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Original Article

The comparison of outcomes of macrosomic deliveries with gestational diabetes or non gestational diabetes

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ABSTRACT

Objective: To compare the prenatal, neonatal and postnatal complications of macrosomic deliveries in pregnancies with GDM (gestational diabetes mellitus) and non gestational diabetes mellitus.

Material and Methods: The medical records of 42034 patients who made delivery in a tertiary hospital between 2014 and 2017 were enrolled retrospectively. A total of 2102 patients who made delivery a newborn more than 4000 gr were accepted as macrosomia and included in the study. These patients were divided into two groups as pregnancy with GDM and no GDM so prenatal, birth and neonatal outcomes and complications of these groups were compared.

Results: 258 women with GDM and 1844 women with no GDM were included in this study. Patients who were in GDM group were younger than the patients in no GDM group with statistically significant ($p<0.001$). Preeclampsia, cesarean delivery and primary cesarean rate were higher in the GDM group with statistically significant ($p<0.001$). The mean birth week was lower significantly in the GDM group and mean newborn birth weight of GDM group was higher compared with no GDM group ($p<0.001$ and $p<0.001$, respectively). The rate of necessity of newborn intensive care unit hospitalization and shoulder dystocia were higher in the GDM group.

Conclusion: Macrosomic pregnancies with GDM have some poor obstetrics and neonatal outcomes compared with macrosomic pregnancies with no GDM. On the other hand, it should be kept in mind that macrosomia can be occurred with non-complicated pregnancy and obstetrician should consider the related complications.

Keywords: Diabetes, Fetal macrosomia, Fetal hypoxia, Shoulder dystocia

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Introduction

Macrosomia is defined as higher average fetal weight according to the gestational age. The threshold of the macrosomia can be changed by countries' own guidelines and mostly it is accepted as higher than 4000 gr [1]. Some developed countries consider the birth weight is higher than 4500 gr as a macrosomia [2]. The incidence of the macrosomia is 30 % in pregnancies with gestational diabetes mellitus (GDM) and 10 % in others. Among worldwide, the incidence is reported as 9%, 7% in USA and 1-5% in developing countries [3–5].

The relationship between the macrosomia and maternal complications such as prolonged delivery time, increased operative delivery and cesarean delivery, higher rate of postpartum hemorrhage, uterine rupture and injury of genital tract is stated in some articles [6,7]. On the other hand, shoulder dystocia, brachial plexus trauma and the other delivery related traumas; asphyxia, higher rate of neonatal intensive care unit hospitalization, respiratory distress syndrome, hypoglycemia, electrolyte imbalance and polycythemia in neonatal period; obesity, impaired glucose intolerance and metabolic syndrome in the childhood can be related with macrosomia as a early and late complications [8–11].

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The macrosomia and related complications usually are considered in pregnancies complicated with GDM which incidence is reported 1.2-4.5% in Turkey. However, this situation can be seen also in non diabetic pregnancies and the related complications can be overlooked in these pregnancies [12].

In our study, we aim to compare the prenatal, neonatal and postnatal complications of macrosomic deliveries in pregnancies with GDM and non gestational diabetes mellitus.

Material and Methods

The medical records of 42034 patients who made delivery in a tertiary hospital between 2014 and 2017 were enrolled retrospectively. A total of 2102 patients who made delivery a newborn more than 4000 gr were accepted as macrosomia and included in the study. Our inclusion criteria's were all of the patients' pregnancy follow-ups had been made in our hospital, newborn examinations were made in our hospital and if necessary, the hospitalization to the newborn intensive care unit in our hospital and the accessibility of the all of the

Twin pregnancies, the pregnancies with fetal anomalies were diagnosed in either prenatal or postnatal period, oral glucose tolerance test were made in other clinic and mothers who were below 18 years old were excluded in the study.

