Received: 27 Nov 2023 | **Accepted:** 01 Apr 2024 **Genel Tıp Derg. Volume** 34/**Issue** 3 (June), 306-312
DOI: 10.54005/geneltip.1396561

ORIGINAL ARTICLE

Uncovering the Risks: Investigating the Impact of Abnormal 50 g Results of Two-Step Gestational Diabetes Mellitus Screening in Pregnant Women

Risklerin Ortaya Çıkarılması: Gebe Kadınlarda İki Adımlı Gestasyonel Diabetes Mellitus Taramasının Anormal 50 gr Sonuçlarının Araştırılması

[1]Sakine Rahımlı Ocakoglu, [2]Bayram Ali Dorum, [1]Zeliha Atak, [1]Ozlem Ozgun Uyanıklar, [3]Gokhan Ocakoglu

[1]Department of Obstetrics and Gynecology, Bursa City Hospital, Bursa, Turkiye
[2]Department of Neonatology, Bursa City Hospital, Bursa, Turkiye
[3]Department of Biostatistics, Faculty of Medicine, Bursa Uludag University, Bursa, Turkiye

Correspondence

Sakine Rahımlı Ocakoglu, Department of Obstetrics and Gynecology, Bursa City Hospital 16110, Nilüfer, Bursa, Türkiye

E-Mail: dr.sakineocakoglu@gmail.com

How to cite ?

Rahımlı Ocakoglu S, Dorum BA, Atak Z, Uyanıklar ÖÖ, Ocakoğlu G. Uncovering the Risks: Investigating the Impact of Abnormal 50 g Results of Two-Step Gestational Diabetes Mellitus Screening in Pregnant Women. Genel Tıp Derg. 2024;34(3):306-12.

ABSTRACT

Background/Aims: Gestational Diabetes Mellitus (GDM) is a prevalent medical concern among pregnant women. The study aimed to explore maternal characteristics that could lead to an isolated increase in the 50 g Glucose Challenge Test (GCT) levels and to assess the impact of elevated 50 g GCT levels on fetal and neonatal outcomes.
Methods: This retrospective trial included 177 pregnant women and 177 infants. All pregnant women who applied to the antenatal clinic and screened for GDM were included in the study. Patients were divided into two groups: patients with abnormal GCT (50 g levels) but normal 100 g-OGTT results (study group) and those with normal 50 g results (control group).
Results: The advanced maternal age (AMA) rate (14.80% vs. 4.80%, p=0.028) and maternal weight measurements at the first pregnancy visit were higher in the study group. The rate of overweighted patients (more than 80 kg at the first pregnancy visit) was higher in the study group (35.20% vs. 5.80%, p<0.001). The rate of fetal macrosomia was higher in the study group (10.20% vs. 0, p<0.05). It was determined that the neonate's head circumference (HC) was larger in the study group (35.15 cm vs. 34.69 cm, p=0.029). Emergent (primary) cesarean section (C/S) rate with cephalopelvic disproportion (CPD) indication was higher in the fetal macrosomia group (p<0.05). The power of the current study was determined as 87%
Conclusions: According to the study result, the patients with isolated elevation of the 50 g Glucose Challenge Test are at risk of fetal macrosomia, which increases the risk of C/S. In overweight patients over 35 years old, 75 g OGTT may be more sensitive in detecting glucose metabolism disorders.

Keywords: Macrosomia, screening, cephalopelvic disproportion, primary cesarean section rate.

