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Original Research Article

Impact of Obesity on Female Reproductive Health: Infertility and Menstrual Irregularities

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Abstract:

Background: Obesity is a growing global public health concern and has been increasingly linked to adverse reproductive outcomes, including menstrual disorders and infertility, among women of reproductive age.

Aim: To assess the association between obesity, menstrual irregularities, and infertility in women aged 18–40 years.

Methodology: A hospital-based descriptive cross-sectional study was conducted among 80 overweight and obese women attending the outpatient department of General Medicine at Nalanda Medical College and Hospital in Bihar, India. Data on sociodemographic characteristics, menstrual patterns, infertility status, and anthropometric measurements were collected using a structured questionnaire. BMI was classified according to WHO criteria. Statistical analysis was performed using SPSS version 27.0.

Results: The majority of participants were aged 18–35 years. Menstrual irregularities were observed in 62.5% of women, with oligomenorrhea being the most common. The prevalence of irregular menstrual cycles increased progressively with higher BMI categories. Infertility was reported in 45% of participants, with primary infertility being more common than secondary infertility.

Conclusion: Obesity is significantly associated with menstrual disorders and infertility, with increasing BMI linked to worsening reproductive outcomes. Early identification and weight management may improve menstrual regularity and fertility potential.

Keywords: Obesity, Body Mass Index, Menstrual Disorders, Infertility, Reproductive Age Women.

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Introduction

Obesity has emerged as one of the most significant global public health challenges of the twenty-first century, with its prevalence rising steadily across both developed and developing countries [1]. Characterized by excessive accumulation of body fat, obesity is commonly assessed using the body mass index (BMI), which serves as a practical indicator of adiposity at the population level. Beyond its well-recognized association with metabolic and cardiovascular disorders such as type 2 diabetes mellitus, hypertension, and dyslipidemia, obesity has profound implications for reproductive health [2]. In recent decades, increasing attention has been directed toward understanding the complex relationship between obesity, infertility, and menstrual disorders, particularly among women of reproductive age. The escalating burden of obesity among adolescents and young adults has raised concerns regarding its potential to impair reproductive potential and disrupt normal menstrual function, thereby contributing to subfertility and adverse reproductive outcomes.

Infertility, defined as the inability to conceive after one year of regular, unprotected sexual intercourse, affects a substantial proportion of couples worldwide and represents a major psychosocial and clinical concern [3]. While infertility is multifactorial in origin, female factors such as ovulatory dysfunction, menstrual irregularities, and endocrine disturbances play a crucial role. Obesity has been increasingly recognized as an independent risk factor for female infertility, acting through both direct and indirect mechanisms. Excess adipose tissue functions not merely as an energy storage organ but as an active

endocrine organ that secretes a wide array of adipokines, cytokines, and hormones. These bioactive substances influence the hypothalamic–pituitary–ovarian (HPO) axis, leading to alterations in gonadotropin secretion, impaired follicular development, and disrupted ovulation [4]. Consequently, obese women are more likely to experience delayed conception, anovulation, and reduced fecundity compared to women with normal body weight.

Menstrual disorders represent another critical aspect of reproductive dysfunction associated with obesity [5]. Normal menstrual cyclicity depends on the precise coordination of hormonal signals within the HPO axis, ensuring regular ovulation and endometrial shedding. Obesity disrupts this delicate hormonal balance through mechanisms such as hyperinsulinemia, insulin resistance, and altered sex hormone metabolism [6]. Increased peripheral conversion of androgens to estrogens in adipose tissue results in chronic estrogen exposure without the cyclical progesterone opposition necessary for regular menstruation. This hormonal milieu often manifests clinically as oligomenorrhea, amenorrhea, menorrhagia, or dysfunctional uterine bleeding. Such menstrual abnormalities not only affect quality of life but also serve as clinical indicators of underlying ovulatory dysfunction and potential infertility.

One of the most well-studied conditions linking obesity, menstrual irregularities, and infertility is polycystic ovary syndrome (PCOS) [7]. PCOS is a common endocrine disorder among women of reproductive age and is frequently associated with obesity, insulin resistance, and hyperandrogenism. Obesity exacerbates the metabolic and reproductive manifestations of PCOS, leading to more severe menstrual disturbances and reduced ovulatory frequency. However, even in the absence of PCOS, obesity alone has been shown to negatively influence menstrual regularity and fertility outcomes. This highlights the independent role of excess adiposity in reproductive dysfunction, emphasizing that obesity-related infertility is not confined to specific endocrine syndromes.

