e-ISSN: 3049-2904, Print ISSN: 3107-6262

Oral Sphere Journal of Dental and Health Sciences

www.oralsphere.com

Original Research Article

Effects of Menstruation on Oral Health: A Cross-Sectional, Questionnaire-Based Study

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Citation: Javed Q, Singhal C. Effects of Menstruation on Oral Health: A Cross-Sectional, Questionnaire-Based Study. *Oral Sphere J Dent Health Sci*. 2026;2(4):211-218.

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Received: April 25, 2026;

Revised: July 15, 2026;

Accepted: August 28, 2026,

Published: October 01, 2026

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DOI: https://doi.org/10.63150/osjdhs.2026.31

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ABSTRACT

Background: Hormonal changes throughout the menstrual cycle have an impact on many areas of women's health, and may even impact oral health. Gingival inflammation, oral discomfort, plaque buildup and other periodontal issues can be caused by changes in estrogen and progesterone levels.

Materials and Methods: The study was a cross-sectional study with random sampling of females age group 18-50 years. This was done using a pre-validated, self-administered Google Forms questionnaire designed to assess demographic characteristics, oral health awareness, and oral symptoms related to menstruation. Data were analyzed using SPSS version 27.

Results: OG was a very common occurrence (most frequently reported, especially during the luteal phase), as were gingival bleeding, swelling, and oral discomfort. There was a trend of positive relationship between higher educational status and higher oral health awareness, which did not necessarily follow through to preventative oral health measures. Postmenopausal women reported higher levels of xerostomia, which may be due to the impact of hormones on salivation. Higher BMI was correlated to menstrual irregularities and overweight and obese participants experienced more menstrual and oral discomfort. There were indications that oral manifestations might be influenced systemically.

Conclusion: This study indicates the importance of awareness and awareness-raising in the field of oral health care among women in various reproductive phases. Oral health promotion within reproductive health programs and routine dental care can help to reduce the impact of hormonal changes on the oral cavity. Longitudinal studies are required to confirm causal relationships and mechanisms that link indicators.

Keywords: Menstrual cycle, Oral health, Hormonal fluctuations, Gingival inflammation, Periodontal health, Awareness, Preventive dental care.

INTRODUCTION

Oral health is the health of the teeth, gums, throat and underlying bone tissue. It is an integral part of health and is affected by several systemic and hormonal factors [1]. The menstrual cycle is a complex event that occurs in the female body, which is regulated by female sex hormones, such as estrogen and progesterone and has four phases: menstruation, follicular, ovulation, and luteal phase [2].

Systemic health can be affected by hormonal shifts at these times as well as oral health [3].

During the luteal phase, vasa permeability is increased and an inflammatory reaction occurs in the gingival tissues, which makes them more susceptible to accumulation of plaque, resulting in inflammation and gingivitis even in the absence of much plaque [4]. The presence of estrogen and progestrone receptors in human gingiva further emphasizes the role of hormones in periodontal health [5].

Oral health is impacted by hormonal changes during every stage of puberty, menstruation, pregnancy and menopause [6]. Bleeding, sensitivity and discomfort around gums often occur in the later part of adolescence and the days leading up to menstruation, but resolve during menstruation. During postmenopause, the woman's saliva production decreases and is more susceptible to periodontal disease and dental caries, all of which can contribute to xerostomia [7]. Changes in hormones during menopause also increase the risk of osteoporosis and this can lead to tooth loss.

New evidences also suggest that oral health is linked with hormonal imbalance disorders like polyendocrine metabolic ovarian syndrome (PMOS) [8]. Additional contributing factors, like high body mass index (BMI) and inactivity, complicate this relationship as well by contributing to systemic inflammation, metabolic syndrome and irregular menstrual cycles (all of which could affect the periodontal outcomes) [9].

Despite the awareness of women's health related issues, very little research has been conducted on menstrual cycle and oral health of Indian people. The data available are from Western countries and there is little research on different communities in the city of India [10]. The study was conducted to find out the difference in the oral health parameters when seen in the women of Delhi and Faridabad in the various phases of the menstrual cycle and also to find out the effect of awareness, lifestyle, BMI and systemic disease (PMOS) on their oral health.

MATERIALS AND METHODS

The study was carried out in the Department of Public Health Dentistry, Manav Rachna Dental College from 18-10-2025 to 02-12-2025 using cross-sectional and questionnaire-based study method. The purpose of the study was to evaluate the awareness, attitudes and practices of the effect of menstruation on the periodontal and general oral health.

