

PRACA POGLĄDOWA  
REVIEW ARTICLE

## OBSESITY DURING PREGNANCY: LITERATURE REVIEW

### OTYŁOŚĆ W CIĄŻY: PRZEGLĄD LITERATURY

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#### ABSTRACT

**Introduction:** Maternal obesity is a serious problem in obstetric-gynecological practice in the world. Pathophysiological changes create conditions for obstetric and perinatal complications, the most important complications of which is gestational diabetes mellitus, preeclampsia, pathological course of labor, increased operative delivery, fetal distress. **The aim** of the study is to find out the depth of the problem "Obesity and Pregnancy" by analyzing the range of obstetric, perinatal complications based on the processing of scientific relevant literature data.

**Materials and methods:** An analysis of international and national scientific literature on the problem of pregnancy has been made. Methods used: bibliographic, scientific research, synthetic, analytical and generalizing.

**Review and conclusions:** Taking into account the high risk of maternal and perinatal complications associated with obesity, it is necessary to develop therapeutic and diagnostic measures and implement dynamic monitoring of pregnant women to minimize these risks.

**KEY WORDS:** pregnancy, obesity, complications

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#### INTRODUCTION

At present, obesity is the most widespread health threat in the western world, and its influence on the general condition of a person is growing rapidly. Obesity has become the second leading cause of death in developed countries [1, 2]. In 1940, the first articles in the English literature on the topic of pregnancy were published and obesity, which established that obesity increases the level of danger at the birth of a child [3].

In the United States, obesity is the most common chronic disease and affects more than one out of four Americans, including children, in addition, for the last 20 years, the level of disease has been steadily increasing. In Europe, Australia and New Zealand, in the Middle East and in other countries of the American continent, cases of detection of obesity are becoming more frequent and today account for 10-20%.

The spread of obesity among women ranges in Europe from 11% in the Netherlands to 24% in Spain. In China, Japan and many other African countries, the spread of obesity is still rather low. In Japan, the average body mass index (BMI) in young women, especially those living in large cities, has decreased, although during the last 20 years, the prevalence of overweight body in Japanese aged men and women has increased.

An observation like this and even more promising, has been made involving pupils, as a rule the BMI and the waist circumference exceeded the norm in winter compared with summer. In studies that describe the prevalence of obesity

among the population, this fact should be taken into account [3]. The importance of heredity in obesity problem has been underlined by several scientists. In particular, children of two fat parents will be overweight with 50% probability [4].

Nevertheless, this can not explain to some extent the current epidemic. Obesity, genes and lifestyle abilities can better reflect the situation that has arisen [5]. Recent research has shown that fat women have more children than lean ones, which also points to the role of genetics [6]. The latter fact has the right to exist, despite the increase in reproductive system disorders in women with obesity.

Not only aged people suffer from obesity, but more and more young people. So, obstetricians and gynecologists will deal with pregnant patients who are overweight or obesity more often. In our time, obesity overweight is the most common high risk factor in pregnancy

#### THE AIM

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#### MATERIALS AND METHODS

An analysis of international and national scientific literature on the problem of pregnancy has been made. Methods

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## REVIEW AND DISCUSSION

After the treatment of a reproductive function failure, the risk of spontaneous abortion in women with obesity increases. The risk of spontaneous abortion in subfertility patients increases with the increase in BMI and more than two in women who have been diagnosed with obesity as a disease. Among the population of recipients of oocytes from donors of obesity, the probability of spontaneous abortion doubled.

The stimulation of endogenous endometrium estrogens before implantation serves as a possible explanation for a higher number of abortions, as it is the cause of adverse phenomena in the intramuscular site. The pathophysiological changes in obesity, which make conditions for obstetric and perinatal complications have been described.