2102 macrosomic pregnant women were divided into two groups as pregnancy with GDM and no GDM so prenatal, birth and neonatal outcomes and complications of these groups were compared. In our clinic, pregnant patient with confirmed fetal heartbeat by ultrasonography and vaginal bleeding without cervical dilatation is diagnosed as threatened abortion. Persistent nausea and vomiting, weight loss and presence of ketone in urine present the hyperemesis gravidarum. The criteria of ADA 2014 [13] for GDM and the criteria of ACOG 2013[14] for preeclampsia are used as a reference in our clinic.

Newborn birth weight, newborn head circumference and newborn birth height are examined during routine newborn examination and are recorded with first and fifth minutes APGAR scores on the newborn information chart. The necessity of newborn intensive care hospitalization is decided by pediatricians after these examinations.

The incomes of mothers are divided into two groups according to their health insurances. Mothers whose health insurances are paid by themselves are accepted as people with high incomes, whose health insurances are paid by Ministry of Health or the income of the family per person is lesser than one third of minimum wage are accepted as people with low incomes.

Statistical analysis

Data analyses were performed by using SPSS Version 21.0 (IBM Corporation, Armonk, NYC, USA). Shapiro-Wilk test was used to test distribution of normality. According to the results, parametric tests were preferred. Continuous variables were compared with Student's t test. Categorical variables were compared with Chi-square test. A P value of <0.05 was considered statistically significant.

Results

A total of 2102 women who delivered macrosomic baby were included in this study. These women were divided into two groups: 258 women with GDM and 1844 women with no GDM. These groups were compared between each other according to demographics features, pregnancy complications, obstetrics and early neonatal complications. During the study period, there were 42034 deliveries in our clinic and the macrosomic birth incidence is calculated as 5% in our hospital.

Demographic features, pregnancy complications and birth methods of participants were stated in the table 1. Patients who were in GDM group were younger than the patients in no GDM group with statistically significant (p<0.001).

Pregnancies in no GDM group were mostly nulliparous and pregnancies with GDM group were mostly multiparous (p=0.016). Preeclampsia, caesarean delivery and primary caesarean rate were higher in the GDM group with statistically significant (p<0.001).

Obstetric and early neonatal outcomes of patients were presented in the table 2. The mean birth week was lower significantly in the GDM group and mean newborn birth weight of GDM group was higher compared with no GDM group (p<0.001 and p<0.001, respectively). The rate of necessity of newborn intensive care unit hospitalization and shoulder dystocia were higher in the GDM group and there was no difference in the early neonatal outcomes of these groups.

Table 1. The comparison of demographic, prenatal and natal features of patients

	GDM group (n, 258)	No GDM group (n, 1844)	P value
Maternal age, year	32 (18-47)	37 (18-50)	<0.001
Parity			
Nulliparous	63 (24.6%)	1261 (68.3%)	0.016
Multiparous	195 (75.4%)	583 (31.7%)	
Income			
Low income	56 (21.%9)	408 (22.4%)	0.886
High income	202 (78.3%)	1436 (77.9%)	
Threatened abortion	13 (5%)	71 (%3.9)	0.361
Hyperemesis gravidarum	5 (1.9%)	28 (1.5%)	0.381
Preeclampsia	22 (8.5%)	46 (2.5%)	<0.001
Stillbirth	4 (1.6%)	10 (0.5%)	0.082
Method of birth			
Operative	0	6 (0.3%)	<0.001
Vaginal	24 (9.3%)	544 (29.5%)	
Cesarean	234 (90.7%)	1294 (70.2%)	
Type of cesarean			
Primary	71 (27.5%)	304 (16.5%)	<0.001
Prior cesarean story	163 (63.2%)	990 (53.7%)	

Discussion

Macrosomia that is one of the most often complication of GDM also occurred in 10 % of pregnancies with no GDM but specific screening for macrosomia is not made in non complicated pregnancies. The rate of macrosomia related avoidable complications can be increased cause of this approach [1]. In the present study, the incidence of macrosomia is reported as 5 % in consistent with the literature [5]. In the present study, the mean age of no GDM groups is found higher than the GDM group with statistically significant. We think that the increased probability of metabolic syndrome, changes in calorie intake and more sedentary life may have an effect on macrosomic baby birth even if there is no diabetes in older mothers [15].