In addition to hormonal and metabolic factors, obesity influences fertility through its effects on oocyte quality, endometrial receptivity, and early embryonic development [8]. Studies have demonstrated that obese women may exhibit altered follicular fluid composition, impaired oocyte maturation, and reduced implantation rates. Furthermore, obesity is associated with chronic low-grade inflammation and oxidative stress, which may adversely affect the reproductive tract environment. These factors contribute to lower success rates of both spontaneous conception and assisted reproductive technologies, underscoring the clinical relevance of obesity in reproductive medicine.

The association between obesity and reproductive dysfunction extends beyond biological mechanisms to encompass psychosocial and lifestyle factors. Obese women may experience body image concerns, reduced self-esteem, and psychological stress, all of which can indirectly affect reproductive health and sexual function. Additionally, obesity often coexists with sedentary behavior, poor dietary habits, and comorbid medical conditions that further compound reproductive risks. From a public health perspective, the rising prevalence of obesity among women of childbearing age poses a significant challenge, with implications for fertility rates, maternal health, and future generations.

Given the multifaceted relationship between obesity, infertility, and menstrual disorders, understanding this association is of paramount importance for clinicians, researchers, and policymakers. Early identification of obesity-related reproductive dysfunction provides an opportunity for timely intervention through lifestyle modification, weight management, and targeted medical therapy. Addressing obesity not only improves metabolic health but also holds the potential to restore menstrual regularity and enhance fertility outcomes. Therefore, exploring the link between obesity and reproductive health is essential for developing comprehensive strategies aimed at improving women's reproductive well-being and reducing the growing burden of infertility and menstrual disorders in the modern era.

Methodology

Study Design: The present study was designed as a hospital-based descriptive cross-sectional observational study to assess the association between obesity and infertility as well as menstrual disorders among women of reproductive age.

Study Area: The study was conducted in the Department of General Medicine, Nalanda Medical College and Hospital (NMCH), Patna, Bihar, India from March 2025 to October 2025.

Study Participants

Inclusion Criteria

- Women aged 18–40 years attending the outpatient department of General Medicine
- Participants with Body Mass Index (BMI) ≥25 kg/m², classified as overweight or obese according to WHO criteria
- Women presenting with menstrual irregularities, including:
    - Oligomenorrhea
    - Polymenorrhea
    - Menorrhagia
    - Amenorrhea
    - Dysmenorrhea

- Women ʿreporting primary or secondary infertility
- Participants who provided written informed consent

Exclusion Criteria

- Women with known endocrine disorders, such as:
  - Thyroid dysfunction
  - Hyperprolactinemia
  - Cushing's syndrome
- Patients with a prior diagnosis of polycystic ovary syndrome (PCOS)
- Women with congenital reproductive tract anomalies
- Patients suffering from chronic systemic illnesses or malignancy
- Women receiving hormonal therapy or undergoing fertility treatment
- Pregnant women and lactating mothers

Sample Size: A total of 80 participant**s** fulfilling the inclusion criteria were enrolled in the study. The sample size was selected based on feasibility and outpatient attendance during the study period.

Procedure: After obtaining approval from the Institutional Ethics Committee, eligible participants attending the outpatient department were recruited. A pre-structured and pre-validated questionnaire was used to collect sociodemographic details, menstrual history, obstetric history, infertility status, lifestyle factors, and dietary habits. Menstrual history included age at menarche, cycle length, duration and amount of menstrual flow, interval between cycles, presence of ʿdysmenorrhea, premenstrual symptoms, and any missed cycles in the last three months. Women with two or more cycles lasting 21–35 days were considered to have ʿregular cycles, while those with cycles <21 days or >35 days or missed periods were classified as having irregular cycles.

Anthropometric measurements including height, weight, and BMI were recorded using standard techniques. Dietary assessment was carried out using the 24-hour dietary recall method, and dietary diversity was categorized as poor, moderate, or high. A brief clinical examination was performed, and relevant laboratory investigations such as hemoglobin estimation were carried out where indicated. Infertility was classified as primary or secondary based on history. All data were recorded confidentially.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using SPSS (Statistical Package for Social Sciences) version 27.0. Descriptive statistics were used to summarize sociodemographic variables and clinical characteristics. Associations between obesity and menstrual disorders or infertility were analyzed using appropriate statistical tests such as the Chi-square test and Student's t-test. A p-value of <0.05 was considered statistically significant.

Result

Table 1 depicts the age-wise distribution of the 80 study participants, showing that the majority belonged to the 26–30 years age group, which accounted for 32.5% (n = 26) of the total sample. This was followed by participants aged 18–25 years, comprising 27.5% (n = 22), and those in the 31–35 years age group, representing 25% (n = 20). The least representation was observed in the 36–40 years age group, which constituted 15% (n = 12) of the participants. Overall, the distribution indicates that most participants were within the reproductive age range of 18–35 years, which is relevant to the objectives of the study.

