

Influence of Gestational Weight Gain on the Development of Complications of Gestational Diabetes Mellitus: A Literature Review

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ABSTRACT

In the article modern data on the relationship of the gestational weight gain on the development gestational diabetes mellitus (GDM) are presented. The aim of this study is to review the literature on pregestational obesity, gestational weight gain for improvements of perinatal outcomes in women with gestational diabetes mellitus. Possible obstetric and neonatal complications of GDM in obese women are considered. The debatable data on optimal gestational weight gain are presented.

Keywords: gestational weight gain, obesity, gestational diabetes mellitus, diabetic fetopathy, metabolic syndrome, insulin resistance.

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INTRODUCTION

Gestational changes in a woman's body, which begin with early pregnancy, are similar to the processes that occur in the metabolic syndrome (MS). These processes are aimed at the formation of energy resources in the mother and fetus. Some authors think that the development of pregnancy is essentially a "physiological metabolic syndrome of pregnant women".¹

MS and obesity are conditions which meets in every 5-th man of the planet. They are recognized as a non-infectious modern pandemic due to their high and increasing prevalence in the world.²

Obesity, pregestational insulin resistance (IR) establish preconditions for the development of GDM against the background of gestational transformations. The study Roca-Rodríguez et al. 2017. it was shown that the course of GDM is accompanied by biochemical changes (an increase in the level of adiponectin, leptin, and tumor necrosis factor), typical for the latent form of the metabolic syndrome.³ Women with GDM and obesity have higher levels of C-peptide, fructosamine compared to normal weight patients with GDM.⁴ The frequency of obesity in patients with GDM exceeds the average population by 1.7-

3.3 times.⁵ This allows to consider GDM as a special form of metabolic syndrome.

Objectives

The aim of this study is to review the literature on pregestational obesity, gestational weight gain for improvements of perinatal outcomes in women with gestational diabetes mellitus.

Methods

A search was performed on Web of Science, Scopus, and The Cochrane Library and in the information search engine of the Russian Federation named E-library. Studies from 2010 to 2020 were considered. The information received has been summarized, systematized and presented in this review. 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.

Literature review

Pregestational IR and MS are the basis of obstetric and neonatal complications. Against the background of hyperinsulinemia, the aggregation ability of blood increases. This leads to a violation of the main mechanisms of normal placenta formation and fetal growth: vasodilation and angiogenesis.¹ Therefore, children born to mothers with GDM and obesity are at a higher risk of developing neonatal complications compared to newborns from mothers with GDM of normal weight.^{6,7}

The most common neonatal complication is diabetic fetopathy (DF). It should be noted that its typical forms do not prevail in the structure of neonatal morbidity. Mainly develop complications such as morphofunctional immaturity, perinatal damage to the central nervous system, maladaptation in the early neonatal period.⁶ Children from mothers with GDM and obesity are more often to develop hepatomegaly, central nervous system depression syndrome, and diabetic cardiomyopathy.⁷ This corresponds to the literature data on the high frequency of neurological complications of children from mothers with GDM and obesity.⁸ It is the central nervous system depression syndrome that is the leading neurological complication in the early neonatal period.^{6,8} It is expected that existing neurological disorders remains into later life. The basis of long-term neuropsychiatric disorders, psychomotor development delay is perinatal damage to the central nervous system.⁹ In the literature there are similar data on the influence of the mother in GDM on the reduction of the child's cognitive abilities, perceptual characteristics, performance, and the development of attention deficit disorder.^{10,11}

The question of optimal gestational weight gain (GWG) remains debatable. Excessive gestational weight gain occurs in every second woman with an overweight and obesity¹² However, the norms of GWG are not clearly defined, there is not enough evidence of GWG norms depending on the state of fat and carbohydrate metabolism.⁶

Changes in carbohydrate and lipid metabolism, IR are the result of excessive GWG, including in the initial obesity. That is the primary is overweight, and insulin resistance is secondary.¹³

However, it is important not only the overall weight gain during pregnancy, but also its stratification by trimesters.⁵ For a normal-weight woman, the increase in body weight in the first trimester should not exceed 0.5-2.0 kg, in the second – 300-370 g. weekly, in the third trimester-300-350 g/week.¹⁴ This unevenness is conditioned to the fact that gestational changes that provoke an increase in body weight (growth of the uterus, volume of intra-and extracellular fluid, fat depots) occur in the second trimester. Therefore, Boriboonhirunsarn V.; Feng N., Jiang S. V. believe that excessive weight gain in the second trimester (more than 7 kg) is a risk factor for the development of GDM.^{15,16} However, on Hao M. et al. they have a different opinion. They believe that the predisposing factor to GDM is an increase in body mass index (BMI) in the first trimester of pregnancy. According to the study, pregnant women with a BMI>23.5 kg/m² in the first trimester were at high risk of developing GDM. And the combination of a BMI>38.2 kg / m² and a belly circumference>91.5 cm increases the risk of GDM by 13 times.¹⁷

Discussion

What is better: insufficient or excessive GWG in patients with pregestational obesity? B.Barquel, L.Herranz, D.Menses, O.Moreno et al. (2018) are believed that the optimal GWG for obese women is no more than 5 kg, since exceeding this limit increases the risk of fetal macrosomia, and an increase of more than 7 kg contributes to the risk of preeclampsia and hypertensive disorders.¹⁸

However, insufficient GWG increases the risk of fetal growth retardation. According to the review by M. A. Faucher and M. K. Barger (2015), GWG below the recommended Institute of Medicine USA-IOM norms (0-4 kg) in the case of pregestational obesity of the I degree increases the incidence of RRP by 37-40%, for obesity of the II degree-10%. But for pregnant women with pregestational obesity of I degree, the absence of GWG or loss of body weight, according to the same authors, increases the risk of fetal growth delay, significantly reduces the frequency of cesarean section to 26-44%.¹⁹ So, in pregnant women with gestational obesity, it is necessary to find an optimal balance between the risk of developing fetal growth retardation on the one hand, and the risk of developing GDM, preeclampsia, macrosomia and a high frequency of cesarean section, on the other. Excessive GWG is often caused by the lack of proper control of the doctor leading the pregnancy.²⁰ According to Emery R.L. et al. 2018, 50-80% of obese pregnant women do not receive the correct recommendations on nutrition, lifestyle, acceptable weight gain.²¹

Conclusion

In the realities of the present time there is a need to conduct large scale studies in order to develop a differentiated approach to gestational weight gain in patients with pregestational obesity, its stratification according to the degree, as well developing recommendations on nutrition and lifestyle in order to prevent the development of GDM and its complications.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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