

## RESEARCH ARTICLE

### Prevalence of menstrual irregularities in correlation with body fat among students of selected colleges in a district of Tamil Nadu, India

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#### ABSTRACT

**Background:** Menstrual irregularities are usually due to imbalance of hormones. Although menstrual irregularities may be normal during the early postmenarchal years, pathological conditions require proper and prompt management. Obesity associated with many health consequences including hormonal imbalance has a direct effect on menstrual cycle. Hence, attention to obesity is obligatory for the inclusion of diagnosis and treatment of menstrual complaints which has become a leading issue in women's life. **Aims and Objectives:** The aims and objectives of the study are to assess the menstrual irregularities and to find the association between menstrual irregularities and body fat among students. **Materials and Methods:** A cross-sectional study was conducted in three selected colleges in a district of Tamil Nadu in India. A total of 399 samples were included in the study. A 10-item questionnaire was administered to assess the menstrual irregularity in each student. The demographic variables along with anthropometric measurements were collected. Anthropometric measurements were taken to calculate the body fat percentage using modified YMCA formula. **Results:** The prevalence of menstrual irregularities was high in obesity compared with those with normal body fat and particularly oligomenorrhea, amenorrhea, and hypomenorrhea had statistically significant increase in obese students. **Conclusion:** This study revealed 4-fold increase in the prevalence of menstrual irregularities in students with increased body fat when compared with the normal. Effective steps to reduce body fat by regular exercise, healthy eating habits and lifestyle modifications should be undertaken to revert menstrual irregularities back to normal. Young women can thus lead a normal active life and prevent infertility which has become a most striking event in this generation.


**KEY WORDS:** Menstrual Irregularities; Obesity; Body Fat Percentage

#### INTRODUCTION

Menstruation is a clear sign that indicates the body is working normally with the hormonal changes that keep women healthy. It is to represent the readjustment of the uterus to the non-pregnant state following proliferative changes accompanying

the preceding ovulation. However, the prevalence of menstrual irregularity documented in India is about 30%.<sup>[1]</sup> The major complications of menstrual irregularities are anemia, osteoporosis and infertility.<sup>[2]</sup> The vital causes of menstrual irregularities are hormonal imbalance, polycystic ovarian syndrome (PCOS), infections, malignancy, trauma, certain medications, and obesity. Out of which obesity reports more than the other causes.<sup>[3]</sup>

In the present generation due to globalization, there is a drastic change from healthy eating habits and agile lifestyle to poor eating habits and sedentary lifestyle which is a major concern on the increasing reproductive health problems.<sup>[3]</sup>

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Traditionally known for malnutrition, Indians now report more and more frequently with obesity and their consequences. According to the World Health Organization global estimates (2008)<sup>[4]</sup> more than 10% of the world's adult population were obese. Based on the National Family Health Survey (2007),<sup>[5]</sup> the prevalence of obesity in Indian females is 16%, and the prevalence of obesity among females is 24.4% in Tamil Nadu.

There are two important detectors to indicate obesity which is body mass index and body fat percentage. The basic relationship between obesity and menstruation is that the fat cells contain cholesterol compounds which can get changed into a form of weak estrogen called "estrone." Obese women carrying extra fat cells have "little estrogen making factories," which have an oestrogenic effect on glands. This added estrogen can cause bleeding or menstrual disorders.<sup>[6]</sup> Hence, one can expect the significant consequences of obesity on the female reproductive system.

## MATERIALS AND METHODS

This cross-sectional study was conducted after obtaining an approval from the Institutional Ethical Committee at three colleges in a district of Tamil Nadu, India which were selected by lottery method. 399 students were selected for the study by simple random sampling technique, and informed consent was obtained for participation. Married students, students taking hormonal contraceptives and students with major ailments such as cardiovascular disease, diabetes mellitus, hypertension, anemia, and endocrine disorders were excluded from the study.

A validated 10-item, multi-choice questionnaire with closed-ended questions was administered to all students to assess menstrual irregularities. Menstrual irregularities refer to any kind of changes occurring in amount or duration of bleeding in normal menstrual cycle which includes menorrhagia (menstruation >7 days), hypomenorrhea (menstruation <3 days), polymenorrhea (menstrual interval <21 days), oligomenorrhea (menstrual interval >35 days), dysmenorrhea (severe abdominal pain and unable to carry out daily routine activities), metrorrhagia (spotting between menstrual cycle), and amenorrhea (menstrual interval >3 months).<sup>[7-9]</sup>

In this study, the body fat percentage has been used as an indicator of obesity. Students with body fat percentage above 32 were considered to be obese.<sup>[10]</sup> To calculate the body fat percentage the following anthropometric measurements including forearm circumference, wrist circumference, waist circumference, and hip circumference were measured with students standing erect with abdomen relaxed, arms at the side and feet together with the help of an inch tape in inches at the end of a normal expiration, without the tape compressing the skin to the nearest 0.1 cm was tabulated.<sup>[11]</sup> Body weight was measured in kilograms using analog weighing scale without footwear. The body

fat percentage was calculated using modified YMCA formula<sup>[12]</sup> as follows:

- Factor 1: Total body weight  $\times$  0.268
- Factor 2: Wrist measurement (at fullest point)  $\times$  0.318
- Factor 3: Waist measurement (at navel)  $\times$  0.157
- Factor 4: Hip measurement (at fullest point)  $\times$  0.245
- Factor 5: Forearm measurement (at fullest point)  $\times$  0.434

Body fat percentage = [(Factor 1 – Factor 2 + Factor 3 + Factor 4 – Factor 5 – 8.987)  $\times$  100]/total body weight.