ÖZ

Amaç: Gestasyonel Diabetes Mellitus (GDM) hamile kadınlar arasında yaygın görülen bir tıbbi sorundur. GDM'nin zamanında tanımlanması ve yönetimi, anne ve fetusa ait komplikasyon potansiyelini azaltabilir. Bu çalışmanın amacı, Glukoz Challenge Testi (GCT) 50 gr düzeyi yüksek olup, ancak 100 gr OGTT sonuçları normal olan hastalarda, 50 gr düzeyinin yüksekliğine neden olabilecek anne özelliklerini araştırmak ve bu yüksekliğin fetal ve neonatal sonuçlar üzerindeki etkisini değerlendirmektir.
Gereç ve Yöntemler: Bu retrospektif çalışmaya 177 hamile kadın ve 177 yenidoğan dahil edildi. Doğum öncesi kliniğine başvuran GDM taraması yapılan tüm gebelerin sonuçları incelendi. Hastalar iki gruba ayrıldı: anormal GCT (50 gr düzeyleri) olup, ancak 100 gr-OGTT sonuçları normal olan hastalar (çalışma grubu) ve normal 50 gr sonuçları olan hastalar (kontrol grubu).
Bulgular: İleri anne yaşı (AMA) gözlenen hasta oranı çalışma grubunda daha yüksekti. (%14,80 vs. %4,80, p=0,028). İlk trimester maternal kilosu ölçümlerinde gruplar arasında fark vardı. Aşırı kilolu (ilk gebelik muayenesinde 80 kg'ın üzerinde) hasta oranı çalışma grubunda daha yüksekti (%35,20 vs. %5,80, p<0,001). Çalışma grubunda fetal makrozomi oranı daha yüksekti (%10,20 vs. 0, p<0,05). Yenidoğanın baş çevresinin (HC) çalışma grubunda daha büyük olduğu belirlendi (35,15 cm vs. 34,69 cm, p=0,029). Baş-pelvik uyumsuzluk (CPD) endikasyonu ile acil (primer) sezaryen (C/S) oranının fetal makrozominin tespit edilen hastalarda daha yüksek olduğu belirlendi (p<0,05). Gerçekleştirilen güç analizi sonucunda mevcut çalışmanın gücü %87 olarak belirlendi
Sonuç: Çalışma sonucuna göre, çalışma grubundaki hastalar fetal makrozomi açısından risk altındadır ve bu da sezaryen riskini artırmaktadır. Aşırı kilolu ve 35 yaş üstü hastalarda 75 gr OGTT glukoz metabolizması bozukluklarının tespitinde daha duyarlı olabileceği düşünmekteyiz.

Anahtar Kelimeler: Makrozomi, tarama, baş-pelvik uyumsuzluğu, primer sezaryen oranı.

Introduction

Gestational Diabetes Mellitus (GDM) is a form of impaired glucose tolerance diagnosed for the first time during pregnancy (1). According to "Coustan and Carpenter," diagnostic criteria in a study conducted in Turkiye, the prevalence of GDM in pregnant women was 9.2% (2). It affects a significant number of pregnant women, with prevalence rates varying based on factors such as race, diagnostic methods and gestational age at screening (3). There are various screening methods for GDM, but no consensus on diagnostic criteria has been established. Screening for GDM can be done using either a single-step or double-step method. The single-step (75 g oral glucose tolerance test -OGTT) screening was performed with 75 g glucose. In the double-step screening, the glucose level is checked one hour after the 50 g glucose load (50 g glucose challenge test-GCT), regardless of the fasting status, and if it is above the threshold value, a three-hour 100 g oral (glucose tolerance test-OGTT) is performed.

Peer-Review: Double anonymized - Two External
Plagiarism Checks: Yes - intihal.net
Complaints: geneltip@selcuk.edu.tr

Selcuk University Press
Genel Tıp Dergisi | e-ISSN: 2602-3741
https://dergipark.org.tr/tr/pub/geneltip
https://yayinevi.selcuk.edu.tr/

The complications related to the fetus and the mother in patients diagnosed with GDM should be taken seriously. The most common pathological conditions are preeclampsia, gestational hypertension, polyhydramnios, macrosomia, increased risk of birth trauma, shoulder dystocia, perinatal mortality, increased operative birth rate (cesarean section (C/S) and instrumental delivery), fetal cardiomyopathy, neonatal respiratory and metabolic problems (hypoglycemia, hypocalcemia) (4). Close monitoring and treatment of GDM and abnormal serum glucose levels can reduce adverse effects on the mother's health and neonate complications.

This study aims to define patients with abnormal 50 g glucose challenge test (GCT) results but normal 100 g oral glucose tolerance test (OGTT) results, and to determine maternal characteristics that may relate to this condition. Additionally, study's objective is to diagnose and identify an isolated increase in the 50 g level of GCT, and its impact on fetal and newborn outcomes.

Material and Methods

This retrospective study was conducted in our hospital between 01.01.2020 and 01.01.2021. (Approved Number: 2020-9/8). We included all patients who gave birth in our hospital and were scanned for GDM. All pregnant women attending the antenatal clinic were offered screening for GDM, which was done with two-step screening at 24–28 weeks of gestation. In the first screening step, if the patients had plasma glucose levels more than > 135 mg/dl (7.5 mmol/l) in GCT, they were scanned with 100 g OGTT (5, 6). Patients with glucose levels ≥ 183 mg / dL (10.2 mmol/l) of GCT were considered diabetic and excluded from the trial. If screens are positive following STEP-I, a diagnostic test, with a 100 g 3-hour oral glucose tolerance test (OGTT), is performed. If at least two values were exceeded, GDM was diagnosed, and these patients were also excluded from the dataset. Women with an abnormal level of GCT (50 g) and nondiabetic 100 g OGTT results were included in our study. Pregnant women who did not consent to screen, and those who did not give birth in our hospital were excluded from the study. The patients were divided into two groups based on the results of 50g by using the consecutive sampling method: patients with abnormal GCT (50 g levels) but normal 100 g-OGTT results (study group) and those with normal 50 g results (control group). In the present study, the group of patients with an abnormal GCT (50 g) results at the two-step screening who were not diagnosed with GDM was defined as the study group. There were 88 patients in the study group and 89 in the control group. The control group included patients with normal results of GCT (50 g) (Figure 1). Maternal demographic and obstetric characteristics were analyzed. Those were maternal age (advanced maternal age more than 35 (AMA), gravida, parity, initial weight (overweighted pregnancy defined as weight ≥ 80 kg), gestational weight gain (GWG) from randomization to delivery (in kilograms), gestational hypertension, preterm birth (23 weeks <PTB <37 weeks), cesarean section history (planned C/S) and primary C/S rate (during labor).

