

Evaluation of the prevalence of gestational diabetes mellitus in Kayseri city hospital: A cross-sectional study

Kayseri şehir hastanesinde gestasyonel diabetes mellitus prevalansının değerlendirilmesi: Kesitsel bir çalışma

Mefkure Eraslan Şahin¹, İlknur Çöl Madendağ¹

¹ Department of Obstetrics and Gynecology,
Kayseri City Hospital, Kayseri, Turkey

ORCID ID of the author(s)

MEŞ: 0000-0001-6484-9132

İÇM: 0000-0001-6700-2236

Abstract

Aim: Gestational diabetes mellitus (GDM) is an important disease worldwide and its incidence is rising with increasing maternal age and obesity. The aim of this study is to investigate the prevalence of GDM in accordance with International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria by obtaining data from a single center in Kayseri.

Methods: All pregnant women between the ages of 18 and 45 who were referred to the clinic for routine pregnancy follow-up visits between January 2018-2019 at Kayseri City Hospital's Gynecology and Obstetrics Department were included in this study. Their records were obtained from the hospital registry and retrospectively examined. A single stage 75g oral glucose tolerance test (OGTT) was performed to all patients and IADPSG criteria were used for diagnosis.

Results: 2652 pregnant women were included in this study and screened for GDM with a single-step 75-g OGTT. The mean age of all pregnant women was 26.42 (22-31) years. The mean gravid, parity and gestational weeks at the time of testing were 3 (range 1-5), 3 (range 1-4), 26 (range 24-28), respectively. The prevalence of GDM, detected in 424 of 2652 patients, was 16% (424/2652).

Conclusion: The prevalence of GDM among pregnant women who were referred to our clinic for routine pregnancy follow-up was 16% according to the IADPSG criteria, as determined with a single-step 75-g OGTT.

Keywords: Gestational diabetes mellitus, Prevalence, Kayseri

Öz

Amaç: Gestasyonel diyabet (GDM) dünya genelinde önemli bir sağlık problem olup obezitenin ve maternal yaşın artmasıyla sıklığı giderek artmaktadır. Bu çalışmada, Kayseri'deki tek bir merkezden veri kullanarak International Association of Diabetes and Pregnancy Study Group (IADPSG) kriterlerine göre GDM prevalansını araştırmayı amaçladık.

Yöntemler: Ocak 2018 ile Ocak 2019 arasında, 18-45 yaş arası, 24-28. gebelik haftaları arasında, Kayseri Şehir Hastanesi Kadın Hastalıkları ve Doğum Kliniğinde rutin gebelik takibi için başvuran tüm gebeler retrospektif olarak bilgisayar hastane sistemi kayıtları ile incelendi. Hastalar tek aşamalı 75 g oral glikoz tolerans testi (OGTT) ile tarandı ve tanı için IADPSG kriterleri kullanıldı.

Bulgular: Çalışmaya toplam 2652 gebe dahil edildi ve tek adımlı 75 g OGTT ile GDM taraması yapıldı. Tüm gebelerin yaş ortalaması 26,42 (22-31) idi. Ortalama gravid değeri 3 (1-5 arasında), ortalama parite 3 (1-4 arasında) ve test sırasındaki ortalama gebelik haftası 26 idi (24-28 aralığı). GDM 2652 hastanın 424'ünde tespit edildi. GDM prevalansı %16 olarak bulundu (424/2652).

Sonuç: Kliniğimize başvuran gebelerde, tek adımlı 75 g OGTT ile IADPSG kriterlerine göre GDM prevalansı %16 olarak bulundu.

Anahtar kelimeler: Gestasyonel diabetes mellitus, Prevalans, Kayseri

Corresponding author / Sorumlu yazar:
Mefkure Eraslan Şahin

Address / Adres: Kayseri Şehir Hastanesi, Kadın Hastalıkları ve Doğum Bölümü, Kayseri, Türkiye
e-Mail: mefkuree@hotmail.com

Ethics Committee Approval: The study was approved by the Erciyes University Ethics Committee (Approval no: 2019/616).

