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How maternal obesity affects pregnancy? - literature review

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Abstract

Introduction: Obesity is a well-known risk factor for many health problems. Recently, the increasing number of obese pregnant patients deserves our special attention, because maternal obesity is associated with numerous complications during the antepartum, intrapartum, and immediate postpartum stages of pregnancy.

Purpose of the study: The aim of this study is to collect and summarize the latest views on maternal obesity in pregnancy and highlights the complications associated with it.

Material and methods: Literature review was performed in English different databases, using keywords: morbid obesity, super-obesity, maternal obesity, pregnancy, complications.

Results and conclusions: In our systematic review we would like to present the most important threats of obesity among pregnant women such as: cardiovascular, respiratory, endocrinology and gestational weight gain problems; pregnancy loss; fetal anomalies; anesthetic and delivery problems; breastfeeding disorders; problems with contraception and long-distant effects in a child's adult life. Therapeutic success of such a pregnancy should consist of the cooperation of many specialists. This phenomenon of maternal obesity will certainly spread in the future and for this reason - awareness of this problem is very important for both patients and physicians taking care of them.

Keywords : maternal obesity, morbid obesity, super-obesity, pregnancy, complications.

Introduction and purpose:

Obesity is considered one of the most popular civilization diseases. It is classified according to Body Mass Index (BMI) - defined as weight in kilograms divided by height in meters squared (kg/m²). The World Health Organization divides BMI ranges into six categories (Table 1). [1]

Table 1 - Classes of BMI (WHO)

Body Mass Index	Nutritional status
< 18.5	underweight
18.5 - 24.9	normal weight
25.0 - 29.9	pre-obesity
30.0 - 34.9	obesity class I
35.0- 39.9	obesity class II
>40	obesity class III – it is known also as a morbid obesity

It is obvious that obesity is a well-known risk factor for many health problems among the entire human population, but in our literature review we would like to emphasize the risk it poses to pregnant patients. The scale of this phenomenon is increasing e.g. - based on the 2017-2018 National Health and Nutrition Examination Survey, the prevalence of obesity in women of reproductive age (20–39 years) in the United States is 39.7%. [2] Statistics show that 2% of pregnant women in the United States are classified as having super-obesity (BMI at or above 50 kg/m²). [3]

Recently, the increasing number of obese pregnant patients deserves our special attention, because maternal obesity has been recognized as an additional risk to both the mother and the fetus. Maternal obesity is associated with numerous complications during the antepartum, intrapartum, and immediate postpartum stages of pregnancy such as: cardiovascular, respiratory, endocrinology and gestational weight gain problems; pregnancy loss, fetal anomalies; anesthetic and delivery problems; breastfeeding disorders; problems with contraception and long-distant effects in a child's adult life. [4] [5]

The aim of this study is to collect and summarize the latest views on maternal obesity in pregnancy and highlights the complications associated with it. It is worth noticing that the amount of scientific research about maternal obesity is limited - as it is a relatively new problem. This phenomenon of maternal obesity will certainly spread in the future and for this reason - awareness of this problem is very important for both patients and physicians taking care of them.

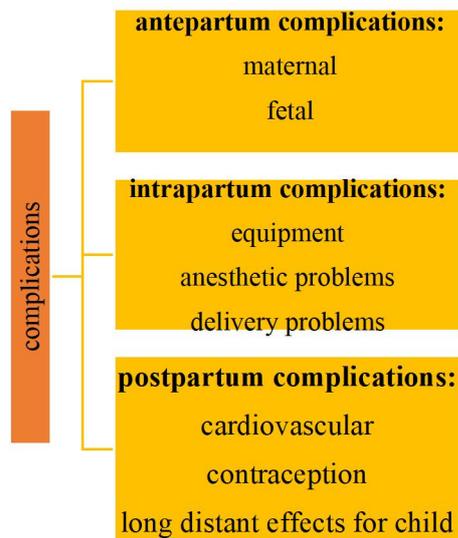
Material and methods:

We carried out literature search using English based databases (PubMed, ClinicalKey, Free Medical Journals, National Library of Medicine, PubMed Central, The Lancet) looking for articles referring to keywords used: morbid obesity, super-obesity, maternal obesity, pregnancy, complications. The most recent studies (from 2004 to 2022) have been reviewed and those most relevant to our summary have been selected.

Results:

The most important complications related to pregnancy in obese patients can be divided into 3 groups. (Diagram 1) According to this division, they will be discussed in our review.

