

Prevention of metabolic syndrome in pregnant women based on study of body composition

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- metabolic syndrome
- pregnancy
- obesity

Abstract

Metabolic syndrome (MS) is a highly significant public health problem. Its prevalence throughout the world is growing steadily every year, and in some countries, it reaches a third of the adult population. Obesity is a major component of MS and a significant independent risk factor for developing many gestational complications. The study included 46 women aged 22 to 41 years. Studies began at 2-4 weeks of gestation and continued until delivery. The bioimpedance method using a body composition monitor “Omron BF-512”, Japan, was used to study the body’s composition to determine of muscle and fat components, and the level of visceral fat. Biochemical studies included the determination of blood glucose, glucose tolerance, insulin, triglycerides, high and low-density lipoproteins by standard methods. A close relationship was found between the initial value of the fat component and the amount of weight gain during pregnancy. Of prime importance is the amount of weight gain during pregnancy.

Introduction

Metabolic syndrome (MS) is an extremely significant public health problem, as its prevalence throughout the world is steadily increasing every year, and in some countries, it reaches a third of the adult population. Mention should also be made of the high cardiovascular risk associated with MS [1, 2]. According to modern concepts, MS is a complex of metabolic disorders, including abdominal obesity, impaired carbohydrate metabolism (impaired fasting glycemia, impaired glucose tolerance), insulin resistance, dyslipidemia, and arterial hypertension [6]. Obesity is a major component of MS and a significant independent risk factor for developing of many gestational complications. It is known that in the presence of obesity during pregnancy, the risk of having children with both underweight and pathological overweight increases, which, in turn, increases the risk of metabolic disorders in this group of children throughout life [3, 5]. According to several American authors, obesity is noted in 20% of women at the time of pregnancy, and in general, it is diagnosed in 30% of women of reproductive age. It is known that obesity during pregnancy, diagnosed with a body mass index (BMI) of more than 30 kg/m², increases the risk of developing fetal growth retardation syndrome, fetal macrosomia, gestational diabetes mellitus, preeclampsia, and sudden fetal death syndrome [7, 4]. Thus, it was found that BMI > 30 kg/m² increases the risk of developing preeclampsia by 2-3 times, while an increase in the indicator by 5-7 kg/m² before pregnancy doubles the risk of developing this complication. Obesity is also associated with a higher risk of complications during vaginal delivery [4, 8]. All of the above indicates the need for early diagnosis of the development of metabolic syndrome in order to take the necessary rehabilitation measures.

Purpose of the work. To study the frequency of metabolic syndrome in pregnant women, depending on the body’s composition.

Materials and Methods

46 women aged 22 to 41 were observed. Studies began at 2-4 weeks of gestation and continued until delivery. The bioimpedance method using a body composition monitor «Omron BF-512», Japan, was used to study the body's composition with the determination of muscle and fat components, and the level of visceral fat. Biochemical studies included the determination of blood glucose, glucose tolerance, insulin, triglycerides, high and low-density lipoproteins by standard methods.

Results

It was found that the relationship between the initial weight before pregnancy and the newborn's weight is described by Pearson's correlation coefficients $r = +0.46$, which is characterized as weak. At the same time, the relationship between the amount of weight gain during pregnancy and the newborn's weight is assessed as strong $r = +0.73$. A close relationship was found between the initial value of the fat component and the amount of weight gain during pregnancy. A strong relationship was also found between body mass index at the beginning of pregnancy and the visceral fat level in the prenatal period ($r = +0.82$). A similar correlation was observed with triglyceride and glucose levels. Consequently, the BMI value at the beginning of pregnancy can be used as a prognostic factor for developing of one of the main components of metabolic syndrome, namely, central abdominal obesity. This allows adequate physical rehabilitation to be carried out from the earliest stage of pregnancy.

Conclusions

Thus, the study of the composition of the body of pregnant women is relevant for the prognostic assessment of the development of the metabolic syndrome. Of primary importance is the amount of weight gain during pregnancy. This increase is mainly observed in the second trimester. Consequently, during this period, physical rehabilitation methods aimed at adjusting the pregnant woman's weight should be applied to a special extent.

References

- [1] Cornier M-A, Dabelea D, Hernandez TL, Lindstrom RC, Steig AJ, Stob NR, et al. The Metabolic Syndrome. *Endocrine Reviews* [Internet]. 2008 Dec 1;29(7):777–822. Available from: <https://doi.org/10.1210/er.2008-0024>
- [2] Franchini M, Targher G, Montagnana M, Lippi G. The metabolic syndrome and the risk of arterial and venous thrombosis. *Thrombosis Research* [Internet]. 2008 Jan;122(6):727–735. Available from: <https://doi.org/10.1016/j.thromres.2007.09.010>
- [3] Gluckman PD, Hanson MA, Cooper C, Thornburg KL. Effect of In Utero and Early-Life Conditions on Adult Health and Disease. *New England Journal of Medicine* [Internet]. 2008 Jul 3;359(1):61–73. Available from: <https://doi.org/10.1056/NEJMr0708473>
- [4] Kristensen J, Vestergaard M, Wisborg K, Kesmodel U, Secher NJ. Pre-pregnancy weight and the risk of stillbirth and neonatal death. *BJOG: An International Journal of Obstetrics and Gynaecology* [Internet]. 2005 Apr;112(4):403–408. Available from: <https://doi.org/10.1111/j.1471-0528.2005.00437.x>
- [5] Lakshmy R. Metabolic syndrome: Role of maternal undernutrition and fetal programming. *Reviews in Endocrine and Metabolic Disorders* [Internet]. 2013 Sep;14(3):229–240. Available from: <https://doi.org/10.1007/s11154-013-9266-4>
- [6] Niu JM, Lei Q, Lu LJ, Wen JY, Lin XH, Duan DM et al. Evaluation of the diagnostic criteria of gestational metabolic syndrome and analysis of the risk factors. *Zhonghua Fu Chan Ke Za Zhi*. 2013 Feb;48(2):92-97.

- [7] Nohr EA, Vaeth M, Bech BH, Henriksen TB, Cnattingius S, Olsen J. Maternal Obesity and Neonatal Mortality According to Subtypes of Preterm Birth. *Obstetrics & Gynecology* [Internet]. 2007 Nov;110(5):1083–1090. Available from: <https://doi.org/10.1097/01.AOG.0000286760.46679.f8>
- [8] Yu C, Teoh T, Robinson S. Review article: Obesity in pregnancy. *BJOG: An International Journal of Obstetrics & Gynaecology* [Internet]. 2006 Aug 10;113(10):1117–1125. Available from: <https://doi.org/10.1111/j.1471-0528.2006.00991.x>