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Prediction and Pregravid Preparation of Women with High-Risk Development of Gestational Diabetes Mellitus

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ABSTRACT

The aimed of the study was to research of main risk factors leads to development of gestational diabetes mellitus and based on the data received to creation of scale for predicting the development of this disease in women.

Methods: The study included 137 pregnant women with gestational diabetes mellitus (GDM) and 100 without disorders of carbohydrate metabolism, who gave birth during the period: II quarter of 2018 II quarter of 2019 in the maternity ward of the city clinical hospital No. 29 named after N.E. Bauman in Moscow. This was a retrospective case-control study.

Results: the highest pregestational body mass was in women with GDM insulin therapy. The amount women with obesity in both groups with GDM formed 40%. Based on the data received analysis questionnaire was created to identify high-risk patients during pregnancy planning.

Conclusion: The introduction of the proposed questionnaire into the practice will allow for personalized pregravid preparation.

Keywords: gestational diabetes mellitus, metabolic syndrome, obesity, overweight, pregravid preparation.

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INTRODUCTION

The rapid growth of gestational diabetes mellitus (GDM) in the contemporary world is directly related to the obesity pandemic. [1-4] According to A.J. Reichelt et al. (2017), over the past 20 years the proportion of GDM patients with pregestational obesity has increased at least twice.[3] The incidence of obesity during pregnancy is 12.3-38%.[5] In this case, many authors consider GSD as one of the manifestations of the metabolic syndrome (MS).[6,7,8]

The combination of obesity and GDM is a risk factor for complications of pregnancy and lador, and the postpartum period. According to the literature, the frequency of postpartum bleeding in metabolic syndrome increases by 2.0–5.2 times compared to the average population values.[9] Defects of implantation, a thrombophilic condition that has a multi-factor nature, become important pathogenetic links of thromboembolic complications, decompensated forms of placental insufficiency, miscarriage and premature labors.[10]

Identification of patients at risk of developing GDM allows for differentiated preparation for pregnancy, thereby reducing the incidence of complications of pregnancy and childbirth and improving neonatal outcomes.

Back in 2009, the American diabetes Association (ADA) defined the risk criteria for developing GDM. Women with a history of obesity, GDM and macrosomia, with glucosuria, polycystic ovary syndrome and genetic predisposition to type 2 diabetes mellitus are considered to be at high risk.[11]

In modern conditions of increasing frequency of metabolic syndrome, pregestational obesity, successful implementation of reproductive function requires a personalized approach in patients to pregravidar preparation.

OBJECTIVES

The aimed of the study was to research of main risk factors leads to development of gestational diabetes mellitus and based on the data received to creation of scale for predicting the development of this disease in women.

METHODS

This was a retrospective case-control study. A retrospective analysis of the course of pregnancy and labors in 137 women with gestational diabetes mellitus (61-on insulin therapy, 76-on diet therapy) and 100 without disorders of carbohydrate metabolism, who gave birth during the period: II quarter of 2018 II quarter of 2019 in the maternity ward of the city clinical hospital No. 29 named after N.E. Bauman in Moscow was performed. This study was funded by the Ministry of Education and Science of the Russian Federation on the programme to improve to competitiveness of the Peoples` Friendship University of Russia (RUDN University) «5-100» among the world`s leading research and education centres in 2016-20.

All patients were comparable by social status, number of labors, had spontaneous single-pregnancy, head presentation of the fetus. The diagnosis of GDM was made on the basis of diagnostic criteria approved by the Ministry of Health of the Russian Federation in the form of clinical guidelines (2014).[12] Leading of pregnancy and delivery was carried out in accordance with the requirements of The order of the Ministry of health of the Russian Federation No. 572n of January 12, 2016.[13]

Statistical data processing was performed using the program Statistica v. 10.0. (StatSoft ©Inc., USA). When comparing binary signs, the exact Fisher criterion was used to determine the statistical significance of differences, and the Mann –

Whithey criterion was used for quantitative signs (significance level p <0.05).

RESULTS

Clinical and anamnestic data of patients with GDM and without carbohydrate metabolism disorders were analyzed in order to identify the most significant risk factors for the development of GDM.