Diagram 1 – Complications related to pregnancy in obese patients



Antepartum complications:

Maternal complications

Antepartum maternal complications include: cardiovascular, respiratory, endocrinology and gestational weight gain problems. Pregnancy obesity can lead to the development of hypertension in pregnancy, as well as preeclampsia, which is a direct threat to life. Some studies report a 3–10 fold increase in preeclampsia risk compared to normal weight women. Preeclampsia is mainly associated with elevated leptin levels, which leads to placental ischemia and endothelial dysfunction. Therefore, it is extremely important to control the level of lactate dehydrogenase - LDH, urine protein creatinine ratios in all pregnant women with obesity many times. [6]

Pregnancy in obese women means a much greater increase in intra-abdominal pressure and reductions in lung volume, compared to pregnancy in women with normal body weight. The incidence of Obstructive Sleep Apnea(OSA) is also higher among the obese women. Interestingly, OSA without coexisting obesity in pregnancy, is an independent risk factor of preeclampsia, eclampsia, cardiomyopathy, pulmonary embolism and in-hospital mortality. This means that with coexisting obesity, the risk of these complications increases. In according to that, the screening for OSA using the STOP-bang questionnaire, supported by the Society of Anesthesiology and Sleep Medicine, is recommended before a planned pregnancy. [7]

Obesity can also contribute to the development of gestational diabetes. Women with developed pre-gestational diabetes should decide to consult an endocrinologist and diabetologist before becoming pregnant. Controlled pre-gestational diabetes increases the chances of pregnancy without major complications. Obesity in the general population leads to vitamin D deficiency, but in pregnancy it is associated with a significantly increased risk of developing preeclampsia as well as worsening glucose tolerance. Vitamin D deficiency is also associated with a risk of low birth weight and of an increased rate of caesarean births. [4]

In 2009, the Institute of Medicine (IOM) published guidelines with a recommendation of a weight gain of 11–20 lbs for all patients with obesity throughout the course of their pregnancy. The estimated proportion of women who have achieved these targets is below 50%. Excessive weight gain during pregnancy is obviously combined with maintaining overweight or obesity in the postpartum period. [5]

Fetal complications

Obese women have an increased risk of spontaneous abortion (SAB) and of recurrent miscarriage. For instance, BMI >30 kg/m² is responsible for the increase of this risk by more than 30%. [6] The risk of stillbirth increases with increasing BMI. The most significant increase of this risk was in patients with a BMI > 50 kg/m². The mechanism of this phenomenon is still unknown, but the following are taken into account: undiagnosed comorbidities, chronic intrauterine inflammation, hypoxia, placental dysfunction. [8] Swedish and American studies showed that maternal obesity is a strong independent risk factor for very early (22-27 weeks EGA) spontaneous preterm delivery. [9] Pregnancy in obese women is also associated with the risk of fetal anomalies such as: neural tube defects, hydrocephaly and cardiac, orofacial and limb reduction defects, macrosomia, underlying insulin resistance, hyperglycemia, nutritional deficiencies. It is worth emphasizing that due to the limitations of ultrasonography sensitivity among obese patients, the detection of fetal defects by this examination is extremely difficult. The result of cell free fetal DNA screening is also unreliable because of the increased volume of distribution. What is more, diagnostic tests such as: chorionic villus sampling and amniocenteses can be technically very difficult, sometimes impossible. [4] Therefore, attention is drawn to more frequent ultrasound examinations, the use of endovaginal probe transabdominally in the umbilicus, and the consideration of MRI. [10]

Intrapartum complications:

Equipment

First, it should be noted that hospitalization of an obese pregnant woman requires special equipment from the hospital, such as: wider doorways, elevators with increased maximal weight allowances, bariatric bed and surgical table, portable or ceiling-mounted lifting equipment, bariatric wheelchairs and commodes, large surgical safety belts (if a surgical intervention is required). These basics show that from the very beginning - when planning space development, the possibility of contact with such patients should be taken into account. [4]

Anesthetic problems

Anesthesia during delivery by forces of nature and caesarean delivery is one of the most important issues for a pregnant woman. It is extremely important to conduct an anesthesia consultation, taking into account the patient's actual body weight. Placement of the labor epidurals may be more difficult in obese patient and may take more time than usual. The percentage of failed regional anesthesia is increased and the percentage of the need of general anesthesia is increased. [11] If a caesarean delivery is required, the anesthesiologist should be aware of positioning, intraoperative blood pressure monitoring and postoperative analgesia. In obese patients, non-invasive methods of measuring blood pressure may be unreliable. Invasive methods should be considered to control the patient's condition during eventually cardiopulmonary instability or haemorrhage. It should be also noted that obese patients have a higher risk of hyperventilation during opioid therapy. [4]

Delivery problems

Generally, obesity increases the risk of: cesarean delivery, prolonging the second stage of labor and a second stage arrest cesarean delivery. [12] Maternal obesity limits the assessment of the fetus by transvaginal examination and external examination. It also limits fetal heart rate detection by the cardiotocograph. In this situation fetal ultrasound evaluation may be necessary. Sometimes physicians use endovaginal probe transabdominally in the umbilicus, because of reduced tissue thickness. The GE Monica Novii Wireless Patch System is a fetal and maternal monitor used to measure the heart rates of fetus and mother, which has improved fetal heart tracings in women with obesity. [13] Obese pregnant patients also have an increased risk of postoperative complications and post-caesarean wound infections. BMI > 30 kg/m² involves increased operative

time, estimated blood loss and the percentage of intraoperative injury such as: perioperative transfusion, reoperation, hysterectomy, bladder, bowel, or ureteral injury, or broad ligament hematomas. [3] [4] Moreover, studies have shown that obese patients should be given higher doses of antibiotics before cesarean section than those with normal BMI. Some institutions use 3-gram of cefazolin instead of the standard 2-gram of cefazolin. During abdominal skin preparation is good to use two or more chlorhexidine-alcohol swabs, because of increased surface area. [14] [4]

