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Original Article

Postpartum glucose testing, related factors and progression to abnormal glucose tolerance in a rural population with a known history of gestational diabetes

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ABSTRACT

Aims: Gestational diabetes is a strong risk factor for postpartum progression to glucose intolerance. The aims of the study were to determine rate of postpartum glucose testing , its related factors and rate of progression to glucose intolerance in women who underwent postpartum glucose testing after pregnancy that complicated by gestational diabetes.

Materials: this is a retrospective study and women with gestational diabetes who received prenatal care during 2005-2015 in 3 rural health centers of Khuramshahr (southwestern of Iran) were enrolled. Gestational diabetes mellitus diagnosed by FPG test only, 75g OGTT or GCT. The American Diabetes Association(ADA) criteria applied for definition of postpartum glucose intolerance (pre-diabetes or diabetes) .

Results: Mean duration of follow-up was 29.7 months. BMI≥ 25 was detected in 73.3% and 78.7% of women during pre-pregnancy and postpartum respectively. Overall 45.8% (60/131) of women received postpartum glucose testing. Rate of progression to abnormal glucose tolerance was 23.3% (8.5% pre-diabetes and 15.2% diabetes). Advanced maternal age was associated with postpartum glucose testing (OR 1.066, CI 1.008-1.128, p=0.02).

Discussion: high rate of overweight and obesity, sub optimal rate of postpartum glucose testing and high prevalence of glucose intolerance, highlights the importance of postpartum screening with a more sensitive test and implementation of an intervention program to prevent type 2 diabetes in rural population particularly older women with prior gestational diabetes.

Diabetes Mellitus (DM) as a leading cause of mortality and disability imposes a large economic burden on global health care system [1,2]. In women, incidence of DM has been reported up to 12 million in 2010 and more undiagnosed cases were reported in this population versus men [3]. About one third of women with type 2 diabetes had history of gestational diabetes mellitus [4].

Gestational diabetes mellitus (GDM) includes any degree of glucose intolerance that begins or is first recognized during pregnancy [5]. Diabetes epidemic, high rate of obesity, as well as advanced maternal age at pregnancy, and use of new diagnostic criteria may be causes of rising trend of GDM prevalence [6–8], 1–28% [9] even more [10], in recent decades.

Hyperglycemia disappears immediately after termination of pregnancy in 90–95% of women with GDM [11,12] but this population is at increased risk for future progression to type 2 diabetes or pre-diabetes. The risk of developing type 2 diabetes can remain for more than 25 years in former gestational diabetes patients [13]. A study suggested that this risk varied from 2 to 70%, 6–8 weeks to 28 years after GDM pregnancy [14].

Early postpartum screening at 6 weeks postpartum by the 75 g, 2 h oral glucose tolerance test (OGTT), and repeat the test at one-year postpartum and then every 3 years for women after GDM

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pregnancy is suggested by the International Workshop Conference of GDM, American college of Obstetricians and Gynecologists (ACOG) and the American Diabetes Association (ADA) [15–17]. Well-documented increased risk of diabetes after GDM pregnancy and clear recommendation of international associations for postpartum screening cannot overcome on barrier of return and adherence of a postpartum glucose screening in this high-risk population. In most population, rates of women who screened are low [18].

Few studies focused on postpartum screening in rural area. For this reasons, we sought to determined rate of postpartum glucose testing and to identify related factors and rate of progression to glucose intolerance in women who underwent postpartum glucose testing.

1. METHODS

In a retrospective study women with gestational diabetes who received prenatal care during 2005–2015 in three rural health centers of Khuramshahr were recruited in 2016. Khuramshahr is located in Khuzestan province (southwestern of Iran) with high fertility rate [19].

High rate of gestational diabetes and low rate postpartum after GDM pregnancy were reported in Ahvaz city, neighbor city with many similar characteristics [10,20].

A list of women with gestational hyperglycemia and details of glucose screening during pregnancy and contact information were extracted from health records. Known cases of diabetes type 1 or type 2 excluded. In addition women who were unavailable due to move out of Khuramshahr or changed their address or phone number excluded. Of 303 women identified with GDM in this period, 131 women accepted to attend to rural center and participated in the study. Using direct contact by phone we invited the women for participation in the study.

