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Original Research Article

Association Between BMI and Menstrual Irregularities in Women of Reproductive Age

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Abstract:

Introduction: Body Mass Index (BMI) influences menstrual health, with both obesity and underweight linked to cycle irregularities due to hormonal imbalances. Rising trends in abnormal BMI correlate with increased menstrual disturbances. The study aims to assess the relationship between BMI and menstrual irregularities in reproductive-aged women for targeted interventions.

Methods: A six-month prospective study at GSL Medical College included women aged 15–45 with regular cycles. After ethics approval and consent, data on menstrual history, lifestyle, and BMI were collected. BMI was categorized per WHO norms. Menstrual irregularities were defined by abnormal cycle length, flow duration, or intermenstrual bleeding.

Results: Among 88 women aged 15–45 years, 38.6% reported menstrual irregularities, most commonly oligomenorrhea. Irregularities were highest in underweight and obese groups. A statistically significant association ($P < 0.05$) was observed between BMI and menstrual patterns. Mean BMI was significantly higher in women with irregular cycles ($P < 0.001$), indicating strong correlation.

Conclusion: This study found a significant association between abnormal BMI and menstrual irregularities, with higher prevalence in underweight and obese women. Maintaining a healthy BMI is crucial for menstrual health. Limitations include small sample size and single-center design, warranting larger, multi-center studies for broader applicability and hormonal assessment.

Keywords: Body Mass Index (BMI), Menstrual Irregularities, Reproductive Health, Oligomenorrhea.

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Introduction

Body Mass Index (BMI) is an essential anthropometric indicator of nutritional status and overall metabolic health. In women of reproductive age, alterations in BMI particularly overweight and obesity have been consistently associated with disruptions in menstrual cycle and reproductive function. Menstrual irregularities, including oligomenorrhea, amenorrhea, and polymenorrhea, are often manifestations of underlying hormonal imbalances that may be influenced by adiposity-related changes in insulin resistance, sex hormone-binding globulin levels, and androgen production [1].

Recent studies have demonstrated a significant correlation between elevated BMI and the risk of menstrual disturbances. For instance, women with obesity have shown higher incidences of anovulation and irregular cycles compared to women with normal BMI, potentially compromising fertility outcomes [2]. Conversely, underweight women may also experience hypothalamic amenorrhea due to insufficient energy availability and disrupted hypothalamic-pituitary-ovarian (HPO) axis activity [3]. The prevalence of menstrual irregularities in women with abnormal BMI is rising, paralleling the global trends in obesity and undernutrition, particularly in urbanizing regions of developing countries [4].

Understanding the association between BMI and menstrual health is critical for timely intervention and prevention of long-term reproductive and metabolic complications. This study aims to assess the relationship between BMI and menstrual irregularities among women of reproductive age, with the objective of identifying at-risk populations

and formulating appropriate lifestyle and clinical interventions.

Methods

It was a prospective observational study was conducted at GSL Medical College and General Hospital, Rajahmundry, over a period of six months from October 2024 to April 2025. Study protocol was approved by the institutional Ethics committee. An informed written consent was taken from the study members.

Women aged 15 – 45 years with spontaneous menstrual cycles for at least the past 6 months were included in the study. Women with known endocrine disorders, those on hormonal therapy, known uterine abnormalities, pregnancy, or lactation were excluded. Convenient sampling was considered in the study.

The participants were interviewed using a pre-validated, structured questionnaire to collect data on sociodemographic characteristics, menstrual history (cycle length, duration, regularity, and flow), lifestyle factors such as physical activity and diet, and any relevant medical history. Anthropometric measurements were recorded under standardized conditions. Weight was measured using a calibrated digital scale, and height was measured using a stadiometer. BMI was calculated using the formula: weight in kilograms divided by height in meters squared (kg/m²), and classified according to WHO guidelines: underweight (<18.5), normal (18.5–24.9), overweight (25–29.9), and obese (≥30). Menstrual irregularities were defined as cycle length outside 21–35 days, flow duration of <2 or >7 days, or presence of intermenstrual bleeding.

Statistical Analysis: Data were analyzed using SPSS software version 21. Chisqaure and T test were used to find the associations between the variables. P <0.05 was considered to be significant.

Results

The study included 88 women aged 15–45 years. Most participants (31.8%; 28) were between 21 – 25 years, followed 26 – 30 (22.7%; 20), least (4.6%; 4) in 41 – 45 group. Most (40.9%; 36) of the study members had normal BMI, followed by overweight (27.3%; 24), obese (20.4%; 18) and underweight (11.4%; 10). Menstrual irregularities were reported by 34 (38.6%) members. Among these, oligomenorrhea was most common (18.2%; 16), followed by polymenorrhea (11.4%; 10), hypomenorrhea (5.7%; 5), and intermenstrual bleeding (3.4%; 3).

