

OBESITY VS. PRECONCEPTION PERIOD, PREGNANCY, AND LABOR

OTYŁOŚĆ A OKRES PREKONCEPCYJNY, CIĄŻA ORAZ PORÓD

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ABSTRACT

Obesity is defined as the increased accumulation of adipose tissue in an organism, which is determined by genetic and environmental factors. Nowadays, this condition is most commonly found in women of child-bearing age, exhibiting short – as well as long-term effects on their health. Excessive body weight can affect the reproductive capability of women. In the case of pregnant women, a group characterized by a range of metabolic and hormonal disturbances, obesity may lead to functional impairment of the placenta, miscarriage, gestational diabetes, fetal macrosomia, and the need to complete the delivery by surgery.

Obesity is one of the main causes of fertility disorders and obstetric failures. Due to fetal macrosomia and an increased risk of shoulder dystocia and obstetric injuries, the most common route of delivery in pregnancies complicated by obesity is Cesarean section, which often poses a challenge for the obstetric team.

To reduce the number of obesity-complicated pregnancies, educating patients on undergoing laboratory testing, following a correct diet, and performing a physical activity is necessary. Actions aiming at reducing the body weight of pregnant women can enable reducing the risk of disturbances associated with pregnancy, labor, and puerperium, as well as having a positive impact on the future of the fetus and neonate.

KEYWORDS: obesity, pregnancy, labor, puerperium.

STRESZCZENIE

Otyłość definiuje się jako genetycznie i środowiskowo uwarunkowaną zwiększoną zawartość tkanki tłuszczowej w organizmie. Współcześnie stanowi najczęstsze schorzenie kobiet w wieku rozrodczym, wykazując zarówno krótko-, jak i długoterminowe, niekorzystne konsekwencje dla stanu zdrowia. Skutki nadmiernej masy ciała przekładają się na zdolność prokreacyjną kobiet. W przypadku ciężarnych, ze względu na zaburzenie szeregu procesów metabolicznych i hormonalnych, otyłość może doprowadzić do upośledzenia funkcji łożyska, poronienia, cukrzycy ciąży, makrosomii płodu oraz konieczności ukończenia porodu drogą operacyjną.

Otyłość stanowi jedną z głównych przyczyn zaburzeń płodności oraz niepowodzeń położniczych. Ze względu na makrosomię płodu oraz zwiększone ryzyko wystąpienia dystocji barkowej i urazów okołoporodowych, najczęstszą drogą ukończenia ciąży powikłanej otyłością jest cięcie cesarskie, nierzadko stanowiące wyzwanie dla zespołu prowadzącego poród.

W celu zmniejszenia liczby ciąży powikłanych otyłością konieczna jest edukacja pacjentek w zakresie badań laboratoryjnych, prawidłowej diety oraz pozytywnego wpływu aktywności fizycznej. Działania mające na celu wyrównanie masy ciała pozwalają obniżyć ryzyko zaburzeń ciąży, porodu i połogu oraz w sposób korzystny wpływają na przyszłość płodu i noworodka.

SŁOWA KLUCZOWE: otyłość, ciąża, poród, połóg.

Introduction

Obesity is commonly defined as having the body mass index (BMI) exceeding 30 kg/m² [1]. It is also defined as a chronic dysfunction of dietary drive, which leads to the growth of adipose tissue and consequently to destabilization of the energy homeostasis in an organism [2]. Nowadays, obesity is viewed as the most serious civilization disease [1], with a number of countries, par-

ticularly those well developed, dealing with the problem of a constantly growing number of people suffering from overweight or obesity. This is primarily attributed to the constant economic and technological changes. Modern civilizational progress has led to extensive lifestyle changes with increased consumption of highly processed foods, which are inexpensive in production but high in calories [3]. The wide availability of such products

and encouraging marketing techniques are attracting an increasing number of consumers. The technological progress has also had a marked negative impact on the general physical activity of people [1].

According to the health field model of Marc Lalonde, lifestyle is the greatest health determinant, having as high as a 53% impact on the health status of an individual. This indicates that dietary habits and physical activity play a significantly greater role in determining the health of the society in comparison with physical, environmental, and genetic factors and even medical care organizations [4].

Obesity may occur at any stage of human life, including the gestation period. In recent years, there has been a dynamic increase in the number of obese pregnant women, which requires the obstetric standards to undergo changes [1]. Obesity, as a clinical entity, is the main cause of diabetes, arterial hypertension, and atherosclerosis, among other conditions. As it is widely known, the well-being of the fetus and neonate mainly depends on the health status of the pregnant woman. Thus, any complication affecting the health of a pregnant woman may also have an impact on the functioning of the maturing fetus [5].