Etik Kurul Onayı: Çalışma Erciyes Üniversitesi Etik Kurulu tarafından onaylandı (Onay no: 2019/616).

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

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Financial Disclosure: The authors declared that this study has received no financial support.

Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

Published: 10/4/2019
Yayın Tarihi: 04.10.2019

Copyright © 2019 The Author(s)
Published by JOSAM

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License 4.0 (CC BY-NC-ND 4.0) where it is permissible to download, share, remix, transform, and buildup the work provided it is properly cited. The work cannot be used commercially without permission from the journal.



Introduction

Gestational diabetes mellitus (GDM) does not usually begin until the second trimester of pregnancy, but it is extremely common and continues throughout pregnancy once it begins. Glucose intolerance and elevated blood glucose levels are key to the diagnosis of this pregnancy complication [1,2]. The increase in obesity and older pregnancy age contribute to GDM's increasing prevalence, and public health systems bear this burden [3]. GDM may cause various complications for the offspring, including neonatal hypoglycemia, stillbirth, preterm birth, macrosomia, shoulder dystocia, and affect the mother in many ways, ranging from hypoglycemia to a need for caesarean section [4]. Besides these risks associated with pregnancy and delivery, women with GDM are also at increased risk for type 2 diabetes and cardiovascular diseases later in life [5]. The women at highest risk for GDM are those with a family history of type 2 diabetes, a previous personal history of GDM or a macrosomic infant, obesity, and those of advanced age [6].

In the literature, the prevalence of GDM varies between 1.2 and 27.9% in different studies conducted regionally in Turkey [7-20]. Since there has been no multicenter study in our country, there is no data on the national prevalence of GDM today. The use of different diagnostic criteria may be associated with the detection of a wide prevalence range. For this reason, we aimed to investigate the prevalence of GDM in accordance with the criteria of International Association of Diabetes and Pregnancy Study Groups (IADPSG) by using the data from a single center in Kayseri, which is a reference center in Turkey.

Materials and methods

Pregnant women between the ages of 18 and 45 who were referred to the clinic for routine pregnancy follow-up visits between January 2018 and 2019 at Kayseri City Hospital's Gynecology and Obstetrics Department were included in this study. Their records were obtained from the hospital registry and retrospectively examined. All research was conducted in accordance with the Helsinki Declaration, and ethics approval was obtained from Erciyes University Ethics Committee (No: 2019/616). Patients with previously diagnosed diabetes mellitus (type 1 and type 2), those with a history of endocrine diseases (Cushing's disease, Addison's disease, pituitary failure, acromegaly, etc.) or drug use that could affect blood glucose levels were excluded from the study. The date of last menstrual period was used to determine the gestational week of the patients. The gestational age of any patient who did not know the date of her last menstrual period was calculated according to ultrasonographic measurements performed in the first trimester. Patients were screened with single-stage 75-g OGTT, and the IADPSG criteria were used for diagnosis.

Inclusion criteria included the following risk factors for gestational diabetes: diabetes mellitus in the family, particularly in first degree relatives, a body mass index (BMI) >30 kg/m² or excessive gestational weight gain, gestational diabetes or birth of a macrosomic baby >4.1 kg, a syndromic infant, unexplained perinatal loss in a previous pregnancy, a history of impaired glucose tolerance, glycosuria during prenatal examination, and conditions leading to diabetes, such as metabolic syndrome,

polycystic ovary syndrome or actual use of glucocorticoids [21]. Following 12 hours of fasting, the plasma glucose of the patients were measured, after which 75 mg glucose was ingested orally by the patients. Venous blood samples were obtained one and two hours later. The upper limit of plasma glucose values for fasting state, and at the first- and second hours following ingestion of glucose were 91, 179 and 152 mg/dL, respectively (Table 1) [22]. Any value crossing the threshold was considered positive. GDM prevalence was determined according to these one-step screening test results.