The rate of preeclampsia that is one of the pregnancy complications is higher in GDM group. The positive relationship of GDM and preeclampsia have already been stated in the literature and it can be because of the weight gain, the impaired insulin metabolism and the impaired nutrition [16]. In 2015, Pintaudi et al. [17] found that macrosomic babies had a higher stillbirth rate because of higher fetal cardiovascular risk in pregnancies with GDM. In the present study, stillbirth rate is found higher in the GDM group similarly with aforementioned study.

Table 2. The comparison of birth and early neonatal period results of patients

	GDM group (n, 258)	No GDM group (n, 1844)	P value
Gestational week	39 (37-41)	40 (38-43)	<0.001
Birth weight, gr	4200 (4000-5750)	4150 (4000-5550)	<0.001
Birth height, cm	52 (47-59)	52 (48-58)	0.203
Head circumference, cm	36 (34-53)	36 (32-59)	0.301
Neonatal intensive care hospitalization Yes No	26 (10.1%) 232 (89.9%)	96 (5.2%) 1748 (94.8%)	0.002
APGAR 1. Minutes <5	13 (5%)	94 (5%)	0.751
APGAR 5. Minutes <5	6 (2.3%)	9 (0.5%)	0.105
Perinatal asphyxia	2 (0.7%)	4 (0.2%)	0.161
Shoulder dystocia	14 (5.5%)	40 (2.4%)	0.004

In our study, both rate of cesarean delivery and primary cesarean delivery was stated higher in GDM group. This can be explained by the fact that obstetricians are afraid of macrosomia caused by GDM and choose the cesarean delivery in order to reduce the complications, overlook the possibility of macrosomia in no GDM pregnancies so they approach less defensively in this group. In consistency with the literature, patients in the GDM group had a lower birth week and higher birth weight than patients in the no GDM group [1,9,18].

In the present study, macrosomic newborns delivered by pregnancy with GDM had higher necessity of newborn intensive care unit hospitalization, significantly. On the other hand, there was no difference between the groups considering the first and fifth minutes APGAR score was below 5 and the rate of perinatal asphyxia. This may be due to the correction of electrolyte and glucose imbalances and the need for intensive care of newborns due to the increased cardiac anomaly [11].

Although vaginal delivery rates were higher in the non-GDM group, shoulder dystocia was found more frequently in accordance with the literature in macrosomic newborn was delivered after GDM. [1,19]. The weight distribution of GDM pregnancies' newborn is different than no GDM pregnancies' newborn weight distribution and the higher weight/height ratios in macrosomia after GDM pregnancies may play a role in higher shoulder dystocia rates [1].

The weaknesses of our study are that it is retrospective nature and late neonatal period results could not be compared in the study. However, the number of patients is more than similar studies and our patient selection criteria are the strengths of our study.

It should be kept in mind that macrosomia will be observed in 10 % of no GDM mothers' babies. Although routine screening is not recommended for macrosomia seen in non-diabetic pregnancies or they do not have poor outcomes as much as macrosmosia after GDM, it is our opinion that if health professionals who are interested in delivery consider the macrosomia after no GDM will prevent many complications.

References

[1] Cordero L, Paetow P, Landon MB, Nankervis CA. Neonatal outcomes of macrosomic infants of diabetic and non-diabetic mothers. Journal of Neonatal-Perinatal Medicine 2015;8:105–12. doi:10.3233/NPM-15814102.

[2] Metzger BE. International Association of Diabetes and Pregnancy Study Groups Recommendations on the Diagnosis and Classification of Hyperglycemia in Pregnancy. Diabetes Care 2010;33:676–82. doi:10.2337/DC09-1848.

[3] Chauhan SP, Grobman WA, Gherman RA, Chauhan VB, Chang G, Magann EF, et al. Suspicion and treatment of the macrosomic fetus: a review. American Journal of Obstetrics and Gynecology 2005;193:332–46. doi:10.1016/j.ajog.2004.12.020.

[4] Martin JA, Hamilton BE, Osterman MJK. Births in the United States, 2016. NCHS Data Brief 2017:1–8.