The primary outcomes were fetal, and the secondary outcomes were neonatal. Fetal outcomes were pathological conditions diagnosed in the current pregnancy: macrosomia (i.e., LGA or birth weight> 4000 g), polyhydramnios, small for gestational age (SGA), and fetal anomalies. Neonatal outcomes were: Apgar scores, neonatal anthropometric parameters (infant birth weight (BW), and head circumference (HC), birth weight (i.e., birth weight> 4000 g), clinically diagnosed neonatal hypoglycemia, hyperbilirubinemia and neonatal hospitalization rate.

Statistical Analysis

Considering the overall macrosomia rates in the 50 g high (p1= 10.20%, n=9/88) and control (p2=0, n=0/89) group, the current post hoc power of the study was calculated as 87% for α=0.05. G*Power v.3.1.9.6 software was used. The conformity of continuous variables to the normal distribution was examined using the Shapiro-Wilk test. Continuous variables were expressed as mean ± standard deviation if they followed the normal distribution and median (minimum: maximum) values if they did not fit the normal distribution. The Mann-Whitney U test independent sample t-test and ANOVA test were used for between-group comparisons. Categorical variables were compared using Chi-Square, Fisher's Exact, and Fisher-Freeman-Halton Test. Multivariable logistic regression analysis was applied to determine the risk factors affecting the 50 g level. SPPS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) software was used to perform the statistical analysis. A $p < 0.05$ was considered statistically significant.

Results

In total, 177 pregnant and 177 infants were included in the study. The mean age of the pregnant was 27.78 ± 5.07 years. The mean gestational age of the infant was 38.84±1.46 weeks, and the birth weight was 3382.38 ± 497.73 grams.

It was determined that the median age was higher in the study group (29 years vs. 26 years, $p<0.001$) (Table-1). The proportion of participants aged ≥35 years was higher in the study group than in the control group (17% vs. 5.60%, p=0.016) (Table-1). There was no difference between groups in terms of gravida and parity numbers (p=0.487 and p=0.282); abortion rates also did not differ between groups (p=0.131) (Table-1). There was no difference between the groups according to the history of the (C/S) in previous pregnancies (p=0.125) (Table-1). Type of delivery, previous cesarean section history and C/S with cephalopelvic disproportion (CPD) indications did not differ between the groups (p=0.198) (Table-1).

There was a difference between the groups in maternal weight measurements at the first pregnancy visit (initial weight) (Table-1). The median maternal weight measurement was higher in the study group

Table 1. Comparison of demographic and obstetric characteristics, weight, and fasting plasma glucose levels.

	50g levels				
	n	Study group	n	Control group	p-value
Age (years)	88	29(20:42)	89	26(18:41)	<0.001[a]
<35 years	88	73(80%)	89	84(94.40%)	0.016[b]
≥35 years		15(17%)		5(5.60%)	
Gravida	88	2(1:6)	88	2(1:5)	0.487[a]
Parity	88	1(0:5)	88	1(0:3)	0.282[a]
Abortus	88	9(10.20%)	88	16(18.20%)	0.131[b]
C/S History	88	28(31.80%)	88	19(21.60%)	0.125[b]
Type of birth					
Vaginal Delivery	88	43(48.90%)	89	53(59.60%)	0.198[b]
C/S (previous pregnancy)		28(31.80%)		18(20.20%)	
C/S (primary)		17(19.30%)		18(20.20%)	
Initial weight (kg)	86	68(47:92)	85	64(45:95)	0.010[a]
Third-trimester weight (kg)	85	79.26±11.04	85	78.20±11.04	0.532[c]
Gestational Weight Gain (kg)	85	10(-3:25)	82	13(2:27)	<0.001[a]
Overweight Pregnancy	88	31(35.20%)	86	5(5.80%)	<0.001[b]
Fasting glycemia	88	84(55:151)	89	84(66:124)	0.851[a]

Data were presented as median (minimum: maximum), mean ± st. deviation and n%.
a: Mann Whitney U Test, b: Chi-Square Test, c: Independent Samples t-Test, d: Fisher-Freeman-Halton Test

Table 2. Comparison of perinatal, and neonatal characteristics.