Table 1: Proposed diagnostic criteria for gestational diabetes mellitus*

Status	Plasma or serum glucose levels (mg/dl)
Fasting	92
1 hour	180
2 hours	153

*Metzger BE, Gabbe SG, Persson B, Buchanan TA, Catalano PA, Damm P, et al. International Association of Diabetes and Pregnancy Study Groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. International Association of Diabetes and Pregnancy Study Groups Consensus Panel. Diabetes Care. 2010;33:676-82.

Statistical analysis

For statistical analysis of the study data, PASW Statistics 18 (SPSS version 18, 2009, Chicago, IL, USA) was used, and percentages were determined. Data were expressed as mean (standard deviation), median (25-75%), or n (%). Descriptive statistics was performed.

Results

Two thousand, six hundred and fifty-two pregnant women were included in this study and screened for GDM with a single-step 75-g OGTT. The mean age of all pregnant women was 26.42 (22-31) years. The mean gravid, parity and gestational weeks at the time of testing were 3 (range 1-5), 3 (range 1-4), 26 (range 24-28), respectively. The demographic data, fasting, 60th minute and 120th minute plasma glucose levels are presented in Table 2.

Table 3 shows the prevalence of GDM and the higher rates of fasting, 60-min, and 120-min plasma glucose levels. The prevalence of GDM, detected in 424 of 2652 patients, was 16% (424/2652).

Table 2: Mean age, fasting, 60-min, and 120-min. plasma glucose levels of the patients

	Mean (SD)	25-75 percentile
Maternal age	26.42 (6.02)	(22-31)
Fasting plasma glucose (mg/dL)	79.6 (12.35)	(74-84)
60 min plasma glucose (mg/dL)	130.8 (36.93)	(106-153)
120 min plasma glucose (mg/dL)	104.8 (31.40)	(86-119)

Table 3: Prevalence of GDM and the higher rates of fasting, 60-min and 120-min plasma glucose levels

	Number of patients	%
Fasting plasma glucose ≥92 mg/dL	232/2652	8.7
60-min plasma glucose ≥180 mg/dL	242/2652	9.1
120-min plasma glucose ≥153 mg/dL	158/2652	6
GDM prevalence	424/2652	16

Discussion

There is no clear international consensus on GDM screening and diagnosis. The World Health Organization and the Endocrine Society suggest a one-step approach using the IADPSG diagnostic criteria. The American College of Obstetricians and Gynecologists (ACOG) and the National Institutes of Health (NIH) suggest a two-step approach, while The American Diabetes Association (ADA) has stated that any one of the one- or two-step approaches may be used. In the literature, the prevalence of GDM in our country is reported as 1.2-27.9% [6-19]. In our study, GDM screening with a single step 75g OGTT revealed that the prevalence in Kayseri was 16%

according to the IADPSG criteria. The difference in GDM prevalence in different regions of our country may be caused by differences in dietary groups, nutritional status, age groups, and diverse diagnostic tests.

Although a large amount of research was conducted in central Anatolia in Turkey, the vast majority have been conducted in Ankara. In a study conducted by Altay et al. [14] with 6909 pregnant women in 2010, the prevalence of GDM was determined as 10.4%. They used two-step screening according to the National Diabetes Data Group (NDDG) criteria. Ozdemir et al. [16] prospectively researched GDM prevalence and found it to be 8.4% according to single-step screening and IADPSG criteria. The prevalence of GDM among 1434 pregnant women by Karcaaltincaba et al. [18] revealed it as 11.1% according to IADPSG criteria with single-step screening. Recently, Ozgu et al. [19] found that the prevalence of GDM was 21% according to IADPSG criteria with single-step screening. The prevalence of GDM is increasing within Ankara, another reference city for the Central Anatolia region. In Kayseri, two-step screening of pregnant women in 2008 revealed that the prevalence of GDM, according to the NDDG criteria, was 6.2% [10]. The single-step GDM screening performed in accordance with the IADPSG criteria in the USA revealed 18% prevalence, which was at least

