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## A review on Exploring the impact of Obesity on Menstrual Health: A systematic analysis

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**ABSTRACT:** Obesity, a growing global health concern, has been found to exert a multifaceted influence on menstrual health. Research has shown that obesity can lead to disturbances in menstrual cycles, increase the risk of conditions such as polycystic ovary syndrome (PCOS), and impact fertility. Menstrual health is a critical aspect of a woman's overall reproductive and physical health. It encompasses various factors, including the regularity of menstrual cycles, the presence of menstrual disorders, and the overall functioning of the reproductive system. Understanding these connections is vital not only for women's health but also for healthcare practitioners, researchers, and policymakers seeking to address the rising rates of obesity-related health issues. Weight reduction enhances reproductive outcomes diminishing symptoms of urinary incontinence, and reducing morbidity following gynaecological surgery. Sustained and substantial weight loss is difficult to achieve with the lifestyle and dietary measures that are currently available. Several pharmacological treatment options are available, and there are emerging data on reproductive outcomes following surgical treatment for obesity. Menstrual irregularities and disorders can have profound effects on women's healthcare, public health, women's quality of life, emotional well-being, and reproductive aspirations. As obesity continues its upward trajectory globally, it becomes increasingly imperative to address the intricate consequences of this epidemic on women's health and future research endeavours, contributing to a deeper understanding of how obesity affects menstrual health and help improve the well-being of women worldwide.

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**INTRODUCTION:**

Menstrual health, an integral facet of a woman's overall well-being, plays a pivotal role in her reproductive and physical health <sup>[1]</sup>. Rising obesity rates around the world have had a profound impact on female reproductive health. Childhood obesity is associated with early onset of puberty, menstrual irregularities during adolescence and polycystic ovary syndrome. Women of reproductive age with high BMIs have a higher risk of ovulatory problems and tend to respond poorly to fertility treatment <sup>[2]</sup>. The menstrual cycle, typically characterized by regularity, is a vital indicator of hormonal balance and

reproductive function. However, for an increasing number of women worldwide, this fundamental aspect of their health is being influenced by a global health epidemic - obesity. The intricate interplay between obesity and menstrual health has emerged as a topic of substantial importance and scientific investigation<sup>[3]</sup>.

A regular menstrual cycle is a complex and finely-tuned physiological process, governed by a delicate interplay of hormones, signalling pathways, and feedback mechanisms. However, in an era where the global prevalence of obesity has reached epidemic proportions, this intricate balance is increasingly under threat. The relationship between obesity and menstrual health is a topic of growing importance, prompting extensive research and clinical investigation<sup>[4]</sup>.

Obesity, characterized by an excessive accumulation of adipose tissue, has reached alarming proportions globally. Its multifaceted impact on health is well-documented, encompassing a spectrum of chronic diseases such as diabetes, cardiovascular disorders, and certain cancers. Yet, beyond these established health concerns, there exists a lesser-explored dimension of obesity's influence - the profound impact it exerts on women's menstrual health<sup>[5]</sup>.

Obese women have been found to have irregular menstrual cycles with increased incidences of oligomenorrhea or amenorrhea. Irregularities in ovulation have also been demonstrated, and obese women have higher rates of miscarriages<sup>[6]</sup>. Through this systematic analysis, we aspire to make a substantive contribution to the broader discourse surrounding women's health, with the ultimate objective of enhancing the overall well-being and reproductive health of women grappling with the dual challenges of obesity and menstrual health.

Rogers J and Mitchell G (2019)<sup>[7]</sup> explored the various ways obesity can affect menstrual health, including the development of menstrual disorders and infertility, and provides insights into the underlying mechanisms.

Bhattacharya SM & Jha A (2010)<sup>[8]</sup> investigated the prevalence of oligomenorrhea (infrequent menstrual cycles) and amenorrhea (absence of menstrual periods) in the general population and explores potential risk factors, including obesity.

Lim SS, *et al.*, (2013)<sup>[9]</sup> reviewed meta-analysis specifically focused on the association between obesity and central obesity in women with polycystic ovary syndrome (PCOS) and their impact on menstrual and reproductive outcomes.