The random sampling technique was used to select participants aged 18-50 years. Inclusion criteria were: discomfort during or just prior to menstruation, willingness to participate. The Institutional Ethics Committee approved the ethical aspects of the study, and informed consent was taken prior to participation.

Structured pre validated self-administered questionnaire was sent using Google Forms. The questionnaire included questions on demographic information (age and education), general health assessment questions related to BMI, general oral health awareness, oral health awareness questions related to menstruation, and general menstruation discomfort.

The questionnaire was modified from the one used by Asaad et al. and was pre tested with 30 out patients from the attached dental college. Results of the pilot study were used to make the necessary adjustments. Data were analyzed using SPSS version 27 and the chi-square test ($p<0.05$) was used to determine the levels of significance.

RESULTS

The socio-demographic data of the study participants are presented in the Table 1 and the answers to the questionnaires are given in Table 2.

Most participants, 165 (68.8%) were between 18 and 25 years of age, suggesting that the majority of participants were young women. Most of them were under 30 years of age (60.1%) and undergraduates, 142 (59.2%) with 27.1% of postgraduates; 13.8% were at school level, indicating a high level of education among the participants, which may affect their awareness and health-seeking behavior.

Table 1: Socio-demographic characteristics of the study participants

Variable	Category	Frequency (n)	Percent (%)
Age group	18-25 years	165	68.8
	26-35 years	56	23.3
	36-45 years	11	4.6
	>45 years	8	3.3
Education level	Postgraduate	65	27.1
	Undergraduate	142	59.2
	School	33	13.8

N = 240.

44.2% of the participants reported irregular periods, which is a significant number, indicating a common menstrual health concern. Higher BMI categories were associated with higher proportions who reported irregular periods; the combined overweight/obese (BMI > 25) category had the largest proportion of irregular periods (48% overweight and 8% obese), and weight management is important for the health of menstruation.

The result showed that the majority in this study had never consumed alcohol (82.5%) or smoking (93.8%), and both of these were low in prevalence. However, most of the participants (62.5%) exercised only sometimes, and 21.3% of the participants never exercised, suggesting low physical activity which can be correlated with obesity and this calls for more consistent physical activity.

As far as oral hygiene was concerned, most participants brushed their teeth once a day (55.4%) or twice (43.3%) and 71.7% used only brushing. Low preventive dental care was seen as most went to the dentist only when needed (77.1%).

A small proportion had red or swollen gums (5.8%), ulcers (11.3%) and bleeding gums (3.8%) during menstruation, with many not knowing or saying "maybe", indicating unclear or inconsistent symptoms and the need to educate women on menstrual awareness and its symptoms. Systemic symptoms of lassitude and increased body temperature were very common (Lassitude = 60%, increased body temperature = 60%). Other common side effects included nausea or vomiting (29.6%), bitter taste (19.2%), and dry mouth (16.7%), which occurred more often than excess salivation (7.9%).

Association between BMI and regularity of periods is shown in Table 3. There was a strong and statistically significant association (p = 0.000) between BMI and menstrual irregularity.

Association between awareness and age group, education level along with attitude towards oral health is presented in table 4. The period of menstruation showed significant association with red and swollen gums (p = 0.000) as well as with age and education (p = 0.000). There was also a strong association between bleeding gums and the others (p = 0.016). This means that age and/or education levels may be more likely to notice or report on any specific oral changes that occur during menstruation. Other symptoms like ulcers, tiredness, sore throat, bitter taste, hot flushes, nausea and dry mouth were not statistically significant when correlated with age or level of education, possibly because these women didn't know these symptoms; hence, there is a need to educate women about the effect of menstruation on oral health.