## Statistical Analysis

Association between menstrual irregularity and body fat percentage was analyzed by Chi-square test, and *P* values were interpreted at a significance level of 0.05.

## RESULTS

The average age of the students was  $19.29 \pm 1.65$  years with a range of 18 to 24 years. A total of 399 students were included in the study out of which 93 (23.3%) students had menstrual irregularities. Among the menstrual irregularities, dysmenorrhea accounts the maximum of 22.6%, menorrhagia of 19.4%, oligomenorrhea of 18.3%, hypomenorrhea and polymenorrhea of 14%, amenorrhea of 10.8%, and metrorrhagia of 1% (Figure 1).

Based on body fat percentage, 348 (87.2%) of the students were within normal range and 51 (12.8%) were obese.

There was a statistically significant difference in the prevalence of menstrual irregularity between normal and obese students ( $Z = -7.50$ ,  $P < 0.0001$ ). Among the students with normal body fat percentage, 17.2% had menstrual irregularity, while among the obese category 64.7% had menstrual irregularity (Figure 2).

When the prevalence of each of the menstrual irregularity was compared between the normal and obese girls, the significance was assessed after adjusting the *P* values using Bonferroni test. Oligomenorrhea, amenorrhea, and hypomenorrhea were statistically significant and more common among the obese students compared to the normal students. Overall, the menstrual irregularities were common in obesity significantly (Figure 3).

## DISCUSSION

In this study, among the 399 total students, 348 (87.2%) of the students were within the normal body fat percentage and 51 (12.8%) were obese. A study done among the Indian young adolescent girls reported that eating habit such as junk food, chocolate, and eating outside at weekend and physical activity such as exercise, sports, and sleeping habit

in afternoon having a remarkable effect on prevalence on overweight and obesity.<sup>[13]</sup> However, the girls with menstrual irregularities account for 93 girls (23.3%) most of them

belongs to obese category which is in agreement with the other reports presented in India and Abroad.<sup>[14-16]</sup>

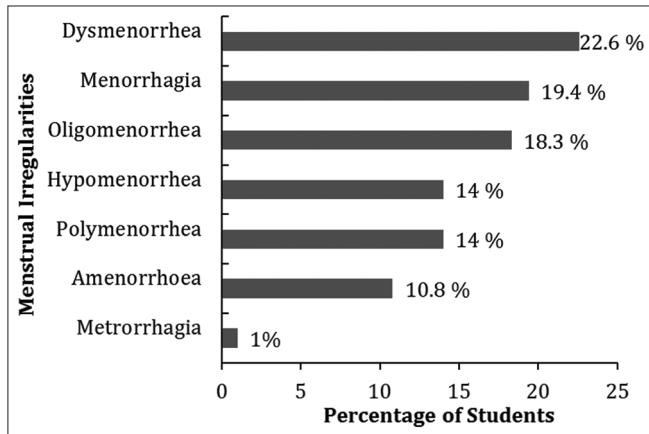


Figure 1: Distribution of different types of menstrual irregularities

The result of the study showed that the most common menstrual irregularity was dysmenorrhea (22.6%) followed by menorrhagia (19.4%), oligomenorrhoea (18.3%). Although dysmenorrhea is not life threatening it is serious enough to affect daily activities or academic attendance and also menstrual blood loss in menorrhagia affects women’s quality of life and heavy bleeding can put women at risk of anemia.<sup>[14]</sup> PCOS, Cushing’s disease, thyroid dysfunctions, premature ovarian failure, strong physical exercise, eating disorders, congenital adrenal hyperplasia, ovarian, and adrenal tumors or prolactinomas are all examples of endocrine dysfunctions that can cause oligomenorrhoea.<sup>[17]</sup> In this study, hypomenorrhoea and polymenorrhoea each account for 14%, and amenorrhoea noticed in 10.8% girls, and metrorrhagia reported only for 1%.