The respiratory system is: reduced functional capacity left at the risk of hypoxia due to lower oxygen stores. Obstructive sleep apnea in 50-90% of patients with obesity is a risk of pulmonary hypertension and pulmonary heart, increased the risk of difficulty in ventilation and intubation of the trachea; increased metabolic need in breath due to increased diaphragmatic work; the risk of atelectasis and shunts, due to hypoventilation syndrome (Picquets syndrome) - 5-10% for pathological obesity; increased risk of regurgitation and aspiration [7]. Obesity makes an increased load on the cardiovascular system, causing an increase in blood volume; an increase in the heart rate is proportional to the degree of obesity, that is, fat requires 2-3 ml of blood / 100 g / min, and in particular, an additional 50 kg requires 1-1,5 l / min. extra cardiac output; increased hematocrit due to hypoxia; hypertension in 60% of people suffering from obesity and leading to increased post-loading and left ventricular hypertrophy. Right ventricular hypertrophy due to obstructive sleep apnea; systolic and diastolic dysfunction; the appearance of arrhythmias due to fatty deposition in the myocardium; increase of previous loading in accordance with increase in blood volume; the risk of myocardial ischemia due to increased oxygen consumption and a decrease in its supply; dilated cardiomyopathy, cardiomyopathy insufficiency; the risk of coronary heart disease; the risk of hypotension in the underlying position due to aorto-venous compression. Besides at obesity, pathophysiological changes affect the gastrointestinal tract, metabolic disorders, renal and endocrine systems, support musculoskeletal system, coagulation system [7]. At obesity, the burden on the cross-sectional system, in particular, the kidneys, increases significantly: the content of the angiotensin-converting enzyme and renin increases, leptin, which leads to an increase in sodium absorption and renal vasodilation.

High intra-abdominal pressure may reduce renal blood flow. From the endocrine system at obesity, there is an increase in the content of leptin, which leads to hypertension, retention of sodium and water. Insulin resistance leads to

a high level of insulin, which together with leptin and free fatty acids stimulate the sympathetic nervous system. The risk of diabetes mellitus increases as BMI grows.

According to the Royal College of Acupuncture and Gynecology, women with obesity during pregnancy increase the incidence of the following diseases [8]. Antagonists are: an onset of glycaemia and glucose intolerance, gestational diabetes mellitus (GDM), miscarriage, stillbirth, pre-eclampsia, thromboembolism, sleep apnea, maternal death, abnormalities in fetal growth and development. Among anaesthesiological risks, authors distinguish: difficulties with access, difficulties with the correct placement of the catheter in the epidural space, difficulties with spinal anesthesia and increased risk of displacement, the complexity of maintaining adequate respiration [9]. In the childbirth women with obesity, more often, there are postpartum complications, represented by delayed exposure, increased risk of wound infection, high probability of hypogalactia, post-partum depression, long-term effects on newborns (weight gain of the child, obesity). Joshua L. Weiss in the American Journal of Obstetrics and Gynecology, in the article "On Acute Surgery and Cesarean section", describes a study that was done to determine whether there is a relationship between obesity and obstetric complications and Cesarean case [10]. The study included 16,102 patients, of which 3752 - control, 1473 - with obesity, and 877 - with pathological obesity. Obesity and pathological obesity had a statistically significant association with gestational hypertension (ratio 2,5 and 3,2), preeclampsia (1,6 and 3,3), gestational diabetes (2,6 and 4,0), and fetal weight at birth more than 4000 g (1,7 and 1,9) and more than 4,500 g (2,0 and 2,4).

The incidence of Cesarean section was 20,7% for the control group, 33,8% for women with obesity and 47,4% for women with pathologic obesity. Other American scientists [10,11] investigated the effect of obesity and weight gain in young women for obstetric results. The results of a multi-factorial analysis showed that the increase in BMI during pregnancy, but not the weight, was a significant predictor of Cesarean section.

When large, infants were removed from the analysis for gestational age, an even greater effect of BMI on Cesarean section (OR 1,76, CI 1,17 to 2,66,  $p = 0,007$ ) was determined, but no increase in weight (OR 1,45, DI 0,94, 2,17,  $p = 0,093$ ). It was found that an increase in BMI during pregnancy is a more significant predictor of cesarean section than the increase in weight during pregnancy in young women. All women with BMI  $\geq 30$ , who were diagnosed with GDM, should have a tolerance test for glucose within 6 weeks of delivery. Women with BMI  $\geq 30$  and GDM who have normal postpartum glucose tolerance tests should regularly be screened for Type II diabetes mellitus (DM).