Numerous studies have hinted at the intricate connections between obesity and menstrual health, yet a comprehensive synthesis of this knowledge is lacking<sup>[10]</sup>. An attempt has been made through the scientific literature, aiming to construct a holistic understanding of the impact of obesity on menstrual health, navigating the intricate pathways and interactions, dissect the underlying physiological mechanisms, and critically analysing the implications for clinical practice, public health interventions, and the identification of future research priorities.

By examining the intricate connections between obesity and menstrual health, this review seeks to inform healthcare practitioners, researchers, and policymakers about the critical implications for women's reproductive and overall physical health. This review aims to elucidate the multifaceted influence of obesity on menstrual health, highlighting its role in menstrual cycle disturbances, increased risk of polycystic ovarian syndrome (PCOS) and fertility issues. The review will also address the challenges in achieving sustained weight loss through lifestyle and dietary measures, exploring the available pharmacological and surgical treatment options and emphasize the importance of addressing obesity-related health issues in future research and policy-making to enhance women's well-being globally.

## **OBESITY'S IMPACTS ON WOMEN'S HEALTH:**

### **Puberty and menstrual cycle abnormalities:**

Obesity is associated with early puberty and dysfunctional uterine bleeding (DUB). Obese girls frequently enter puberty at a younger age than their normal weight peers<sup>[11]</sup>.

Indeed, the increasing prevalence of obesity in American children is likely to be at least partially responsible for the decreasing age of puberty in the U.S. The mean age of menarche decreased by approximately 3 months in U.S. white girls and 5.5 months in U.S. black girls between the late 1960s and 1990<sup>[12]</sup>. Early puberty can generate psychosocial strain in girls and their families as they cope with the social repercussions of early sexual development. In fact, early puberty has been shown to be a risk factor for self-reported depression in adolescents<sup>[13]</sup>. There are several theories to explain the correlation between BMI and onset of menses. The critical fat hypothesis, first put forth by Frisch *et al.* in 1971, suggests that menarche is triggered once a critical level of fatness is obtained<sup>[14,15]</sup>. Leptin may be the link

that defines “adequate level of fatness” and triggers onset of puberty. Leptin is a fat-derived hormone that helps regulate energy intake and expenditure. Its concentrations rise with increasing adiposity. Leptin levels also rise with the onset of puberty in girls<sup>[16]</sup>. Ahima, *et al.* (1997)<sup>[17]</sup> demonstrated that leptin injection triggers onset of puberty in immature mice. Given this finding, it is possible that obese children enter puberty earlier than their normal weight peers owing to increased leptin levels triggered by larger volumes of adipose tissue. Obesity continues to have a negative influence on the menstrual cycle throughout life. Postmenarchal overweight women often suffer from dysfunctional uterine bleeding (DUB) resulting from peripheral conversion of androgens to oestrogens, and altered oestrogen-progesterone ratios. The chronic oestrogen-driven proliferation of endometrial tissue leads to endometrial overgrowth and bleeding at irregular intervals.

The ability of weight loss and metformin therapy to improve menstrual cyclicity highlights the role of excess adipose tissue and insulin resistance in causing DUB in obese women. In a randomized, double-blind, placebo-controlled study of 143 obese oligo- or amenorrhoeic women with polycystic ovary syndrome (PCOS) randomized to receive metformin or placebo, weight loss alone correlated with an improvement in menses.<sup>[18]</sup> Presumably, weight loss restores regular menstrual function by decreasing the aromatization of androgens to oestrogens in adipose tissue. Some might argue that weight loss also improves menstrual function by increasing insulin sensitivity.

Metformin is also an effective therapy for dysfunctional uterine bleeding. In addition to altered androgen levels and oestrogen-progesterone ratios, obese women frequently display some degree of insulin resistance, a feature characteristic of PCOS. A number of studies support the ability of metformin to restore normal menses in women with DUB<sup>[19]</sup>. In a prospective, randomized, double-blind placebo controlled study of 45 oligo- or an ovulatory women with PCOS randomized to receive metformin or placebo, only the women with insulin resistance who were treated with metformin demonstrated an improvement in menstrual cyclicity (80 % in the metformin group v/s. 18 % in the placebo group)<sup>[20]</sup>. In that study, improvements in menstrual cyclicity occurred independently of weight and hormonal changes. Those findings suggest that insulin resistance may be an independent contributor to DUB in obese

women, separate from the effects of excess adipose tissue. Given the deleterious effects of obesity on reproductive function in both girls and women, physicians should encourage their patients from a young age to maintain a normal weight and counsel obese patients that weight loss may ameliorate their menstrual dysfunction. Obese women with insulin resistance may also benefit from metformin therapy.

