

Peculiar Properties of Pregnancy and Childbirth in Women with Gestational Diabetes Mellitus Depending on Body Weight

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ABSTRACT

The purpose of this study was to study the particularities of pregnancy in women with gestational diabetes mellitus and methods of delivery depending on body weight.

Methods: The study included 366 pregnant women with gestational diabetes mellitus (GDM) who were delivered in the II quarter of 2019 - I quarter of 2020 in the maternity Department of The Moscow city clinical hospital No. 29 of the Moscow Department of health (gestation period – 37.0–41.0 weeks).

Results: patients with GDM and obesity had significant weight gain during pregnancy, especially in the 1st and 2nd trimesters. Trimester weight gain in pregnant women with GDM and various degrees of obesity did not differ significantly. Correlation analysis showed that the higher the body weight of a mother with GDM, the higher the incidence of diabetic fetopathy (DF). The rate of delivery by caesarean section was much higher in the groups of patients with GDM and obesity than in normal-weight women with GDM.

Keywords: Gestational weight gain, gestational diabetes mellitus, obesity, diabetic fetopathy.

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INTRODUCTION

The rapidly spreading global "carbohydrate fever" entails a global change in the nature of nutrition and the disruption of mechanisms to compensate for the physiological insulin resistance of pregnant women, the development of gestational diabetes mellitus (GDM). Due to the common mechanisms of insulin resistance between obesity and GDM, some researchers consider it as a special form of metabolic syndrome [1,2].

The frequency of GDM among overweight and obese patients is 5-10 times higher than the average for the pregnant population [3]. Over the past 20 years, the obesity pandemic has changed the profile of patients with GDM, doubling the proportion of pregestational obese patients [4]. Children born to mothers with GDM and obesity are at a higher risk of developing neonatal complications compared to newborns from normal-weight mothers with GDM [5].

However, it is important not only pregravid weight and gestational weight gain (GWG). Excessive gestational weight gain occurs in every second woman with an initial overweight and obesity [5-7].

Currently, there are no clear criteria for the norm of weight gain by trimester, there is no evidence-based stratification depending on the pregestational state of fat and carbohydrate metabolism, and the degree of obesity. Therefore, the question of GWG in the development of GDM against the background of previous obesity is relevant.

Objectives: The purpose of this study was to study the particularities of pregnancy in women with gestational diabetes mellitus and methods of delivery depending on body weight.

METHODS

The study included 366 pregnant women with gestational diabetes mellitus (GDM) who were delivered in the II

quarter of 2019 - I quarter of 2020 in the maternity Department of The Moscow city clinical hospital No. 29 of the Moscow Department of health (gestation period – 37.0–41.0 weeks).

Inclusion criteria: full-term pregnancy, head presentation, single pregnancy. The diagnosis of GDM was made based on diagnostic criteria approved by the Ministry of health of the Russian Federation in the form of clinical recommendations [2020] [8]. Depending on the body mass index (BMI), all patients were divided into 5 groups. The 1st group included pregnant women with normal BMI (n=188, 51.3%); 2nd group – patients with overweight (n=77, or 21.0%); 3rd - patients with obesity of 1 degree (n=42, 11.4%), 4-th - obesity 2 degrees (n=77, or 21.0%); in 5-th-with obesity grade 3 (n=32, 8.7 percent). Women with GDM had 366 live full-term newborns.

We conducted a survey of the examined patients, studying: 1) family history of carbohydrate metabolism disorders and obesity; 2) chronic somatic and gynecological diseases; 3) reproductive history; 4) complications of real pregnancy, timing of GSD detection. We also performed a retrospective analysis of newborn development maps: anthropometric characteristics, Apgar score, presence/absence of phenotypic signs of diabetic fetopathy (DF).

Statistical data processing was performed using the program Statistica v. 10.0. (StatSoft ©Inc., USA). For all qualitative signs, absolute and relative frequencies are indicated, for quantitative - median (25%, 75%). When comparing binary features to determine the statistical significance of differences the exact Fisher criterion was used, and for quantitative traits the Mann-Whitney criterion was used (significance level $p < 0.05$).

