

# THE INFLUENCE OF OVERWEIGHT AND OBESITY ON WOMEN'S PREGNANCY, LABOUR AND FETAL DEVELOPMENT

## VLIV NADVÁHY A OBEZITY NA TĚHOTENSTVÍ ŽENY, POROD A VÝVOJ PLODU

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### Abstract

**Background:** Obesity is a global disease whose incidence in recent years increases dramatically. It contributes to the occurrence of many serious diseases (diabetes, high blood pressure, diseases of the joints, spine, sleep disorders, infertility), and also involves the human physical condition (increased fatigue, decreased physical fitness, lower performance, feelings of exhaustion and others). Obesity and overweight negatively affect fertility in women, pregnancy and fetal development.

**Objective:** The aim of the article was to process the available Czech and foreign sources of relevant information regarding the impact of female overweight and obesity on pregnancy, childbirth and fetal development.

**Method:** The article is designed as a theoretical essay.

**Results:** It was found that maternal obesity leads to congenital defects in children, increased perinatal mortality, shoulder dystocia, fetal macrosomia and stillbirth. During pregnancy, complications such as gestational diabetes, infertility, miscarriage, thromboembolic diseases, preeclampsia, gestational hypertension and complications at birth (premature birth, higher likelihood of C-section birth, induced labour, prolonged labour, greater post-partum haemorrhage). After birth, obese women suffer of infectious complications and failure of lactation more frequently.

**Conclusion:** An important role in the issues of overweight and obesity is played by education. Education is most aptly received by the preconception period women, or better still, puberty-aged girls. Women should receive information about the ideal weight, weight gain during pregnancy and healthy lifestyle. This should include calculating their BMI, providing information on the impact of obesity on pregnancy, childbirth and fetal development.

### Keywords

obesity, overweight, female fertility, pregnancy, fetal development, results

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## Abstrakt

**Východiska:** Obezita je celosvětové onemocnění, jehož incidence v posledních letech výrazně stoupá. Přispívá ke vzniku řady závažných onemocnění (cukrovka, vysoký krevní tlak, nemoci kloubů, páteře, poruchy spánku, infertilita) a dotýká se také fyzické stránky člověka (zvýšená únava, menší fyzická kondice, menší pracovní výkonnost, pocity vyčerpání a jiné). Obezita i nadváha negativně ovlivňují fertilitu ženy, průběh těhotenství i vývoj plodu.

**Cíl:** Cílem článku bylo zpracovat z dostupných českých a zahraničních zdrojů relevantní informace týkající se vlivu nadváhy a obezity ženy na těhotenství, porod a vývoj plodu.

**Metoda:** Článek je koncipován jako teoretická stať.

**Výsledek:** Bylo zjištěno, že u dětí vlivem obezity matky dochází k vrozeným vývojovým vadám, ke zvýšené perinatální úmrtnosti, dystokii ramének, makrosomii plodu a mrtvorozenosti. V těhotenství se objevují komplikace typu gestačního diabetes mellitus, neplodnosti, potratu, tromboembolické nemoci, preeklampsie, gestační hypertenze a komplikace při porodu (předčasný porod, vyšší pravděpodobnost porodu císařským řezem, indukovaný porod, protrahovaný porod, větší poporodní krvácení). Po porodu se u obézních žen častěji vyskytují infekční komplikace a selhání laktace.

**Závěr:** Důležitou roli v problematice nadváhy a obezity hraje edukace. Vhodným obdobím pro edukaci je u ženy prekoncepční období nebo ještě lépe období dospívání u dívek. Žena by měla obdržet informace o ideální hmotnosti, hmotnostním přírůstku v těhotenství a zdravém životním stylu. Součástí by mělo být vypočítání BMI, poskytnutí informací o vlivu obezity na těhotenství, porod a vývoj plodu.

## Klíčová slova

obezita, nadváha, plodnost ženy, těhotenství, vývoj plodu, výsledky

## INTRODUCTION

### Obesity in the general context

Obesity is defined as excessive accumulation of fat tissue in the body outside the standard limits which poses a health risk (Krajčovičová and Hudeček, 2008; Müllerová, 2013; Krejčí, 2016; WHO). The World Health Organization further defines overweight and obesity more specifically. Body Mass Index (BMI) over 25 is considered overweight and BMI over 30 as obese (WHO). This problem has grown to epidemic proportions and over 4 million people die of it every year. The rate of overweight and obesity is increasing. Obesity is becoming a very serious socio-economic problem worldwide. Obese people have

