



International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Operating Publisher
SciFormat Publishing Inc.
ISNI: 0000 0005 1449 8214

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Calgary, Alberta, T3E0A7,
Canada
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ARTICLE TITLE	THE RELATIONSHIP BETWEEN OBESITY AND FEMALE FERTILITY
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DOI	https://doi.org/10.31435/ijitss.2(50).2026.5517
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RECEIVED	10 April 2026
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ACCEPTED	17 June 2026
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PUBLISHED	30 June 2026
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LICENSE	
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THE RELATIONSHIP BETWEEN OBESITY AND FEMALE FERTILITY

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ABSTRACT

Obesity has become a major global public health concern, with increasing prevalence among women of reproductive age. The aim of this study was to analyze the relationship between obesity and female fertility based on scientific evidence from studies indexed in the PubMed database. A literature review was conducted including peer-reviewed articles evaluating the impact of body mass index (BMI) on reproductive parameters such as menstrual regularity, ovulation, ovarian reserve, time to pregnancy, and outcomes of assisted reproductive technologies (ART). The findings indicate that obesity negatively affects fertility through hormonal imbalance, insulin resistance, chronic inflammation, and disruption of the hypothalamic–pituitary–ovarian axis. Obese women are more likely to experience ovulatory dysfunction, prolonged time to conception, and reduced effectiveness of ART procedures. Additionally, obesity is associated with poorer oocyte quality, lower implantation rates, and increased risk of miscarriage. Evidence suggests that moderate weight loss can significantly improve reproductive outcomes. In conclusion, obesity represents an important modifiable risk factor for female infertility, and appropriate lifestyle interventions may enhance fertility potential.

KEYWORDS

Obesity; Female Fertility; BMI; Infertility; Ovulation; Assisted Reproduction

CITATION

Alicja Sokołowska, Maria Golińska, Natalia Wasilewska, Marcin Masłowski, Piotr Dudziak, Łukasz Wabiszczewicz, Anna Nowak, Natalia Kita, Tomasz Woźniak, Tomasz Mróz, Zuzanna Filipiak. (2026) The Relationship Between Obesity and Female Fertility. *International Journal of Innovative Technologies in Social Science*. 2(50). doi: 10.31435/ijitss.2(50).2026.5517

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1. Introduction

Obesity has emerged as one of the most pressing global public health challenges of the 21st century. According to international epidemiological data, the prevalence of obesity has increased dramatically over the past several decades, affecting individuals across all age groups. Particularly concerning is the increasing prevalence of obesity among women of reproductive age. Obesity is typically defined using body mass index (BMI), a measure calculated as weight in kilograms divided by height in meters squared. According to widely accepted criteria, individuals with a BMI ≥ 30 kg/m² are classified as obese, while those with a BMI between 25 and 29.9 kg/m² are considered overweight.

Excess body weight has been associated with numerous health complications, including metabolic syndrome, type 2 diabetes, cardiovascular disease, and certain types of cancer. However, in recent years increasing attention has been paid to the impact of obesity on reproductive health. In women, obesity has been identified as an important risk factor for infertility, menstrual irregularities, and adverse pregnancy outcomes.

Infertility is commonly defined as the inability to achieve pregnancy after 12 months of regular unprotected sexual intercourse. It is estimated that infertility affects approximately 10–15% of couples worldwide. Female factors contribute to nearly half of infertility cases, highlighting the importance of understanding conditions that impair female reproductive capacity.

Obesity can influence female fertility through multiple biological mechanisms. Adipose tissue is now recognized as an active endocrine organ capable of secreting hormones, cytokines, and metabolic regulators that affect numerous physiological processes. Excess adiposity leads to hormonal disturbances, insulin resistance, chronic inflammation, and oxidative stress, all of which may interfere with normal reproductive function.

One of the primary pathways through which obesity affects fertility is disruption of the hypothalamic–pituitary–ovarian (HPO) axis. This regulatory system coordinates the secretion of gonadotropin-releasing hormone (GnRH), luteinizing hormone (LH), and follicle-stimulating hormone (FSH), which together regulate ovarian follicular development and ovulation. Alterations in this hormonal signaling network may lead to ovulatory dysfunction, which represents one of the most common causes of female infertility.

Furthermore, obesity is strongly associated with polycystic ovary syndrome (PCOS), a complex endocrine disorder characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology. PCOS is one of the leading causes of infertility in women and is frequently accompanied by obesity and insulin resistance.

In addition to affecting ovulation, obesity may also impair oocyte quality, endometrial receptivity, and embryo development. Studies have shown that obese women may experience lower success rates during assisted reproductive technologies (ART), including in vitro fertilization (IVF), and may have a higher risk of miscarriage and pregnancy complications.

Given the increasing prevalence of obesity among reproductive-age women and its potential consequences for fertility, understanding the relationship between obesity and reproductive function is essential for improving clinical management and developing effective preventive strategies.

The aim of this study is to analyze the relationship between obesity and female fertility using scientific evidence from studies indexed in the PubMed database and to summarize the mechanisms through which excess body weight influences reproductive outcomes.