Table 2: Responses to the questionnaire

Question	Response	Frequency (n)	Percent (%)
Are your periods irregular?	No	134	55.8
	Yes	106	44.2
Body mass index (kg/m2)	<18.5	10	4.2
	18.5-24.9	115	47.9
	25.0-29.9	93	38.8
	>30	22	9.2
Do you take alcohol?	No	198	82.5
	Occasionally	37	15.4
	Yes	5	2.1
Do you smoke?	No	225	93.8
	Occasionally	12	5.0
	Yes	3	1.3
How often do you exercise?	Daily	39	16.3
	Sometimes	150	62.5
	Never	51	21.3
How often do you brush?	After every meal	3	1.3
	Once a day	133	55.4
	Twice a day	104	43.3
What is your oral hygiene practice?	Brush	172	71.7
	Brush and mouthwash	65	27.1
	Finger	3	1.3
How often do you visit your dentist?	Once a year	24	10.0
	Once every 3-6 months	31	12.9
	When required	185	77.1
During menstruation, red and swollen gums?	Yes	14	5.8
	No	189	78.8
	Maybe	37	15.4

Table 2 Continued...			
During menstruation, sudden outbreak of oral ulcers?	Yes	27	11.3
	No	190	79.2
	Maybe	23	9.6
Bleeding gums during periods?	Yes	9	3.8
	No	210	87.5
	Maybe	21	8.8
Rise in body temperature and tiredness?	Yes	144	60.0
	No	59	24.6
	Maybe	37	15.4
Pain on swallowing or sore throat?	Yes	32	13.3
	No	180	75.0
	Maybe	28	11.7
Bitter taste in mouth during periods?	Yes	46	19.2
	No	172	71.7
	Maybe	22	9.2
Hot flushes leading to burning sensation of mouth?	Yes	19	7.9
	No	196	81.7
	Maybe	25	10.4
Nausea and vomiting during these days?	Yes	71	29.6
	No	136	56.7
	Maybe	33	13.8
Dry mouth or excess salivation?	Dry mouth	40	16.7
	Excess salivation	19	7.9
	None of these	181	75.4

N = 240.

Table 3: Association between body mass index and regularity of periods

BMI (kg/m2)	Regular (No irregularity)	Irregular	Total	p-value
<18.5	8	2	10	0.000*
18.5-24.9	101	14	115	
25.0-29.9	20	73	93	
>30	0	22	22	
Total	129	111	240	

*Chi-square test. *Statistically significant (p < 0.05). BMI: body mass index.*

Table 4. Association between awareness of and attitude toward oral health and age group and education level

Variable	Chi-square value	p-value
Do you take alcohol?	5.746	0.057
Do you smoke?	1.694	0.429
How often do you brush?	0.402	0.818
What is your oral hygiene practice?	1.384	0.501
How often do you visit your dentist?	1.141	0.565
Red and swollen gums during menstruation	49.455	0.000*
Sudden outbreak of oral ulcers	3.135	0.209
Bleeding gums during periods	5.423	0.016*
Rise in body temperature and tiredness	1.962	0.375
Pain on swallowing or sore throat	1.858	0.395
Bitter taste in mouth	0.345	0.842
Hot flushes / burning sensation of mouth	1.864	0.394
Nausea and vomiting	3.727	0.155
Dry mouth / excess salivation	2.730	0.255

*Pearson chi-square test; N = 240. *Statistically significant (p < 0.05).*

DISCUSSION

The present study showed a significant correlation between menstrual health, BMI, oral-health symptoms and oral-health practices among women. Of the 240 who participated in the study, 44.2% had irregular menstrual periods and 48.0% were either overweight or obese. Menstrual irregularity was found to be significantly associated with BMI ($p<0.001$), more so among participants in the overweight and obese category. The present results corroborate those of Machtei et al. [11] who showed changes in periodontal parameters during different phases of the menstrual cycle but differences were found between individual patients. They also reported significant oral symptoms associated with menstruation in their longitudinal study of premenopausal women, and highlighted the possible effect of hormonal changes on periodontal tissues. This corroborates the current finding that although women did not necessarily view menstruation as a persistent problem of oral health, they still experienced symptoms associated with menstruation.

The current observation of menstrual associated gingival manifestations is also supported by Balan et al. [12] who studied oral symptoms during the normal menstrual cycle in 40 healthy young women. Oral mucosal and gingival symptoms were reported by 30% and 8% of the participants, respectively, suggesting that, along with normal hormonal fluctuations, oral mucosal and gingival symptoms can also occur. A higher proportion of women (11.3%) were found to have oral ulcers, and 3.8% had gingival bleeding compared to the present study. The results of the current study indicate that, while the prevalence was not as high, the direction of the results is similar and indicates that oral symptoms associated with menstruation are present, but may differ based on population characteristics, symptom awareness, and methodology.

