

Factors Associated With Compliance to the Recommendations for Postpartum Diabetes Mellitus Screening Among Women With Gestational Diabetes Mellitus

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Abstract

Objective: Since women with GDM have an increased risk to develop type 2 DM, a 75g OGTT is recommended 6-12 weeks postpartum for all women with GDM. However, screening rates remain low. The aim of this study was to find factors affect the rate of postpartum DM screening.

Materials and methods: A retrospective cohort study between 2016 and 2017 at the Soroka Medical Center, comparing women with GDM who underwent postpartum DM screening test to those who didn't.

Results: 257 women who had a diagnosis of GDM and met the inclusion criteria were included. 53 (20.6%) had a postpartum DM screening test and 204 (79.4%) did not complete the postpartum DM screening.

Women who underwent a DM screening postpartum were more likely to be older, with significantly higher rates of vacuum assisted delivery, more likely to be diagnosed with GDMA2 as compared to GDMA1 during pregnancy and, with high probability of receiving recommendations for screening at a postpartum visit.

Conclusions: The rates of postpartum DM screening for women with GDM are low and need to increase. Age greater than 25, vacuum delivery, GDMA2 and having received a recommendation for postpartum screening increased the likelihood of undergoing a postpartum DM screening.

Synopsis

Age greater than 25, vacuum delivery, GDMA2 and having received a recommendation for postpartum screening increased the likelihood of undergoing a postpartum DM screening

Introduction

According to recent literature, gestational diabetes mellitus is defined as diabetes diagnosed in the second or third trimester of pregnancy that was not clearly overt diabetes or prior to gestation (1). The rate of pregnancies complicated by diabetes ranges between 6-9% percent, with approximately 90% of the diagnoses being classified as GDM (2), most of them are well controlled by diet and life style changes (GDMA1), and only minority need medications (GDMA2).

Women with GDM are seven to ten times more likely to develop type 2 diabetes mellitus (DM) over the years when compared to women without GDM. For this reason, GDM is one of the predicting factors for being inflicted with DM later in life (3). Rates of DM diagnosed postpartum range from 2-12.5% within one year and up to 60% after 10 years (4-7, 20).

Therefore, relevant professional organizations such as the American Diabetes Association (ADA), the American College of Obstetricians and Gynecologists (ACOG) and the Israel Society of Obstetrics and Gynecology recommend screening for DM for all women with GDM at 6-12 weeks postpartum. The

screening test of choice is a two-hour 75g oral glucose tolerance test (OGTT), which includes measurement of fasting glucose with an additional measurement at two hours following glucose ingestion. Another option for diabetes assessment includes a fasting glucose test (1, 8–10). Testing for HbA1C has not been recommended as a screening test during the postpartum period (11).

There has been a continuous rise in DM morbidity over the past several years, with a continuous rise in undiagnosed women (12–13). Disease morbidity resulting from undiagnosed DM has a significant impact from a public health perspective as well as a huge economic burden. Therefore, it is important to diagnose DM early in the course of the disease. Furthermore, early diagnosis and treatment can significantly decrease the harmful effects of hyperglycemic state on future pregnancies and can help to prevent micro and macrovascular complications due to long standing uncontrolled diabetes (5).

Only a few studies have examined predictors of follow up testing for DM in women with GDM. These studies have found that only 23-58% of women diagnosed with GDM perform the recommended postpartum screening tests. In these studies older age, nulliparity, Asian origin, insulin treatment during pregnancy and attending a post-partum follow up visit were found to be associated with completing the postpartum DM screening (5, 14–18). Another study evaluated whether GDM associated complications changed the rate of compliance with postpartum DM screening recommendations and found no significant difference (19).

The Negev population is unique and heterogenic population, consisting primarily of Jewish and Bedouin Arabs. One study examining prenatal care rates in the Negev population showed a high rate of women lacking prenatal care, with higher rates seen in the Bedouin Arab population (20).

Patient compliance and adherence to medical recommendations is a challenge in every health system. Different social, cultural and financial factors have been found to influence compliance with medical recommendations (20).

