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Araştırma

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Postpartum Type 2 Diabetes Mellitus Frequency of Patients with Gestational Diabetes Mellitus

Gestasyonel Diabetes mellitus hastalarında Doğum Sonrası Tip 2 Diabetes Mellitus Sıklığı

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ABSTRACT

Aim: This study aims to examine the frequency of type 2 diabetes mellitus (DM) in the postpartum period and its relationship with other risk factors.

Materials and Methods: Patients who were diagnosed, followed up and treated for gestational diabetes in Malatya Turgut Özal University, Malatya Training and Research Hospital Endocrinology outpatient clinic and who underwent Oral Glucose Tolerance Test (OGTT) in the postpartum period were included.

Results: In our retrospective study, 157 patients were included. The mean age was 31.8±5.6 years. After being followed up with her follow-up and treatment throughout the pregnancy, OGTT administered with 75 grams of glucose was performed at the postpartum 8th week. Impaired glucose tolerance (IGT) was detected in 23 patients (14.64%), impaired fasting glucose (IFG) in 18 patients (11.46%), and type 2 DM in 17 patients (10.8%). When evaluated in terms of the presence of DM in the postpartum period, no difference was found regarding the history of gestational DM in the anamnesis (p=0.305) and the presence or absence of family history (p=0.095). In terms of the presence of DM, there was a significant difference between the patients receiving insulin therapy and those receiving diet therapy (p=0.001).

Conclusion: We can say that type 2 DM development in the postpartum period is associated with high maternal age and an increase in body mass index (BMI). Being pregnant with the ideal weight to be achieved by lifestyle changes may decrease the risk of type 2 DM and diabetes-related complications in the long term.

Key Words: Diabetes, Gestational, Obesity, Insulin

ÖZET

Amaç: Çalışmamızda postpartum dönemde tip 2 diabetes mellitus (DM) sıklığı ve risk faktörleri ile ilişkisinin incelenmesi amaçlanmıştır.

Gereç ve Yöntem: Malatya Turgut Özal Üniversitesi, Malatya Eğitim ve Araştırma Hastanesi Endokrinoloji polikliniğinde gestasyonel diyabet tanısı alan, takip ve tedavisi edilen ve postpartum Oral Glikoz Tolerans Testi (OGTT) yapılan hastalar dahil edilmiştir.

Bulgular: Çalışmaya 157 hasta dahil edildi. Yaş ortalaması 31,8±5,6 idi. Gebelik boyunca takibi ve tedavisi ile izlendikten sonra postpartum 8. haftada 75 gramlık OGTT yapıldı. Yirmi üç hastada (%14,64) bozulmuş glikoz toleransı (BGT), 18 hastada (%11,46) bozulmuş açlık glikozu (BAG) ve 17 hastada (%10,8) tip 2 DM tespit edilmiş olup 99 hastamızın (%63,5) normal glikoz değerleri tespit edilmiştir. Postpartum dönemde DM varlığı açısından değerlendirildiğinde anamnezinde gestasyonel DM öyküsü (p=0,305) ve aile öyküsü varlığı ya da yokluğu açısından farklılık saptanmadı (p=0,095). DM varlığı açısından insülin tedavisi alan hastalar ile diyet tedavisi alan hastalar arasında ise anlamlı farklılık vardı (p=0,001).

Sonuç: Çalışmamızın sonucunda postpartum dönemde tip 2 DM gelişiminin anne yaşının yüksekliği ve vücut kitle indeksi (VKİ) artışının beraberliği ile ilişkili olduğunu söyleyebiliriz. Yaşam şekli değişikliği ile sağlanacak ideal kilo ile gebe kalmak tip 2 DM riskin ve uzun vadede diyabete bağlı komplikasyonlarda azalma gösterebilecektir.

Anahtar Kelimeler: Diyabet, Gebelik, Obezite, İnsülin

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Introduction

Gestational Diabetes Mellitus (GDM) is a glucose intolerance first noticed during pregnancy and it is seen in 7% of all pregnancies [1]. Some of the patients diagnosed during pregnancy are type 2 diabetes patients who have not been recognized before [2-4]. Among the most crucial known risk factors are advanced maternal age, family history, sedentary life and high body mass index (BMI) [5].