twice as high as what was calculated in two-step screening following ACOG recommendations [23]. The high prevalence of GDM in Kayseri may be explained by the usage of the single-step screening method. Many risk factors, including obesity, increased urbanization, sedentary lifestyle, and advanced maternal age increase GDM prevalence. It has been shown that the prevalence of GDM in the province of Kayseri is higher than the other central regions of Turkey. GDM is an important health problem causing both maternal and perinatal complications with increasing incidence in our country and all over the world. This situation calls for immediate action: Improving maternal nutrition and exercise may decrease the rate of death of both mothers and infants due to GDM.

Limitations

The evaluation of the prevalence of GDM in a single center is the main limitation of our study, despite the fact the Kayseri City Hospital is a reference hospital. Additionally, we did not compare maternal demographic and delivery outcomes between GDM positive and negative groups, which is another limitation. Further studies are needed.

Conclusion

The prevalence of GDM was 16% according to the IADPSG criteria with a single-step 75-g OGTT in pregnant women in Kayseri.

References

- Sahin E, Col Madendag I, Sahin ME, Madendag Y, Acmaz G, Muderris, II. Effect of vitamin D deficiency on the 75 g oral glucose tolerance test screening and insulin resistance. *Gynecol Endocrinol.* 2019;35(6):535-8. Epub 2019/01/10. doi: 10.1080/09513590.2018.1554038.
- Aydın A, Atadağ Y, Öksüz A, Kaya D, Aydın NE. Comparison of the effects of impaired fasting glucose and impaired glucose tolerance on diabetic development risks on HbA1c levels: A retrospective study. *J Surg Med.* 2008;1(1):1-4.
- American Diabetes A. 2. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes-2019. *Diabetes Care.* 2019;42(Suppl 1):S13-S28. Epub 2018/12/19. doi: 10.2337/dc19-S002.
- Metzger BE, Coustan DR, Trimble ER. Hyperglycemia and Adverse Pregnancy Outcomes. *Clin Chem.* 2019;65(7):937-8. Epub 2019/04/19. doi: 10.1373/clinchem.2019.303990.
- Bellamy L, Casas JP, Hingorani AD, Williams D. Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. *Lancet.* 2009;373(9677):1773-9. Epub 2009/05/26. doi: 10.1016/S0140-6736(09)60731-5.
- Reece EA, Leguizamón G, Wiznitzer A. Gestational diabetes: the need for a common ground. *Lancet.* 2009;373(9677):1789-97. Epub 2009/05/26. doi: 10.1016/S0140-6736(09)60515-8.