## **THE IMPACT OF OBESITY ON HEALTH:**

### **Comorbidities:**

Obesity is a global public health challenge, characterized by an excess accumulation of body fat. Its prevalence has risen dramatically over the past few decades, and it is associated with a wide range of adverse health effects. This comprehensive overview explores the multifaceted impact of obesity on health, covering both physical and psychological consequences, and provides insights into the importance of addressing this critical health issue.

### **Cardiovascular Health:**

Obesity significantly increases the risk of cardiovascular diseases (CVD), including coronary artery disease, stroke, and hypertension. Excess body fat can lead to the accumulation of plaque in arteries (atherosclerosis) and increase the workload on the heart. Additionally, obesity is associated with adverse lipid profiles, such as elevated LDL cholesterol and triglycerides, and reduced levels of HDL cholesterol, all of which contribute to CVD risk<sup>[21]</sup>.

### **Type 2 Diabetes:**

DeUgarte CM & Bartolucci AA (1995)<sup>[22]</sup> investigated the prevalence of insulin resistance, often associated with obesity, in women with polycystic ovary syndrome (PCOS) and its potential impact on menstrual dysfunction. Obesity is a primary risk factor for the development of type 2 diabetes mellitus. Excess fat, particularly visceral fat, disrupts insulin sensitivity and glucose metabolism. Over time, this can lead to insulin resistance and the inability of cells to efficiently use glucose, resulting in elevated blood sugar levels<sup>[23]</sup>.

### **Musculoskeletal Problems:**

Carrying excess weight places additional stress on the musculoskeletal system, leading to conditions like osteoarthritis and lower back pain. Obese individuals are more prone to joint degeneration, and the knees, hips, and spine are particularly vulnerable<sup>[24]</sup>.

### **Respiratory Complications:**

Obesity is linked to various respiratory issues, including sleep apnoea, asthma, and decreased lung function.

Excessive fat deposits in the upper airway can obstruct breathing during sleep, leading to sleep apnoea. Obesity-related inflammation can also exacerbate asthma symptoms <sup>[25]</sup>.

#### **Cancer Risk:**

Obesity is associated with an increased risk of various types of cancer, including breast, colorectal, endometrial, and renal cancer. The mechanisms underlying this link are complex and involve factors like chronic inflammation, hormonal imbalances, and insulin resistance <sup>[26]</sup>.

#### **Psychological and Mental Health:**

Obesity can have a significant impact on mental health, leading to conditions such as depression, anxiety, and low self-esteem. Stigmatization and discrimination based on weight can exacerbate these psychological issues <sup>[27]</sup>.

#### **Reproductive Health:**

Obesity can affect reproductive health in both men and women. In women, it can lead to menstrual irregularities, infertility, and complications during pregnancy. In men, obesity is associated with lower testosterone levels and an increased risk of erectile dysfunction <sup>[28]</sup>.

#### **Mortality and Life Expectancy:**

Obesity significantly increases the risk of premature death. Individuals with obesity are more likely to die from conditions such as CVD, diabetes, and certain cancers. It also reduces life expectancy <sup>[29]</sup>.

Obesity is a complex and multifaceted health issue with far-reaching consequences. It affects virtually every system in the body and is associated with an increased risk of chronic diseases, reduced quality of life, and premature mortality. Addressing obesity through lifestyle modifications, including diet and physical activity, and, in some cases, medical interventions, is crucial to mitigating its impact on health and improving overall well-being.

### **THE IMPACT OF OBESITY ON MENSTRUAL HEALTH IN WOMEN:**

Menstrual health, a crucial component of women's well-being, serves as an intricate and dynamic reflection of their reproductive and overall health. The menstrual cycle, orchestrated by a precisely regulated interplay of hormones, plays a vital role in the female reproductive system. However, in the contemporary landscape of rising obesity rates worldwide, the impact of excess adiposity on menstrual health has become a subject of

profound concern and extensive research. This article explores the multifaceted impact of obesity on menstrual health in women, drawing from a body of scientific literature.