	50g levels				
	n	Study group	n	Control group	p-value
Perinatal Pathology	88		89		0.005[d]
Polyhydramnios		5(5.70%)		3(4.50%)	
Fetal Macrosomia		9(10.20%)		0	
None		74(84.10%)		85(95.50%)	
Gestational age at delivery	88	39(34:41) (38.69±1.38)	89	39(32:41) (38.98±1.53)	0.034[a]
Prematurity	87		89		0.741[b]
Prematurity		7(8%)		6(6.70%)	
≥37 weeks		80(92%)		83(93.30%)	
Birth weight (gr)	88	3407.50(2300:4565)	89	3407.50(1570:4315)	0.319[a]
Length (cm)	88	51(45:56)	88	50(42:56)	0.146[a]
Head circumference (cm)	88	35(30:38) (35.15±2.27)	88	35(30:38) (34.69±1.44)	**0.029[a]**
Neonatal Hospitalization	88		73		0.126[d]
Sepsis		12(13.60%)		10/73(13.70%)	
Others		5(5.70%)		0	
None		71(80.70%)		63/73(86.30%)	

Data were presented as median (minimum: maximum), mean ± st. deviation and n%.
AMA: Adverse Maternal Age
a: Mann Whitney U Test, b: Chi-Square Test, d: Fisher-Freeman-Halton Test

Table 3. Comparison of maternal characteristics and neonatal outcomes in study group patients with and without fetal macrosomia.

	Macrosomia		
	Present (n=9)	Absent (n=79)	p-value
Age(years)	27(23:34)	29(20:42)	0.464[a]
AMA	0	15(19%)	0.348[e]
Maternal overweight	4(44.40%)	27(34.20%)	0.715[e]
Head circumference (cm)	36(35:38)	35(30:38)	0.005[a]
Infant birth weight (gr)	4290(3950:4565)	3350(2300:4085)	<0.001[a]
Infant length (cm)	52(51:55)	51(45:56)	0.001[a]
Type of Birth			0.003[d]
Vaginal Delivery	2(22.10%)	41(51.90%)	
C/S (previous pregnancy)	1(11.10%)	27(34.20%)	
C/S (primary)	6(66.70%)	11(13.90%)	

Data were presented as median (minimum: maximum) and n%.
a: Mann Whitney U Test, d: Fisher-Freeman-Halton Test, e: Fisher's Exact Test

Table 4. 100 g levels in study group patients with AMA and Overweight Pregnancies.

	50 g Pre-GDM			
	Overweight Pregnancy(n=31)	AMA≥35 (n=15)	AMA≥35 & Overweight Pregnancy (n=6)	p-value[f]
Fasting glycemia	81.20±7.63	81.27±7.19	82±4.38	0.969
1st hour	153.39±25.77	157±33.64	153.67±37.33	0.925
2nd hour	131.13±24.68	141.07±19.11	151.67±13.99	0.084
3th hour	101.16±33.56	107.27±37.81	114.50±43.87	0.006
Data were presented as mean± st. deviation f: ANOVA Test National Diabetes Data Group (NDDG) 1979 Fasting ≥ 105 mg/dL (5.8 mmol/l) 1-hour ≥ 190 mg/dL (10.6 mmol/l) 2-hour ≥ 165 mg/dL (9.2 mmol/l). 3-hour ≥ 145 mg/dL (8.0 mmol/l).				

Table-5: Independent factors affecting the increase of 50 g level

n=176	Wald	p-value	OR	95% CI	
				Lower	Upper
AMA ≥35 years	5.54	0.019	5.90	1.35	25.83
Mild Obesity	15.64	<0.001	13.38	3.70	48.37
Gravida	4.14	0.042	0.67	0.46	0.99
Week of delivery	7.39	0.007	0.63	0.45	0.88
Head circumference (cm)	6.44	0.011	1.48	1.03	1.99
Model χ^2=47.97; **p<0.001**					
Hosmer and Lemeshow Test: p=0.934					
OR: Odds ratio, CI: Confidence Interval					