- Erem C, Cihanyurdu N, Deger O, Karahan C, Çan G, Telatar M. Screening for gestational diabetes mellitus in northeastern Turkey (Trabzon City). *European journal of epidemiology.* 2003;18(1):39-43.
- Tanir H, Sener T, Güler H, Kaya M. A ten-year gestational diabetes mellitus cohort at a university clinic of the mid-Anatolian region of Turkey. *Clinical and experimental obstetrics & gynecology.* 2005;32(4):241-4.
- Akış N, Pala K, Seçkin R. Gestational diabetes mellitus prevalence and related risk factors. *Uludağ Medical Journal.* 2008;34(3):93-6.
- Gürel C, Özgün M, Batukan C, Başbuğ M. Prevalence of gestational diabetes among pregnant women attending Erciyes University Medical Faculty. *Erciyes Medical Journal.* 2009;31(4):323-30.
- Karcaaltincaba D, Kandemir O, Yalvac S, Güvendag-Guven S, Haberal A. Prevalence of gestational diabetes mellitus and gestational impaired glucose tolerance in pregnant women evaluated by National Diabetes Data Group and Carpenter and Coustan criteria. *International Journal of Gynecology & Obstetrics.* 2009;106(3):246-9.
- Akbay E, Torun Şİ, Yalçınkaya H, Uzunçakmak C, Toklucu G. Prevalence of gestational diabetes among pregnant women attending in MD SadiKonuk Training and Research Hospital. *TürkiyeKlinikleriJinekolojiObstetrik.* 2010;20(3):170-5.
- Özyurt R, Aşçıoğlu O, Gültekin T, Güngördük K, Boran B. The Prevalence of Gestational Diabetes Mellitus In Pregnant Women Who Administered to İstanbul Teaching and Research Hospital Obstetrics and Gynecology Department. *İstanbul Kanuni Sultan Süleyman Tıp Dergisi (IKSST).* 2013;5(1):7-12.
- Altay MM, Özdoğan S, Tohma A, Esin S, Erol O, Gelişen O, et al. Can the 3rd Hour Value of 100 g Oral Glucose Tolerance Test Be Ignored in the Diagnosis of Gestational Diabetes Mellitus? *Gynecology Obstetrics & Reproductive Medicine.* 2016;19(3):157-61.
- Sevket O, Ates S, Uysal O, Molla T, Dansur R, Kelekci S. To evaluate the prevalence and clinical outcomes using a one-step method versus a two-step method to screen gestational diabetes mellitus. *The Journal of Maternal-Fetal & Neonatal Medicine.* 2014;27(1):36-41.
- Özdemir Ö, Sari ME, Ertuğrul FA, Şakar VS, Özcanlı G, Atalay C. Ankara numuneçitiimvearaştırırmahastanesikadınhastalıklarivedoğumkliniğinebaşvurangebelerdegastasyoneldiyabetsıklığı. *Journal of Clinical Obstetrics & Gynecology.* 2014;24(1):24-9.
- Balk G, Şahin SB, TekinYB, Şentürk Ş, Kağıtçı M, Şahin FK. The prevalence of gestational diabetes mellitus in pregnant women who applied to the maternity outpatient clinic of a university hospital. *Ege Journal of Medicine.* 2016;55(2):55-8.
- Karcaaltincaba D, Calis P, Ocal N, Ozek A, AltugInan M, Bayram M. Prevalence of gestational diabetes mellitus evaluated by universal screening with a 75-g, 2-hour oral glucose tolerance test and IADPSG criteria. *International Journal of Gynecology & Obstetrics.* 2017;138(2):148-51.
- Ozgu-Erdinc AS, SertUY, BuyukGN, Engin-Ustun Y. Prevalence of gestational diabetes mellitus and results of the screening tests at a tertiary referral center: A cross-sectional study. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews.* 2019;13(1):7-7.
- Gürlek B, Kale İ. RizellindeGastasyonel Diabetes Mellitus Prevalansı. *Jinekoloji-ObstetrikveNeonatoolojiTıpDergisi.* 2019;16(1).
- Madendag Y, Sahin E, Madendag Col I, Eraslan SM, Tayyar A, Ozdemir F, et al. The effect of hyperemesis gravidarum on the 75 g oral glucose tolerance test screening and gestational diabetes mellitus. *The Journal of Maternal-Fetal & Neonatal Medicine.* 2018;31(15):1989-92.
- International Association of D. Pregnancy Study Groups Consensus P, Metzger BE, Gabbe SG, Persson B, Buchanan TA, et al. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. *Diabetes Care.* 2010;33(3):676-82. Epub 2010/03/02. doi: 10.2337/dc09-1848.
- Practice CoO. Practice bulletin no. 137: gestational diabetes mellitus. *Obstet Gynecol.* 2013;122:406-16.

This paper has been checked for language accuracy by JOSAM editors.

The National Library of Medicine (NLM) citation style guide has been used in this paper.

Suggested citation: Patrias K. Citing medicine: the NLM style guide for authors, editors, and publishers [Internet]. 2nd ed. Wendling DL, technical editor. Bethesda (MD): National Library of Medicine (US); 2007-[updated 2015 Oct 2; cited Year Month Day]. Available from: <http://www.nlm.nih.gov/citingmedicine>