancy Study Group (IADPSG), that adverse pregnancy outcomes are related to maternal glucose level in continuous association, even below the traditional cut offs for a diagnosis of GDM[28].

CONCLUSION

The newborns is at high risk of macrosomic to diaetes pregnant women. So diabetes mellitus should be controlled at early stages.

RECOMMENDATIONS

Uniform approach to screening and new diagnostic strategies need to be implemented for early diagnosis and treatment of gestational diabetes that will help in decreasing the prevalence of fetal macrosomia and may halt the rising caesarean section rate in this group.

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REFERENCES

1. Xu H, Simonet F, Luo Zc. Optimal birth weight percentile cut-offs in defining small or large for gestational age. Acta paediatr 2010; 99: 550.
2. Boulet SI, Alexander GR, Salihu HM, pass M. Macrosomic births in United States; determinants, outcomes and proposed grades of risk. AMJ Obstet Gynaecol 2003; 188: 13724.
3. Haram K, Pirhonen J, Bergsjo P. Suspected big baby: A difficult clinical problem in obstetrics. Acta Obstet Gynecol Scand. 2002; 81: 185-94.
4. Alexander GR, Himes IH, Kaufman RB, et al. A United state national reference for fetal growth Obstet Gynaecol 1996; 87: 163.
5. Asplund CA, Seehusen DA, C Allahan TL, Olsen C. Percentage change in antenatal body mass index as a predictor of neonatal macrosomia. Ann Fam Med 2008; 6: 550-54.
6. Ahmed SR, Ellah MA, Mohamed OA, Eid HM. Prepregnancy obesity and pregnancy outcome. INT, Health Sci (Qassim) 2009; 3: 203-08.
7. Sermer M, Naylor CD, Gare DJ. Impact of increasing carbohydratemetabolism intolerance on maternal fetal outcomes in 3637 women without gestational diabetes: the Toronto tri-hospital gestational diabetes project. Am J Obstet Gynecol 1995; 173: 146-56.
8. Metzger BE, Lowe LP, Dyer AR, Trimble ER, Chaovarindr U, Coustan DR, Hadden DR, McCance DR, Hod M, McIntyre HD, Oats JJ, Persson B, Rogers MS, Sacks DA: Hyperglycemia and adverse pregnancy outcomes. The HAPO Study cooperative research group. N Engl J Med 2008, 358: 1991-2002.
9. Abol Fazl M, Hamidreza TS, Narges MY. Gestational diabetis and association with unpleasant outcome of pregnancy. PAK J Med Sci 2008; 24-566-70.
10. American college of obstetricians and gynaecologists. Shoulder dystocia ACOG practice bulletin clinical management guidelines for obstetrician-gynaecologist number 40, obstet gynaecol 2002: 100: 1045-50.
11. Gherman RB, Chauhan S, Ouzounian JG et al. Shoulder dystocia the unpredictable obstetric emergency with empiric management guideline. AMJ obstet gynaecol 2006; 195: 657-72.
12. Salvatore Politi, laura DE Midio, Pietrocignimi, Maurizio Glolandino and Claudio Giorlandino. Journal of prenatal medicine 2010; 4(3): 35-42.
13. Esakoff TF, Cheng YW, Sparks TN, Caughey AB. The association between birthweight 4000 g or greater and perinatal outcomes in patients with and without gestational diabetes mellitus. Am J Obstet Gynecol. 2009; 200: 672-74.
14. Spong CY, Beall M, Rodrigues D, et al. An objective definition of shoulder dystocia, prolong head to body delivery interval and the use of the ancillary obstetric maneuvers. Obstet gynaecol. 1995; 86: 433-36.
15. Gherman RB, Shoulder dystocia an evidence based evaluation of obstetric nightmare. Obstet Gynaecol. 2002; 45: 345-62.
16. Gherman RB, Ouzounain JG, Goodwin TM, obstetric maneuvers for shoulder dystocia and associated fetal morbidity. AMJ obstet gynaecol 1998; 178: 1126-30.
17. Combs C, Rosenn B, Miodiovnik M, Siddi TS. Onographic EFW and macrosomia. Is there an optimum formula to predict diabetic fetal macrosomia? J matern Fetal Med 2000; 9: 55-61.
18. De Reu PA, Smits LJ, Oosterbaan HP, Nijhuis JG. Value of single early third trimester fetal biometry for the prediction of birth weight deviations in a low risk population. J Perinat Med. 2008; 36(4): 324-29.
19. Coomarasamy A, Connock J, Thornton J, Khan KS, accuracy of ultrasound biometry in prediction of macrosomia a systemic quantitative review BJOG. 2005; 112-1461-66.
20. Loetworawanit R, Chittachaoen A, Sututvoravat S, Intrapatartum fetal abdominal circumference by ultrasono graphy for predicting fetal macrosomia. J Med Associ Thai 2006; 4: 560-64.
21. MA Alsammani, Ahmad SR. Fetal and maternal outcomes in pregnancies complicated with fetal macrosomia. N Am J Med Sci 2012; 4(6): 283-86.
22. Evers IM, de Valk HW, Mol BW, ter Braak EW, Visser GH. Macrosomia despite good glycaemic control in type I diabetic pregnancy: Results of a nationwide study in the Netherlands. Diabetologia. 2002; 45: 1484-89.
23. Ardawi MS, Nasrat HA, Jamal HS, AL Sagaaf HM, Mustafa BE. Screening for gestational diabetes mellitus in pregnant females. Saudi Medical J. 2000; 21(2): 155-60.
24. Gyurkovits Z, Kálló K, Bakki J, Katona M, Bitó T, Pál A, et al. Neonatal outcome of macrosomic infants: An analysis of a two-year period. Eur J Obstet Gynecol Reprod Biol. 2011; 159: 289-92.
25. Akin Y, Cömert S, Turan C, Piçak A, Ağzikuru T, Telatar B. Macrosomic newborns: A 3-year review. Turk J Pediatr. 2010; 52: 378-83.
26. Cheng Y, Sparks T, Laros R, Jr, Nicholson J, Caughey A. Impending macrosomia: Will induction of labour modify the risk of caesarean delivery? BJOG. 2012; 11: 402-9.
27. Gherman RB, Ouzounian JG, Miller DA, et al. Spontaneous vaginal delivery: a risk factor Erb's Palsy? Am J Obstet Gynecol 1998; 178: 423-27.
28. Metzger BE, Gabbe, Persson, et al. International association of diabetes and pregnancy study group recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care 2010; 33: 676-82.

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Nadir S: Contributed to the conception, design, acquisition of data and drafting the script. Analysis and interpretation of data.

Jamil S: Helped in interpretation of data related to diabetes.

Hamid M: Approved to carry out the study.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.