Original Article

Association of socio-demographic, dietary and lifestyle factors with Premenstrual Syndrome (PMS) among undergraduate medical students of a tertiary care institute in Ahmedabad, Gujarat

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ABSTRACT

Introduction: The frequency, as well as the severity of the PMS (Pre-Menstrual Syndrome), varies from female to female based on various socio-demographic, dietary, and lifestyle factors. Nevertheless, the PMS is known to affect day-to-day functioning including interference with school/work productivity, relationships with friends, family, and colleagues. This is especially important for medical students where academic performance is much skillful and demanding. **Methodology:** The inclusion criteria for this cross-sectional survey were female medical students studying in one of the medical colleges of the city, having regular menstrual cycle (in the last three consecutive months) and willing to participate in the research. Students were assigned from each of the four professional years (First, Second, Third, and Final) through random sampling so that the desires sample size was achieved. The study used a pre-designed questionnaire, the "Premenstrual Symptoms Screening Tool (PSST)" (through Google form), that included 14 items assessing premenstrual symptoms of appetite, mood, sleep, anxiety and physical symptoms. It includes functional impairment items in five different domains as well. **Results:** The common symptoms seen in the respondents were anger/irritability (Mild $n = 76$, 46.3%; Moderate to severe $n = 68$, 41.4%) followed by physical symptoms which included headaches, joint or muscle pain, breast tenderness, gain in weight and bloating. The commonest functional impairment was college/work efficiency or productivity ($n = 79$, 48.2%). Alcohol and tobacco consumption had a significant association with PMDD. The type of diet did not have significant statistical association with PMS or PMDD. **Conclusion:** The most common symptoms seen were anger/irritability as well as physical symptoms like headache, breast tenderness etc., Factors like sleep, diet, exercise, yoga, alcohol and smoking were assessed.

Keywords: Dietary factors, lifestyle factors, medical students, premenstrual symptoms screening tool, premenstrual syndrome

Introduction

Premenstrual syndrome (PMS) is the term coined for a variety of symptoms occurring in the luteal phase of the menstrual cycle which resolves in some days of onset of menstrual blood flow.[1] Although the symptoms are of physical as well as psychological in nature, it is essentially a neuro-endocrine disorder with biological, social and psychological parameters.[2] It has been observed that more than 90% of the women throughout the world experience its symptoms which include, but not limited to, features like anxiety, irritability, headache, fatigue, breast tenderness, social withdrawal, change in mood, sleep disruption and depression.[3,4] The cause of PMS is largely unknown and various biosocial,

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lifestyle, dietary and psychological causes have been claimed as the cause of the syndrome, including exercise, smoking, alcohol, altered body fluid balance, and a beef-rich diet or beverages containing caffeine.[5,6] The severe form of the syndrome is known as a Premenstrual Dysmorphic Disorder (PMDD) which is prevalent in 2%-6% of females.[5] Both PMS and PMDD are known to cause significant impairment of physical, mental as well social functioning of females globally, without any differences in age, race or ethnicity. They not only affect the daily routines of a woman but also interfere with work, study and interpersonal relationships.[7]

It is surprising to note here that despite the frequent symptoms of PMS among females, the proportions of them seeking care are very less. Further, the physicians often misdiagnosed the symptoms for other entities, which further discourages the women from seeking medical attention during PMS.[8,9]

Female college students are most likely to be affected by PMS as it would not only affect daily life or academic performance, but also would affect psychomotor functions as a result of alterations in the cognitive-emotional processes.[10,11] Likewise, the female medical students would experience the worse situation as the medical curriculum demands high level of concentration, cognitive abilities and grasping power of critical life-saving skills. The prevalence of PMS among university students has been found different in different parts of the world, starting from about 34% in China, 71% in turkey, 80% in Pakistan to 92% in Jordan.[12-14] As various factors are involved, research into the factors responsible for aggravation of symptoms could prove helpful in holistically tackling the same to avoid severe symptoms, inabilities and possibly unnecessary medical consultations. Lifestyle, diet and a few social alterations could be vital in providing much-needed comfort for these young girls keeping local context in to considerations. Therefore, the objectives of the current research were to find the frequency of premenstrual symptoms and to assess the socio-demographic, lifestyle and dietary factors associated with premenstrual symptoms. Further, it will throw light to the common symptoms and their attributes of PMS which would help primary care providers to diagnose it with greater accuracy.

