

## Oral Symptoms during Pre-menstrual Syndrome, a Cross-Sectional Study in Women of Twin Cities, Pakistan

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### ABSTRACT

**Objective:** Distressing behavioural, physical and psychological symptoms occurring before the onset of menstruation in the absence of pathological disease are referred to as premenstrual syndrome (PMS). While a handful of studies have documented ulceration, hypo salivation, taste alterations and gingivitis as oral symptoms associated with PMS, the literature is generally deficient in this regard. Therefore, this investigation aimed to document oral symptoms present during the premenstrual phase in the Pakistani female population.

**Materials and Methods:** A cross-sectional study was conducted on 435 consenting females who were recruited through convenience sampling to provide information about their age, regularity of their menstrual cycle and presence of unusual oral symptoms. Data was entered and analyzed using IBM SPSS Statistics, Version 22.0. Chi-square test, Phi and Cramer's V were applied to determine statistical associations between age groups, menstrual patterns and the presence of oral symptoms.

**Results:** Fifty-one (11.7%) participants suffered from a burning sensation, 74 (17%) experienced a tingling sensation, 110 (25.3%) had taste alteration, 130 (29.9%) complained about hypo salivation while 14 (3.2%) reported hypersalivation. 80 (18.4%) individuals reported a feeling of swelling in the mouth and 11 (2.5%) had gingivitis. No significant association was found between the irregularity of the menstrual pattern and the oral symptoms, while a weak association was found between the age groups, salivary flow rate and a feeling of swelling.

**Conclusion:** Taste alterations, hypo salivation, feeling of swelling, tingling and burning sensations were the commonly reported oral symptoms. Age appears to have a weak association with the presence of some oral symptoms.

**Keywords:** Oral Health, Premenstrual, Syndrome, Symptoms

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## INTRODUCTION

Women of reproductive age can have some physical discomfort, or dysphoria days to weeks before menstruation. This is called premenstrual syndrome (PMS). PMS is described as a neuroendocrine disorder that causes physical, behavioural, and psychological changes during the luteal phase of the menstrual cycle.<sup>1</sup> Symptom begins 6 days before the initiation of bleeding, with a peak on the 4<sup>th</sup> and 5<sup>th</sup> day.<sup>2</sup>

The etiologies of premenstrual syndrome are nutritional defects, environmental factors, age and physical activity.<sup>3</sup> According to statistical analysis the frequency of premenstrual syndrome was reported to be 53% while categorizing them into the severity of symptoms 42% was mild, 18.2% moderate and 31.7% were severe.<sup>4</sup> Risk factors for developing PMS include a family history of dysmenorrhea, smoking, long-term stress, depression, drug abuse, physical or emotional trauma and menstrual patterns.<sup>5-8</sup>

About 90% of women experience at least one of the symptoms during their premenstrual phase.<sup>9</sup> Other common symptoms linked to PMS include gastrointestinal disturbances like cramps and abdominal bloating, breast tenderness, pain in the back and joints, swelling in extremities and headache.<sup>10</sup> Fatigue, depression, irritability, mood swings, anger, manic or hypomanic state, lethargy and changes in appetite are also frequently reported.<sup>5,11</sup> It is speculated that an increase in suicidal tendencies can be noted during the late luteal phase and follicular phase.<sup>12</sup> Nutritional deficiencies and systemic disorders can exacerbate these neuropsychological symptoms.<sup>13,14</sup>

In addition, a study has shown that gingival fluid can increase by 67.5% in the premenstrual phase due to estrogen and progesterone.<sup>15</sup> The bleeding index; increased capillary permeability and microvascular dilation of the gingiva, have also been associated with elevated levels of progesterone, during the premenstrual phase. This process also causes an increase in the production of prostaglandins and affects the host defence mechanisms such as neutrophil chemotactic response.<sup>16</sup> The increased blood flow delivers inflammatory cells to the gingiva that react to the bacterial plaque causing gingivitis. Menstruation gingivitis occurs a day or two before the start of the period and clears up shortly after the period starts. The episodes are recurrent and can vary in severity during

each cycle.<sup>17</sup> Swelling of the salivary glands, xerostomia and development of canker sores may also be seen.<sup>18-20</sup>

A couple of old studies have attempted to correlate alterations in taste perception with menstruation as well.<sup>21,22</sup> Given the dearth of literature available on this subject, the purpose of this investigation was to document oral symptoms associated with PMS in a Pakistani female population.