Table 1: Anamnestic data of patients with gestational diabetes mellitus

Group / Indicators	GDM (total) N=137	GDM insulin therapy N=61	GDM diet therapy N=76	Control N=100
Age (year)	33 (28,0;38,0)	33 (28,0; 37,0)	31,5 (27,0; 36,0)	29,5 (26,0;33,0)
Pregravid body mass (kg)	79 (62,0; 97,0)	83 (68,0; 98,0)	76 (62,0; 91,0)	58 (53,0; 64,0)
Body mass index (BMI)	27,5 (22,0; 33,0)	31 (25,3; 37,0)	27,9 (21,9; 34,0)	20,8 (18,6; 23,0)
Obesity I-III degrees	55 40,0 %	31 51,0%	28 37,4%	2
Type 2 diabetes in relatives of the 1st generation	73 53,6%	24 39,0%	37 49,2%	26 26,0%
Type 2 diabetes in relatives of the 2nd generation	41 30,2%	23 37,0%	22 29,4%	6 6,0%
Obesity in relatives	79 58,0%	33 54,7%	42 55,9%	32 32%
Assisted reproductive technology	7 5,1%	5 7,4%	2 3,1%	6 6,0%
GDM in anamnesis (primiparous only)	32 23,3%	17 29%	14 18,4%	11 11,0%
Macrosomia in anamnesis	41 30,1%	22 35,4%	19 24,9%	0

The average age of patients with GDM was higher compared to the control group, at 33 years and 29.5 years, respectively (p=0,0030). The highest pregestational body weight was found in patients with GDM on insulin therapy - 83 kg, in the control group this indicator was 58 kg (p=0,0065). The number of women with obesity in both groups with GDM was 40%. Patients from the GDM groups had a weighed down anamnesis of type 2 diabetes mellitus compared to the control group in 53.6% and 26% of cases, respectively. 29% of women with GDM on insulin therapy reported developing gestational diabetes in a previous pregnancy.

Based on the data received analysis questionnaire was created to identify high-risk patients to development of GDM on during pregnancy planning.

Table 2: Questionnaire to identify high-risk patients to development of GDM

Risk factors	Group	Points	Number
Age (year)	18-25 25-35 35-45	0 1 2	
Pregravid body mass index	< 25 > 25-35 > 35	0 1 2	
Lifestyle	Playing sport Physical activity Sedentary	0 1 2	
Type 2 diabetes in relatives	No at parents the 2nd generation	0 1 2	
Socioeconomic status	High Middle Low	0 1 2	
Education	High Middle	0 1	

	Without education	2	
GDM in anamnesis	No Glucosuria Yes	0 1 2	
Gestational weight gain (kg)	<8 > 16 > 20	0 1 2	
Assisted reproductive technology	No Yes	0 2	
Macrosomia in anamnesis	No Yes	0 2	
Stillbirth in anamnrsis	No Yes	0 2	
Awareness about GDM	Yes No	0 2	
The weight at birts	<3500 > 3500 >4500	0 1 2	

Guidelines for counting: up to 8 points-low degree, 9-16 points-middle, 17-22 points-high degree of GDM development.

DISCUSSION

Women are recommended to start taking folates at the planning stage of pregnancy 6-12 months in order to reduce the risk of developing fetal neural tube defects. It should be remembered that in obese women with a BMI of more than 30 kg / m^2, it is necessary to increase the dose of folic acid by 350 mcg/day, compared with patients with a normal BMI .[14]

Based on the data obtained, taking into account the recommendations of the Clinical Protocol on pregravid preparation in the Russian Federation, patients with obesity, increased BMI, and a burdened family history of diabetes mellitus are recommended to take folic acid in doses of 4000-5000 mcg/day. at least 1 month before the planned onset of pregnancy.[15]

Obese women have a high risk of developing vitamin d deficiency[16,17] Therefore, it is desirable for such women to receive vitamin D at a dose of at least 600-800 IU/day at the stage of pregravidar preparation. [15]

It is much more difficult to predict how pregnancy will proceed in women with borderline changes in carbohydrate metabolism and conditions such as overweight and metabolic syndrome. There is a direct link between an increase in the mother's body mass index (BMI) and the risk of developing GDM.[4,8,16] According to Ornaghi at al., the leading complication of pregnancy in obese women is gestational diabetes mellitus, the chances of developing which increase by 2-3 times compared to normal weight patients.[17] The development of GDM against the background of obesity is associated with pregestational insulin resistance.[8] Therefore, an important aspect of successful pregnancy is lifestyle modification at the pregravidar preparation stage, which leads to a decrease in pregestational BMI. [4,5,8,15]

Patients with obesity are large, inhomogeneous group: different types and degrees of pre-gravidar obesity, different types of body composition, different state of carbohydrate metabolism. At present there are no appropriate differentiated recommendations for managing pregnancy and delivery in this truly gigantic, progressively increasing group. Stratification of care for pregnant women with obesity is required.

The introduction of the proposed questionnaire into the practice of an outpatient doctor will reduce the time of admission, increase patient compliance, and allow for personalized pre-gravid preparation.

CONCLUSION

1. Lifestyle modification is necessary for obese women at the stage of pregravid preparation with the aim of decreasing the risk of developing GDM and other pregnancy complications.
2. It is necessary to prescribe the optimal dose of vitamin D and folic acid in order to prevent pregnancy loss and reduce the risk of fetal malformations.
3. The introduction of the proposed questionnaire into the practice will allow for personalized pregravid preparation.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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