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Prevalence of Premenstrual Syndrome In Females of Gujranwala Division And Its Associated Risk Factors

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Abstract: Introduction: Premenstrual syndrome (PMS) is characterized by cyclic reoccurrence of distressing somatic and psychological manifestations, during luteal phase of menstrual cycle. Present research work aims to investigate prevalence of PMS in females of Gujranwala division Pakistan and to explore various risk factors associated with this syndrome. **Methods:** The study included self-administered questionnaire, for diagnosis of PMS and PMDD. Participants were analysed for socio-demographic characteristics and menstrual history, serum cholesterol and haemoglobin levels of patients and control were measured. **Results:** In the present study, 56% females were screened positive for PMS while Prevalence PMDD was 18%. Most common physical symptoms of PMS were abdominal bloating (63.2%), muscle pain (71.73%), lack of energy (85.85%) and appetite change (79.15%) whereas major distressing psychological were Irritability (82.32%), anger (74.55%), depression (49%) and anxiety (63.2%). Prevalence of PMS was 22.6% in underweight, 50.1% in participants having normal weight, 15.5% in overweight individuals and 11.6% in obese. Anaemia (P = 0.00), fatigue (P = 0.00), dysmenorrhea (P = 0.00), family history of PMS (P = 0.00) and residential area (P = 0.047) were major risk factors for development of different symptoms of PMS. **Conclusion:** Statistically significant association was not confirmed between PMS, obesity and blood cholesterol level. PMS is a common menstrual disorder among reproductive females of Gujranwala division, Pakistan. Findings of the study revealed that anemic females were at risk to develop PMS symptoms.

Keywords: Premenstrual syndrome, premenstrual disphoric disorder, haemoglobin, cholesterol, obesity

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Introduction

Premenstrual syndrome (PMS) is a psychotic neuroendocrine disorder having biological, social and psychological parameters. It refers to a collection of distressing symptoms that arise around the end of luteal phase (7 to 14 days prior menstruation) of menstrual cycle and remit with onset of menstruation [1]. Most common symptoms include anger, irritability, anxiety, mood swings, fatigue, headache, back pain, nausea, bowel movements, mastalgia, weight gain, acne, joint pain,

peripheral edema and bloating [2]. Premenstrual Dysphoric disorder (PMDD) is an extreme, predominantly psychological end of PMS [3].

Incidence of PMS is widespread, epidemiological surveys indicated that 100% adolescents are suffering from at least one symptom of PMS [4]. About 80% women report mild symptoms while 20-50% report moderate symptoms, severe symptoms of PMS has been reported by 5% females with impairment of functioning in social and occupational context [5].The aetiology of PMS is unclear and multifactorial. Emergence of PMS has been related to biological, genetic, social, psychological and environmental factors [6]. Among the causative factors of PMS [7]. Hormonal, metabolic and neurotransmitter actions are of great interest. Stress is considered as an important contributor to develop psychological symptoms of PMS by increasing adrenal cortisol and decreasing brain beta-endrophin[8].

In medical practice PMS remains a clinical entity of great significance. It is not a life threatening disorder but it can seriously affect quality of life and productivity of women besides physical and mental health [9]. Different treatments such as lifestyle modification, stress management, sports, herbal medicines, selective serotonin reuptake inhibitors (SSRIs), and anti-depressants have been utilized to cure symptoms of PMS [10].

The aim of the study was to investigate prevalence of PMS in females of Gujranwala division Pakistan, to assess haemoglobin level in subjects having PMS and its possible correlation with PMS and to explore association between obesity, serum cholesterol level and PMS. Several studies have been conducted globally to find out possible association of PMS with obesity and dyslipidemia. Results of some studies identify a positive relation between PMS, obesity and family history of dyslipidemia while others identify not a statistically significant association between them. We have designed this study for better understanding of pathophysiology of PMS.

In countries like Pakistan it was usually considered as a stigma even to talk about problems related to menstruation. But now, perception has been changed with time and health is considered as obvious right of women still, women in Pakistan are raised thinking that PMS is not a disease, it is a part of being women. We considered it as an under investigated area as few studies, only in Karachi and Islamabad have been conducted, reporting higher prevalence rate (80.6%) of PMS hence, the study was planned. It is very important to pay attention to problems of women such as PMS that are related to their physical and mental health.

Materials and Methods

Study design and participants: The cross-sectional study comprised of two stages. At first stage 500 respondents (age between 14-45) for prevalence were evaluated, including housewives, working ladies from rural and urban areas, students from different schools, colleges and universities of Gujranwala division Pakistan. In second step premenstrual serum cholesterol levels and Hb of only 80 PMS-patients and 20 controls were measured, due to lack of funding resources.

But majority of surveyed population represented age group of 14-25 years (70.2%) as older age females of Gujranwala region considered menstrual illness as a taboo or stigma which hinders open communication and it was rooted in the believes of the older age females that menstrual issues are source of shame and not to be discussed.

Pregnant females, hospitalized Patients with psychological and medical problems that mimic with PMS, subjects taking antidepressant and psychotherapy, having family history of high blood pressure and thyroid diseases were excluded from study. The purpose of the study was explained and informed consent was obtained from participants.