## MATERIALS AND METHODS

This study was approved by the Institutional Review Committee at the Islamic International Dental Hospital, Riphah International University (IIDC/IRC/2020/002/003). A cross-sectional study was designed in multiple centres across Islamabad and Rawalpindi from March to June 2020. Open Epi sample size calculator was used to calculate the sample size using a design effect of 1, bound on error estimation 5%, and population finite factor 800000, based on these factors the total sample size was calculated to be 384 which was inflated by 10% for data errors. A total of 435 participants between the ages of 15 to 45 years were recruited at the screen dental clinics 2 days before their expected date of menstruation. Following consent, a complete history regarding the regularity of the menstrual cycle was taken along with information about oral symptoms experienced during the PMS, specifically burning/tingling sensation, alteration in taste, hypo- or hyper-salivation, swelling/irritation in the gingiva, or any other noticeable symptoms. Patients with other potential causes of similar oral symptoms like burning mouth syndrome, use of contraceptive drugs, nutritional deficiencies, oral candidiasis, depression, lichen planus, erythroplakia and leukoplakia were excluded from the sample. Patients with systemic diseases that can influence oral health such as anaemia, gastrointestinal ailments and diabetes were also excluded. The menstrual cycle pattern was taken as irregular periods if the length of the menstrual cycle (the gap between the periods starting) keeps changing (either early or late). The regular menstrual cycle was taken to be 28 days, plus minus 4 days.<sup>23</sup> The information was recorded by a single researcher on pre-drafted proforma.

Data were analyzed using IBM SPSS Statistics for Windows, Version 22.0. (IBM Corp., Armonk, NY, US). Age was recorded in ranges (15-25, 26-35 and 36-45 years). Patterns of menstrual cycle and oral symptoms

were recorded as percentages and frequencies. The Chi-square test and Spearman's correlation were applied with a significance of  $p=0.05$ .

**RESULTS**

A total of 435 females participated in the study. The mean age of the participants was  $24.71 \pm 5.36$  years. Three hundred and sixty-four (83.7%) reported having a regular menstrual cycle while 71 (16.3%) had an irregular cycle. The prevalence of oral symptoms in premenstrual syndrome among the study participants is shown in Table 1.

**Table 1: Prevalence of oral symptoms in Premenstrual Syndrome**

Oral Symptom	Participants n (%)
Hypo salivation	130 (29.9)
Taste alteration	110 (25.3)
Swelling in mouth	80 (18.4)
Tingling sensation	74 (17)
Burning	51 (11.7)
Hyper salivation	14 (3.2)
Gingivitis	11 (2.5)
Ulcers	10 (2.3)
Hairy feeling in the mouth	5 (1.1)
Tongue twitching	5 (1.1)
Worm-like sensation	2 (0.5)
Sand like sensation	2 (0.5)
Speech issue	2 (0.5)
Geographic tongue	2 (0.5)
Cuts in mouth	2 (0.5)
Itching in mouth	1 (0.2)
Roughness on tongue	1 (0.2)
Pain in tongue	1 (0.2)

A Chi-square test was applied to determine the association of the age of the participants with oral symptoms, specifically burning sensation, tingling sensation, taste alteration, altered salivary flow rate (hyper and hypo salivation), feeling of swelling and ulcers as the rest of the oral symptoms were very less in number. The age groups were divided into 15-25, 26-35 and 36-45 years. A statistically significant difference was found between age groups for salivary flow rate and a feeling of swelling with a  $p$ -value of 0.01 and 0.001 respectively as shown in Table 2.

**Table 2: Association of oral symptoms with age and regularity of the menstrual cycle of the participants using the Chi-square test**

Oral Symptoms	$p$ -value for age	$p$ -value for the menstrual cycle
Taste alteration	0.160	0.132
Swelling in mouth	0.001	0.187
Tingling sensation	0.106	0.106
Burning	0.062	0.896
Gingivitis	0.601	0.165
Ulcers	0.666	0.158
Salivary Flow	0.01	0.143

The value of Phi and Cramer's V suggested a small effect size or a weak association between the two variables (Cramer's V-age versus salivary flow rate was 0.12, Phi for age versus the feeling of swelling is 0.21). The age range 26-35 exhibited a higher prevalence of these oral symptoms. The same group also exhibited a higher prevalence of a sensation of swelling.