Physiological insulin resistance and concomitant hyperinsulinemia develop to provide adequate nutrition to the fetus and due to hypermetabolic events during pregnancy. Increased placental in pregnancy hormones such as lactogen hormone, progesterone, cortisol, growth hormone, prolactin and their insulin in the second-trimester disruption of receptor substrate-1 (IRS-1) activity, followed by insulin with increased adipose tissue and genetic predisposition in the 3rd trimester. Sensitivity disorder causes insulin resistance. To compensate for this resistance, the pancreas must secrete more insulin. In patients with underlying chronic insulin resistance, this compensation mechanism cannot occur and beta-cell dysfunction develops [6].

Gestational diabetes may cause preeclampsia, spontaneous abortions in the mother, polyhydramnios, macrosomia, birth trauma and increased mortality in the fetus. Especially in the first 10 weeks, high HbA1C causes microcephaly, anencephaly, congenital heart diseases, and pathologies, such as hypoglycemia, hyperbilirubinemia, and hypocalcemia in the neonatal period. In children, advanced obesity, childhood diabetes, motor development disorder, and attention deficit can be seen [7].

More than 10% of women who develop gestational DM are diagnosed with type 2 DM immediately after delivery, and more than 70% in ten-year follow-ups. This metabolic uncontrollability experienced during pregnancy adversely affects maternal and child health in the long term, and may recur in the next pregnancy for GDM, which improves after subsequent delivery [8]. Therefore, early diagnosis of gestational diabetes, initiation of effective treatment of patients with risk factors, and postpartum follow-up are extremely important in reducing maternal/child morbidity and mortality due to GDM .

In our study, the patients who were diagnosed with gestational diabetes by applying to our polyclinic and treated. We aimed to present the results of the glucose loading test performed at the postpartum 8th week together with the demographic characteristics and the relationship with the risk factors in patients who developed permanent type 2 DM.

Material and Method

Our study was designed retrospectively and patients between January 1, 2018 and April 1, 2023 were included. In the general follow-ups of pregnancy, according to the screening program of the American Diabetes Association, the patients who did not have DM history, as a routine diagnosis and screening test at 24-28 weeks, in the morning and after at least eight hours of fasting, a 75-gram oral glucose tolerance test (OGTT) was performed and glucose values were determined. If fasting glucose ≥ 92 mg/dl, an hour postprandial glucose ≥ 180 mg/dl, and 2-hour postprandial glucose ≥ 153 mg/dl is high, it was considered gestational diabetes and is referred to Malatya Turgut Özal University, Malatya Training and Research Hospital Endocrinology outpatient clinic applicant gestational diabetes pregnant patients diagnosed with diabetes mellitus were included. After these patients applied to the endocrinology outpatient clinic, their family history, history and pre-pregnancy weight were questioned regarding the presence of DM, and pre-pregnancy BMI was calculated. In addition, a physical examination of the patients during pregnancy was performed and height, weight and BMI measurements were evaluated. In addition to the OGTT results, HbA1c, insulin, lipid profile, urea, and creatinine biochemical tests were requested for patients diagnosed with GDM. GDM diet (25-30 kcal/kg) and exercise (4 days a week for half an hour) were recommended to each patient in the treatment. Insulin therapy was started in the control examination for patients who were not regulated by diet and exercise therapy.

Postpartum applications of patients whose pregnancy continues with close follow-up and treatment, along with recommendations, blood sugar follow-up and 75 grams oral glucose tolerance test were performed and if the fasting blood glucose is ≥126 mg/dl, impaired fasting glucose (IFG), If the postprandial blood glucose is between ≥140-199 mg/dl, impaired glucose tolerance (IGT), random single value or postprandial blood glucose ≥200 mgr/dl was divided into groups as type 2 DM. The rest were considered normal.

Exclusion criteria: Pregnant women under 18 years of age**,** diagnosed with type 1 diabetes or type 2 diabetes before pregnancy, and pregnant women with kidney or liver failure were excluded from this study.

Ethics Committee**:** This retrospective research was conducted in compliance with the Declaration of Helsinki's guiding principles and authorized by the Malatya Turgut Ozal University Clinic Ethics Committee (Approval no: 2023/27).

Statistical analysis: SPSS 22.0 (IBM, Armonk, NY, USA) was used for statistical analysis. All data were expressed as mean

± standard deviation or number (percent). Mann-Whitney U test was performed to compare the group with or without DM in terms of age, BMI, insulin dose, FPG, and HbA1c averages. The chi-square test was used to compare the presence or absence of DM with the groups of gestational DM history, family history, and treatment status. A p-value of <0.05 was considered significant.