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RESULTS AND DISCUSSION

In order to determine GWG and its effect on the course of GDM, the study groups were compared by total weight

gain during pregnancy, weight gain by trimester, frequency of insulin therapy (GDM on insulin therapy as a more severe form of GDM), and the time of starting follow-up with an endocrinologist. The study groups were also compared by the frequency of delivery by caesarean section.

Table 1. Characteristics of the surveyed groups

	GDM with normal BMI n=138	GDM with overweight n=77	GDM with obesity of 1 degree n=77	GDM with obesity of 2 degree n=42	GDM with obesity of 3 degree n=32
Pregestational body weight, kg Me (25;75%)	13,4 (9,0;16,0)	11,2 (7,0; 15,0)	9,0 (5,0;13,0)	7,3 (5,0;13,0)	8,0 (3,3;14,0)*
weight gain in 1 trimester, kg Me (25;75%)	3,6 (2,0; 5,0)	3,0 (1,0; 5,0)	2,0 (0,0; 3,0)	2,0 (1,0; 4,0)	2,0 (0,0; 3,0)**
weight gain in 2 trimesters, kg Me (25;75%)	5,2 (3,0;7,0)	4,6 (3,0;7,0)	3,5 (2,0;6,0)	3,0 (2,0; 5,0)	3,0 (1,0; 6,0)**
weight gain in 3 trimesters, kg Me (25;75%)	4,2 (2,0; 9,0)	3,8 (2,0; 5,0)	3,0 (1,0;6,0)	4,0 (1,0;5,0)	3,0 (-3,0; 6,0)
GSD on insulin therapy %	40 (30,4%)	34 (44,2%)	46 (59,7%)	21 (50%)	14 (43,7%)**
Follow-up with an endocrinologist %	85 (61,6%)	48 (62,3%)	59 (76,6%)	28 (66,7%)	24 (75,0%)
starting date monitoring by an endocrinologist, week. Me (25;75%)	29 (25,0;33,0)	29 (20,5; 31,5)	28 (24,0; 32,0)	29 (25,0;32,0)	28 (23,0; 30,0)
The rate of cesarean delivery %	24 (19,4%)	21 (27,1%)	18 (23,2%)	13 (30,9%)	10 (31,3%) *

Note:

BMI - body mass index, the differences are statistically significant ($p < 0.05$):

*- between groups «GDM with normal BMI» and other groups

** - between group No. 1 and groups No 3,4,5.

As shown in table 1, patients with GDM and obesity had significant weight gain during pregnancy, especially in the 1st and 2nd trimesters. According to the literature, it is gestational weight gain in 1,2 trimesters that is most significant in the prognosis of GDM development [2,5,6]. In pregnant women with pregestational obesity, excessive gestational weight gain increases the chances of developing GDM by 3.18 times [8,9]. Perhaps, without such a pathological GWG, gestational diabetes in such women did not develop?

It should be noted that the trimester weight gain in pregnant women with GDM and obesity of different degrees did not differ significantly. This is most likely due to the lack of proper control of the obstetrician-gynecologist leading the pregnancy. According to various data, 50-80% of pregnant women with obesity do not receive correct recommendations on nutrition, lifestyle, and acceptable weight gain [3].

It is logical that with an increase in BMI, the frequency of the need for insulin therapy also increases. However, this relationship is not linear. The group of patients with GDM and 1 degree of obesity was the most unfavorable in terms of the amount of insulin therapy prescribed. Although the corresponding indicators are more expected for pregnant women with GDM and grade 3 obesity. This indicates insufficient endocrinological control of patients in this group.

It was also found that the rate of delivery by caesarean section was much higher in the groups of patients with

GSD and obesity than in normal-weight women with GDM. Moreover, the relationship is linear: the higher the degree of obesity, the more often a caesarean section was performed. This is mainly due to the higher incidence of DF in patients with GDM and obesity. Many authors, recognizing the priority for delivery through the natural birth canal in uncomplicated GDM, insist on a significant expansion of the indications for caesarean section in GDM, requiring correction with insulin and DF [9-11].

