The obesity impact on fertility

Abstract

Introduction: The rising prevalence of child obesity has a profound impact on worldwide health, nowadays, the children that have an increased body mass index (BMI) associated with: diet, sedentarism and genetic influence, results in obese child since early ages. The problem has been demonstrated, that since embryo stage, uterus environment promotes expression of genes that predispose degenerative diseases such as diabetes, hypertension, and obesity. Obesity during the childhood continue to puberty create a proinflammatory microenvironment that impact germ cells directly. Male obesity is associated with compromised spermatogenesis and spermogenisis due to hormone levels alterations. Female obesity is associated to ovulatory disorders, poorer outcomes in fertility treatment and requires higher doses of medications for ovulation induction. Pregnancy rate vary among studies however there is a clear association between obesity and early pregnancy loss. There are several mechanisms why obesity causes fertility problems. The increase of leptin concentration, decrease of adiponectin levels, variation of kiss pectin expression to reach puberty all affect hormonal level and influence germ cell development.

Objectives: To describe the impact of obesity in childhood and the possible negative prognosis on future fertility.

Methods: Literature search was performed in PubMed from January 2000 to March 2017 using the search terms child obesity and infertility, spermatogenesis, spermiogenesis, ovulation, oocyte, and pregnancy rates.

Conclusion: Obesity affects fertility since intrauterine development all the way though adult life. Obesity has multiple effects that involve fertility that creates a constant proinflammatory microenvironment in germ cell that have a negative impact on reproduction in adults of both genders.

Keywords: child obesity, fertility prognosis, germ cells
abnormally elevated in obese girls, possibly reflecting the effects of hyperandrogenism and resembling findings of adult polycystic ovary syndrome. Interestingly, weight loss has been associated with a significant decrease in testosterone concentrations in obese boys and girls. These suggest that childhood obesity contribute to the appearance of endocrine disturbances during adolescence, and increase the risk of developing infertility later in life.

**Adult male fertility affections associated to obesity**

The adult age male need to complete a functional spermatogenesis, these process is highly complex and specialized involved various mechanisms (hypothalamus, pituitary, Leydig cells, Sertoli cells, sex steroids). Hypothalamic–pituitary–gonadal (HPG) axis is vital for the reproductive function, and can be dysregulated with obesity. There is a direct correlation between hypogonadism and obesity, due to higher estrogen levels and hypogonadism, affecting aromatase receptors and Leydig and Sertoli behavior. In obesity, testosterone is metabolized to estradiol by the cytochrome P450 enzyme aromatase in adipose tissue, which elevate estrogens levels. The increased of estrogens negative feedback upon the HPG axis and thus spermatogenesis. Obesity promotes expression of proinflammatory cytokines like TNF and IL-6 that down regulate testosterone and thus spermatogenesis.

Testosterone is involved in insulin regulation, metabolism of lipids and body composition. Hyperinsulinemia has been shown to have a negative effect on spermatogenesis with a significantly higher level of nuclear and mitochondrial DNA damage. At the same time, increased concentration of estrogen diminishes SHBG levels. Leptin is a hormone secreted by adipocytes to regulate satiety, but is also involved in sexual maturation and reproduction. Leptin stimulates GnRH release; in obesity, excess leptin cause a resistance later in life. The production of inhibin B by Sertoli cells is the most effective marker for normal spermatogenesis. Inhibin B is a growth-like factor which acts in the testes to inhibit FSH production and to stimulate testosterone levels while endocrine changes modify concentration of insulin, sex-hormone-binding-globulin (SHBG), leptin, and inhibin B, all affecting free testosterone levels.

Obesity is a worldwide problem that affect all ages, the impact of hypogonadism and obesity, establishes a higher incidence of endometrial cancer in obese patients. Animal models have shown that leptin and leptin receptor (LEPR) play a relevant role in the regulation of implantation. Obesity disrupts leptin/LEPR which may disturb endometrial receptivity and implantation leading to impaired fecundity. The effects of leptin on reproduction are not homogenous, and both stimulatory and inhibitory functions have been described. Although it is known that leptin has a complex role in endometrium functionality basic science and clinical studies area necessary to comprehend the effect of obesity on implantation and early pregnancy.

**Conclusion**

Obesity is a worldwide problem that affect all ages, the impact of obesity and fertility involves multiples variants that creates a constant proinflammatory microenvironment in germ cell that have a negative impact on reproduction. We need to empathize the role of the hormone axis in both genders. In male increased BMI affect the testosterone levels and elevated ROS that damage sperm membrane and DNA. In women obesity modify the hormonal axis presenting ovulatory dysfunction and a decrease at endometrial receptivity affecting fertilization rate. Lifestyle modification is important to diminish inflammatory exposure and avoid long microenvironment deregulation on germ cells.

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**Conflict of interest**

Author declares there is no conflict of interest.

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