The participants were asked to fill a self-administered questionnaire, designed with the help of gynecologist and statistician. Questionnaire comprised of socio-demographic and premenstrual assessment form for diagnosis of PMS based on diagnostic criteria of American College of

Obstetricians and Gynecologists (ACOG). Subjects were requested to rate different items that represent signs and symptoms of PMS on a 4 point scale ranging from no change to severe change of usual condition.

Participants of the study having at least one effective and one somatic symptom, five days before the onset of menses, these symptoms remit within four days of onset of menses, with no reappearance till day thirteen and this situation is consistent in last three months, were considered as patients of clinically significant PMS. PMDD require presence of at least five symptoms (one of which must be effective symptom). Interference in social activities, work, school or relationship must be experienced [3].

Calculation of body mass index: Body Mass Index (BMI) was utilized as an indicator of obesity. On the basis of BMI participants were categorized as underweight (BMI < 18.5), normal (BMI = 18.5-24.9), Overweight (BMI = 25-29.9) and obese (BMI of 30 or greater).

Collection of blood samples and lab measurements: After completion of questionnaire 5cc blood samples were collected aseptically from PMS patients (n = 80) and controls (n = 20) by venepuncture. ACOG criteria for PMS was used to categorize cases and control group. Blood samples (1.5 cc) were collected in CBC vials and stored at 4°C for analysis of blood haemoglobin level. Remaining 3.5cc blood samples were stored in clot activator tube, centrifuged at 13500 rpm to get the serum and stored at -20°C for analysis. All the samples were analysed in Biochemical Lab of University of Gujrat. The concentration of haemoglobin was determined by **Sahli's**hemoglobinometer. Total serum cholesterol, low density lipoprotein (LDL) levels were determined by using commercially available kits (Merck, Germany) and microplate reader (Diamate, UK). Serum Triglycerides level was determined by using commercially available kit (Merck, Germany) and spectrophotometer (Teico diagnostic, USA).

Statistical analysis: The statistical analysis was carried out using IBM SPSS statistics v. 23.0. Pearson's chi square test and student t-test were utilized for data analysis. P-value of less than 0.05 was considered statistically significant.

Results:

Mean age of the participants was 21.9 ± 5.74 years, most of them were students (82%), unmarried (84.4%) and urban residents (58%). Mean weight and height of participants was 55.6 ± 13.09 (kg) and 5.2 ± 0.29 (feet) respectively. Largest group was represented by women having menstrual cycle duration of 21-35 days (71.4%) with duration of menstruation 4-7 days (74.1%) and age at menarche 12-14 years (67.8%). The overview of sociodemographic characteristics of surveyed population is presented in Table 1.

Table 1: Sociodemographic characteristics of participants

Characteristics	**Subcategory**	**n (%) of subjects**
Age	14-25 years 25-45 years	351 (70.2) 149 (29.8)
Occupation	Work Housewife Students	30 (6) 60 (12) 410 (82)
Area	Rural Urban	210 (42%) 290 (58%)
Marital Status	Married Unmarried	76 (15.2) 424 (84.4)

Education	Primary Secondary Higher	24 (4.8) 73 (14.6) 403 (80.6)
Income	Unsatisfactory ≤ 50,000 Satisfactory ≥ 50,000	48 (9.6) 452 (90.4)
Menstrual Cycle Duration	<21 days 21-35 days >35 days	127 (25.4) 349 (71.4) 24 (5.8)
Duration of Menstrual bleeding	4 days 5-7 days 8 and more days	114 (22.8) 357 (71.4) 29 (5.8)
Age at Menarche	<11 years 12-14 years >15 years	22 (4.4) 339 (67.8) 139 (27.8)
Weight (kg)	Mean ± SD	55.6 ± 13.09
Height (Feet & inches)	Mean ± SD	5.2 ± 0.29

In the current study magnitude of PMS was found to be 56% and PMDD was 18% in females of Gujranwala division Pakistan and 26% participants were normal as shown in Figure.

