

ORIGINAL RESEARCH

A cross sectional study to evaluate the Association between menstrual irregularities, BMI and periodontal diseases

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ABSTRACT

Background: The association between menstrual cycle irregularities and system disease has been evaluated in previous studies. However, the association between BMI, periodontal disease and menstrual cycle irregularity has not been fully investigated.

Aim: Evaluation of the Association between menstrual irregularities and periodontal diseases.

Material and methods: A total of 100 female participants were included in the present study. The collection of data pertaining to reproductive factors involved the participants' recollection of the duration of their menstrual cycle, as well as their history of hormone replacement therapy and oral contraceptive use. The participants' body weight and height were measured with a precision of 0.1 kg and 0.1 cm, respectively. The assessment of periodontal disease was conducted utilizing the community periodontal index (CPI) established by the World Health Organization (WHO). Periodontal disease was classified as present when the Community Periodontal Index (CPI) had a value of 3 or higher.

Results: The impact of body mass index (BMI) or waist circumference on the occurrence of menstrual cycle irregularity and periodontal diseases. The occurrence of irregular menstrual cycles was found to be more common among individuals with higher body mass index or waist circumference (P values for trend were 0.02 and 0.26, respectively). The prevalence of periodontal disease was found to be higher in individuals with a higher body mass index or waist circumference, as indicated by a statistically significant P-value for trend of less than 0.001. Adjusted odds ratios and their 95% confidence intervals of the individuals with periodontal diseases were 1.71 (1.15, 2.99) after adjustment with age and 1.83 (1.15, 3.22) for BMI.

Conclusion: The study revealed that irregularities in the menstrual cycle among premenopausal Indian women may serve as a potential indicator of increased susceptibility to periodontal diseases.

Keywords: Menstrual irregularities, Periodontal diseases.

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Introduction

The menstrual cycle holds significance as it serves as a fundamental reflection of physiological processes and fertility. Irregularities in these cycles may potentially signify the presence of underlying endocrine disorders. The variability in the length of the menstrual cycle among females can be attributed to the differing durations of follicular growth and development during the follicular phase [1]. Scholars have proposed that the duration of the menstrual cycle serves as a noninvasive indicator of reproductive function in clinical settings. Regular menstruation is dependent on maintaining normal levels of estrogen in the bloodstream throughout the menstrual cycle. When estrogen levels decrease towards postmenopausal concentrations, menstrual cycles can become

irregular or cease altogether. Irregular menstruation typically indicates a state of low estrogen levels.

The length of the menstrual cycle has been proposed as a potential indicator of cardiovascular disease and a risk factor for breast cancer [3]. Women who experience long menstrual cycles (typically lasting 40 days or more) or have highly irregular cycles are at a notably elevated risk of developing type 2 diabetes mellitus [4]. Additionally, the prevalence of type 2 diabetes is higher among women who have a history of menstrual irregularity [5]. Additionally, there have been reports suggesting that irregularities in the menstrual cycle may serve as an indicator of metabolic disorders [6].

Previous studies have examined the correlation between irregularities in the menstrual cycle and

systemic diseases. A prior investigation demonstrated a positive correlation between highly irregular menstrual cycles and an elevated susceptibility to rheumatoid arthritis.[7] There is a notable association between extended or highly irregular menstrual cycles in women and a substantially elevated susceptibility to the development of type 2 diabetes mellitus.[8] The effect of menstrual cycle on oral health has been suggested previously [2,7,8]. Fluctuation in estrogen/progesterone levels has been shown to affect the periodontium [7]. Sex hormones are reported to have the ability to proliferate specific periodontal microorganisms and affect host immunologic response [8]. Moreover, it has been shown that there is an association between menstrual cycle irregularities and periodontal treatment needs.

Since there is paucity of literature regarding association of periodontal disease, BMI and menstrual cycle, we intended to evaluate the Association between menstrual irregularities and periodontal diseases- A cross sectional study.

Material and methods

A total of 100 female participants were included in the present study. The collection of data pertaining to reproductive factors involved the participants' recollection of the duration of their menstrual cycle, as well as their history of hormone replacement therapy and oral contraceptive use. The characteristics of the menstrual cycle were classified into three categories: regular, irregular (occurring once within a three-month period), and duration exceeding three months. Prior to their involvement, all respondents in the survey provided their informed consent by signing a consent form. Trained interviewers administered a survey to all participants, inquiring about sociodemographic and lifestyle variables. The education level was classified into two distinct groups based on the criterion of having completed high school or possessing a higher level of education. After adjusting for the number of family members, the monthly household income was categorized into quartiles. Trained personnel conducted anthropometric measurements. The participants' body weight and height were measured with a precision of 0.1 kg and 0.1 cm, respectively. These measurements were taken while the participants were wearing light indoor clothing and without shoes. The calculation of body mass index involved dividing the body weight (expressed in kilograms) by the square of the height (expressed in square meters). The measurement of waist circumference was conducted in an upright position, specifically at the point of narrowest circumference between the lower border of the rib cage and the iliac crest.[9] Blood pressure measurement was conducted using a conventional mercury

sphygmomanometer. The systolic and diastolic blood pressures were recorded on two occasions, with a 5-minute interval between each measurement. The mean values of these measurements were utilized for the subsequent analysis.