The aim of our study was to investigate the factors associated with compliance to recommendations and completion of the postpartum DM screening test among women diagnosed with GDM during pregnancy.

Materials And Methods

Study design

We conducted a retrospective cohort study of women with GDM who gave birth in a single tertiary center between 2016 and 2017. In our study, patients who performed the postpartum DM screening were compared with patients that did not. Women with multiple gestations, GDM in past pregnancies, or with known pre-gestational DM were excluded from the study.

The study protocol was approved by the Soroka University Medical Center's ethical review board.

Postpartum DM screening was defined as one of the following: A 2-hour 75g oral glucose tolerance test (OGTT), including a measurement of fasting glucose with an additional measurement 2 hours following glucose ingestion, or a test for fasting glucose. Only patients who performed the screening within 12 weeks of delivery were included.

Women with GDM who did the DM screening test postpartum were classified as the study group. The comparison group consisted of women diagnosed with GDM who did not complete the postpartum screening. Both groups of women delivered during the same period, between the years 2016-2017, at the Soroka University Medical Center (SUMC).

Data collection

Data was collected from the SUMC electronic patient record (EPR) and from the postpartum office visits reported in the EPR used in the community health services.

Maternal and neonatal charts were reviewed for the following information: patient demographic and clinical characteristics, type of GDM (GDMA1 or GDMA2), pregnancy complications, postpartum screening recommendation at hospital discharge, postpartum clinic visit, recommendation for screening during the postpartum visit, type of DM screening and time to DM screening.

Statistical analysis

Statistical analyses were conducted using the statistical software program IBM SPSS Statistics 23.

Data was presented as a mean \pm SD if it followed a normal distribution, and if not, then the median and range were reported. The mode (percentage) was used for categorical variables.

To test for difference between two variable means, a t-test was applied if the data was for continuous variables with normal distribution, otherwise Mann–Whitney U test was used. Categorical variables were presented in counts and percentages and their statistical analysis was performed using a chi-square test or Fisher's exact test.

We incorporated all variables with a p value \leq 0.2 in the univariable analysis to the multivariable model. Factors with a p<0.05 in the multivariable logistic regression analysis were considered significant.

Results

We included 257 women in our study, who had a diagnosis of GDM and met the inclusion criteria. Of these, 53 (20.6%) had a postpartum DM screening test and 204 (79.4%) did not complete the postpartum DM screening.

Women who completed the postpartum DM screening were older than 25 years (P=0.032) and were more likely to have had a previous Caesarean section (P=0.048). The demographic and clinical characteristics of both groups are shown in Table 1.

Table 1
Clinical and demographic characteristics of women with GDM who did the postpartum DM screening tests compared to those who did not

Variables	Diabetes screening	NO Diabetes screening	P value
Age	33.2+-5.2	31.3+-5.9	0.032
Jewish ethnicity vs. Bedouin Arabs	30 (56.6%)	105 (51.5%)	0.42
Gravidity	4.1 +-2.66	3.9+-3.32	0.81
Parity	3.3+-2.37	3.2+-2.68	0.77
S/P CS	16 (30.2%)	37 (18.1%)	0.048
In vitro fertilization treatments	7 (13.2%)	14 (6.9%)	0.13
Bad obstetric history	6 (11.3%)	23 (11.3%)	0.99
Smoking	3 (5.7%)	21 (10.3%)	0.3
S/P CS – state past caesarean section			

Women who completed the postpartum DM screening were more likely to have undergone a vacuum assisted delivery (P=0.015). They also had babies with lower Apgar scores at 5 minutes (P=0.047). The delivery and neonatal characteristics of both groups are displayed in Table 2.