Methodology

A cross-sectional study was done among female undergraduate students of a tertiary care teaching institute of Ahmedabad city, Gujarat. The inclusion criteria were female medical students having regular menstrual cycle (in the last three consecutive months), between 18 years and 24 years of age, and who were willing to participate in the study. Exclusion criteria were pregnancy (in rare cases), diseases like Diabetes, Migraine, Epilepsy, Anemia, Endocrine disorders, Sickle cell disease, Thyroid disorders, ovarian diseases or diseases of genital tract as they are likely to distort the premenstrual symptoms and may introduce bias in the results. Considering the prevalence (p) of moderate to severe premenstrual symptoms of about 19%,[12-14]

a population size (finite = N) of 500, confidence limit of 5% (95% CI) and design effect (DEFF) of 1, the sample size (n) calculated as per Epiinfo software came out to be 161 using the equation $n = [DEFF \times Np \ (1 - p)]/[(d^2/Z^2_{1-\alpha/2} \times (N - 1) + p \times (1 - p)]$.[15] Students were assigned from each of the four professional years (First, Second, Third and Final MBBS) through random sampling till the desired sample size was established. The study used pre-designed questionnaire which is the "Premenstrual Symptoms Screening Tool" developed by Steiner et al.[16] which includes 14 items assessing premenstrual symptoms of anxiety, appetite, sleep, mood as well as physical symptoms. It includes functional impairment items in five different domains as well. It has four-point Likert scale, that is, "not at all," "mild," "moderate," or "severe" in last 12 months during their most of the cycles. PSST was forward translated in the vernacular language (Gujarati). The translation was then validated by back translation and comparison with an original English version by a group of experts to check content validity. The study protocol was approved by the institutional ethics committee before data collection. The questionnaire was distributed to each selected participant through Google form in English, as the participants were medical students. The questions also included information on socio-demographic, dietary and lifestyle factors to find their association with premenstrual syndrome. Informed consent was also obtained from each participant. The questionnaire did not include name or any other information which might reveal the identity of the subject. The scores and factors were analyzed using appropriate statistical methods.

Results

A total of 164 female medical students were surveyed across all the professional years. Majority (n = 84, 51.2%) of the students belonged to third year of their study, followed by second year students (n = 29, 17.7%) and fourth year students (n = 26, 15.9%). The average age of the respondents came out to be 20.41 years with a range of 18–24 years. The mean height was 160.17 cm (146.27-174.07 cm) and the mean weight was 55.87 kg (34.85-76.89). The mean Body Mass Index was found to be 21.78 kg/m^2 (13.94-29.62). Among 164 respondents, almost all (n = 152, 92.7%) of the students belonged to urban residence. Only one student was married among all the respondents. On asking about the highest education attained by the mothers of the students, it was seen that majority of the mothers were graduate (n = 96, 58.5%) followed by postgraduate and above (n = 46, 28%), secondary school (n = 15, 9.1%) and primary level (n = 5, 3%). Only 1.2% (n = 2) of the mothers were illiterate in the present study. The study participants were also inquired about any family history of PMS within the mother or the sister. The results showed that about 21.3% (n = 35) of the respondents had a significant family history for PMS. The study also showed that just less than one-fourth (n = 37, 22.6%) of the students were using heating pads for their cramps. About 4.9% (n = 8) of them were using any of the non-contraceptive hormonal medicines.