Definition of obesity and epidemiological information

In pregnant women, obesity is determined as having BMI of over 30 kg/m² at the first visit of pregnancy or during the first trimester. Obesity is divided into three degrees as follows: I–BMI 30.0–34.9 kg/m², II–BMI 35.0–39.9 kg/m², and III–BMI >40 kg/m². The third degree is referred to as morbid obesity [6].

Obesity typically results from a lifestyle characterized by a high-calorie diet and reduced physical activity. In addition, increased body weight may stem from endocrinological disorders, such as polycystic ovary syndrome, hypothyroidism, or Cushing's syndrome. According to the current standards, interdisciplinary teams dealing with obese patients should first determine the cause of obesity for the early initiation of the appropriate therapeutic process [6].

Currently, obesity is treated as a civilization disease and an epidemic [7]. According to 2016 statistics, as many as 13% of people around the world were considered obese. Data from the Central Statistical Office (GUS) indicate that in 2014 obesity was diagnosed in 46% of adult women in Poland. From the beginning of the 21st century, there has been a constant increase in the number of people with increased body weight. Reports have shown that the increase in the body weight of people is directly associated with the frequent consumption of foods rich in sugar [8].

Reproductive capability of obese women

The growing incidence of obesity has had a profound effect on the reproductive health of society [9]. It has been demonstrated that women with increased body weight may have complications with conceiving, as compared with women having a normal BMI. Obesity in adolescence may lead to reduced fertility in the later stages of life [10], which can be related to the dysfunctions of the hypothalamic–pituitary–ovarian axis. Women with obesity have a shorter luteal phase, as well as lower levels of follicle-stimulating hormone, luteinizing hormone, and progesterone [11]. Increased body weight also causes disturbances in the secretion of other hormones such as insulin or adipokines. Upon release by the adipose tissue, these hormones variably interact with numerous molecular pathways of insulin resistance or inflammation conditions, significantly affecting the cardiovascular system or interfering with oocyte maturation [10]. A study conducted on 45,000 transfers demonstrated that increased BMI correlated with lowered likelihood of successful gestation with the use of autologous oocytes, but not when egg cells from slim donors were used, which suggests a direct impact of obesity on the quality of oocytes [12]. In obese women, the production of gonadotropins is influenced by increased peripheral aromatization of androgens to estrogens. Insulin resistance and hyperinsulinemia associated with high body weight lead to hyperandrogenemia. As a consequence, the levels of sex hormone-binding globulin, growth hormone, and insulin-like growth factor-binding protein are reduced, whereas the level of leptin is increased, which severely affects the neuroregulation of the hypothalamic–pituitary–ovarian axis. Obesity is also a cause of miscarriages, significant obstetric history, or reduced well-being of the fetus during pregnancy [13]. In addition, spontaneous abortion is frequently observed among obese women. A meta-analysis of Metwally et al. showed that the risk of miscarriages is higher in women with a BMI ≥25 [14]. In a cohort follow-up study, Boots et al. determined that among women who had recurrent early miscarriages, obese women had a 58% risk of euploid miscarriage as compared with nonobese women with a 37% risk [15].

Dietary recommendations

General dietary recommendations for obese pregnant women indicate that their daily calorie intake should be restricted to a maximum of 2000 kcal. In the case of women accustomed to a particularly high daily consumption, it is recommended that the daily calorie intake should not exceed 33%. Carbohydrates should constitute 40–55% of daily calorie intake, and patients should be

encouraged to consume polysaccharides characterized by a longer absorption time. Fats should be limited to 30% of the total daily calorie value, with trans and saturated fats substituted by polyunsaturated fats [6]. Proteins should constitute 20–30% of the daily calorie value of meals. It has been demonstrated that the risk of excessive body weight is correlated with the consumption of fried and fast foods [16]. The daily meal plan should contain three main courses and 2–3 minor snacks [6]. Moreover, attention should be paid to the glycemic index of the products consumed. A study conducted on pregnant women proved that a diet characterized by a higher glycemic index is associated with excessive body weight, in comparison with a diet containing products with a lower glycemic index and balanced content of nutrients [17]. It is advised that during pregnancy, obese pregnant women should follow a similar diet as pregnant women with diabetes [18].

Physical activity

It is widely known that obesity stems from the lack of balance between daily calorie intake and physical activity. Regular physical activity, for about 45–60 minutes per day, prevents the excessive increase of body weight and significantly reduces the risk of cardiovascular diseases. For individuals who are already diagnosed with obesity, moderate physical activity for about 80–90 minutes every day is recommended [19]. It is equally important for the patient to count the number of steps per day. A number of steps up to 5000 per day is considered as lack of activity, while a number between 5000 and 7499 is considered as low activity. It is recommended to start with a minimum of 10000 steps per day. In addition, it should be remembered that the oxygen consumption during physical activity should not exceed cardiac acceleration by 30% of the cardiac reserve [6].