Table 1: Distribution of Study Participants According to Age Group (n = 80)

Age Group (years)	Number of Participants	Percentage (%)
18–25	22	27.5
26–30	26	32.5
31–35	20	25
36–40	12	15
Total	**80**	**100**

Table 2 depicts the distribution of participants according to Body Mass Index (BMI) based on WHO classification. Among the 80 participants, the largest proportion were overweight, accounting for 35% (n = 28). This was followed by Obese Class I individuals, who constituted 32.5% (n = 26) of ʿthe study population. Participants categorized as Obese Class II represented 22.5% (n = 18), while a smaller proportion fell under Obese Class III, comprising 10% (n = 8). Overall, ʿthe table highlights that a substantial majority of participants were within the overweight and lower obesity categories, indicating a high burden of excess body weight among the study population.

Table 2: Distribution of Participants According to Body Mass Index (BMI)			
BMI Category (WHO Classification)	**BMI Range (kg/m²)**	**Number**	**Percentage (%)**
Overweight	25.0–29.9	28	35
Obese Class I	30.0–34.9	26	32.5
Obese Class II	35.0–39.9	18	22.5
Obese Class III	≥40.0	8	10
Total		**80**	**100**

Table 3 depicts the distribution of menstrual cycle patterns among the 80 study participants. A regular menstrual cycle was observed in 37.5% (n=30) of women, indicating that over one-third of the participants had normal cyclicity. Among menstrual abnormalities, oligomenorrhea was the most common pattern, affecting 27.5% (n=22) of participants. Polymenorrhea and menorrhagia were each reported by 12.5% (n=10) of women, reflecting a moderate prevalence of frequent and heavy menstrual bleeding patterns. Amenorrhea was observed in 10% (n=8) of the participants. Overall, the findings indicate that a substantial proportion of the study population experienced menstrual irregularities, highlighting the predominance of abnormal menstrual patterns among the participants.

Table 3: Distribution of Menstrual Cycle Pattern Among Study Participants		
Menstrual Cycle Pattern	**Number of Participants**	**Percentage (%)**
Regular cycle	30	37.5
Oligomenorrhea	22	27.5
Polymenorrhea	10	12.5
Amenorrhea	8	10
Menorrhagia	10	12.5
Total	**80**	**100**

Table 4 shows a clear association between increasing BMI category and the prevalence of menstrual disorders among the study participants. Among overweight women, a higher proportion had regular menstrual cycles (57.1%) compared to irregular cycles (42.9%). In contrast, women in Obese Class I demonstrated a marked shift toward menstrual irregularity, with 65.4% reporting irregular cycles and only 34.6% maintaining regular cycles. This trend was further accentuated in Obese Class II and III, where the vast majority of participants (80.8%) experienced irregular menstrual cycles, and only 19.2% reported regular cycles. Overall, the findings indicate a progressive increase in menstrual irregularities with rising BMI, suggesting that higher degrees of obesity are strongly associated with disturbances in menstrual cyclicity.

Table 4: Association Between BMI Category and Menstrual Disorders			
BMI Category	**Regular Cycle n (%)**	**Irregular Cycle n (%)**	**Total**
Overweight (n=28)	16 (57.1)	12 (42.9)	28
Obese Class I (n=26)	9 (34.6)	17 (65.4)	26
Obese Class II & III (n=26)	5 (19.2)	21 (80.8)	26
Total	**30**	**50**	**80**

Table 5 illustrates the distribution of infertility status among the 80 study participants. More than half of the participants (44; 55%) reported no infertility, indicating that the majority of women in the study did not experience difficulties in conception. Primary infertility was observed in 22 participants, accounting for 27.5% of the total sample, reflecting a considerable proportion of women who had never achieved pregnancy. Secondary infertility was noted in 14 participants (17.5%), representing women who were unable to conceive after having at least one previous pregnancy. Overall, the findings demonstrate that while infertility affected a substantial segment of the study population, primary infertility was more prevalent than secondary infertility among those affected.