PMS and PMDD

The respondents were further classified into moderate to severe PMS and PMDD depending on the set criteria.[16,17] Accordingly, it was found that 31 students (18.9%) were having moderate to severe PMS while 10 students (6.09%) were having PMDD. Those two outcomes were also analyzed according to the socio-demographic and lifestyle characteristics [Table 1]. From the findings, it was further ascertained that alcohol consumption and tobacco chewing/smoking had a significant statistical association with PMDD. [Table 1]

Lifestyle factors

In the present study, most of the respondents (n = 118, 72%) were involved in some form of physical exercise. On further questioning, it was found that almost half of them (n = 51, 43.2%) were involved in moderate form of exercise. On the other hand, only about one-third of the respondents (n = 51, 31.1%) were doing Yoga/Pranayama in their daily routine. Only 20.7% (n = 34) of the respondents agreed to have alcohol occasionally. However, almost all (n = 158, 96.3%) of the respondents replied that they were never involved in chewing tobacco/smoking. The majority of the respondents (n = 84, 51.2%) had 7-8 hours of sleep on an average, followed by a sleep of 6-7 hours (n = 47, 28.7%), more than 8 hours (n = 21, 12.8%) and less than 6 hours (n = 12, 7.3%). Just less than half of the respondents (n = 79, 48.2%) believed that lack of sleep has something to do with their premenstrual symptoms.

The Premenstrual symptoms

According to Table 2, the most common symptom seen in the respondents was anger/irritability. About half of the respondents (n = 76, 46.3%) had mild symptoms while the other half (n = 68, 41.4%) had moderate to severe symptoms. The second most common symptoms were physical symptoms, which included headaches, joint/muscle pain, breast tenderness, weight gain and bloating. Almost half of the respondents (n = 69, 42.1%) complained of mild symptoms while a quarter (n = 42, 25.6%) of them had moderate symptoms. The other common symptom was fatigue/lack of energy. Many of the respondents (n = 69, 42.1%) had mild fatigue/lack of energy while only some (n = 37, 22.6%) had no symptom of fatigue at all. The majority of respondents (n = 116, 70.7%) had no symptoms of insomnia while around only 18.9% (n = 31) had mild symptoms. Up to 41.5% (n = 68) of respondents had mild symptoms of decreased mood/hopelessness while a quarter (n = 42, 25.6%) had moderate symptoms. Respondents also had symptoms of reduced interest for home, work and social acts. Out of which decrease interest in home activities was the major symptom (n = 115, 70.2%).

Functional impairment and PMS

In the given survey, the commonest functional impairment was school/work efficacy [Table 3]. More than half of the students had mild symptoms (n = 79, 48.2%). However, respondents did not complain about any change in relationships with their family members. (n = 78, 47.6%). The most severe complaints

Table 1: Distribution of Social-Demographic and Lifestyle characteristics among the respondents (n=164)							
Characteristic	Category	No PMS or Mild PMS (n=133)	Moderate or Severe PMS (n=31)	X^2 with P	No PMDD (n=154)	PMDD (n=10)	X^2 with P
Study Year	First	12	2	X^2=4.656, P=0.811	14	0	X^2=0.916, P=0.199
	Second	22	7		29	0	
	Third	67	16		75	8	
	Final	32	6		36	2	
Residence	Urban	11	1	X^2=0.943, P=0.331	12	0	X^2=0.814, P=0.359
	Rural	122	30		142	10	
Mother's education	Post-graduate	39	7	X^2=1.734, P=0.784	43	3	X^2=1.682, P=0.794
	Graduate	75	21		89	7	
	Secondary	13	2		15	0	
	Primary	4	1		5	0	
	Illiterate	2	0		2	0	
Obesity (BMI ≥25 kg/m²)	No	116	23	X^2=3.301, P=0.069	131	8	X^2=0.186, P=0.666
	Yes	17	8		23	2	
Smoking/ Chewing tobacco	Never	128	30	X^2=1.108, P=0.575	150	8	X^2=19.71, P=0.00*
	Rarely	2	1		1	2	
	Frequently	3	0		3	0	
Alcohol consumption	Never	106	24	X^2=3.632, P=0.163	123	7	X^2=7.161, P=0.028*
	Rarely	9	5		11	3	
	Frequently	18	2		20	0	
Regular Yoga/ Pranayam	Yes	36	15	X^2=5.333, P=0.021*	48	3	X^2=0.006, P=0.983
	No	97	16		106	7	
Regular physical exercise	Yes	96	22	X^2=0.018, P=0.892	111	7	X^2=0.02, P=0.887
	No	37	9		43	3	