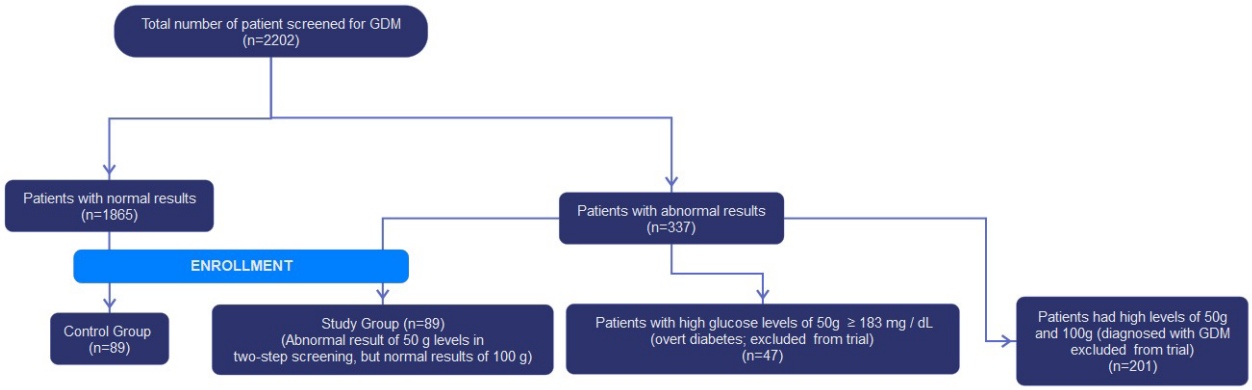

Figure 1: Flowchart of patients included in the study.

(68 kg vs. 64 kg, p=0.010). There were no differences between groups for maternal weight in the third trimester (p = 0.532) (Table-1). It was determined that the gestational weight gain (GWG) during pregnancy differed between the groups. The gestational weight gain (GWG) was lower in the study group (10 kg vs. 13kg, p<0.001) (Table-1). There was a difference between the groups in terms of the ratio of overweight pregnancy patients, and the rate of overweight pregnant women was higher in the study group (35.20% vs. 5.80%, p<0.001) (Table-1). Fasting blood glucose levels (fasting glycemia) did not differ between groups (p=0.851) (Table-1).

There was a difference between the groups according to the distribution of perinatal pathology (p=0.005) (Table-2). In the subgroup analysis, there was no difference between the groups in terms of the incidence of polyhydramnios (p>0.05) while the rate of fetal macrosomia was higher in the study group (10.20% vs. 0, p<0.05). The gestational age at delivery was lower in the study group (38.69 vs. 38.98, p=0.034) (Table-2), but the premature birth rate did not differ between the groups (p=0.741) (Table-2). There were no differences in neonatal birth weight and height (p=0.319 and p=0.146) (Table-2). It was determined that the neonatal head circumference (HC) was larger in the study group (35.15 cm vs. 34.69 cm, p=0.029) (Table-2). There were also no differences between groups for neonatal hospitalization rate (p = 0.126) (Table-2).

In total, nine macrosomic fetuses were found in the study group; there were no macrosomic fetuses in the control group (Table-2). Maternal and neonates' characteristics with and without fetal macrosomia in the study group are given in Table-3. There was no difference regarding age (27 & 29; p=0.464) and AMA (0 & 19%; p=0.348) between groups with and without fetal macrosomia. The rate of overweight pregnant patients did not differ between the groups (44.40 & 34.20, p=0.715). Birth weight, head circumference, and height measurements of neonates are different in fetuses diagnosed with prenatal macrosomia. Birth

weight (4290 g & 3350 g; p<0.001), infant height (52 cm & 51 cm; p=0.001), and median head circumference (HC) (36 cm & 35 cm; p=0.005) were higher in the fetal macrosomia group. It was determined that there was a difference in the type of birth between groups (p=0.003). In the subgroup analyses, vaginal delivery and C/S (planned) rates did not differ with or without fetal macrosomia (p>0.05), while emergent (primary) C/S rate with cephalopelvic disproportion indication was higher in the fetal macrosomia group (p<0.05).

Fasting, 1st hour, 2nd hour, and 3rd hour plasma glucose measurements of 100g levels in the abnormal GCT group (high levels of 50 g) were compared among overweight pregnant patients, AMA ≥35, and AMA ≥35 & overweight pregnant women groups (Table-4). When the table was examined: no difference was observed between the groups according to fasting, 1st hour, and 2nd hour plasma glucose measurements (p>0.05). It was determined that the 3rd hour measurement differed between the groups (p=0.006). In subgroup analyses, it was determined that the mean plasma glucose measurement of the AMA ≥35 & overweight pregnancies group at the 3rd hour was higher than the overweight pregnancies and AMA ≥35 groups (p<0.01 and p<0.05, respectively).