Menstrual irregularities were highest in the underweight (6.8%) and obese (11.4%) groups. Only 6.8% of women with normal BMI reported irregularities, while overweight women showed 13.7%. The association between BMI and menstrual irregularities was statistically significant ($P < 0.05$), indicating a strong correlation (Table 1). The mean BMI among women with irregular menstruation was significantly higher (27.6 ± 4.1 kg/m²) compared to those with regular cycles (22.8 ± 3.2 kg/m²). This difference was statistically significant ($P < 0.001$), suggesting a strong positive correlation between elevated BMI and menstrual irregularities in reproductive-aged women (Table 2).

Table 1: Association between BMI and menstrual irregularities among the study members; n (%)

BMI	Regular cycles	Irregular cycles	Total
Underweight	4 (4.5)	6 (6.8)	10 (11.4)
Normal	30 (34)	6 (6.8)	36 (41)
Overweight	12 (13.7)	12 (13.7)	24 (27.3)
Obese	8 (9)	10 (11.4)	18 (20.5)
Total	54 (61.4)	34 (38.6)	88 (100)

Table 2: Correlation between mean BMI and menstrual history among the study members

Group	Mean BMI (kg/m²)	Standard Deviation
Regular menstruation	22.8	3.2
Irregular menstruation	27.6	4.1

Discussion

In this prospective study of 88 women aged 15–45 years, the majority of participants were in the 21–25 year age group (31.8%), consistent with the typical reproductive health-seeking population in outpatient settings. Normal BMI (18.5–24.9 kg/m²) was observed in 40.9% of participants, while the remainder were either overweight (27.3%), obese (20.4%), or underweight (11.4%). These findings mirror global trends indicating a rising burden of overweight and obesity among reproductive-aged women, especially in low- and middle-income countries [5]. Notably, menstrual irregularities were reported by 38.6% of the participants, a prevalence comparable to other Indian and international studies examining menstrual health in relation to BMI [6].

Among women with irregular cycles, oligomenorrhea was most frequent (18.2%),

followed by polymenorrhea (11.4%), hypomenorrhea (5.7%), and intermenstrual bleeding (3.4%). A clear pattern emerged wherein higher BMI was associated with an increased prevalence of irregular cycles. Obese and overweight women collectively accounted for 25.1% of those with menstrual disturbances. Elevated BMI is known to contribute to hormonal dysregulation, primarily through increased peripheral aromatization of androgens to estrogens, insulin resistance, and altered gonadotropin secretion, all of which disrupt the hypothalamic-pituitary-ovarian axis [7]. Conversely, underweight women are prone to hypothalamic amenorrhea due to energy deficits, further confirming that both ends of the BMI spectrum adversely affect menstrual cycle [8]. These results underscore the importance of maintaining optimal body weight for preserving menstrual and reproductive health.

This study demonstrated a statistically significant association between BMI and menstrual irregularities among reproductive-aged women. Menstrual disturbances were more frequent among women with abnormal BMI, particularly in the obese (11.4%) and overweight (13.7%) categories. Interestingly, a comparable proportion (6.8%) of underweight women also reported irregularities, while women with normal BMI had the lowest prevalence (6.8%). These findings indicate that both extremes of the BMI spectrum are associated with menstrual dysfunction. Studies suggest that excess adipose tissue in overweight and obese women contributes to altered estrogen metabolism, insulin resistance, and hyperandrogenism—factors known to disrupt the HPO axis and ovulatory cycles [9, 10].

The present study also revealed a significantly higher mean BMI (27.6 ± 4.1 kg/m²) among women with irregular menstruation compared to those with regular cycles (22.8 ± 3.2 kg/m²), with the difference being statistically significant ($P < 0.001$). This supports prior research that elevated BMI is a strong predictor of anovulatory cycles, delayed follicular development, and menstrual irregularities [11]. Adipose tissue functions as an endocrine organ, producing leptin and inflammatory cytokines that interfere with gonadotropin-releasing hormone (GnRH) pulsatility, leading to dysregulated menstrual function [12]. Furthermore, insulin resistance common in overweight women exacerbates ovarian androgen production, which contributes to oligomenorrhea and other cycle abnormalities [13].

In contrast, underweight women may experience menstrual irregularities due to insufficient energy availability and hypothalamic suppression, resulting in functional hypothalamic amenorrhea [8]. This emphasizes that both undernutrition and overnutrition can impair reproductive health. These findings reinforce the importance of achieving and maintaining optimal BMI through lifestyle modification and clinical intervention for menstrual health and fertility regulation. Public health programs targeting nutritional counseling and physical activity should be emphasized in reproductive health strategies to minimize BMI-related menstrual disorders.

Conclusion: This study highlights a significant association between abnormal BMI and menstrual irregularities among women of reproductive age. Both underweight and overweight/obese individuals exhibited a higher prevalence of menstrual disturbances, with elevated BMI showing a strong positive correlation. These findings underscore the importance of maintaining optimal body weight for menstrual and reproductive health. However, small sample size single center research are the limitations. These may affect generalizability.

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