Results

A total of 157 volunteer patients with no previous diagnosis (Diabetes, impaired fasting glucose, impaired glucose tolerance) were included in our study. The age range was 21- 44 years and the mean age was 31.8±5.6. The number of pregnancies was between one and six, with an average of 2.5±1.1.

There was a history of GDM in 64 (40.8%) patients who participated in this study, and a family history in 108 (68.2%) patients. Forty-nine (31.2%) patients had both a history of GDM and a family history.

When the anamnesis of the patients was questioned, 13 (8.3%) patients had birth complications in their previous pregnancies and four (2.5%) patients had fetal anomalies.

Diet and exercise therapy (69 patients; 43.9%) were recommended as non-pharmacological treatment for pregnant patients diagnosed with gestational diabetes. In case of insufficient blood sugar regulation, insulin therapy was added once (66 patients; 42.0%), twice (17 patients; 10.8%), and four times (5 patients; 3.2%).

After the pregnancy follow-up of the patients was followed at certain intervals, a 75-gram glucose test was performed in the 8th week for blood sugar follow-up during and after delivery. Patients with postprandial blood sugar or blood sugar ≥200 mg/dlt at any time were considered to have persistent type 2 DM. Impaired glucose tolerance (IGT) was detected in 23 patients (14.64%), impaired fasting glucose (IFG) in 18 patients (11.46%), type 2 DM was detected in 17 patients (10.8%), and 99 patients (63%, 5) normal glucose values were present.

The mean age, pre-pregnancy BMI, pregnancy BMI and postpartum BMI, mean insulin dose, and HbA1c mean of patients with postpartum DM were significantly higher than the mean of those without DM (Table 1).

When evaluated regarding the presence of DM in the postpartum period, no difference was found between patients with and without a history of gestational DM (p=0.305). There was no difference in terms of the presence or absence of family history (p=0.095). Of the patients with DM, 16 (94.1%) were receiving insulin therapy and one (5.9%) was receiving diet therapy. Regarding the presence of DM, there was a significant difference between the patients receiving insulin therapy and those receiving diet therapy (p=0.001) (Table 2).

Table 1. Comparison of age, BMI, insulin dose, FPG, HbA1c averages of pregnant women with and without DM

	DM available (n=17)	no DM (n=140)	P
Age (year) mean ±SD (n=157)	36.9±4.3	31.2±5.5	**0.001**
Pre-pregnancy BMI (kg/m^2) mean ±SD (n=157)	30.8±3.3	27.7±4.4	**0.006**
Pregnancy BMI (kg/m^2) mean ±SD (n=157)	33.9±3.8	30.3±4.5	**0.001**
Post-pregnancy BMI (kg/m^2) mean ±SD (n=157)	32.4±3.4	28.8±4.3	**0.001**
Mean insulin dose (Units) mean ±SD (n=89)	21.6±7.2	13.9±5.2	**0.001**
Pregnancy FPG (mg/dl) mean ±SD (n=157)	118.5±31.7	113.1±34.7	**0.216**
Postpartum FPG (mg/dl) mean ±SD (n=157)	94.9±15.7	94.6±21.6	**0.659**
Pregnancy of HbA1c (%) mean ±SD (n=157)	7.7±0.5	6.5±0.5	**0.001**
Postpartum HbA1c (%) mean±SD (n=157)	7.4±0.5	5.7±0.5	**0.001**

n: number of patients, SD: standard deviation; p-values were obtained by Mann-Whitney U test.

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Table 2. Comparison of pregnant women with and without DM in terms of gestational DM history, family history and treatment methods

	DM available n (%)	No DM n (%)	P
Has a history of gestational DM (n=64)	9 (52.9)	55 (39.3)	0.305
No history of gestational DM (n=93)	8 (47.1)	85 (60.7)	
There is a family history (n=107)	15 (88.2)	92 (65.7)	0.095
No family history (n=50)	2 (11.8)	48 (34.3)	
Diet therapy (n=69)	1 (5.9)	68 (48.6)	0.001
Insulin therapy (n=88)	16 (94.1)	72 (51.4)	

n: number of patients; p-values were obtained by chi-square test.

Discussion

Gestational diabetes mellitus (GDM) is the most common metabolic disorder of pregnancy. It is defined as glucose intolerance characterized by hyperglycemia, which has not been detected before and first appears during pregnancy [7,8]. The prevalence of GDM in our country varies between 1.9% and 27.9%, and it is shown in various sources that it is 7.7% on average. Less part of these cases are pregestational diabetes, and 90% of them are gestational diabetes diagnosed during pregnancy [9,10]. It causes an increase in the risk of type 2 DM that may develop after birth, together with the risk it carries during pregnancy and delivery [11].