A systematic review and a meta-analysis has found out that women with gestational diabetes had an increased risk of developing type II diabetes as compared to those who had normoglicemia during pregnancy (OR 7,43, 95% CI 4,79-11,51) [12]. One of the previous systematic reviews revealed a sharp increase in the incidence of type II diabetes

during the first 5 years after pregnancy, which occurred with GDM 4,12. Women with BMI  $\geq 30$  after Cesarean section have an increased risk of developing an infection in the postpartum period. Therefore, OR for Cesarean delivery was 0,73 (95% CI 0,53-0,99), with a planned Cesarean section 0,36 (95% CI 0,26-0,51), and for of all Caesarean sections 0,41 (95% CI 0,29-0,43) [13].

The data suggest that children born to mothers with obesity are 1,5 times more likely to require intensive care than children born to mothers of normal weight [9]. In the postpartum period, women with obesity come across the problem of hypogalactia [12]. For women with obesity, the number of complications increases, as well as the risk of anesthesia. Pathologically overweight women have higher rates of unsuccessful cases of epidural anesthesia (EDA) and complicated intubation. The impossibility of identifying landmarks, the difficulty of finding points for a local blockade, and the uneven spread of the anesthetic solution contributed to an increase in the frequency of unsuccessful attempts at these manipulations. A high initial error rate requires the catheter to be installed as soon as possible, a critical evaluation of the blockade, and replacement of the catheter, when needed, and also an alternative rehabilitation of respiratory tract. Preventive testing and assessment of the patient's condition by anesthesiologist is recommended for optimum care [14]. For women with obesity, the use of local anesthetic techniques can be a rather complicated process and takes a lot of time. This fact should be taken into account when deciding on the implementation of an urgent Cesarean section during delivery.

During childbirth, patients with obesity feel pain at the same level as women without obesity, and pain relief measures give them more relief [14]. In general, obesity is considered to be a major risk factor for health problems and has a causal relationship with chronic diseases and all causes of death. Already more than 60 years ago, it was found that in pregnant women maternal mortality doubled. Maternal mortality studied in the UK came to the conclusion that depression and obesity are the main causes of maternal mortality [15].

About 35% of dead women suffered from obesity that is 50% more than the number of deaths in the general population [3]. Regional anesthesia has many benefits, although it is difficult to deal with obese patients, however, it can provide the most effective form of analgesia and reduce the burden on the respiratory and cardiovascular systems during labor. Women with obesity are at increased risk of Cesarean section, and epidural anesthesia can reduce the risk of general anesthesia. Regional anesthesia in obese patients is best carried out at the beginning of labor to optimize positioning and is easier to sit in position.

The regional type of anesthesia has been described in patients with BMI above 88, and more and more evidence is emerging that ultrasound may be useful in helping to form an epidural catheter. There are specific difficulties with regard to epidural (spinal) anesthesia in patients with obesity: great difficulty in staging; increased risk of moving an epidural catheter; increased risk of accidental stupid roll;

headache after puncture. This is probably due to elevated pressure in the epidural space, high venous pressure and increased epidural fat [7].

According to the relevant literature, pregnant women with obesity have a greater risk of complications during anesthesia than women with normal BMI [10, 17, 18]. So, obesity is an important risk factor for maternal mortality at anesthesia. Women of the obesity III degree will have the highest risk and need local anesthesia. The need of epidural anesthesia increases with the growth of BMI. The number of women with obesity who refused epidural anesthesia at labor was 42% at one hospital [12].

Pathological obesity is connected with a significant risk of developing thromboembolism during the pre- and postpartum periods. In a retrospective study conducted in Denmark, there were involved 129 women with deep vein thrombosis and pulmonary embolism who were diagnosed during pregnancy and post-partum period, as well as 258 healthy women.