The data obtained allow us to consider GDM with obesity, as well as GDM with excessive weight gain during pregnancy as a more severe form of the disease than GDM in normal-weight pregnant women.

CONCLUSION

1. The probability of developing gestational diabetes is presumably affected by excessive gestational weight gain in the 1st and 2nd trimesters, and the severity of its course is pregestational obesity.
2. It is necessary to stratify the approach to the management of pregnant women with various degrees of obesity.
3. The greater the degree of obesity in women with GDM, the higher the probability of delivery by caesarean section.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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REFERENCES

1. Papysheva O.V., Kotaysh G.A., Lukanovskaya O.B., Arakelyan G.A., Savenkova I.V., Zhilinkova N.G., Volkova S.V. Is gestational diabetes mellitus another mask of metabolic syndrome? *Akusherstvo i ginekologiya: novosti, mneniya, obucheniye* [Obstetrics and Gynecology: News, Opinions, Training]. 2019; 7 (3): 32–7. doi: 10.24411/2303-9698-2019-13005.
2. Orazmuradov A.A., Savenkova I.V., Arakelyan G.A., Damirova S.F., Papysheva O.V., Lukanovskaya O.B. Peculiar Properties of Metabolism Women with Gestational Diabetes Mellitus// *Sys Rev Pharm* 2020; 11(2): 237-241.
3. Obesity. Diabetes. Pregnancy. Versions and contraversions. Clinical practice. Prospects. / V. E. Radzinsky, T. L. Botasheva, O. V. Papysheva and others; ed. by V. E. Radzinsky, T. L. Botasheva, G. A. Kotaysh-Moscow:GEOTAR-Media, 2020. P. 330-337.
4. Papysheva O. V., Kotaysh G. A., Savenkova I. V., Arakelyan G. A., Lukanovskaya O. B., Damirova S. F. Influence of pregestational obesity on perinatal outcomes in women with gestational diabetes // *Obstetrics and gynecology: news, opinions, training*. 2019. Vol. 7, No. 3. P. 25-30. doi: 10.24411/2303-9698-2019-1390
5. Boriboonhirunsarn D. Second trimester weight gain > 7 kg increases the risk of gestational diabetes after normal first trimester screening // *J.Obstet.Gynaecol.Res.*2017. Vol. 43, N.3 P.462-467
6. Feng Y.,Jiang C.D., Chang A.M., Shi Y. et al. Interactions among insulin resistance, inflammation factors, obesity-related gene polymorphisms, environmental risk factors, and diet in the development of gestational diabetes mellitus // *J. Matern, Fetal Neonetel Med.* 2018. Vol.8. P. 1-9.
7. Ornaghi S., Algeri P., Todyrenchuk L. et al. Impact of excessive pre-pregnancy body mass index and abnormal gestational weight gain on pregnancy outcomes in women with chronic hypertension // *Pregnancy Hypertens.* 2018. Vol. 12. P. 90–95. doi: 10.1016/j.preghy.2018.04.005. Epub 2018 Apr 10.
8. Gestational diabetes mellitus. Clinical guidelines (protocol). Russian Federation, Moscow; 2020.
9. Papysheva O. V., Esipova L. N., Startseva N. M., Lukanovskaya O. B., Savenkova I. V., Arakelyan G. A., Mayatskaya T. A., Kotaysh G. A. Optimal terms of delivery in gestational diabetes: a problem requiring a consensus solution / / *Obstetrics and gynecology: news opinions, training*. 2019. Vol. 7, No. 3. P. 122-128.
10. Grabowska K., Stapińska-Syniec A., Saletra A., Jarmużek P. et al. Labour in women with gestational diabetes mellitus// *Ginekol Pol.* 2017;88(2):81-86.doi: 10.5603/GP.a2017.0016.
11. Derulle P. Quoi de neuf dans la prise en charge de la macrosomia? // *Ginecol.Obstet. Fertil.* 2015.Vol. 43, N 9. P.616-618