In this study, the relationship between these risk factors and the development of type 2 DM in the postpartum period of gestational diabetes patients with increased maternal age, BMI, gestational DM in previous pregnancies, and a family history of DM were investigated.

According to our data, there was no significant difference in the family history of DM persistence in the postpartum period in the group without DM persistence (p= 0.095). However, postpartum DM persistence was significantly higher in patients using insulin (p=0.001) and patients with high BMI (p=0.001).

In the study of Özay et al., 260 pregnant patients were divided into two groups with BMI <25 and ≥25, and the risk of developing gestational diabetes in the patient group with BMI ≥25 was significant (p=0.001). In addition, it was found that the frequency of GDM increased significantly in patients with increased gravida and multiparity (p-values 0.006 and <0.001, respectively) [12].

However, there are fewer publications on pregnancy follow-up after delivery. There is a significant decrease in insulin requirement due to the sudden decrease in placental hormones with anti-insulin effect after delivery [13]. Patients with GDM who are not insulin dependent before pregnancy and are controlled by diet alone may not need insulin after delivery. The insulin dose for type 2 diabetic women is minimal within 1-3 days postpartum. For women with type 1 diabetes, small doses to be determined by blood glucose levels may be needed [14].

In the study of Lin et al. in 302 patients with GDM, 43% of women who had postpartum diabetes have detected the mellitus [15]. In our study, postpartum diabetes mellitus development was lower at 10.8%. We think this can be achieved with close follow-up, treatment and weight control of our patients.

Since the incidence of DM development in the postpartum period is higher than those without GDM, pregnant women who were followed up with the diagnosis of GDM should be screened for DM after delivery. There are many studies supporting this finding in the literature. In studies conducted on this subject, the incidence of DM development after GDM ranges from 6.06% to 34.6% [16,17].

In another study, 235 patients with GDM were metabolically evaluated at week 6, with Type 2 DM in 17 (13.4%), impaired glucose tolerance in 37 (29.1%) patients, and normal in 73 (57.5%) patients. [18]. In our study, after OGTT was performed at the postpartum 8th week of 157 volunteer GDM patients, 23 patients (14.64%) had impaired glucose tolerance (IGT), 18 patients (11.46%) had impaired fasting glucose (IFG), and 17 patients (10%,) type 2 DM was detected. Normal glucose values were determined in 99 patients (63.5%). It was noted that the presence of type 2 DM was proportional to increasing maternal age and BMI. Regarding the presence of DM, there was a significant difference between the patients receiving insulin therapy and those receiving diet therapy (p=0.001).

In the study conducted by Turker et al., in which 40 GDM patients were included, it was observed that postpartum Type 2 DM developed in seven patients (17.5%) in the follow-up of metabolic values in the postpartum period [19]. In our study, postpartum DM was observed in 17 patients (10.8%) in proportion to high BMI and increased maternal age. The number of those who needed insulin was higher, especially during pregnancy.

While the rate of developing type 2 DM within five years postpartum in mothers who gave birth varies from 5 to 50%, it was determined that the risk of developing type 2 DM in 15-25 years is 50-70% [20]. In a study conducted by Krishnaveni et al. on this subject, the frequency of diabetes was higher in the 5th year of postpartum screening of South Indian GDM patients compared to pregnant women without GDM (37% vs. 2%) [21]. In our study, the rate of type 2 DM was 10.8% in our OGTT results at the postpartum 8th week. Our data show consistency with previous study results.

Among the shortcomings are the retrospective nature of this study and the relatively low number of patients. The limitations of our study are that the number of patients is in a certain range since it is retrospective and single-center. Despite this, we think that patient follow-ups do not adversely affect the results due to the regularity and completeness of the data.

Conclusion

Pregnancy is a process that creates opportunities for diabetes screening and the determination of future risks. The coexistence of increasing maternal age and sedentary life, in other words, the increase in BMI will increase the risk of developing type 2 DM in the postpartum period in women with gestational diabetes. Close follow-up and treatment of women with GDM during the postpartum period should not only reduce the risk of developing diabetes but also prevent or delay micro and macrovascular complications.

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ORCID and Author contribution: ***L.K. (0000-0001-8283-4516)*** Concept and Design, Data Collection, Interpretation of Results, Literature Search, Critical Review. Final Approval

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