[5] Koyanagi A, Zhang J, Dagvadorj A, Hirayama F, Shibuya K, Souza JP, et al. Macrosomia in 23 developing countries: an analysis of a multicountry, facility-based, cross-sectional survey. Lancet (London, England) 2013;381. doi:10.1016/S0140-6736(12)61605-5.

[6] Das AG, Gopalan S, Dhaliwal LK. Fetal growth and perinatal outcome of pregnancies continuing after threatened abortion. The Australian & New Zealand Journal of Obstetrics & Gynaecology 1996;36:135–9.

[7] Siggelkow W, Boehm D, Skala C, Grosslercher M, Schmidt M, Koelbl H. The influence of macrosomia on the duration of labor, the mode of delivery and intrapartum complications. Archives of Gynecology and Obstetrics 2008;278:547–53. doi:10.1007/s00404-008-0630-7.

[8] Raio L, Ghezzi F, Di Naro E, Buttarelli M, Franchi M, Dürig P, et al. Perinatal outcome of fetuses with a birth weight greater than 4500 g: an analysis of 3356 cases. European Journal of Obstetrics, Gynecology, and Reproductive Biology 2003;109:160–5. doi:10.1016/s0301-2115(03)00045-9.

[9] 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. American Journal of Obstetrics and Gynecology 2009;200:672.e1-672.e4. doi:10.1016/j.ajog.2009.02.035.

[10] Ju H, Chadha Y, Donovan T, O'Rourke P. Fetal macrosomia and pregnancy outcomes. The Australian & New Zealand Journal of Obstetrics & Gynaecology 2009;49:504–9. doi:10.1111/j.1479-828X.2009.01052.x.

[11] Onal EE, Hirfanoglu IM, Beken S, Altuntas N, Turkyilmaz C, Camurdan AD, et al. Are the neonatal outcomes similar in large-for-gestational age infants delivered by women with or without gestational diabetes mellitus? World Journal of Pediatrics 2012;8:136–9. doi:10.1007/s12519-011-0291-7.

[12] Gümüş E, Çelik H, Özkan S, Keskinkılıç B, Satman İ, Yetkin İ, et al. Turkey Diabetes Programme. 2015.

[13] American Diabetes Association. Diagnosis and Classification of Diabetes Mellitus. Diabetes Care

2014;37:S81–90. doi:10.2337/dc14-S081.

[14] American College of Obstetricians and Gynecologists, Task Force on Hypertension in Pregnancy. Hypertension in pregnancy. Report of the American College of Obstetricians and Gynecologists' Task Force on Hypertension in Pregnancy. Obstetrics and Gynecology 2013;122:1122–31. doi:10.1097/01.AOG.0000437382.03963.88.

[15] Li Y, Liu Q-F, Zhang D, Shen Y, Ye K, Lai H-L, et al. Weight Gain in Pregnancy, Maternal Age and Gestational Age in Relation to Fetal Macrosomia. Clinical Nutrition Research 2015;4:104. doi:10.7762/cnr.2015.4.2.104.

[16] Liu X, Zhang W. Effect of maternal age on pregnancy: a retrospective cohort study. Chinese Medical Journal 2014;127:2241–6.

[17] Pintaudi B, Lucisano G, Pellegrini F, D'Ettorre A, Lepore V, De Berardis G, et al. The long-term effects of stillbirth on women with and without gestational diabetes: a population-based cohort study. Diabetologia 2015;58:67–74. doi:10.1007/s00125-014-3403-9.

[18] Walsh JM, McAuliffe FM. Prediction and prevention of the macrosomic fetus. European Journal of Obstetrics & Gynecology and Reproductive Biology 2012;162:125–30. doi:10.1016/J.EJOGRB.2012.03.005.

[19] Liu Y, Li G, Chen Y, Wang X, Ruan Y, Zou L, et al. A descriptive analysis of the indications for caesarean section in mainland China. BMC Pregnancy and Childbirth 2014;14:1–9. doi:10.1186/s12884-014-0410-2.