Postpartum complications

Cardiovascular complications

Obesity in pregnancy is a risk factor for pre-pregnancy obesity in the next pregnancy. [5] Women with maternal obesity are due to develop an increased central fat mass in the postpartum period. It is obvious that central obesity is associated with multiple cardiovascular complications. Obesity during pregnancy is a risk factor for the development of hypertension in pregnancy and gestational diabetes. These diseases cause numerous complications for both the mother and the fetus. For the mother, they are a risk factor for the development of type 2 diabetes and hypertension after pregnancy. [15] [4] Pregnancy is a proven risk factor for the development of venous thromboembolism, so the obesity increases this risk even more. [16]

Breastfeeding problem

Obesity in the postpartum period may make it difficult to start and continue breastfeeding. Maternal obesity has been considered as a risk factor for delayed stage II lactogenesis. Obese women have increased baseline progesterone levels and decreased prolactin response to infant suckling. In conclusion, breastfeeding in obese women is difficult and is often associated with no breastfeeding or a short duration of breastfeeding. [17] [18]

Problem with contraception

The selection of contraceptives for obese women after pregnancy is also a challenge. It is worth noting that there are several studies that show that the use of progestin-only contraceptives are less effective in obese women. Moreover, obesity is a obvious risk factor for venous thromboembolism and this risk increases with the use of estrogen-containing contraception. [19]

Long-distant effects for child

Newborns have an increased amount of adipose tissue. It has turned out that apart from the obvious complications in the fetus or newborn, more and more attention in the literature is devoted to long-term effects among the offspring of obese mothers. Long-term effects in adolescence and adulthood include mainly metabolic syndrome, obesity and risks of coronary heart disease, stroke, type 2 diabetes. However, these are not the only long-term complications. What is interesting, in a Scandinavian study maternal obesity was associated with an increased risk of childhood asthma. Maternal obesity has also been mentioned as a possible risk factor of autism spectrum disorders, childhood developmental delay, and attention-deficit/hyperactivity disorder. High BMI is also associated with risk of neurodevelopmental disorders, including cerebral palsy. [20] - [22]

Conclusions :

1. The increasing number of obese pregnant patients deserves our special attention, because maternal obesity has been recognized as an additional risk to both the mother and the fetus. The most important complications related to pregnancy in obese patients can be divided into 3 groups: antepartum, intrapartum and postpartum.
2. Maternal obesity is associated with a higher risk of the development of hypertension in pregnancy, preeclampsia, Obstructive Sleep Apnea, gestational diabetes, gestational weight gain problems. [4] - [7]
3. Fetal complications include increased risk of spontaneous abortion and recurrent miscarriage. Maternal obesity can cause fetal anomalies such as: neural tube defects, hydrocephaly and cardiac, orofacial and limb reduction defects, macrosomia, underlying insulin resistance, hyperglycemia, nutritional deficiencies. [4]
4. Anesthesiologists should be aware that the placement of the labor epidurals may be more difficult in obese patient and the percentage of the need of general anesthesia is increased. [11] [4]
5. Maternal obesity increases the risk of cesarean delivery, extended operative time, amount of blood loss and the amount of intraoperative injury such as: perioperative transfusion, reoperation, hysterectomy, bladder, bowel, or ureteral injury, or broad ligament hematomas.
6. The thickness of the adipose tissue may limited fetal heart rate detection by the cardiotocograph. [13]

7. Obese patients should be given higher doses of antibiotics before cesarean section than those with normal BMI. [14] [4]
8. Pregnancy is a proven risk factor for the development of venous thromboembolism and cardiovascular complications.
9. Pregnant women who are obese are at risk of breastfeeding problems, because of the delayed stage II lactogenesis.
10. The long-term effects of pregnancy obesity on offspring include: metabolic syndrome, obesity, risk of coronary heart disease, stroke, type 2 diabetes, childhood asthma and psychiatric disorders.

In summary, the awareness of society about the risk of obesity during pregnancy is still unsatisfactory. Caring for an obese pregnant woman is an extremely challenge for the obstetrician. Therefore, it is so important to start obesity treatment in women of reproductive age before pregnancy. Therapeutic success should consist of the cooperation of many specialists: obstetricians, Maternal-Fetal Medicine (MFM) specialists, anesthesiologists, diabetologists, endocrinologists, dieticians, sleep medicine specialists and psychiatrists.

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