In the case of pregnant women, physical activity should be customized to each patient and introduced gradually. The American College of Obstetricians and Gynecologists recommends that in the absence of medical complications or significant obstetric history, a pregnant woman should perform moderate physical activity for at least 30 minutes per day. Activities that are associated with a high risk of falling or involving significant heights should be avoided. Due to the benefits brought by physical efforts, pregnant individuals diagnosed with obesity should be constantly motivated to perform daily activities. It has been proven that doing exercises three times per day for 10 minutes each time is as effective as 30 minutes of activity done once per day. Regular physical activity also significantly reduces the risk of preeclampsia, eclampsia, and gestational diabetes [20].

Laboratory examinations preceding pregnancy

Every woman who plans pregnancy should perform the prepregnancy laboratory examinations. Diabetes is the most severe complication associated with obesity in women of child-bearing age. In recent years, it has been observed that the number of women with type 2 diabetes in reproductive age significantly increases with the increase in the number of women with obesity. Therefore, examination for type 2 diabetes is valid for obese women during the first prenatal visit, with the use of standard diagnostic criteria recommended for nonpregnant women [18]. During the pregnancy planning period, the level of glucose on an empty stomach should be 70–90 mg/dl (3.9–5.0 mmol/l), while in the first hour after commencing a meal the level should be below 140 mg/dl (<7.8 mmol/l). Glycemia testing prior to getting pregnant is particularly crucial for obese women due to the neonatological consequences of untreated hyperglycemia [22].

Regular measurement of arterial blood pressure is equally important in the case of obese individuals. An arterial blood pressure value of 140/90 mm Hg prior to conception or before 20 weeks of pregnancy indicates hypertension in women. As untreated hypertension increases the risks of complications, such as preeclampsia or eclampsia, arterial blood pressure should be regularly checked in obese women of child-bearing age [23].

Assessment of thyroid function is also mandatory in obese patients. The level of thyrotropin (TSH) should be in the range of 0.4–2.5 mIU/l, and any value that does not fit in the mentioned range indicates the need for endocrinological consultation to exclude thyroid diseases [6]. In particular, obese patients should be monitored for hypofunction or Hashimoto's disease as these are associated with excessive body weight [24].

Independent of gender and age, obesity is an indicator of lipid profile disturbances. Women planning for pregnancy should undergo laboratory examinations for the assessment of triglyceride levels and cholesterol fractions. If these parameters are found to be abnormal, a low-fat diet should be immediately adopted and the level of physical activity should be increased [6]. If a need for pharmacotherapy with statins arises, the patient must be informed on taking care and avoiding pregnancy. According to the latest study, statins do not exhibit teratogenic effects. However, as long as the effect of these drugs on the fetus remains unclear, and opinions seem contradictory, they should be avoided in the brief time before and during pregnancy [25].

Care during pregnancy

After confirming pregnancy in an obese woman, laboratory testing should be repeated up to a period longer than 3 months. In the case of an unplanned pregnancy, the standard is to perform all tests in the shortest possible time after pregnancy diagnosis. Controlling body weight throughout the gestation period is imperative. The general increase of body weight in obese women during pregnancy should not exceed 7 kg, and reduction of body weight is recommended if the BMI of a pregnant woman exceeds 40 kg/m² [6]. The most appropriate method of body weight reduction is the introduction of a balanced diet, adapted to a given patient and her obstetric history, as well as the level of physical activity. It has been demonstrated that moderate physical effort does not increase the risk of miscarriage, preterm delivery, or death of fetus or neonate. Physical activity should also be treated as an important determinant of treatment for overweight and obesity, even during the prenatal period. Pregnant women should be educated on complications of excessive body weight [26]. The consequences of untreated obesity include, but are not limited to, preeclampsia, eclampsia, gestational diabetes, and arterial hypertension [27]. Another parameter that should be constantly monitored is arterial blood pressure. Every obese patient with hypertension should perform routine self-monitoring with a domestic pressure meter, report irregularities as soon as possible, and undergo appropriate treatment.

Special attention should be paid to the risk of thromboembolism in pregnancy complicated with obesity. If second- or third-degree obesity is diagnosed, from the beginning of pregnancy to 7 days postpartum, prophylaxis with low-molecular-weight heparin should be provided, with the dosage adjusted according to the patient's body weight. In women diagnosed with at least one additional risk factor, heparinization should also be performed during puerperium (up to approximately 6 weeks postpartum). Another risk factor for thromboembolism is the need for regular use of compression stockings [6].