Questionnaires related to socio-demographic characteristic, obstetrics and medical history, family history of diabetes mellitus, previous GDM, details of gestational diabetes screening in pregnancy, numbers and date of screening for postpartum glucose intolerance and infant nutrition after delivery up to 2 years postpartum (breast feeding, formula or combined) were completed by trained questionnaires.

Postpartum blood pressure, weight, height and waist and hip circumferences were measured and recorded. Pregnancy blood pressure, weight in first and last months of pregnancy extracted from health records.

GDM were diagnosed using three methods inclusive of fasting plasma glucose (FPG), glucose challenge test (GCT) or 75 g oral glucose tolerance test (OGTT). Postpartum pre-diabetes and diabetes defined in accordance with ADA criteria (fasting plasma glucose between 100 and125 mg/dl, and, fasting plasma glucose $\geq$126 mg/dl, respectively) [21].

BMI calculated and body mass index (BMI) $\geq$25 kg/m^2 and BMI$\geq$30 kg/m^2 considered as overweight and obesity, respectively.

Data were expressed as frequency and percentages for categorical variables. Categorical variables were compared using the chi-square test and *t*-test. A model of multivariate logistic regression was used to evaluate the factors related to postpartum glucose testing. Data were analyzed using SPSS software version 22 at a significance level of $p < 0.05$.

2. RESULTS

One hundred and thirty-one women with history of GDM were studied mean age was 32.64 ($\pm$6.42, SD) years and almost all of them were of Arab ethnicity (94.7%) and housewife (98.5%). Distribution of demographic, obstetrics and clinical characteristics in women with gestational diabetes mellitus is presented in Table 1.

Table 1
Distribution of demographic, obstetrics and clinical characteristics in women with gestational diabetes mellitus.

Gravidity	
1	18 (13.7)
2	36 (27.5)
3	30 (22.9)
4	23 (17.6)
5–6	24 (18.3)
History of IUFD	8 (6.1)
History of abortion	44 (33.6)
Family history diabetes mellitus	54 (41.2)
Number of pregnancy with GDM	
1	107 (81.7)
2	24 (18.3)
Hypertension	10 (7.6)
Prepregnancy BMI*	
Normal	35 (26.7)
Overweight	46 (35.1)
Obesity	50 (38.2)
Postpartum BMI	
Normal	28 (21.4)
Overweight	50 (38.2)
Obesity	53 (40.5)
Waist circumference $\geq$88	53 (40.5)
Waist/hip ratio $\geq$0.85	51 (41.8)
Results of postpartum test**	
Normal	46 (76.7)
Prediabetes	5 (8.3)
diabetes	9 (15)
Child nutrition	
Breast feeding	81 (65.3)
Formula	8 (6.5)
Combined	35*** (28.2)

IUFD: intra uterine fetal death; GDM: gestational diabetes mellitus; BMI: body mass index.
* BMI < 25, BMI 25–29.9, BMI $\geq$30 defined as normal, overweight and obesity, respectively.
** In 60 women who tested postpartum.
*** 7 missing cases.

Gestational diabetes mellitus diagnosed by FPG test (9.9%), 75 g OGTT (47.3%) or GCT (42.7%) (Chart 1). Excess BMI ($\geq$25 kg/m^2) was detected in 73.3% of women before pregnancy and 78.7% postpartum and 40.3% had central obesity. Mean duration of follow-up was 29.7 months.

Overall 45.8% (60/131) received postpartum glucose testing. Of women who underwent postpartum glucose testing, one half of women were screened at 6–12 weeks postpartum (Chart 2). Mean age of mother who received postpartum glucose testing was higher than who not compliance for postpartum screening (OR 1.066, CI: 1.008–1.128, $p = 0.02$).

Rate of progression to abnormal glucose tolerance was 23.3% (8.5% prediabetes and 15.2% diabetes. All of postpartum screening performed by only FPG test. Mean $\pm$ SD of clinical and biochemical characteristic of women based on receiving at least one postpartum glucose test are presented in Table 2.

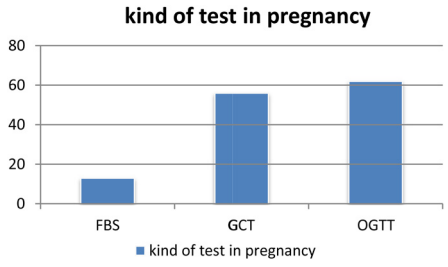

Chart 1. Distribution of screening methods for diagnosed of gestational diabetes mellitus in pregnancy.

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