In accordance with the aforementioned assertion, the diagnosis of metabolic syndrome necessitates the fulfillment of three or more of the subsequent criteria. In order to assess certain health risks, it is recommended to consider waist circumference measurements of 90 cm or greater in men and 80 cm or greater in women, as well as blood pressure readings of 130/85 mm Hg or higher.

Oral health behaviors were recorded by documenting the specific time of day at which participants engaged in tooth brushing and the use of secondary oral products.[10] The frequency of daily tooth brushing was determined by quantifying the total number of times the teeth were brushed within a 24-hour period. The participants' self-reported oral condition was classified into three categories: favorable, average, and problematic. The assessment of periodontal disease was conducted utilizing the community periodontal index (CPI) established by the World Health Organization (WHO). Periodontal disease was classified as present when the Community Periodontal Index (CPI) had a value of 3 or higher. The presence of a permanent dental root fragment was deemed indicative of absence.

Statistical analyses

The data are reported in the form of mean±standard error or percentage (standard error). To evaluate the disparities in characteristics based on the presence of periodontal disease, a Chi-square test was conducted for categorical variables, while an independent t-test was employed for continuous variables. The study employed a hierarchical multivariable logistic regression analysis to assess the association between menstrual cycle irregularity and the risk of periodontal disease. Adjustments were made for potential confounding factors, and odds ratios along with 95% confidence intervals were computed. In this study, statistical significance was determined by considering two-sided p-values that were less than 0.05.

Results

Table 1 presents an overview of the fundamental attributes of the participants in the study, categorized based on the existence or absence of periodontal disease. Participants with periodontal diseases exhibited significantly higher mean age, body mass index, waist circumference, menstrual cycle irregularity, systolic blood pressure, diastolic blood pressure, and low income. Table 2 presents the impact of body mass index (BMI) or waist

circumference on the occurrence of menstrual cycle irregularity and periodontal diseases. The occurrence of irregular menstrual cycles was found to be more common among individuals with higher body mass index or waist circumference (P values for trend were 0.02 and 0.26, respectively). The

prevalence of periodontal disease was found to be higher in individuals with a higher body mass index or waist circumference, as indicated by a statistically significant P-value for trend of less than 0.001.

Table 1: Basic parameter of the patients

	Number	Percentage
Age		
below 25	6	6
25-30	29	29
30-35	50	50
35-40	15	15
Mean	34.58±4.58	
BMI	24.85±3.64	
Waist circumference, cm	24.58±3.96	
Systolic blood pressure	112.58±4.56	
Diastolic blood pressure	74.85±3.16	
Income		
Low	17	17
Average	61	61
High	22	22
Frequency of tooth brushing per day		
1	29	29
2	65	65
3	5	5
Above 3	1	1

TABLE 2. The Effects of Body Mass Index or Waist Circumference on Menstrual Cycle Irregularity, Periodontal disease

Body mass index kg/m ²	Menstrual Cycle Irregularity= 100	Periodontal diseases=30
below 18.5	10	3
18.5-23	15	5
23-25	30	6
Above 25	45	16
P value	0.02	0.001
Waist circumference, cm		
70	10	4
70-75	13	3
75-80	27	6
Above 80	50	18
P value	0.26	0.001

VPI, GBI, Calculus, BOP, PPD, CAL_D and CAL_I were present 41 ± 1.5, 15 ± 0.58, 20 ± 2.5, 31.69 ± 3.69, 2.53 ± 0.96, 4.11 ± 0.87 and 4.53 ± 0.83 respectively.

Menstrual cycle irregularity was more prevalent in individuals with higher body mass index or waist circumference. Periodontal disease was more prevalent in individuals with higher body mass index or waist circumference.

