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Original article

The role of clinical factors in the association of gestational diabetes amongst women aged 15–49 years residing in Yazd-Iran

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) has occurred in Fourteen percent of all pregnancies in the world. Epidemiological evidences about risk factors of GDM may be different from region to region and are unknown, exactly. This study examines the role of clinical factors in the association of gestational diabetes in Yazd, Iran.

Methods: This study was carried out on 168 women with gestational diabetes and 168 women as controls after matching for age and place of residence. Each participant was interviewed about her pregnancy history and tobacco consumption. Information including BMI, weight before pregnancy and background of underlying diseases were recorded from information system in Health Centers. Finally, data were analyzed by using chi-square test, logistic regression and multiple correspondence analyze(MCA).

Results: History of gestational diabetes in past pregnancy OR = 3.2[95%CI:1.1, 9.7], a family history of gestational diabetes OR = 3.7 [95%CI:1.1, 11.5], a history of hookah smoking OR = 3.6 [95%CI:1.06, 12.3], being obese before pregnancy OR = 1.9[95%CI:1.01, 3.5], and weight gain during pregnancy OR = 0.5[95% CI:0.2, 0.9], were the most important determinants of gestational diabetes. There were not significant relation between GDM and underlying diseases, history of stillbirth, abortion, twinning, cigarette smoking, alcohol and drug abuse.

Conclusions: In this research modifiable risk factors for gestational diabetes were high BMI before pregnancy, weight gain during pregnancy and history of hookah consumption. We advise that appropriate education, avoiding sedentary lifestyle, diet improvement and advertising which focus on tobacco consumption is playing as an important role in developing the chronic diseases, including GDM.

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1. Introduction

Diabetes is increasing as the most common metabolic disorder in recent years [1]. Elderly population, urbanization and lifestyle changes, have accelerated the development of diabetes and other chronic diseases [2]. The reported prevalence of diabetes among various ethnic groups around the world is 7.8%–15.5% [3], that can be attributed to the epidemiological transition and the global lifestyle trend. There are 4.6 million people with diabetes in Iran.

It has been accounted for 8.5% of the population [4]. The prevalence of type 2 diabetes in the population over 30 years is 14% [5] and is one of the most important causes of blindness and chronic renal failure [6]. Diabetes with many complications affects patients quality of life and results enormous economic costs on the individual and society [7,8]. Diabetes is divided into several categories, Type 1 diabetes, Type 2 diabetes, Secondary diabetes and gestational diabetes, which is characterized by the onset and detection of diabetes during pregnancy. Gestational diabetes is a temporary increase in blood sugar or glucose intolerance during pregnancy, and increases the risk of maternal and fetal complications [9]. Gestational diabetes generally occurs in fourteen percent of all pregnancies in the world [10]. About 40 percent of women with gestational diabetes have been diagnosed with diabetes during 30 years later and mothers with gestational diabetes had a greater chance of developing type 2 diabetes [11].

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According to the past research, predictors of diabetes include: systolic blood pressure [12], family history of diabetes, body mass index [13], a history of previous high-risk pregnancy [14] and so on. Impaired glucose metabolism during pregnancy had adverse outcomes such as premature delivery, congenital malformations, miscarriage and preeclampsia for mother and baby [15]. According to previous studies, the reasons for increasing gestational diabetes in other countries, were included reduced levels of physical activity [16], changes in eating patterns [17], obesity [18], smoking [19] and so on. The general pattern of diabetes in the world indicates that the prevalence of gestational diabetes is increasing in most developing countries [20]. The overall prevalence of gestational diabetes in pregnant women had been reported 8.4% in Iran [21]. But prevalence of gestational diabetes in Yazd province compared to others had been reported 10.2% [22]. Gestational diabetes is a disease with no obvious symptoms, so identifying the risk factors and suitable screening test is necessary [23]. Our final target, is reducing the economic costs of diabetes, reducing the disability of the disease and adverse outcomes in diabetic mothers and babies with its complications. Since epidemiologic evidences from region to region may be different and various studies had raised conflicting relations about risk factors of gestational diabetes [24,25]; And there were not any analytical observational study that explain the odds ratio or relative risk, in Yazd, this study examines the clinical risk factors for GDM in Yazd. The results of this study will be used by the authorities to plan appropriate interventions and thus reducing the complications of the disease.