Similarly, the Chi-square test was applied to establish a correlation between menstrual cycle pattern and oral symptoms, namely, burning sensation, tingling sensation, taste alteration, salivary flow rate (hyper and hypo salivation), feeling of swelling and others. No statistically significant difference was found between the menstrual pattern and any of the oral symptoms.

**DISCUSSION**

The consequences of premenstrual syndrome on the quality of life have been categorized into psychological (emotional disorder, mood swings and cognitive), physical (musculoskeletal disorders, genitourinary, digestive disorders, neurological disorders), behavioural (changes in sleep pattern and nutritional disturbances) and social (social isolation and sexual dysfunction).<sup>24</sup> Oral symptoms while rare have been reported as gingivitis, ulcers and mouth dryness.<sup>17-19</sup>

We had 11 patients that reported gingivitis as clinically assessed presenting with swollen puffy red gingiva and recession. A prior study has shown that gingival exudates increase during ovulation.<sup>25</sup> This has been attributed to increased levels of sex hormones during the ovulatory phase.<sup>26</sup> In addition, the increase in circulating levels of estrogen and progesterone causes

an inflammatory effect on periodontium mimicking gingivitis.<sup>18</sup>

Ulceration was also reported by a small percentage in our sample. A study has shown that the effectiveness of the epithelial barrier in gingiva decreases due to glycogen production in presence of high estrogen levels. This also decreases the keratinization of the gingiva. Estrogen and progesterone reduce glycosaminoglycan synthesis and thus may affect the ground substance of connective tissue.<sup>18</sup> Thinning of the epithelium and associated connective tissue may result in ulcerations in the oral cavity.

In addition, some women experience a drop in serotonin when their estrogen levels go down. This happens usually within 2 weeks before menstruation. Women with low serotonin levels are more likely to have PMS symptoms.<sup>27</sup> Since estrogen and progesterone have nociceptive properties, a premenstrual drop in these hormone levels causes disinhibition of pain and alteration of salivary output and composition.<sup>28</sup> Depression in the late luteal phase exacerbates the perception of underlying pain throughout the body, including that of the mouth and tongue.<sup>29</sup> This may explain why so many women complain of symptoms that appear neuropathic and those of dryness.

About one-fourth of our sample reported experiencing taste alterations during menstruation. A study from 1965 found that menstruating women were more sensitive to propylthiouracil and quinine-sulfate.<sup>22</sup> However, a study from the same period failed to show alterations in taste for phenylthiourea in menstruating women.<sup>21</sup>

We were unable to establish an association between irregular cycles and oral symptoms. This is consistent with a prior study that failed to establish an association between PMS and irregularity of the menstrual cycle.<sup>30</sup> However, this is contrary to other studies that did establish a correlation between PMS and irregularity of the menstrual cycle.<sup>31-33</sup> Our sample with oral symptoms was small. This might help explain why we were unable to establish any significant relationships between our variables. Moreover, the scarcity of related literature was taken into account while comparing the results of the present study.

Future implications include a larger sample size with proper intra and extra-oral examination to eliminate the

bias of self-reporting. More such studies may help provide some kind of relief to the women during this stressful period of the month. Some of the limitations of our study include recruiting participants from a single city and relying on self-reporting. It is also possible that our proforma was insufficient in listing all possible symptoms and some may have slipped through the cracks.

## CONCLUSION

In conclusion, we found taste alterations, hypo salivation, feeling of swelling, tingling and burning sensations as the most commonly reported oral symptoms in the mouth. While we were able to establish a weak relationship as per the values of Phi and Cramer's V, of age with salivary flow and sensation of swelling, irregularity of the menstrual cycle failed to show a statistically significant relation with any of the reported oral symptoms. Future research will be directed towards using quantifiable testing for taste and sensation alterations.

## DISCLAIMER

None to declare.

## CONFLICT OF INTEREST

There is no conflict of interest among the authors.

## ETHICAL STATEMENT

The ethical approval is provided by the Ethical Review Board at Islamic International Dental College, Riphah International University (IIDC/IRC/2020/002/003).

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## AUTHORS CONTRIBUTION

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Drafting of the manuscript: B. K. Rana, K. Sohail

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