The results showed a significant association between venous thromboembolism and BMI  $\geq 30$  (95%, CI 2,1-13,5) [11,17]. Recently in Britain a "case-control" study has shown that BMI  $\geq 30$  was associated with pulmonary artery thromboembolism (95% CI 1,09-6,45) [10]. To date, in many foreign clinics, overweight women in the prenatal period are given heparin due to an increase in the number of thromboembolic complications. Before delivery, the dose is reduced: 12 hours should pass after a prophylactic dosage of low molecular heparin and 24 hours after therapeutic dosage before spinal or epidural anesthesia [7].

Alternative anesthesia includes the following: entonox (50% nitrous oxide in oxygen) may be useful; intramuscular opiates and controlled intravenous analgesics [7]. Attempts to achieve full analgesic effect in the treatment of childbirth anesthesia with a minimal effect on the body of the mother and the newborn contributed to the appearance an interest to the use of epidural anesthesia, since its pronounced analgesic and antispasmodic effects combined with a lack of suppressive effects on the functions of the respiratory system, the heart, kidney.

The method of epidural anesthesia at labor has been studied sufficiently. There is a large amount of data of epidural anesthesia positive effect on labor, the absence of adverse effects on the fetus and the newborn. The beneficial effect of epidural anesthesia at labor in women with obesity, complicated by gestosis is important. The positive role of epidural anesthesia in relieving at labor in the breech presentation has been established in women with obesity. Epidural anesthesia has a beneficial effect on the course of preterm labor, extending the period of cervix opening and extending the period of expulsion, which contributes to a more smooth progression of the fetal head. At the same time, the relaxation of the perineal muscles and the pressure on the head decreases [7].

It has been established that at childbearing age, when analgesia was carried out by narcotic analgesics, children were born with neuro-reflex activity much worse than mothers who received it at labor with epidural analgesia

[10]. At the same time, epidural anesthesia can cause a decrease in uterine activity, as a consequence of reduced aortic-cava compression. The increase in labor duration and decrease in maternal activity in the second period of childbirth, which contributes to the increase in the number of operations have been also noted.

It is also known about the negative hemodynamic effect of epidural anesthesia at childbirth, which is associated with the development of peripheral vasodilatation, which in its turn leads to a decrease in venous reversal, the appearance of bradycardia.

In addition, in women with obesity hypotension of the bladder, hyperthermia have been described [11]. The primary mechanisms of hemodynamic reactions and disorders at regional anesthesia are as follows: arterial-dilatation and reduced total peripheral vascular resistance caused by it, venodilatation, accompanied by relative hypovolemia, decreased venous reversal and cardiac output; violation of the correct distribution (auto regulation) of the flow between the organs. A low arterial hypotension caused by spinal anesthesia acquires an independent pathogenetic significance only in patients with obesity and with atherosclerotic lesions of cerebral and coronary vessels, or in pregnant women with aortic compression. There are only two of all types of respiration disturbances at regional anesthesia: ventilator acute respiratory failure due to suppression of the respiratory center or the weakness of the respiratory muscles, and the partial separation of ventilation and flow in healthy lungs caused by lowering pressure in the small circle of the blood that results in hypoxemia [7].

## CONCLUSIONS

1. The result of literature sources analysis has shown that pregravidar overweight is the most common high risk factor in pregnancy.
2. Pathophysiological changes at obesity create conditions for obstetric, perinatal and anesthetic complications, the most important of which are gestational diabetes mellitus, preeclampsia, pathological labor, fetal distress, stillbirth, thromboembolism, hemodynamic and respiratory disturbances at anesthetic support.
3. Taking into account the high risk of maternal and perinatal complications associated with obesity, it is necessary to develop a complex of treatment and diagnostic measures and to carry out dynamic monitoring for pregnant women to minimize these risks.

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## Conflict of interest:

*The Authors declare no conflict of interest*

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