Table 2
Delivery and neonatal characteristics of women with GDM who did the postpartum DM screening tests compared to those who did not

Variables	Diabetes screening	NO Diabetes screening	P value
Induction of labour	19 (35.8%)	70 (34.3%)	0.83
Gestational age	38.8+-1.22	38.7+-1.41	0.87
Birth weight	3378.4+-586.9	3279.7+-529.9	0.23
Vacuum delivery	4 (7.5%)	3 (1.5%)	0.015
Caesarean section	22 (41.5%)	71 (34.8%)	0.36
Postpartum haemorrhage	2 (3.8%)	3 (1.5%)	0.27
1st minute Apgar	8.5+-1.54	8.7+-0.87	0.11
5th minute Apgar	9.6+-1.23	9.9+-0.76	0.047

Women who completed the postpartum DM screening were more likely to have GDMA2 (P=0.002), with no other significant differences between the groups. Pregnancy characteristics for both groups are

presented in Table 3.

Table 3

Pregnancy complications of women with GDM who did the postpartum DM screening tests compared to those who did not

Variables	Diabetes screening	NO Diabetes screening	P value
GDMA2	19 (35.8%)	34 (16.7%)	0.002
Preeclampsia	2 (3.8%)	9 (4.4%)	0.83
Gestational hypertension	2 (3.8%)	10 (4.9%)	0.72
Chronic hypertension	2 (3.8%)	4 (2%)	0.43
IUGR	1 (1.9%)	6 (2.9%)	0.67
Macrosomia	10 (18.9%)	22 (10.8%)	0.11
Polyhydramnios	3 (5.7%)	15 (7.5%)	0.66
Oligohydramnios	1 (2%)	6 (2.9%)	0.7
Premature PROM	2 (3.8%)	2 (1%)	0.14
Preterm delivery	1 (1.9%)	11 (5.4%)	0.28
Poor prenatal care	0 (0%)	9 (4.4%)	0.12
GDM – gestational diabetes mellitus; IUGR - Intrauterine growth restriction; PROM – premature rupture of membranes			

Among the women that were included in the study, only 143 (55.6%) had a documented recommendation to perform postpartum DM screening and of these, only 37 women (25.8%) carried out the screening test. In 114 women, no documented recommendation to perform screening was noted. Sixteen (14%) of the women with no documented recommendation performed the postpartum DM screening test. Information regarding postpartum screening recommendations is shown in Table 4.

Table 4

Postpartum diabetes mellitus screening rates of women with GDM who did and did not undergo the postpartum DM screening tests

Variables	Diabetes screening	NO Diabetes screening	P value
Recommendation for postpartum screening at discharge	33 (62.3%)	105 (51.5%)	0.16
Postpartum visit at gynaecologist office	33 (62.3%)	101 (49.5%)	0.09
Recommendation for screening at postpartum visit	8 (15.1%)	10 (4.9%)	0.01

Table 5 presents the results of the multivariate logistic regression for independent factors associated with postpartum DM screening. The multivariate analysis revealed that age above 25 (OR 9.93, 95% CI 1.78+55.28), GDMA2 (OR 3.24, 95% CI 1.57-6.65), vacuum assisted delivery (OR 14.49, 95% CI 2.09-100.59), and receiving a recommendation for screening during the postpartum visit (OR 3.1, 95% CI 1.1-8.72) were positively and significantly associated with postpartum DM testing.

Table 5
Independent factors associated with postpartum diabetes mellitus testing, results of a multivariable regression model.

Variable	OR	95% CI	P value
Age>25	9.93	1.78+55.28	0.009
Vacuum assisted delivery	14.49	2.09+100.59	0.007
GDMA2	3.24	1.57+6.65	0.001
Recommendation for screening at postpartum visit	3.1	1.1+8.72	0.032

Discussion

In our study, we aimed to investigate factors associated with postpartum DM screening in women with GDM. We found that only 20.6% of the women with GDM performed the postpartum DM screening. We also found that older age, GDMA2, vacuum assisted delivery, and recommendation for screening during the postpartum visit were all associated with increased rates of actually performing the postpartum DM screening test.

GDM is a well-known risk factor for diabetes further in life. However, the rate of the postpartum DM screening remains much lower than desired among women with GDM. This screening test is essential for identifying women at risk for overt diabetes and to reduce the harmful effects of a hyperglycemic state on their general health and its consequences on future morbidity. Identifying the factors influencing these low rates is crucial and may aid in raising the awareness and rates of postpartum DM screening.