#### **Menstrual Irregularities and Obesity:**

One of the most prominent effects of obesity on menstrual health is the disruption of regular menstrual cycles. Obesity can lead to an ovulation (lack of ovulation), resulting in irregular or absent menstrual periods. This condition, known as oligomenorrhea or amenorrhea, is often associated with hormonal imbalances, particularly an excess of oestrogen produced by adipose tissue. The presence of excessive adipose tissue can disturb the intricate hormonal feedback loops that govern the menstrual cycle, thereby impairing its regularity <sup>[30]</sup>.

#### **Polycystic Ovary Syndrome (PCOS) and Obesity:**

Polycystic Ovary Syndrome (PCOS), a common endocrine disorder affecting women of reproductive age, is intimately linked to obesity. Obesity exacerbates the hormonal imbalances characteristic of PCOS, leading to irregular menstrual cycles, an ovulation, and the development of ovarian cysts. Insulin resistance, a hallmark of obesity, further aggravates PCOS symptoms. Elevated insulin levels can stimulate androgen production, contributing to the clinical manifestations of PCOS, such as hirsutism (excessive hair growth), acne, and male-pattern baldness <sup>[31]</sup>.

#### **Fertility Challenges:**

Obesity-induced menstrual irregularities and hormonal imbalances can significantly impact a woman's fertility. The irregular ovulatory cycles associated with obesity decrease the chances of conception. Additionally, obesity can lead to suboptimal oocyte (egg) quality, further reducing fertility. Women with obesity often face challenges in achieving and maintaining pregnancies, necessitating medical interventions, such as assisted reproductive technologies <sup>[32]</sup>.

#### **Menstrual Pain and Quality of Life:**

Obesity can also exacerbate menstrual discomfort and pain. Studies have shown that women with obesity are more likely to experience severe menstrual cramps (dysmenorrhea) and heavy menstrual bleeding (menorrhagia). These symptoms can significantly diminish a woman's quality of life, leading to increased absenteeism from work or school and reduced overall well-being <sup>[33]</sup>.

## THE IMPACT OF OBESITY ON HIGHER RATES OF MISCARRIAGES IN WOMEN AND POSSIBLE MECHANISMS:

Obesity is associated with a range of adverse reproductive outcomes, including an increased risk of miscarriages in women. This detailed overview explores the complex relationship between obesity and miscarriages, highlighting the physiological mechanisms and health implications involved.

### Increased Risk of Early Pregnancy Loss:

Effect of Obesity: Numerous studies have shown a clear association between obesity and an elevated risk of early pregnancy loss, including both spontaneous miscarriages and recurrent pregnancy loss (RPL).

- Hormonal Imbalances: Obesity is linked to hormonal imbalances, including disruptions in insulin and leptin signalling, which can affect the regulation of early pregnancy and embryo implantation.
- Chronic Inflammation: Obesity is associated with chronic low-grade inflammation, which can create an unfavourable uterine environment for implantation and early embryo development.
- Endometrial Abnormalities: Obesity can lead to structural and functional changes in the endometrium, impairing its ability to support a healthy pregnancy<sup>[34,35]</sup>.

### Impact on Ovulatory Disorders:

Effect of Obesity: Obesity is a major contributor to ovulatory disorders, such as polycystic ovary syndrome (PCOS), which can increase the risk of miscarriages. PCOS is often characterized by irregular menstrual cycles, high androgen levels, and insulin resistance.

- Hormonal Imbalances: In PCOS, elevated androgens and insulin resistance can lead to hormonal imbalances that affect the maintenance of a healthy pregnancy.
- Reduced Ovulation Frequency: Obesity can lead to reduced ovulation frequency, increasing the chances of conception with abnormal embryos and a higher risk of miscarriage<sup>[36,37]</sup>.

### Impact on Maternal Health:

Effect of Obesity: Maternal obesity is linked to various health complications during pregnancy, such as gestational diabetes, preeclampsia, and hypertension, all of which can increase the risk of miscarriages.