PMDD=Premenstrual Dysmorphic Disorder, PMS=Premenstrual Syndrome, *Significant at 5% level

Table 2: Distribution of severity of PMS symptoms among the respondents (*n*=164) with percentages

Symptoms	Not at all (%)	Mild (%)	Moderate (%)	Severe (%)
Anger/irritability	20 (12.2)	76 (46.3)	54 (32.9)	14 (8.5)
Anxiety/Tension	54 (32.9)	67 (40.9)	31 (18.9)	12 (7.3)
Tearful/Increased sensitivity to rejection	56 (34.1)	60 (36.6)	35 (21.3)	13 (7.9)
Decreased mood/Hopelessness	40 (24.4)	68 (41.5)	42 (25.6)	14 (8.5)
Decreased interest in work activities	50 (30.5)	59 (36)	37 (22.6)	18 (11)
Decreased interest in home activities	49 (29)	62 (37.8)	36 (22)	17 (10.4)
Decreased interest in social activities	56 (34.1)	51 (31.1)	39 (23.8)	18 (11)
Difficulty concentrating	55 (33.5)	61 (37.2)	38 (23.2)	10 (6.1)
Fatigue/Lack of energy	37 (22.6)	69 (42.1)	37 (22.6)	21 (12.8)
Overeating/food cravings	68 (45.1)	53 (32.3)	27 (16.5)	16 (9.8)
Insomnia	116 (70.7)	31 (18.9)	13 (7.9)	4 (2.4)
Hypersomnia	100 (61.1)	43 (26.2)	14 (8.5)	7 (4.3)
Feeling overwhelmed/out of control	76 (46.3)	54 (32.9)	29 (17.7)	5 (3)
Physical symptoms	34 (20.7)	69 (42.1)	42 (25.6)	19 (11.6)

Table 3: Distribution showing the severity of functional impairment and their association with Moderate to Severe Premenstrual Syndrome and Premenstrual Dysmorphic Disorder among the respondents, using Chi-square and Logistic Regression analysis (*n*=164)

Functional Impairment	No	Yes			Moderate to Severe PMS (*n*=31)	X^2 with *P*	Logistic Regression analysis (B) with *P*	PMDD (*n*=10)	X^2 With *P*	Logistic Regression analysis (B) with *P*
	Not at all (*n*, %)	Mild (*n*, %)	Moderate (*n*, %)	Severe (*n*, %)						
Your school/work efficiency or productivity	50 (30.5)	79 (48.2)	30 (18.3)	5 (3)	No=83, Yes=31	16.766, *P*<0.001*	18.82, *P*=0.997	No=104, Yes=10	4.671, *P*=0.031*	15.09, *P*=0.997
Your relationship with friends, classmates/co-workers	76 (46.3)	60 (36.6)	21 (12.8)	7 (4.3)	No=62, Yes=26	14.032, *P*<0.001*	0.147, *P*=0.832	No=78, Yes=10	9.197, *P*=0.002*	16.833, *P*=0.996
Your relationships with your family	78 (47.6)	59 (36)	24 (14.6)	3 (1.8)	No=57, Yes=29	25.902, *P*<0.001*	1.877, *P*=0.037*	No=76, Yes=10	9.659, *P*=0.02*	15.854, *P*=0.996
Your social life activities	73 (44.5)	61 (37.2)	28 (17.1)	2 (1.2)	No=63, Yes=28	18.78, *P*<0.001*	-0.026, *P*=0.975	No=81, Yes=10	8,543, *P*=0.003*	15.446, *P*=0.996
Your home responsibilities	80 (48.8)	59 (36)	22 (13.4)	3 (1.8)	No=55, Yes=29	27.412, *P*<0.001*	1,863, *P*=0.029*	No=74, Yes=10	10.142, *P*=0.001*	16.768, *P*=0996