A more objective study was made by Becerik et al. [13] who monitored the women during menstruation, ovulation and premenstrual period. Among women with gingivitis, they observed higher bleeding-on-probing values at the time of menstruation and ovulation, and more limited phase-related changes for inflammatory biomarker responses. The present study also found that the menstrual associated gingival symptoms were present, but in the present investigation, the main method of data collection was the participant's own report of such symptoms, rather than the sequential clinical periodontal measurements. Therefore, the results confirmed the theory that hormonal shifts could alter the inflammatory response of the gums, as well as that the individual may not necessarily be aware of these changes and may not have a direct correlation with a clinically measurable periodontal inflammatory response.

The present observations regarding salivary and oral symptoms are also similar to the observations of Saluja et al. [14] who compared the salivary flow, pH and gustatory function among menstruating, pregnant and postmenopausal women. The study she and her colleagues published did not show any differences in salivary flow between groups; however, postmenopausal women did have significantly lower pH. The frequency of dry mouth and excess salivation reported in the present study were 16.7% and 7.9%, respectively. The difference between these studies might be explained by the fact that the present investigation was of subjective symptoms during menstruation, whereas Saluja et al. was an objective measurement of salivary parameters. However, both studies suggest that hormonal status could affect oral sensations and salivation.

It is also interesting to note in the present study that gingival symptoms were related to age and education. The association of red and swollen gums was highly significant with age/education ($p<0.001$) and gingival bleeding was also significant ($p=0.016$). Oral ulcers, tiredness, sore throat, bitter taste, burning sensation, nausea/vomiting and dry mouth showed no statistically significant associations with age and/or with education. This indicates that awareness and recognition of gingival manifestations may be more related to demographic factors than to non-specific systemic symptoms. The result is consistent with the result obtained by Moharir et al. [15] who assessed awareness and oral manifestations of premenstrual syndrome in women visiting a dental hospital at Pune. They said there were changes in oral condition in 59% of the premenstrual period and the most frequently reported changes included oral ulcers and halitosis. The study highlights the need to include oral symptoms in women's awareness of menstruation.

The current study's significant relationship between BMI and menstrual irregularity is confirmed by Tang et al. [16] who looked at 1012 women aged between 17 and 53 years and specifically evaluated BMI and menstrual characteristics. They focused their study on the fact that obesity has been linked with irregular menstrual cycles, but that this association is not necessarily strong in all populations. The present study also found an extremely strong relationship between BMI category and menstrual regularity, especially among those who were overweight and obese. The results

confirm the hypothesis that metabolic and reproductive health should not be assessed separately in women with menstrual irregularities.

The BMI finding is also corroborated by Seif et al. [17] who reviewed obesity and menstrual disorders and found that the menstrual cycles in obese women were irregular, oligomenorrhea or amenorrhea were common findings. The current study applies this finding to a fairly young, mainly educated population and proves the link through individual BMI categories. Since the present study is of a cross-sectional in nature, the association observed must be interpreted as an association and not as a causal relation. There are other factors that could play into the relationship such as PCOS, insulin resistance, activity, diet, stress and hormonal imbalances.

The link between metabolic/reproductive abnormalities and periodontal health is pertinent to the present findings. Varadan et al. [18] compared women with and without PCOS and observed that PCOS women exhibited significant increase in gingival inflammation along with variations in plaque index, modified gingival index, testosterone, fasting blood glucose and triglycerides. They also noted that there were correlations between the gingival inflammatory parameters and the oxidative-stress parameters. The results of this study are of interest to the current investigation in that a significant number of subjects were overweight or obese and women with higher BMI had a higher frequency of irregular periods. The results of the present study indicate that metabolic and hormonal abnormalities could be a significant pathway between menstrual abnormalities and oral manifestations, even though PCOS itself was not specifically diagnosed.

Further studies by Pavankumar et al. [19] agree that there is an association between reproductive endocrine disorders and periodontal health. They also had lower scores for loss of attachment and gingival index, but not for community periodontal index. They also had a lower score for loss of attachment and gingival index than did healthy women, despite similar scores for oral hygiene. This is especially important for the present study as it indicates that oral hygiene and accumulation of plaque are not the only factors contributing to periodontal changes in women, systemic hormonal and metabolic changes could also play a role in gingival inflammatory response. The current discovery of significant differences in gingival expression by demographics, therefore, suggests that the consideration of a wider range of reproductive and metabolic health factors is warranted.