The present study applied multivariable logistic regression analysis to determine the risk factors affecting the 50 g level. Each variable in the study was first examined with univariate logistic regression analysis, and variables meeting the p<0.25 condition were included in the multivariable analysis. Age (≥35 years), number of gravida, abortion (presence), history of C/S (presence), first-trimester weight, type of birth, chronic disease (presence), overweight pregnancies (presence), week of delivery, infant birth weight, head circumference, and infant height measurement were included in the multivariable analysis. The analysis used the backward elimination method as the variable selection method. It was observed that the model obtained in the final step of the analysis was significant (p<0.001) and suitable for the sample data (Hosmer-Lemeshow Test: p=0.934). In the final model of multivariable analysis, it was seen that the risk of 50 g level increased in the age of 35 and above increased 5.90 [OR(95%CI): 5.90(1.35-25.83; p=0.019)] times, in overweight pregnancies, it increased 13.38 [OR(95%CI): 13.38(3.70-48.37; p<0.001)] times, and it was determined that a one-unit increase in the number of gravida decreased the 50g level by 33% [OR(95%CI): 0.67(0.46-0.99; p=0.042)]. Moreover, in the case of a one-unit increase in the newborn's head circumference measurement, the 50 g level increased by 1.48[OR(95%CI): 1.48(1.03-1.99; p=0.011)] times. On the other hand, a one-unit increase in the delivery week decreased the risk of a 50 g increase by 37% [OR(95%CI): 0.63(0.45-0.88; p=0.007)].

Discussion

The present study focuses on patients with abnormal GCT (high value of 50 g) who have not been diagnosed with GDM. In the United States, the prevalence of both pre-existing and GDM increased from 2000 to 2010 (7). We believe that the increase in the incidence of GDM and abnormal glucose levels has also increased the population of patients with high 50 g levels in the first step of double-step screening. A recent study has shown that patient whose 50g levels results between 130 and 140 mg/dl or a single-value abnormality of 100-g OGTT are at increased risk for diabetic complications (8). In our study, we selected patients with abnormal GCT results who had not been diagnosed with GDM and investigated how high levels of 50g affected the outcomes of fetuses and neonates. Moreover, we aimed to identify maternal characteristics affecting the 50 g levels of GTT, which may be a light in preventing unwanted neonatal and obstetric complications.

The proportion of women giving birth over 35 has increased over time (9, 10). A. P. Frick emphasized in his research that the AMA increased the risks of miscarriage, chromosomal abnormalities, stillbirth, fetal growth restriction, premature birth, preeclampsia, GDM, and C/S rate (11). Advanced maternal age, obesity, and a family history of diabetes are known risk factors for GDM (12). Our study also showed that the prevalence is related to maternal weight and age. When maternal overweight is added to the AMA, the risk of high blood glucose levels increases. As shown in Table 4, the group of overweight patients who were also over 35 years old had statistically higher 100 g levels at 3rd hour compared to the groups of overweight or over 35-year patients alone. This finding is important due to the fact that the studies show maternal and fetal outcomes are associated with glucose levels in pregnancy (13).

Hyperglycemia in pregnancy (HIP) is associated with a significantly increased risk of adverse events during pregnancy, intrapartum and postpartum periods. Our study showed that all nine pregnant women with fetal macrosomia were in the study group only. The median infant birth weight of macrosomic fetuses was 4290 g. Seven patients with fetal macrosomia were delivered by C/S, and six of those had C/S due to cephalopelvic disproportion (CPD) indication. These findings show that patients with high 50 g levels should be followed meticulously because this group is at a high risk of CPD. However, no difference was found between the study and control group for the type of delivery according to the C/S rate. We explained this discrepancy by selecting study group patients from normal 50 g level patients and guided the study group for diet and lifestyle changes. That is how we avoided adverse neonatal and obstetric outcomes in the study group. Kautsky-Willer A. et al. suggest that all women with GDM should receive nutritional counseling, be informed and trained in blood glucose self-monitoring, and be motivated to increase physical activity (13). The authors made these suggestions for GDM patients, but this recommendation may also be suitable for patients with high blood glucose levels of 50 g even if they are not diagnosed as GDM. In our clinic, patients with detected high glucose levels who are not subjected

to medical treatment undergo close monitoring and lifestyle modification recommendations. This is how we can also explain a weight gain that was lower in the study group than in the control group. This is how we can also explain a weight gain that was lower in the study group than in the control group.

Dabelea et al. pointed out that parity and gravidity were not significantly associated with GDM and had no effect on the GDM increase over time (14). In contrast, another study conducted by Akter S et al. shows that data on the association between reproductive events and the prevalence of diabetes mellitus are controversial but they found a relationship between multi-parity and gravidity as a risk factor for metabolic syndrome (15). Multivariate analysis results of the current study determined that a one-unit increase in gravida decreased the 50g level by 33%. The analysis also shows that in the case of a one-unit increase in the neonate's head circumference measurement, levels of 50 g increase 1.48 times. These data show that increased 50 g levels affect the neonate's head circumference (HC). Head circumference measurements were higher in the study group. Thus, patients in the study group are at risk for Cephalopelvic Disproportion (CPD), the leading cause of obstructed labor.