PMDD=Premenstrual Dysmorphic Disorder, PMS=Premenstrual Syndrome, *P* significant at 5% level, B=Slope of Logistic Regression

the respondents (*n* = 7, 4.3%) had were about their relationships with their friends and colleagues. More than half (*n* = 73, 44.5%) of the respondents never had any complain about their social life activities while only 1.2% (*n* = 2) had a severe complaint. From the table, it can be seen that there was any level of functional impairment of all the domains were had a significant association with having moderate to severe PMS as well as having PMDD.

Diet and PMS

In the given survey, when asked to the respondents about their diet, it was found that most of them had a healthy diet [Table 4]. Almost half of the students had green leafy vegetables (n = 69, 42.1%) and fruits (n = 68, 41.5%) everyday. Also, majority of the respondents (n = 95, 57.9%) had other vegetables like Brinjal, Potato, Carrot, etc., daily. The intake of dairy products was also found to be very high among the respondents. Most (n = 141, 86%) of the respondents consumed dairy products every day. Most of the respondents (n = 127, 77.4%) were vegetarian while only about a quarter (n = 37, 22.8%) consumed meat/poultry. Consuming green leafy vegetables or other vegetables or dairy products did not affect the symptoms of PMS. Moreover, it was found that

consumption of diet containing high sugar/salt/calories was not associated with PMDD or moderate to severe PMS [Table 4]. Also, the consumption of poultry items like meat, fish, and many more did not have any significant association with symptoms of moderate to severe PMS.

Discussion

The objective of this research was to find out the association between PMS/PMDD with various factors such as socio-demographic, dietary and lifestyle. In this study, the average age of study respondents was 20.41 (17.93-22.89) years, which was comparable with the studies done in Ethiopia[1] (17.61 ± 1.93 years), Bhavnagar, India[18] (18.9 ± 1.6 years), Iran[2] (16.0 ± 2.3 years), Turkey[19] (19.5 ± 1.3 years) and UAE[12] (20.07 ± 1.53 years) as far recruiting young adults in the study is concerned. The urban to rural difference was vast in the present study, which depends on the locality of the institute as well as the admission criteria for the medical courses. The percentage of married female was 0.60% in the present study, which is different from the study done by Raval CM *et al.* (2.7%) and Hashim MS *et al.* (2%),

Table 4: Distribution frequency according to the types of food items among the respondents and their association with Moderate to Severe Premenstrual Syndrome and Premenstrual Dysmorphic Disorder (*n*=164)

Diet Item	Frequency					Not consuming the item daily (*n*, %) [A + B + C + D]	Moderate to Severe PMS (*n*=31) *P*	PMDD (*n*=10) *P*
	Everyday (*n*, %)	Once a week (*n*, %) [A]	Twice a week (*n*, %) [B]	Once a month (*n*, %) [C]	Never (*n*, %) [D]			
Green leafy vegetables	69 (42.1)	38 (23.2)	54 (32.9)	3 (1.8)	0 (0.0)	95 (57.9)	0.699	0.6
Fruits	68 (41.5)	34 (20.7)	54 (32.9)	8 (4.9)	0 (0.0)	96 (58.5)	0.73	0.059
Other vegetables	95 (57.9)	23 (14)	40 (24.4)	4 (2.4)	0 (0.0)	69 (42.1)	0.986	0.6
Dairy products	141 (86)	9 (5.5)	12 (7.3)	2 (1.2)	0 (0.0)	23 (14)	0.708	0.574
High calorie/fat/sugar/salt	72 (43.9)	48 (29.3)	37 (22.6)	7 (4.3)	0 (0.0)	92 (56.1)	0.806	0.29
Caffeinated products	55 (33.5)	30 (18.3)	24 (14.6)	26 (15.9)	29 (17.7)	109 (66.5)	0.018*	0.067
Meat/poultry	4 (2.4)	7 (4.3)	5 (3.0)	21 (12.8)	127 (77.4)	160 (97.6)	0.328	0.606
Herbal tea	32 (19.5)	11 (16.7)	11 (16.7)	13 (7.9)	97 (59.1)	132 (80.5)	0.632	0.433