Table 5: Distribution of Infertility Status Among Study Participants		
Infertility Status	**Number of Participants**	**Percentage (%)**
No infertility	44	55
Primary infertility	22	27.5
Secondary infertility	14	17.5
Total	**80**	**100**

Discussion

The present study explored the association between obesity, menstrual disorders, and infertility among women of reproductive age and demonstrated a clear trend of worsening reproductive health outcomes with increasing body mass index (BMI). The concentration of participants in the 18–35-year age group strengthens the validity of these findings, as this period represents peak reproductive potential. Similar age distributions have been reported in earlier studies assessing menstrual and fertility problems, indicating that menstrual irregularities and infertility are most frequently identified and clinically relevant during early and mid-reproductive years (Herman-Giddens et al., 1997 [9]; Harlow & Campbell, 2003) [10].

A substantial proportion of women in the present study were classified as overweight or obese, with the majority falling into overweight and Obese Class I categories. This pattern is consistent with reports from South Asian populations where mild to moderate obesity predominates over extreme obesity, yet is sufficient to adversely affect reproductive physiology (Dars et al., 2014) [11]. Ramlau-Hansen et al. (2007) [12] similarly observed that even modest increases in BMI were associated with reduced fecundity, emphasizing that reproductive risk begins well before morbid obesity is reached. The current findings reinforce the concept that early stages of excess weight gain should not be considered benign with respect to reproductive health.

Menstrual irregularities were common in the present study, with oligomenorrhea emerging as the most frequent abnormality, followed by amenorrhea and menorrhagia. Comparable patterns have been reported in population-based studies, where oligomenorrhea was strongly linked to higher BMI and metabolic disturbances (Harlow & Campbell, 2003). Dars et al. (2014) reported menstrual irregularities in approximately one-fourth of overweight and obese adolescent girls, a proportion higher than that observed among normal-weight individuals. In contrast, Begum et al. (2009) [13] noted relatively lower irregularity rates among overweight young girls, suggesting that the impact of obesity on menstrual cyclicity may intensify with increasing age, duration of obesity, or associated metabolic derangements—factors likely relevant in the present adult cohort.

The progressive rise in menstrual irregularities across increasing BMI categories in this study supports a dose-dependent relationship between adiposity and menstrual dysfunction. Women in higher obesity classes predominantly experienced irregular cycles, a finding aligned with earlier evidence demonstrating that excess adipose tissue alters estrogen metabolism, increases peripheral aromatization, and disrupts gonadotropin secretion (Schuiling & Likis, 2013) [14]. While Tayebi et al. (2018) [15] reported a decrease in heavy menstrual bleeding with higher BMI, the present study observed a broader spectrum of abnormalities, including menorrhagia, indicating that obesity may influence menstrual patterns in multiple, sometimes contrasting, ways depending on population characteristics and underlying hormonal profiles.

Infertility assessment revealed that although more than half of participants did not report infertility, a considerable proportion experienced primary infertility, exceeding secondary infertility. This finding is consistent with observations by Ramlau-Hansen et al. (2007), who reported higher rates of subfecundity among overweight and obese couples, particularly due to ovulatory dysfunction. The predominance of primary infertility in the present study suggests that obesity-related menstrual irregularities and anovulation may impair conception from the outset rather than only after prior pregnancies. Sutton-McDowall et al. (2010) [16] further demonstrated that altered glucose and insulin metabolism in obese women negatively affects oocyte quality, providing a biological explanation for reduced fertility even in the absence of overt gynecological pathology.

Contrasting findings have been reported in some earlier studies where lifestyle factors such as diet and physical activity showed inconsistent associations with menstrual patterns (Rupavani et al., 2013) [17]. However, the present study focused primarily on BMI as an integrated marker of long-term energy imbalance rather than isolated lifestyle behaviors. This may explain the clearer associations observed, as BMI captures cumulative metabolic and hormonal effects that directly influence the hypothalamic–pituitary–ovarian axis (Likis, 2013). The coexistence of obesity, menstrual disorders, and infertility in a significant subset of participants underscores the interconnected nature of these conditions.

Overall, the findings of this study are largely concordant with existing literature spanning from the 1990s to recent years, while also extending evidence to a contemporary clinical population. The progressive increase in menstrual disturbances and the notable burden of infertility with rising BMI highlight obesity as a critical, modifiable risk factor. Early identification of overweight and obesity, particularly during the reproductive years, may therefore play a pivotal role in preventing menstrual dysfunction and improving fertility outcomes. Integrating weight management strategies into routine gynecological and infertility care could substantially enhance reproductive health in this population.