As we know, obstructed and prolonged labor is associated with short-term and long-term complications (16, 17). JP Neilson et al. (18) noticed that obstructed labor is an important cause of maternal deaths in communities. In another study, researchers reviewed the evolution of the human pelvis and obstructed labor (19). This article is very intriguing, but perhaps the answer is simple. As we know, obesity has risen sharply over the past three decades (20). Maternal metabolic status has also changed over recent decades, influenced by maternal excess weight and advanced age. These changes, both during pregnancy, which was shown in our study, and during the peripartum and postpartum periods, have an adverse maternal, fetal and neonatal outcome. However, obstructed labor is a preventable obstetric complication (21). So, we can prevent obstetric complications in patients with high levels of 50 g, who have not been diagnosed with GDM (study group) with attentive follow-up and timely surgery intervention.

The International Association of Diabetes and Pregnancy Study Groups (IADPSG) recommended universal maternal hyperglycemia testing for women without a prior diagnosis of overt diabetes mellitus using a one-step 75 g oral glucose tolerance test (OGTT) (22). No recent studies of 50 g GGT have shown that how high levels in the first STEP-I of screening lead to adverse neonatal outcomes such as fetal macrosomia and increased primary C/S rate due to labor. Olagbu et al. pointed out that the 50 g GCT performed poorly compared with the 75 g OGTT for detecting hyperglycemia in pregnancy (23). The authors also emphasized that 50 gr GCT seemed as an unsuitable replacement for the 75 g OGTT. The results of our study may support the idea that the 75 g OGTT for GDM screening can identify the study population of patients and diagnose them as GDM.

Study Limitations

Since this study is retrospective, the main limitation is the lack of information on patients' diet and physical activity. Another essential limitation is the fact that the study is a single-center study with a small sample size. These limitations suggest that further research is needed to confirm the findings and better understand the underlying mechanisms of the relationships observed in this study. Future research should aim to revisit these findings in a larger, prospective study to investigate further the relationship between advanced maternal age, maternal weight, and high levels of of 50 g, in cases who have not been diagnosed with GDM. Additionally, more research is needed to explore potential interventions for reducing the risk of abnormal levels of 50 g in high-risk populations, such as increasing awareness about the importance of healthy weight management before and during pregnancy.

Conclusion

The present study aimed to investigate the risk of adverse maternal and fetal outcomes in women with abnormal 50 g but normal 100 g levels on two-step screening tests for gestational diabetes mellitus (GDM). Our results showed that the high levels of 50 g (study group) had a higher incidence of advanced maternal age and a higher proportion of overweight pregnant patients compared to the control group. Additionally, the study group had a higher rate of fetal macrosomia and larger neonatal head circumference measurements. These findings suggest that patients with high 50 g levels should be followed meticulously as this group is at high risk for cephalopelvic disproportion. However, attentive follow-up and diet and lifestyle changes in the high levels of 50 g (study group) may help to avoid adverse neonatal and obstetric outcomes. Further research is required to identify the specific maternal characteristics that affect 50 g levels and to develop interventions to prevent unwanted complications in this population.

Ethics Committee Approval: The study was approved by the Local Clinical Research Ethics Committee (Approval number: 2020-9/8).

Data Sharing Statement: The raw data supporting the conclusions of this article will be made available without reservation by the authors upon request.

Conflict of Interest: No conflict of interest was declared by the authors.

Funding: The authors declared that this study received no financial support.

Author contributions:

SRO: Research concept and design, collection and/or assembly of data, writing the article, critical revision of the article, final approval of the article

BAD: Research concept and design, critical revision of

the article, final approval of the article

ZA: Research concept and design, data collection, critical revision of the article, final approval of the article

OOU: Collection and/or assembly of data, critical revision of the article, final approval of the article

GO: Research concept and design, data analysis and interpretation, final approval of the article

References

1.Sharma AK, Yerrabelli D, Sagili H, Sahoo JP, Gaur GS, Kumar A. Relationship between advanced glycated end products and maternal cognition in gestational diabetes: a case control study. The Journal of Maternal-Fetal & Neonatal Medicine. 2022;35(25):7806-11.

2.Ozyurt R, Asicioglu O, Gultekin T, Gungorduk K, Boran B. The prevalence of gestational diabetes mellitus in pregnant women who were admitted to Istanbul Training and Research Hospital Obstetric and Gynecology Department. JOPP Derg. 2013;5(1):7-12.