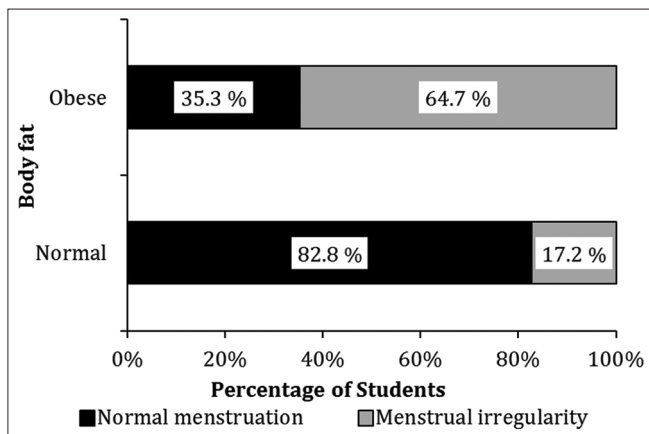


Figure 2: Distribution of prevalence of overall menstrual irregularities among normal and obese students

Several studies have shown that obese women are more likely to experience menstrual irregularity than non-obese women. It has been suggested that body fat may be more strongly associated with menstrual abnormalities and adverse hormonal profiles.<sup>[18]</sup> The high percentage of fat in the mature human female may influence reproductive ability directly through two metabolic mechanisms: (a) Fat converts androgens to estrogens; (b) relative fatness influences the direction of metabolism of estrogen to the most potent or least potent forms. Hence, variations in body fat result in various menstrual irregularities such as menorrhagia, hypomenorrhoea, polymenorrhoea, oligomenorrhoea, dysmenorrhea, metrorrhagia, and amenorrhoea.<sup>[19]</sup>

The strength of this study is that the researches that have been conducted regarding menstrual irregularities in obesity have

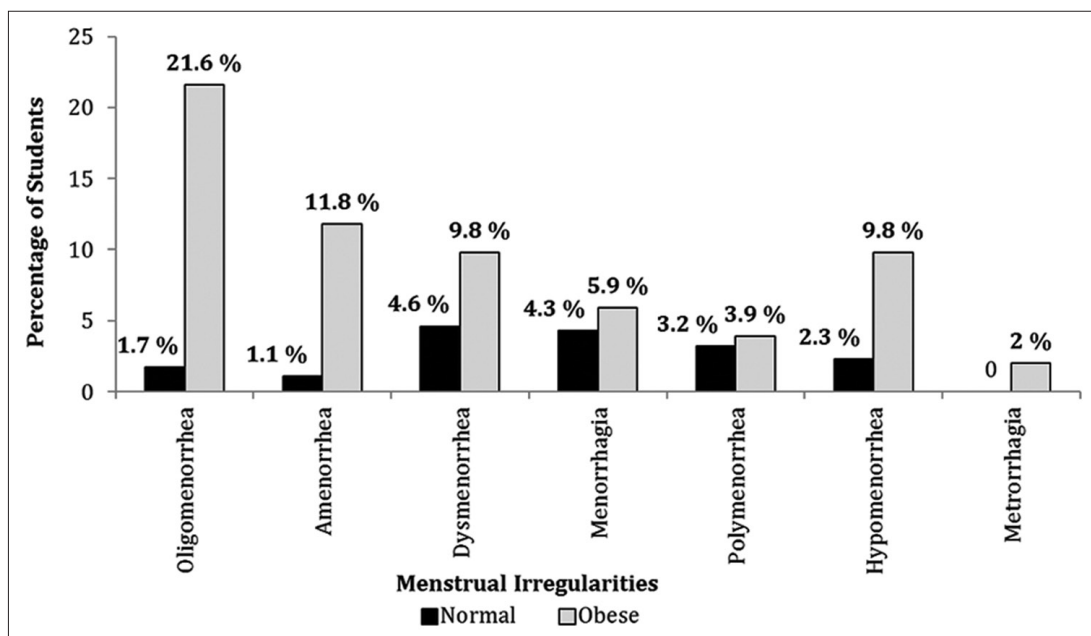


Figure 3: Comparison of prevalence of different types of menstrual irregularities between normal and obese girls

classified obesity based on body mass index and not on body fat percentage which actually has an effective impact on menstrual irregularity. In this study, an attempt was made to correlate menstrual irregularities with body fat. Further, the questionnaire that was used in this study was statistically validated, and the reliability was checked after conducting a pilot study.

The study has some limitations too. The first limitation is that information of the menstrual history was assessed by questionnaires rather than menstrual diaries. Other studies have suggested that retrospective self-reports of menstrual history are prone to have errors<sup>[20]</sup> with volatile accuracy between diary records and retrospectively recalled menstrual history.<sup>[21]</sup> Second, hormones such as estrogen, testosterone, sex hormone-binding globulin, follicle-stimulating hormone, and luteinizing hormone that may affect the associations between body fat and menstrual cycle characteristics were not examined, nor we were able to find whether women with irregular or variable cycles were anovulatory or oligo-ovulatory. A study has reported that obese women have increased estrogen, luteinizing hormone levels, or an increased ratio of androgen to estrogen.<sup>[22,23]</sup>

## CONCLUSION

Menstrual irregularities are common among the obese in this population. However, students of the late adolescent stage are reluctant to seek medical treatment leading to a delay in diagnosis and treatment. Appropriate health education measures need to be put into place to prevent this trend. We recommend that the students should be emphasized to design their menstrual health and encouraged to chart their body fat percentage along with their menstrual frequency and regularity prospectively to focus their attention on the need to take care of their reproductive health.

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