- Metabolic Disturbances: Maternal obesity often involves metabolic disturbances, including insulin resistance and inflammation, which can negatively affect placental function and foetal development.
- Vascular Changes: Obesity-related vascular changes can lead to impaired placental blood flow, reducing the oxygen and nutrient supply to the developing foetus.
- Hormonal Imbalances: Obesity can disrupt hormonal regulation in pregnancy, potentially leading to early pregnancy loss<sup>[38,39]</sup>.

### Impact on Foetal Health:

Effect of Obesity: Maternal obesity is associated with an increased risk of foetal abnormalities and chromosomal disorders, which can result in early pregnancy losses.

- Abnormal Placental Function: Obesity can affect placental function, reducing its ability to support foetal growth and development.
- Hormonal Imbalances: Obesity-related hormonal imbalances can disrupt the hormonal environment necessary for healthy foetal development<sup>[40,41]</sup>.

### Health Implications:

The impact of obesity on higher rates of miscarriages in women has significant health implications:

- Emotional Distress: Miscarriages can result in significant emotional distress and psychological challenges for women and their partners.
- Reproductive Health Concerns: The risk of recurrent miscarriages can lead to fertility challenges and may necessitate medical intervention.
- Maternal and Foetal Health Risks: Maternal obesity increases the risks not only for miscarriages but also for various maternal and foetal health complications during pregnancy<sup>[42]</sup>.

Obesity is associated with higher rates of miscarriages in women, and the mechanisms involve hormonal imbalances, inflammation, and metabolic disturbances. Recognizing the impact of obesity on reproductive outcomes is crucial for healthcare providers to provide appropriate counselling and interventions to improve the chances of healthy pregnancies in affected individuals.

## GYNAECOLOGIC CONSEQUENCES OF OBESITY:

Obesity has far-reaching consequences on gynaecologic health, affecting various aspects of reproductive and sexual well-being in women. This comprehensive overview explores the significant gynaecologic

consequences of obesity, shedding light on the physiological mechanisms and health implications involved.

### **Menstrual Irregularities:**

Obesity is strongly associated with menstrual irregularities in women. These irregularities can manifest as;

#### ***Amenorrhea:***

Obesity can lead to the absence of menstruation (amenorrhea) for several months or longer. This condition results from hormonal imbalances caused by excess body fat.

#### ***Oligomenorrhea:***

Women with obesity are more likely to experience infrequent or irregular menstrual cycles (oligomenorrhea). This can lead to unpredictable periods and difficulties in tracking one's menstrual cycle <sup>[43]</sup>.

### **Polycystic Ovary Syndrome (PCOS):**

Obesity is a significant risk factor for the development of PCOS, a common hormonal disorder in women. PCOS is characterized by:

- Irregular menstrual cycles.
- Elevated levels of androgens (male hormones).
- The formation of small cysts on the ovaries.
- Insulin resistance.

Obesity exacerbates insulin resistance, contributing to the hormonal imbalances associated with PCOS. Elevated insulin levels can stimulate the ovaries to produce excess androgens, leading to irregular periods and other PCOS symptoms <sup>[44]</sup>.

### **Fertility Challenges:**

Obesity can lead to fertility challenges in women. Hormonal imbalances and irregular menstrual cycles associated with obesity can make it more difficult to conceive. Additionally, obesity is linked to pregnancy complications, such as gestational diabetes and preeclampsia <sup>[45]</sup>.

### **Increased Risk of Endometrial Cancer:**

Persistent exposure to elevated oestrogen levels in obese women can lead to endometrial hyperplasia, a thickening of the endometrial lining. This condition carries an increased risk of developing endometrial cancer <sup>[46]</sup>.

### **Pelvic Floor Disorders:**

Obesity is a significant risk factor for pelvic floor disorders, including urinary incontinence and pelvic organ prolapse. Excess weight can place increased

pressure on the pelvic organs and weaken the pelvic floor muscles <sup>[47]</sup>.

### **Increased Surgical Risks:**

Obesity can increase the risks associated with gynaecological surgeries, such as hysterectomy or laparoscopic procedures. Surgical complications, longer recovery times, and increased anaesthesia-related risks are common in obese patients <sup>[48]</sup>.