Overall, only 20.6% of women with GDM performed a DM screening test postpartum. This is a lower rate than previously reported, with rates ranging from 23-58% in different studies (5, 14–18). The lower rate of screening in our study can be attributed to a number of factors. In our hospital, there is a high prevalence of patients with poor prenatal care, which can be associated with poor compliance. Additionally, less than 60% of the women discharged from the maternity unit were given a recommendation for postpartum DM screening. Only half of the women in our study attended a postpartum visit at the gynaecologist office, and only 10% of them were given a recommendation for screening, which is a much lower rate than previously described (25).

Our findings show that the odds of postpartum DM testing increased with increasing maternal age, a similar findings were shown in a 2010 study by Lawrence et al. (4). We also found that vacuum assisted delivery was associated with higher rates of postpartum DM screening. A possible explanation for this finding is that a more distressing delivery may increase the likelihood for better postpartum follow-up. This finding is in opposed to previous study which compared screening rates of women with and without GDM associated complications, and did not find a difference in screening rates between the two groups (19). On the other hand, caesarean section was not found to be significantly associated with increasing postpartum DM screening. It is possible that a caesarean section is considered a more routine mode of delivery especially if elective, while vacuum delivery is considered as a more traumatic occurrence.

Hunt et al. found that women who were diagnosed with GDMA2 and required insulin during their pregnancy also failed to return for postpartum glucose testing (5). In our study we found the opposite. A diagnosis of GDMA2 was significantly associated with higher rates of postpartum DM testing, similar to findings of several other studies (22-25). One explanation could be that the use of insulin therapy during pregnancy may lead to greater awareness of diabetes and to higher rates of compliance with postpartum DM screening recommendations. Moreover, setup of treating patients with GDM may have major influence on the compliance for screening after labour. Since in the Negev most of the women with GDMA2 are treated in hospital setup and are accompanied with multi-disciplinary team during pregnancy, we expect more awareness for the future risk of developing diabetes and higher percent of completing screening.

In our study, the recommendation for screening at discharge had no effect on rates of postpartum DM screening. However, like Tovar et al. found in their study, recommendation for screening during a postpartum visit was positively and significantly associated with postpartum DM testing (12). This finding highlights the impact of the primary gynaecologist on patient education and compliance. Increasing referrals for postpartum screening by primary physicians, will likely increase the rates of completing postpartum DM screening. Medical workers should make an effort to increase awareness to the importance of postpartum DM screening, which may ultimately result in improved DM screening.

Our study's strength is in the fact that our medical center is the only tertiary medical center in the south of Israel, and most patients receive all their in-patient management at SUMC, therefore represents unselected data. Another strength is the fact that all the medical information about inpatient and outpatient visits and tests is available through computerized medical records. We also have the advantage of having a heterogenic population in the Negev reducing the risk of selection bias.

Our study is not without limitations. It is a retrospective study, and as such, there is a possibility of recall bias as well as missing data. There is also a possibility of the presence of confounding variables, which we attempted to control for using multivariable logistic regression models.

In conclusion, among women with GDM, screening during the postpartum period offers a window of opportunity for early identification of DM. The rates of screening are low and need to increase. The low rates may be attributed to a lack of patient compliance but also to the relatively low rates of postpartum

screening recommendations by medical staff. We found that women with older age, vacuum extraction delivery, GDMA2 and those who received a recommendation for screening during the postpartum visit were more likely to perform postpartum DM testing. Further studies should be conducted and different interventions should be evaluated in order to increase the postpartum DM screening rates.

Declarations

All authors declare no conflicts of interest, and received no personal funding.

Role of Authors

Dr Yahav - Project development, Data collection and management, Data analysis, Manuscript writing

Dr Yaniv Salem - data collection, Manuscript editing

Dr Sandler-Rahat - data collection, Manuscript editing

Dr Baumfeld – data collection, Manuscript editing

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Prof Weintraub – Project development, Data management, Manuscript editing

Dr Eshkoli - data collection, Manuscript editing

All agree to be accountable for all aspects of the work

The study received the approval of the Soroka medical center Helsinki review board (#0333-17-SOR) on 12/11/2017

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