2. Materials and Methods

This study was conducted as a literature-based scientific review using peer-reviewed publications indexed in the PubMed database. The analyzed studies included women of reproductive age (18–45 years), representing both the general population and patients undergoing infertility treatment.

Participants described in the selected studies were categorized according to body mass index (BMI): normal weight (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), and obese (≥30 kg/m²).

A comprehensive literature search was performed using the following keywords: “female obesity and fertility”, “obesity and ovulation”, “BMI and infertility”, “obesity and reproductive outcomes”, and “obesity and assisted reproduction”.

Inclusion criteria comprised peer-reviewed articles published in English, focusing on the relationship between obesity and female reproductive function. Both original studies and systematic reviews were included.

The analyzed reproductive parameters included menstrual regularity, ovulation frequency, ovarian reserve markers, time to pregnancy, response to ovulation induction, and ART outcomes.

Data were extracted and synthesized descriptively. Statistical interpretation included reported correlations, comparative analyses between BMI groups, and synthesis of risk estimates (odds ratios, relative risks) using data presented in the selected publications.

3. Results

3.1 Effect of Obesity on Ovulation and Menstrual Function

Numerous studies have demonstrated that obesity negatively affects ovulatory function and menstrual regularity. Women with elevated BMI frequently experience menstrual disturbances such as oligomenorrhea or amenorrhea.

Adipose tissue produces hormones and signaling molecules that influence reproductive physiology. Elevated levels of leptin and inflammatory cytokines may disrupt normal hormonal signaling within the hypothalamic–pituitary–ovarian axis. These disturbances may impair follicular maturation and reduce ovulation frequency.

Insulin resistance represents another important mechanism linking obesity and ovulatory dysfunction. Hyperinsulinemia stimulates androgen production in ovarian theca cells, leading to hyperandrogenism and impaired follicular development.

Studies have shown that obese women are significantly more likely to experience anovulatory cycles compared with women with normal body weight. These hormonal and metabolic disturbances ultimately decrease the probability of successful conception.

3.2 Influence of Obesity on Assisted Reproductive Technologies

Obesity has also been shown to negatively affect outcomes of assisted reproductive technologies such as ovulation induction, intrauterine insemination (IUI), and in vitro fertilization (IVF).

Research indicates that obese women often require higher doses of gonadotropins during ovarian stimulation due to reduced responsiveness of ovarian follicles. Additionally, obese patients may produce fewer mature follicles and fewer retrieved oocytes during IVF procedures.

Several clinical studies have reported that embryo quality may also be reduced in obese women. This may be related to metabolic disturbances in the follicular environment, which can affect oocyte maturation and early embryo development.

Implantation rates during IVF may also be lower among obese women. Furthermore, obesity has been associated with increased risk of miscarriage following assisted reproductive treatments.

These findings suggest that obesity may significantly reduce the effectiveness of infertility treatments and may require adjustments in treatment protocols.

3.3 Relationship Between BMI and Time to Pregnancy

Epidemiological studies investigating natural fertility have shown that BMI is strongly associated with time to pregnancy. Women with higher BMI values are less likely to conceive during each menstrual cycle compared with women with normal BMI.

Several cohort studies have reported that obese women experience significantly longer time to pregnancy and higher rates of infertility. The probability of conception decreases progressively as BMI increases.

Central adiposity, measured by waist circumference or waist-to-hip ratio, may also be an important predictor of reduced fertility. Abdominal fat accumulation is strongly associated with insulin resistance and metabolic disturbances that negatively affect reproductive function.

In addition to delayed conception, obesity has been associated with increased risk of early pregnancy loss, gestational diabetes, hypertensive disorders, and other pregnancy complications.

4. Discussion

The results of this study confirm that obesity plays a significant role in the development of female infertility. Numerous clinical and epidemiological studies consistently demonstrate an association between increased BMI and impaired reproductive outcomes.

One of the primary mechanisms linking obesity and infertility involves hormonal dysregulation within the hypothalamic–pituitary–ovarian axis. Excess adipose tissue increases estrogen production through aromatization of androgens and alters the secretion of gonadotropins. These hormonal changes may impair follicular development and ovulation.

Insulin resistance also contributes to reproductive dysfunction in obese women. Elevated insulin levels stimulate androgen production in the ovaries, which may lead to hyperandrogenism and the development of polycystic ovary syndrome.

Chronic inflammation and oxidative stress may also play a role in obesity-related infertility. Adipose tissue produces inflammatory cytokines that may damage reproductive tissues and impair oocyte quality.

Importantly, many studies have demonstrated that weight reduction can improve reproductive outcomes. Even moderate weight loss of approximately 5–10% of body weight has been shown to restore ovulation and improve pregnancy rates in obese women.

Lifestyle interventions including dietary modification, increased physical activity, and behavioral counseling therefore represent important components of infertility treatment for obese patients.

Despite strong evidence linking obesity and infertility, further research is required to better understand the complex biological mechanisms involved and to develop effective clinical interventions.

5. Conclusions

1. Obesity significantly impairs female reproductive function.
 2. Excess body weight disrupts hormonal balance and ovulation.
 3. Obese women experience longer time to pregnancy and higher infertility risk.
 4. Obesity negatively affects assisted reproductive technology outcomes.
- Weight reduction improves fertility outcomes.

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