Regardless of the result of the glucose load test performed at the beginning of pregnancy, obese patients should undergo repeated sugar curve tests in the standard, recommended period between 24 and 28 weeks of pregnancy. For women with a BMI exceeding 35 kg/m², the test should be repeated at 32 weeks of pregnancy [6]. According to the generally assumed standards, a glycemic index value exceeding 125 mg/dl on an empty stomach, 180 mg/dl at 60 minutes of the test, or 200 mg/dl at 120 minutes of the test indicates the diagnosis of diabetes. Treatment of diabetes commences

with lifestyle changes, with the introduction of an appropriate diet based on glycemic index values and with moderate physical activity. In the case of uncontrolled diabetes, insulin treatment is recommended [28].

Fetal supervision is required in pregnancy complicated with obesity due to the associated consequences on the fetus. Although no unfavorable perinatal effects associated with obesity have been demonstrated in women giving birth, available data show that increased insulin resistance and accompanying hyperinsulinemia, inflammation, and oxidative states may possibly lead to early placental disorders [29]. Ultrasound examinations should be performed regularly in compliance with the recommendations provided by the Section of Ultrasonography of the Polish Gynaecological Society. Performing ultrasound and cardiotocographic control in obese women is difficult due to the increased amount of adipose tissue within the trunk and requires experienced gynecologist-obstetricians [6]. During the examination, attention should be paid to the dimensions and weight of the fetus due to the significantly higher risk of macrosomia – a condition characterized by abnormal fetal weight (>4000 g) [30]. Therefore, it is recommended to perform an ultrasound examination before the assumed labor date in order to make the final decision on the route of pregnancy completion [6].

Care during the delivery

Choosing an appropriate medical facility for childbirth is critical in the case of obesity-complicated pregnancy. The selected center should have the necessary medical equipment, according to the needs of the patient, as well as handling the complications that may arise during delivery.

The most frequent perinatal effects, closely related to the increased weight of the pregnant woman, are crotch injuries, which occur due to less susceptibility to stretching. During vaginal delivery, shoulder dystocia may also occur, which can consequently lead to a collarbone fracture or cervical dystonia of the neonate. In addition, obesity increases the risk of perinatal hemorrhage, resulting in perinatal anemia. Clinical entities accompanying obesity, such as diabetes or hypertension, may also increase the risk of perinatal mortality [6].

The assessment of biometrics and fetal welfare is challenging in an obese woman giving birth due to the increased amount of adipose tissue within the trunk. Difficulties associated with performing a cardiotocographic test should be communicated to the patients. Due to the limitations in measuring and interpreting the cardiotocography records, it is recommended to select a medical center that is equipped with an ultrasound apparatus in the delivery room [6].

Considering the number of complications related to excessive body weight, the gestation period should be considered as an opportunity to encourage an obese pregnant woman to adopt a balanced diet and regular physical activity [31]. The body weight of the mother has a pronounced impact on the decision concerning the route of labor completion. If the fetus is diagnosed with macrosomia, the interdisciplinary team taking care of the patient may decide to induce delivery. Due to the excessive amount of adipose tissue and lack of fitness, obstetrical forceps or vacuum extraction are more frequently used for obese women as a surgical means of completing vaginal delivery in comparison with healthy women. However, it is mostly recommended to complete an obesity-complicated pregnancy with a Cesarean section.

Operational completion of delivery in an obese mother poses a special challenge for the team conducting the delivery. Intubation and anesthesia of the patient are difficult. An anesthesiologist assisting during the operation should carefully choose the doses of drugs to be administered, based on the body weight of the woman giving birth, and hence the employees of the operating suite should be prepared to accept an obese patient before her arrival [6].

No precise data on the most favorable technique of Cesarean section in obese women are currently available, and there is no evidence demonstrating the advantage of incision along the midline over the transverse line. Some authors state that longitudinal incision below the navel should be taken into consideration to gain better access to the operation field and shorten the operation time, which would significantly reduce the blood loss of the patient [32].

Directly after the extraction of the fetus, a neonatological examination should be performed due to the increased risk of meconium aspiration syndrome, mechanical perinatal injuries, hypoglycemia, and hyperbilirubinemia and, above all, breathing abnormalities [33].

Puerperium

The postpartum period is characterized by a high risk in the case of an obese patient, as thromboembolic disorders may occur, particularly following a Cesarean section. It is necessary to use low-molecular-weight heparin and mobilize the patient as soon as possible after the surgery. Endocrine disruption and reduced mobility may lead to lactation disturbances and increased abandonment of breastfeeding during puerperium. Therefore, it is advised that obese postpartum women should consult a reliable midwife dealing with lactation. If dietary changes and physical activity did not result in desired

outcomes, a glucose load test should be repeated in the period between 6 and 12 weeks after birth [34].

Summary

Excess body fat is a threat, especially for pregnant women, due to its negative effects on the developing fetus. Education on proper nutrition and physical activity is often underestimated, which may also be the reason for the increasing number of obese women of reproductive age. Nowadays, particular attention should be paid to educating pregnant women in a healthy lifestyle, both for their own good and for that of their developing child.

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