a reduced quality and length of life (Braunerová and Hainer, 2010). The sad fact is that this epidemic does not spare children. From 1975 to 2016, the prevalence of overweight and obese children and adolescents 5–19 years of age increased worldwide and almost quadrupled from 4% to 18% (WHO). This statement is confirmed by Bakun et al. (2018), who reported that in the United States, obesity is the most common chronic disease that affects adults in addition to children as well (Bakun et al., 2018). Obesity is one of the sides of the double burden of malnutrition and in every region except sub-Saharan Africa and Asia, there are more obese people than underweight people. The prevalence of obesity is rising not only in developed, but also in developing countries (Krejčí, 2016). The vast majority of overweight or obese children live in developing countries where the increase rate is more than 30% higher than in developed countries (WHO). Krajčovičová and Hudeček (2008) and Krejčí (2016) report that epidemiological data show a global pandemic disease whose incidence in recent years significantly increases (Krajčovičová and Hudeček, 2008; Krejčí, 2016). According to Bakun et al. (2018), obesity is the second leading cause of death. Obesity has serious health consequences and it is the underlying cause of metabolic diseases (lifetime increased risk of type II. diabetes mellitus), cardiovascular diseases, orthopaedic complications, psychiatric disorders, as well as some cancers. For women, this risk is particularly breast and genital cancer. It is estimated that the basis of 20% of tumours is precisely obesity. Besides the above-mentioned cancer diseases, obesity increases the risk of cancer of the endometrium, the gall bladder, the kidneys and the risk of oesophageal adenocarcinoma (Müllerová, 2013). Obesity contributes to increased mortality (Braunerová and Hainer, 2010) and it is one of the greatest health problems of the present time (Melzer and Schutz, 2010). According to Andělová (2013), obesity is currently ranked among the most significant health risks (Andělová, 2013). The prevalence of overweight and obesity in women over the last year has increased threefold. Obesity has a negative effect on both overall and reproductive health of women (Espinós et al., 2020). Müllerová (2013) reported that due to the accumulation of fats in the organism, substances are produced which impair the whole organism as a system. Determining the limits of body fat ratio for each person is difficult and depends on the sex, age, muscle size and other variables. Therefore, the BMI is widely used universal screening tool to determine overweight and obesity which expresses the relationship between body weight and body height. Obesity is simply an imbalance between energy intake and expenditure, when energy intake exceeds that of the expenditure (Krejčí, 2016; Müllerová, 2013). The causes of obesity are multi-factorial, including genetic, hormonal, behavioural and environmental influences (Müllerová, 2013).

## DESCRIPTION OF RESEARCH STRATEGY

### Objective

The aim of the article was to process the available Czech and foreign sources of relevant information regarding the impact of overweight and obesity in women in pregnancy, childbirth and fetal development.

## Methodology

The article is designed as a theoretical essay whose method is document content analysis. This method is used to create inferences, conclusions, implications, deductions or hypotheses (Farkašová, 2006). Documents analysis is further defined as a qualitative and interpretative analysis of written testimony that explains human behaviour. In practice, this entails analysis of any documents where the researcher works with data that has already been processed. The researcher him or herself does not gather data during their research (Kutnohorská, 2009). Considered as documents, according to Hendl (2016), are all traces of human existence (books, newspaper articles, magazines, films, photos). Document analysis was conducted over the period from June to November 2020. On the basis of these sources, main documents were selected that met the specified keywords.

## OBESITY AND FERTILITY IN WOMEN

Extreme nutritional states reduce fertility in women (Müllerová, 2013). In women of childbearing age, obesity affects the reproductive functions. It leads to impaired formation of ova and consequently to infertility. Obesity is also associated with the production of the female hormone oestrogen. Oestrogen is a hormone whose source is found in the ovaries. In addition, oestrogens are also produced by the adrenal glands and adipose tissue. If the woman is obese (has a lot of fat tissue), the organism has too much oestrogen, which may cause hormonal imbalance, consequently leading to deterioration of the menstrual cycle. The woman menstruates irregularly or stops menstruating completely, thus the woman does not ovulate and loses the ability to become pregnant (Neubergerová, 2012). The significance of the impact of the growing obesity epidemic on overall health is great but it is reproduction that is particularly burdened by it. It is known that obesity affects reproductive functions in women in many ways. Due to obesity, changes in the levels of reproductive hormones occur in women, influencing the development of oocytes and of the endometrium appears and also causing increased abortion rates to occur. Assisted reproduction techniques lead to negative results. Menstrual cycle disorders are three times more common in obese women (Glenn, Harris and Lindheim, 2019). Obesity threatens the reproductive function of women and is associated primarily with infertility and an increased risk for both the mother and the foetus during pregnancy and childbirth, including restricted lactation in the post-par tum period (Müllerová, 2013). In women, obesity may result in the polycystic ovary syndrome, irregular anovulatory cycles and fertility disorders (Krajčovičová and Hudeček, 2008). The risk of anovulatory infertility in obese women increases by 4 % with each BMI point. The cause of anovulatory cycles is polycystic ovary syndrome (Krejčí, 2016). Polycystic ovaries and hormone level change that occurs due to obesity may affect the quality of the ova, fertility, development of the embryo and the implantation of fertilized ovum. Obesity is also associated with endometrial abnormalities and negative ovum implantations (Espinós et al., 2020). Obese women (in whom other cause of infertility have been excluded) have an increased likelihood of conception only after weight loss of 10 to 15 % of the initial weight. Weight