2. Materials and methods

Ethics code of this article is IR.SSU.SPH.REC.1395.123. The present case-control study has been performed on 341 pregnant women who had recently given birth. Data were collected from patients and controls. Patient group was selected from pregnant women who were referred for testing gestational diabetes and the results were positive and had given birth. The control group was selected from pregnant women who had negative result of gestational diabetes and had given birth. Diagnostic criteria for GDM, was FBS¹ test in the first prenatal visit for all pregnant women. If blood sugar result was less than 92 mg/dl, it was considered as healthy (controls); If it was between 92–126 mg/dl, it had been diagnosed as gestational diabetes (as cases) and more than 126 mg/dl as diabetic patients (which were excluded from the study). Also, for healthy people, the OGTT² test (with eating 75 g oral glucose during 24–28 weeks of pregnancy) was performed. These two test result for this people has been described as below:

Gestational diabetes diagnosis criteria for healthy people by OGTT and FBS results	> = 92	Fasting blood glucose (mg/dl)
	> = 180	Blood sugar 1 h after taking the glucose (mg/dl)
	> = 153	Blood sugar 2 h after taking glucose (mg/dl)

If at least one of these blood sugar test results were abnormal, diagnosis of GDM had been confirmed. We had applied a multi-stage stratified sampling method for determining the samples from the health centers of Yazd in five geographic regions (North, South, East, West and Center), randomly. Then we had chosen two centers from each location. Cases and controls were matched for

age variable and place of residence. Inclusion criteria for the study were: pregnant women in the reproductive age group 15–49, who had up to 30 weeks of pregnancy, had at least five years residency in Yazd and were ready to participate in the study. Exclusion criteria included: non-native women, pregnant women before age 15 and after 49 years, people who had been suffering from diabetes mellitus before pregnancy. Each participant was interviewed about her pregnancy history, socio-economic status and behavioral factors, after obtaining informed consent. Information including demographic characteristics, anthropometric parameters, chronic systemic diseases status, previous history pregnancy factors, reproductive factors related to the individual were recorded from information system in health centers. Data for this study were analyzed using chi-square and *t*-test to assess the significance of relationships between variables. Also, we used multiple correspondence analyze (MCA) to obtain socioeconomic score, and in this analysis, varimax rotation was used to create a simple and distinct matrix. The scores were calculated and categorized to three quantile. To find predictive factors on gestational diabetes and eliminate the confounding effect of other variables, variables that had significance level less than 0.2 in univariate analysis were entered into logistic regression models. We analyzed the data by using 95% confidence interval level in STATA 12 software.

3. Results

In the present case-control study, 168 pregnant women with gestational diabetes and 168 women without GDM who had given birth were investigated. From whom, 36.4% of patients and 38.1% of controls had experienced second birth. The mean age (years) in cases was 30.2 ± 5.9 and in controls was 29.1 ± 5.7 , which was not statistically significant ($P = 0.1$). Table 1 shows anthropometric indices in case and control groups. Comparing two groups showed that weight and body mass index means of women with GDM before pregnancy were higher than control group.

Table 2 shows socio-economic characteristics of the population of pregnant women with GDM and without GDM. There was no significant difference in the levels of education, occupation and socio-economic status between two groups.

Table 3 shows GDM determinants due to family history and medical history. This table shows family history of GDM and diabetes, history of thyroid disease and history of infertility related to GDM ($P < 0.05$).

Assessment of the risk of gestational diabetes with other clinical factors such as behavioral factors, history of previous pregnancies and reproductive factors in two groups shows in Table 4.

No one of the subjects reported any history of smoking, alcohol and drug abuse. All people who had a history of consumption of hookah in two groups had been reported less than 5 years history for consumption. Also, weekly duration of exposure to passive smoke had no significant association between two groups ($P = 0.15$).

Between the age of marriage in two groups and gestational diabetes were not statistically significant association ($P = 0.21$). As well as birth weight of subjects ($P = 0.55$), age at first menstruation ($p = 0.23$), interval between pregnancies ($P = 0.15$) age at first delivery ($P = 0.51$) and numbers of pregnancies ($P = 0.08$).

Control group did not have any history of twinning; newborns with congenital abnormalities had not been observed in two groups as well. Abortions, stillbirths and birth of 4 kg child and over, were higher among the patients but were not significantly different.

Table 5 shows the results of multivariate logistic regression models. Based on this table, variables such as history of gestational diabetes, family history of gestational diabetes, a history of hookah

¹ Fasting Blood Sugar.

² Oral Glucose Tolerance Test.

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