But the association between BMI and periodontal disease isn't necessarily linear. Mariam et al. [20] observed that the plaque index, periodontal disease index, probing depth and BMI were significantly higher in PCOS group compared to non-PCOS group, but no statistically significant correlation was observed between BMI and periodontal disease index in both groups. Since our study found a significant association between BMI and menstrual irregularity, this finding is important when interpreting the present results and knowing that the oral manifestations in the present study were not directly related to BMI. Thus, other metabolic factors, such as hormonal status, PCOS, oral hygiene habits, and diet may play a role in these oral findings, in addition to BMI.

The present oral-hygiene situation also deserves attention. Most of the participants reported brushing at least once a day, but 55.4% brushed once a day only while 71.7% reported only brushing (not using mouthwash). In addition, 77.1% were said to see the dentist only when necessary. These results reveal a symptom-focused (non-preventive) dentistry approach. This behavior is thought to be a factor in gingival inflammation without the involvement of hormones and could be responsible for some of the differences in oral symptoms seen between women but not others during menstruation. This association of dental biofilm and hormonal modulation is significant because the activity of dental biofilm is more likely to affect the host response to the plaque rather than cause gingival disease. This interpretation is corroborated by Colaco et al. [21] who compared the women at different hormonal stages and showed significant differences in the flow rate of saliva, pH of saliva and oral-hygiene status between the different hormonal groups.

The overall results obtained from the present study are broadly similar to those published in the PubMed-indexed literature that showed the hormonal changes occurring during menstruation can affect gingival and oral symptoms, whereas BMI and metabolic issues are linked to menstrual irregularity. The agreement is best with previous studies for the presence of gingival bleeding, oral ulcers, and the alterations of oral sensation during the hormonally active periods. The low rates of some symptoms in the current study compared to some previous reports also underscore the need for differences in study population, symptom definitions, clinical assessment versus self-report, and awareness. The strong relationship between BMI and menstrual irregularity also indicates the need for a holistic approach where mental, metabolic, physical and oral health are taken into account together. The present study is cross-sectional study and mainly relies on self-reported symptoms, so a longitudinal study that involves hormonal assays,

periodontal examination and standardized assessment of PCOS along with the evaluation of the saliva will yield robust evidence of the causal direction between menstrual physiology and oral health.

LIMITATIONS

This study offers a valuable contribution to the discussion, but it has some shortcomings. The questionnaire was self-administered, and may suffer from recall bias, and the online administration may have restricted the study to more tech-savvy individuals. Further, the cross-sectional design does not permit any causal conclusions. Future clinical assessments with larger samples in a longitudinal study would aid in the understanding of the relationship between menstrual cycles and oral health.

CONCLUSION

The study highlights the need to be aware of this and take proactive steps to protect the oral health from the impact of hormonal changes. Integrating oral health education into any reproductive health service, regardless of the age group (adolescent, menstruating women, and postmenopausal women) can improve oral health education and the use of preventive measures. Other lifestyle factors, weight, exercise etc., and other factors such as PMOS can also help to further minimize oral hygiene issues during menstruation. Regular dental care is an integral part of women's health care and regular dental visits can be a key factor in healthy women.

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Ethical Approval: The study was approved by the Institutional Ethics Committee (IEC) of Manav Rachna Dental College, MRIIRS (Ref. No. MRIIRS/MRDC/SDS/IEC/2025/150).

Declaration of Participant Consent: Written informed consent was obtained from all participants prior to participation in the study.

Financial Support and Sponsorship: Nil

Conflicts of Interest: The authors declare that they have no conflicts of interest.

Use of Artificial Intelligence (AI) - Assisted Technology for Manuscript Preparation: The authors confirm that no artificial intelligence (AI) - assisted technology was used to assist in the writing or editing of the manuscript, and no images were manipulated using AI tools.

AUTHOR CONTRIBUTIONS

Quareena Javed (QJ): Conceptualization, Methodology, Formal Analysis, Data Curation, Writing – Original Draft Preparation, Project Administration.

Chanika Singhal (CS): Conceptualization, Methodology, Supervision, Validation, Visualization, Writing – Review & Editing.

ABBREVIATIONS USED IN THE STUDY

a) BMI: Body Mass Index
b) PCOS: Polycystic Ovary Syndrome
c) PMOS: Polyendocrine Metabolic Ovarian Syndrome
d) SPSS: Statistical Package for the Social Sciences

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