loss is recommended for women already in preconception period, they are thus reduced health risks that are caused by obesity in pregnant women (Müllerová, 2013). Women are at risk of developing gestational diabetes, gestational hypertension and preeclampsia while the risk of urinary tract infections, genital inflammation and thromboembolism when pregnant increases (Müllerová, 2013).

## OBESITY AND ITS IMPACT ON PREGNANCY AND CHILDBIRTH IN WOMEN

Obesity is a global health problem among pregnant women (Hajagos-Tóth et al., 2017). In the last decade, global prevalence of overweight and obesity has increased rapidly and contributes to chronic diseases. Increasing prevalence of overweight and obesity affects women of reproductive age (Yang et al., 2019). Obesity is considered a modern plague and represents a major problem for pregnancy (Rasmussen et al., 2008). Maternal overweight and obesity increases the risk of complications during maternity and negatively affects the course of childbirth. Maternal overweight and obesity are associated with gestational diabetes mellitus, preeclampsia, C-section birth, premature birth, macrosomic foeti and hospitalization of the child at intensive care units. Due to maternal obesity, children are at risk of macrosomia, shoulder dystocia, congenital anomalies, stillbirth and neonatal death. It was found that maternal obesity has a negative influence on the subsequent development of the child (Yang et al., 2019). Vojtěch et al. (2013) reports that obesity during pregnancy represents the risk of many complications for the mother and it is associated with increased maternal morbidity and mortality (Vojtěch et al., 2013). Two trends currently meet in pregnant women. Obesity moves to increasingly lower age-groups and maternity is postponed to a later age, which is precisely associated in women with a further weight gain (Ulmannová, Špálová and Štechová, 2014). Vašíčková (2003) reports that pregnancy diagnostics by itself is already difficult due to large amount of fat tissue in obese women. This is also confirmed by Vojtěch et al. (2013). Detection of pregnancy in women of BMI over 30 is already problematic, but with the technical development of ultrasound, especially of the transvaginal probe, chances of confirming intrauterine pregnancy increase. Detecting pregnancy using the transvaginal probe can create uncertainty in terms of detection and localization of the embryo's vitality. In the first trimester screening, obesity has an adverse effect on ultrasound detection which is why obese pregnant women are usually sent to a superconsiliary workplace (Vojtěch et al., 2013). Obese women are more difficult to examine and due to the hormonal disturbances and disturbed menstrual cycle, they may not even be able to recognize that they are pregnant (Vašíčková, 2003, p. 18). Obesity in pregnant women is associated with increased risk not only for pregnant women, but also a risk to the newborn. They are at risk of lower Apgar scores at birth, the risk of hypoglycemia in early post-partum, increased likelihood of congenital neural tube defects or cryptorchidism in male offspring. Obese mothers initiate lactation later and generally breastfeed for a shorter time than mothers of normal weight (Müllerová, 2013). The same claim is also put forth by Andělová (2013) who sees in pregnancy in women who are overweight or