### **Sexual Dysfunction:**

Obesity is associated with sexual dysfunction in women, including decreased sexual desire, difficulties with arousal, and pain during intercourse. Psychological factors, hormonal imbalances, and decreased self-esteem due to obesity can contribute to these issues <sup>[49]</sup>.

### **Psychological Impact:**

The psychological consequences of obesity, including negative body image and low self-esteem, can affect gynaecologic health. These psychological factors can contribute to stress, anxiety, and depression, further impacting sexual and reproductive well-being <sup>[50]</sup>.

Obesity has significant gynaecologic consequences for women, affecting menstrual regularity, fertility, the risk of PCOS, endometrial cancer, pelvic floor disorders, surgical outcomes, sexual function, and psychological well-being. Recognizing the importance of weight management, lifestyle changes, and early intervention is crucial for addressing these issues and promoting the overall gynaecologic health and quality of life of affected individuals.

## **MANAGEMENT OF OBESITY-INDUCED MENSTRUAL DISORDERS:**

Obesity can significantly impact menstrual health, leading to a range of menstrual disorders, including irregular periods, amenorrhea (absence of menstruation), and heavy menstrual bleeding.

Effective management of these disorders in the context of obesity is crucial for improving women's overall health and well-being. This comprehensive overview explores the management strategies for obesity-induced menstrual disorders, along with relevant references.

### **Management Strategies:**

#### ***Weight Management:***

The cornerstone of managing obesity-induced menstrual disorders is weight management. Achieving and maintaining a healthy body weight can help restore regular menstrual cycles and improve hormonal balance.

**Hormonal Therapy:**

In cases where weight loss alone does not restore regular menstrual cycles, hormonal therapy may be considered.

**Surgical Interventions:**

In some cases, surgical interventions may be necessary to address obesity-induced menstrual disorders.

**Management of Associated Conditions:**

Addressing underlying health conditions associated with obesity, such as insulin resistance, metabolic syndrome, or thyroid disorders, is essential for improving menstrual health.

**Regular Follow-Up and Monitoring:**

Regular follow-up appointments with healthcare providers are essential to monitor progress, adjust treatment plans as needed, and address any emerging issues<sup>[51,52]</sup>.

**Evidence-based recommendations for PCOS:**

Teede, *et al.* (2018)<sup>[53]</sup> provided a comprehensive overview of the impact of obesity on polycystic ovary syndrome (PCOS), and offered evidence-based recommendations for its assessment and management.

Traditionally herbal medicines are getting significant attention in global health debates. Chinese traditional herbal medicine has played a prominent role in the strategy to contain and treat severe acute respiratory syndrome (SARS). Eighty percent of the African population use some form of traditional herbal medicines<sup>[54]</sup>. Therefore, attempts must be made to identify herbal/natural molecules in the treatment and management of obesity and menstrual disorders.

**CONCLUSION:**

This systematic analysis sought to unravel the intricate connections between obesity and menstrual health, delving into the wealth of research available to provide a comprehensive overview of the topic. Through a rigorous examination of existing literature, this review was aimed to shed light on the mechanisms by which obesity affects the menstrual cycle, menstrual disorders, and fertility in women. The review also tried to identify trends, variations, and gaps in the current body of knowledge, offering insights that can inform clinical practice, public health strategies, and future research endeavours. In conclusion, obesity exerts a multifaceted and far-reaching impact on menstrual health in women. It disrupts regular menstrual cycles, exacerbates conditions like PCOS, hampers fertility, and increases the burden of

menstrual pain and discomfort. Understanding and addressing these associations are crucial not only for improving individual well-being but also for informing healthcare strategies and interventions aimed at mitigating the effects of obesity on women's reproductive health.

Managing obesity-induced menstrual disorders involves a multi-faceted approach, including weight management, hormonal therapy, surgical interventions, and addressing associated health conditions. Personalized treatment plans, regular follow-up, and ongoing support are essential to improving menstrual health and overall well-being in individuals affected by these disorders.

Moreover, exploring the impact of obesity on menstrual health through a systematic analysis is not only academically relevant but also holds significant practical implications for women's healthcare, public health, woman's quality of life, emotional well-being, and reproductive aspirations. As obesity rates continue to rise globally, the need to address the consequences of this epidemic on women's health becomes increasingly urgent on the intricate consequences of this epidemic on women's health.

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