Table 3 Clinical periodontal measures of patients

VPI	41 ± 1.5
GBI	15 ± 0.58
Calculus	20 ± 2.5
BOP	31.69 ± 3.69
PPD (mm)	2.53 ± 0.96
CAL _D (mm)	4.11 ± 0.87
CAL _I (mm)	4.53 ± 0.83

BOP, bleeding on probing; CAL_D, clinical attachment loss measured using the direct method; CAL_I, clinical attachment loss measured using the indirect method; GBI, gingival bleeding index; PPD, periodontal probing depth; VPI, visible plaque index.

Table 4 Adjusted Odds Ratio and 95% Confidence Interval of the Individuals With Periodontal diseases in Multivariate Logistic Regression Model in the Presence of Menstrual Cycle Irregularity

	Periodontal disease	<i>P</i>
	Odds Ratio (95% Confidence Interval)	
Age	1.71 (1.15, 2.99)	0.043
income	1.79 (0.98, 2.91)	0.06
BMI	1.83 (1.15, 3.22)	0.04
Waist circumference, cm	1.81 (1.21, 3.11)	0.03

Table 3 shows the adjusted odds ratios and their 95% confidence intervals from multivariate logistic regression analyses for individuals with the periodontal diseases. Adjusted odds ratios and their 95% confidence intervals of the individuals with periodontal diseases were 1.71 (1.15, 2.99) after adjustment with age and 1.83 (1.15, 3.22) for BMI.

Discussion

The objective of this study was to establish correlations between periodontal disease in women and irregularities in the menstrual cycle. The findings of the study indicate a significant statistical association between menstrual cycle irregularity in premenopausal women and an elevated risk of periodontal disease.

Variations in the evaluation of menstrual cycle characteristics were observed across various studies.[11] The precise mechanism that explains the link between periodontal disease and irregularities in the menstrual cycle remains incompletely understood. The participants assessed the regularity of their menstrual cycles by examining their menstrual history over the past 12 months. They categorized their cycles into one of three groups: regular (11-13 menstrual cycles per year), irregular (3-10 menstrual cycles per year), or amenorrheic (≤ 2 menstrual cycles per year). In a separate study, periods were classified as regular if the total duration fell within the range of 20 to 40 days. In a separate study, menstrual cycle characteristics were categorized based on self-reported data into three categories: short cycles (≤ 25 days), normal cycles (26–34 days), and long cycles (≥ 35 days). Additionally, cycles were considered irregular if the difference between the longest and shortest cycle in the preceding 12 months was equal to or greater than 15 days. In the present study, the menstrual cycle characteristics were classified into three categories: regular, irregular (occurring once within a span of three months), and duration exceeding three months.

One of the primary determinants of menstrual cycle regularity has been proposed to be body weight. According to a previous investigation, it was found that women who are obese have a higher likelihood of encountering irregularities in their menstrual cycle, such as amenorrhea and oligomenorrhea, compared to women who are not obese.[12] The study revealed that individuals with a body mass index (BMI) of 25 or higher exhibited a higher prevalence of irregular menstrual cycles, accounting for 45% of the sample. In contrast, only 25% of individuals with a BMI ranging from 18 to

23.5 experienced irregular menstrual cycles. These results were consistent when obesity was defined as a waist circumference of 88 cm or greater.[11] The proposition was made that the distribution of body fat in the central region of the body is more strongly linked to menstrual irregularities and unfavorable hormonal profiles compared to measures of body fat in peripheral areas or overall adiposity, such as body mass index. The previous research has established a correlation between obesity and periodontal disease, which could potentially elucidate the connection between irregular menstrual cycles and the necessity for periodontal treatment.[13-15]

Prior research has indicated a correlation between elevated androgen levels and the occurrence of menstrual irregularities within clinical populations.[11] Elevated androgen levels have been linked to both central and peripheral adiposity. Furthermore, increased concentrations of androgen may impact cellular reactions to an inflammatory stimulus through the suppression of the production of the anti-inflammatory cytokine IL-6.[16]

It is important to acknowledge the presence of certain limitations that warrant consideration. The causal direction of the observed associations cannot be definitively determined due to the cross-sectional design of the study. To establish a more conclusive understanding, it would be beneficial for future research to employ a longitudinal study design that includes repeated measurements of both periodontal treatment needs and menstrual characteristics. Another constraint of this study pertains to the fact that participants relied on self-reported cycle characteristics in a retrospective manner, rather than utilizing menstrual diaries. Additionally, the precise duration of each cycle was not documented in this particular study. Significant measurement error was observed in the self-reported cycle length, and the level of agreement between the observed and reported cycle length was moderate.[17]

Conclusion

The study revealed that irregularities in the menstrual cycle among premenopausal Indian women may serve as a potential indicator of increased susceptibility to periodontal diseases. Women having altered BMI are more susceptible to develop periodontal diseases and irregular menstruation.

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