obese an increased risk for the unborn child and identifies a number of pregnancy and neonatal risks associated with maternal obesity (congenital malformations of the fetus, hypertrophic feti, gestational hypertension, gestational diabetes mellitus, preeclampsia, fetal death, higher neonatal death rate, fetal growth retardation, higher number of newborns who require admission to an intensive care unit) (Andělová, 2013). Bakun et al. (2018) states in his article that obese pregnant women are at higher risk of gestational diabetes mellitus, miscarriage, stillborn child, preeclampsia, thromboembolism, sleep apnoea, maternal deaths and abnormalities of fetal development. They also cite the anaesthesiological risks (problems with the insertion of an epidural catheter into the epidural space, problems with spinal anaesthesia, difficult intubation and difficult maintenance of adequate respiration under anaesthesia). Women suffering from obesity are also at risk of post-partum complications (increased risk of infection, hypogalactia, postpartum depression). The risk of hospitalization in intensive care units is one and half times higher with children of obese mothers. (Bakun et al, 2018). Andělová (2013) states that pregnancy complications for overweight and obese women are associated with the large amount of fat, especially in the visceral region. Increased visceral fat is associated with insulin resistance, chronic inflammation and lipotoxicity with possible harmful effects on placental vasculature and subsequently degraded conditions for fetal development (Andělová, 2013). Weight gain during pregnancy is important predictor of not only the infant's birth weight, but also other perinatal and obstetric complications, especially gestational hypertension, preeclampsia, gestational diabetes mellitus, C-section birth, premature birth, fetal macrosomia, shoulder dystocia, fetal congenital defects and stillborn child (Krejčí, 2016). Obesity and gestational diabetes mellitus represent higher risk of gestational hypertension, preeclampsia, births of hypertrophic fetuses, higher numbers of C-section births, fetal shoulder dystocia, labour inductions and preterm births. Pre-existing hypertension (hypertension developed before pregnancy) also brings about risks of preeclampsia, placental abruption, gestational diabetes, premature labour, small fetus and stillbirth (Krejčí, 2016). Obesity in women may also have adverse effect on uterine contractility and thereby shorten or extend the gestational period, resulting in premature or overdue birth, respectively. Overweight and obesity during pregnancy may lead to a higher incidence of spontaneous abortions (Hajagos-Tóth et al., 2017). An interesting finding was achieved by Kanguru et al. (2017). They found that obesity in women of reproductive age in developing and industrialized countries differs. Generally, obese women are more prone to pregnancy complications like pre-eclampsia, wound infection, aesthetic complications, miscarriages and cardiovascular problems in pregnancies with frequent subsequent maternal deaths. This obstetrical risk is potentially higher in developing countries, where specialized obstetric care may not be sufficient and accessible (Kanguru et al., 2017).

## **OBESITY AND ITS EFFECTS ON FETAL DEVELOPMENT**

Overweight and obesity also represent a risk to the fetus. The common mechanism of such complications is the mother's insulin resistance which leads to excessive nourishment of the fetus. The insufficient use of substances due to insulin resistance in the mother's metabolism cause accumulation of these substances in the bloodstream of the child, which affects birth weight (increase). In the final effect the macrosomic fetuses are born. Fetuses of larger birth weight in obese women and fetal macrosomia are associated with a higher risk of birth injury, need for surgical childbirth and a series of neonatal complications (Krejčí, 2016). Beside high birth weight, these newborns tend to suffer of hypoglycemia in the first hours after birth (Andělová, 2013). Ulmannová, Špálová and Štechová (2014) also add autism spectrum disorders to the list, observing that maternal obesity before pregnancy and large weight gain during pregnancy (over 18 kg) are significantly associated with autism spectrum disorders in children, while other complications mentioned by the authors include spina bifida, omphalocele, cardiac defects and the occurrence of various other associated defects (Ulmannová, Špálová and Štechová, 2014). Vojtěch et al. (2013) add occurrence of other congenital defects of the fetus to the list of complications (anal atresia, hypospadias, disorders of the limbs and diaphragmatic hernia) (Vojtěch et al. 2013).

## **OBESITY PREVENTION IN PREGNANCY**

Pregnancies of overweight and obese women and women with excessive pregnancy weight gain are accompanied by a number of pregnancy and perinatal complications. In terms of prevention, education is vital for overweight and obese women already in the preconception preparation in order to achieve weight loss before pregnancy and eliminate the negative effects of obesity on the mother and her foetus. During pregnancy, it is advisable to choose a strategy that will lead to optimal weight gains in women. Before any infertility treatment or assisted reproduction, obese women with infertility should be offered interventions aimed at gradually reducing body weight and starting treatment of comorbidities (Krejčí 2016). Targeted interventions (diet, physical activity, weight monitoring, waist circumference, education about diet, diets records, setting concrete targets, etc.) as part of preconception care in obese women have a positive impact on women's fertility. More than ten percent weight reduction in obese women before pregnancy increases the probability of a live birth; altered regimen before pregnancy also prevents excessive weight gains during pregnancy (Krejčí, 2016). It is very important to educate women of childbearing age about the harmful effects of overweight and obesity for their future pregnancy and the possible consequences for their children (Andělová, 2013). The main objective should be to preserve reproductive health of women, allowing a healthy pregnancy and foetal development.

## CONCLUSION

Pregnant women should choose appropriate physical activities with regard to the age of pregnancy and their fitness and proper nutrition. Education about the negative impact of obesity on fertility of overweight women should take place before women's pregnancy in the preconception period, better even in the period of puberty when girls become sexually mature, and menarche occurs in girls. In this period, education may take the primary preventive effect and can eliminate the negative effects of obesity and overweight in girls. Subsequently, it can positively affect their reproductive health, pregnancy and fetal development.

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