3.Ashwal E, Hod M. Gestational diabetes mellitus: Where are we now? Clinica chimica acta. 2015;451:14-20.

4.Buchanan TA, Xiang AH, Page KA. Gestational diabetes mellitus: risks and management during and after pregnancy. Nature Reviews Endocrinology. 2012;8(11):639.

5.Esakoff TF, Cheng YW, Caughey AB. Screening for gestational diabetes: different cut-offs for different ethnicities? American journal of obstetrics and gynecology. 2005;193(3):1040-4.

6.Hartling L, Dryden DM, Guthrie A, Muise M, Vandermeer B, Aktary WM, et al. Screening and diagnosing gestational diabetes mellitus. Evidence report/technology assessment. 2012(210):1.

7.Bardenheier BH, Imperatore G, Devlin HM, Kim SY, Cho P, Geiss LS. Trends in pre-pregnancy diabetes among deliveries in 19 US states, 2000− 2010. American journal of preventive medicine. 2015;48(2):154-61.

8.Seval MM, Cavkaytar S, Atak Z, Cagman M. Should we interpret the results of 'two-step'glucose screening again according to the obstetric outcomes? Journal of Obstetrics and Gynaecology. 2016;36(6):705-9.

9.Sauer MV. Reproduction at an advanced maternal age and maternal health. Fertility and sterility. 2015;103(5):1136-43.

10.Division UNDoEaSAP. World Fertility Patterns 2015–Data Booklet (ST/ESA/SER. A/370)2015.

11.Frick AP. Advanced maternal age and adverse pregnancy outcomes. Best Practice & Research Clinical Obstetrics & Gynaecology. 2021;70:92-100.

12.Bulletins C. ACOG Practice Bulletin No. 190: Gestational Diabetes Mellitus2018. e49-64 p.

13.Kautzky-Willer A, Winhofer Y, Kiss H, Falcone V, Berger A, Lechleitner M, et al. Gestationsdiabetes (GDM)(Update 2023). Wiener klinische Wochenschrift. 2023;135(Suppl 1):115-28.

14.Dabelea D, Snell-Bergeon JK, Hartsfield CL, Bischoff KJ, Hamman RF, McDuffie RS. Increasing prevalence of gestational diabetes mellitus (GDM) over time and by birth cohort: Kaiser Permanente of Colorado GDM Screening Program. Diabetes care. 2005;28(3):579-84.

15.Akter S, Jesmin S, Rahman MM, Islam MM, Khatun MT, Yamaguchi N, et al. Higher gravidity and parity are associated with increased prevalence of metabolic syndrome among rural Bangladeshi women. PloS one. 2013;8(8):e68319.

16.Kearney R, Fitzpatrick M, Brennan S, Behan M, Miller J, Keane D, et al. Levator ani injury in primiparous women with forceps delivery for fetal distress, forceps for second stage arrest, and spontaneous delivery. International Journal of Gynecology & Obstetrics. 2010;111(1):19-22.

17.Heilbrun ME, Nygaard IE, Lockhart ME, Richter HE, Brown MB, Kenton KS, et al. Correlation between levator ani muscle injuries on magnetic resonance imaging and fecal incontinence, pelvic organ prolapse, and urinary incontinence in primiparous women. American journal of obstetrics and gynecology. 2010;202(5):488. e1-. e6.

18.Neilson J, Lavender T, Quenby S, Wray S. Obstructed labour: reducing maternal death and disability during pregnancy. British medical bulletin. 2003;67(1):191-204.

19.Pavličev M, Romero R, Mitteroecker P. Evolution of the human pelvis and obstructed labor: new explanations of an old obstetrical dilemma. American journal of obstetrics and gynecology. 2020;222(1):3-16.

20.Twells LK, Gregory DM, Reddigan J, Midodzi WK. Current and predicted prevalence of obesity in Canada: a trend analysis. Canadian Medical Association Open Access Journal. 2014;2(1):E18-E26.

21.Ayenew AA. Incidence, causes, and maternofetal outcomes of obstructed labor in Ethiopia: systematic review and meta-analysis. Reproductive health. 2021;18(1):1-14.

22.Diabetes IAo, Panel PSGC. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy2010. 676-82 p.

23.Olagbuji BN, Aderoba AK, Kayode OO, Awe CO, Akintan AL, Olagbuji YW, Group□Nigeria GDS. Accuracy of 50□g glucose challenge test to detect International Association of Diabetes and Pregnancy Study Groups criteria□defined hyperglycemia. International Journal of Gynecology & Obstetrics. 2017;139(3):312-7.