Conclusion

The present study demonstrates a significant association between increasing body mass index and adverse reproductive health outcomes among women of reproductive age. A high prevalence of menstrual irregularities, particularly oligomenorrhea and

amenorrhea, was observed, with the burden of irregular cycles rising progressively across higher BMI categories. Although more than half of the participants did not report infertility, a substantial proportion experienced infertility, predominantly primary infertility, underscoring the impact of excess adiposity on ovulatory function and fecundity. These findings highlight obesity as an important and modifiable risk factor for both menstrual disorders and infertility, even in the absence of overt endocrine conditions such as PCOS. Early identification of overweight and obesity, coupled with targeted lifestyle and weight management interventions, may help restore menstrual regularity, improve fertility potential, and reduce the long-term reproductive and metabolic consequences in women.

References

1. Villalobos JÁ. Obesity: the real pandemic of the 21st century. Cirugía y Cirujanos (English Edition). 2016 Sep 1;84(5):351-5.
2. Bozkurt B, Aguilar D, Deswal A, Dunbar SB, Francis GS, Horwich T, Jessup M, Kosiborod M, Pritchett AM, Ramasubbu K, Rosendorff C. Contributory risk and management of comorbidities of hypertension, obesity, diabetes mellitus, hyperlipidemia, and metabolic syndrome in chronic heart failure: a scientific statement from the American Heart Association. Circulation. 2016 Dec 6;134(23):e535-78.
3. Luk BH, Loke AY. The impact of infertility on the psychological well-being, marital relationships, sexual relationships, and quality of life of couples: A systematic review. Journal of sex & marital therapy. 2015 Nov 2;41(6):610-25.
4. Sharma I, Kumar R, Giri A. Polycystic Ovarian Syndrome (PCOS): Regulation of Hypothalamus-Pituitary-Gonadal Axis and Steroidogenesis: a Perspective Toward Control of PCOS. In-Herbal Medicine Applications for Polycystic Ovarian Syndrome 2023 Aug 31 (pp. 19-70). CRC Press.
5. Sen LC, Annee IJ, Akter N, Fatha F, Mali SK, Debnath S. Study on relationship between obesity and menstrual disorders. Asian Journal of Medical and Biological Research. 2018 Nov 12;4(3):259-66.
6. Huang Z, Huang L, Waters MJ, Chen C. Insulin and growth hormone balance: implications for obesity. Trends in Endocrinology & Metabolism. 2020 Sep 1;31(9):642-54.
7. Patel S. Polycystic ovary syndrome (PCOS), an inflammatory, systemic, lifestyle endocrinopathy. The Journal of steroid biochemistry and molecular biology. 2018 Sep 1; 182:27-36.
8. Bellver J, Marín C, Lathi RB, Murugappan G, Labarta E, Vidal C, Giles J, Cabanillas S, Marzal A, Galliano D, Ruiz-Alonso M. Obesity affects endometrial receptivity by displacing the window of implantation. Reproductive Sciences. 2021 Nov;28(11):3171-80.
9. Herman-Giddens ME, Slora EJ, Wasserman RC, Bourdony CJ, Bhapkar MV, Koch GG, Hasemeier CM. Secondary sexual characteristics and menses in young girls seen in office practice: a study from the Pediatric Research in Office Settings network. Pediatrics. 1997 Apr 1;99(4):505-12.
10. Harlow SD, Campbell OM. Epidemiology of menstrual disorders in developing countries: a systematic review.
11. Dars S, Sayed K, Yousufzai Z. Relationship of menstrual irregularities to BMI and nutritional status in adolescent girls. Pakistan journal of medical sciences. 2014 Jan;30(1):141.
12. Ramlau-Hansen CH, Thulstrup AM, Nohr EA, Bonde JP, Sørensen TI, Olsen J. Subfecundity in overweight and obese couples. Human reproduction. 2007 Jun 1;22(6):1634-7.
13. Begum J, Hossain AM, Nazneen SA. Menstrual pattern and common menstrual disorders among students in Dinajpur Medical College. Dinajpur Med Col J. 2009 Jul 2;2(2):37-43.
14. Likis FE, editor. Women's gynecologic health. Jones & Bartlett Publishers; 2016 Jul 29.
15. Tayebi N, Yazdanpanahi Z, Yektatalab S, Pourahmad S, Akbarzadeh M. The relationship between body mass index (BMI) and menstrual disorders at different ages of menarche and sex hormones. Journal of the National Medical Association. 2018 Oct 1;110(5):440-7.
16. Sutton-McDowall ML, Gilchrist RB, Thompson JG. The pivotal role of glucose metabolism in determining oocyte developmental competence. Reproduction. 2010 Apr 1;139(4):685-95.
17. Veena KS, Subitha L, Hemanth Kumar VR, Bupathy A. Menstrual abnormalities in school going girls–are they related to dietary and exercise pattern? Journal of clinical and diagnostic research: JCDR. 2013 Oct 10;7(11):2537.