PMDD=Premenstrual Dysmorphic Disorder, PMS=Premenstrual Syndrome, *Significant at 5% level

respectively, which may be due to smaller sample size in the present study or the social and cultural differences in the study participants.[12,18] However, much of the previous research has demonstrated the majority of urban and unmarried respondents in their studies.[16,20]

In this research, the prevalence of moderate to severe PMS and PMDD were found to be 18.9% and 6.09%, respectively, which vary slightly from the other recent research.[21] In the present study, the commonest symptom found were anger/irritability (87.8%), physical symptoms (79.3%), fatigue/lack of energy (77.4%) and decreased mood/hopelessness (75.6%) considering either mild, moderate or severe forms of those symptoms. Similar results were seen in the research done by Raval and colleagues[18] where the commonest symptoms were fatigue (68.3%) followed by reduced interest in work (60.1%) and anger/irritability (59.9%). Fatigue and lack of energy was also third commonest symptom in research done by Pearlstein T and Tabassum S done on girls of the USA and Pakistan, respectively.[22,23]

According to the statistical analysis, types of diet did not have a significant association in both PMDD as well as moderate to severe PMS. On the other hand, not the types of diet but practices like eating too much junk foods and "dieting" for weight reduction were significantly associated with menstrual problems if not PMS.[24] In this study, significant statistical association was seen of caffeine with both moderate to severe PMS but not with PMDD. However, the findings contraindicated to many of the researches which stated there was no association of caffeine with moderate to severe PMS which could be due to difference in the sample size as well as other social and demographic characteristics.[25]

Some females had been taking special drinks like herbal teas for its soothing effects and preventing menstrual cramps during the luteal phase of the menstrual cycle. This research found that the most of the respondents (*n* = 132, 80.5%) did not consume such products on a daily basis. In fact in the current research, majority (59.51%) of the respondents never consumed herbal tea which was different from the study done on university students of Sharjah, UAE, where only 37.1% of the students had

not consumed it.[12] There was no statistical significance of its daily consumption and PMS or PMDD. Similarly, consumption of alcohol and chewing tobacco had a significant association with symptoms of PMDD. However, there was no significant association between alcohol or tobacco consumption and moderate to severe PMS [Table 1].

In this research, it was observed that significant association was found between any forms of exercise with symptoms of PMS (*P* = 0.021) but not for PMDD (*P* = 0.983). The reason might be due to the small sample size in the current research. But exercise can be advised as a preventive measure as recommended in the research done by Vigod S and colleagues as well as Pearce M and co-workers.[26,27] However, there was a slight association of yoga with moderate to severe PMS. Overall, the knowledge of common symptoms along with their possible factors would make it easy for the primary care physicians to diagnose PMS with much certainty and would avoid undue referrals.

Conclusion

Premenstrual symptoms were associated with various socio-demographic, dietary and lifestyle factors. The most common symptoms seen were "anger/irritability" and "fatigue/lack of energy". Physical symptoms like headache, breast tenderness, bloating etc., were also commonly seen. The prevalence of PMS (moderate to severe) and PMDD were 18.9% and 6.09%, respectively. The frequency and types of premenstrual symptoms were similar to the research done in the past in many Asian countries with similar age groups. Factors like alcohol-smoking-tobacco and exercise-yoga had a significant association with PMDD and PMS, respectively. With logistic regression analysis, PMS was more likely to be associated with functional impairment. The role of caffeinated products was found significant in PMS. Similar research should be done comparing different factors in different settings so that better knowledge is gained about premenstrual symptoms which could be utilized to reduce the frequency as well as the severity of such clinical features. The knowledge about prevalent symptoms and their impetus would benefit all the stakeholders of PMS including the females, their parents, teachers, counselors, primary care physicians as well as policymakers.

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Conflicts of interest

There are no conflicts of interest.

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