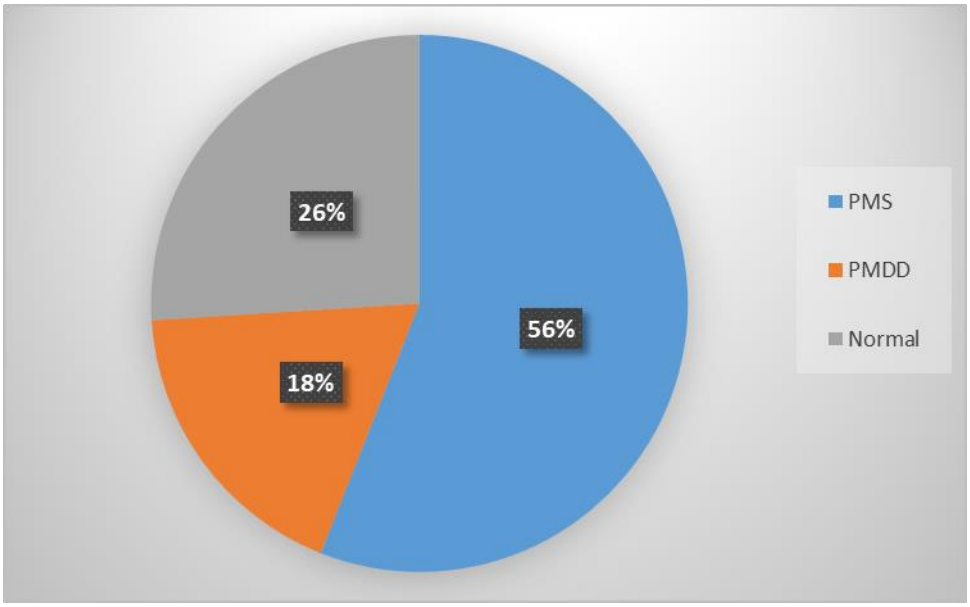

Figure 1: Prevalence rate of PMS and PMDD in females of Gujranwala Division, Pakistan

Most commonly reported physical symptoms of PMS were abdominal bloating (63.2%), muscle pain (79.1%), lack of energy (85.8%) and appetite change (79.1%) whereas major distressing psychological symptoms associated with PMS were Irritability (82.3%), anger (74.5%), depression (32%) and anxiety (63.2%). Comparison of PMS symptoms score in shown in Table 3.

Table 2: Risk Factors Associated with PMS.

Factors	Test Value	df	P- Value
Family History of PMS	44.846[a]	1	0.000
Fatigue	44.459[a]	1	0.000

Dysmenorrhea	32.807[a]	1	0.000
Menstrual cycle Duration	4.531[a]	2	0.104
Duration of Menstruation	4.715[a]	2	0.095
Age at Menarche	0.558[a]	2	0.575
Obesity (BMI)	10.501[a]	3	0.15
Area	3.955[a]	1	0.047
Marital Status	3.081[a]	1	0.102
Occupation	3.111[a]	1	0.211

Chi Square Test *P-Value <0.05 was considered statistically significant

More than half (64%) of the participants were having menstrual irregularities. Only 17% females were aware of PMS and 83% of the participants felt that it is normal part of menstruation. Prevalence rate of PMS was higher (68.9%) in urban area as compared to rural area (31%). PMS was found to be a major gynecological problem (78%) in younger females (14-25 years) as compared to (22.2%) in older (25-45 years). Prevalence of PMS in participants having family history of PMS was 67.84% and 32.15% in participants without PMS history. The results of our study shows possible association of PMS with dysmenorrhea.

Prevalence of PMS was lower (25%) in participants having regular exercise and higher (74.9%) in participants without regular exercise but a statistically significant association was not reported (P = 0.682). Statistically significant association between PMS, dysmenorrhea (P = 0.00), family history of PMS (P = 0.00), fatigue (P = 0.00) and residential area (P = 0.047) was observed in our study. Findings of present study reported that prevalence of PMS in underweight, overweight, healthy weight and obese females was 22.6%, 15.5%, 50.1% and 11.6% respectively. A statistically significant relation between BMI and occurrence of PMS was not detected (P = 0.15) as shown in Table 2.

Table 3: Comparison of premenstrual symptoms score between PMS and Non-PMS

Symptoms	**Total 500 (100)**	**PMS 283 (56.6)**	**Non-PMS 217 (43.4)**
Anxiety	272 (54.4)	179 (63.2)	93 (42.8)
Depression	153 (30.6)	91 (32.1)	62 (28.5)
Confusion	231 (46.2)	148 (52.2)	83 (38.2)
Irritability	366 (73.2)	233 (82.3)	133 (61.2)
Social Withdrawal	191 (38.2)	144 (50.8)	47 (21.6)
Hopelessness	127 (25.4)	100 (35.3)	27 (12.4)
Angry Outbursts	281 (56.2)	211 (74.5)	70 (32.2)
Appetite change	326 (65.2)	224 (79.1)	102 (47)
Sleeping disturbance	243 (48.6)	175 (61.8)	68 (31.3)
Swelling extremities	151 (30.2)	125 (44.1)	26 (11.9)
Lack of energy	357 (71.4)	243 (85.5)	114 (52.5)
Skin disorders	154 (30.8)	121 (42.7)	33 (15.2)
Abdominal bloating	249 (48.8)	179 (63.2)	70 (32.2)
Breast tenderness	96 (19.2)	78 (27.5)	18 (8.2)
Headache	160 (32)	115 (40.6)	45 (20.7)
Muscular pain	287 (57.4)	203 (79.1)	84 (38.7)
Dysmenorrhea	289 (57.8)	194 (68.5)	95 (43)

Data expressed as number (Percentage)

Mean haemoglobin level of PMS patients was lower 9.2 ± 1.003 g/dL as compared to participants who did not have PMS 10.3 ± 1.087 g/dL. Significant difference was reported between mean Hb levels of PMS patients and control (P = 0.00).
We found that total cholesterol level of PMS patients and controls were 205.7 ± 37.72 mg/dL and 199.3 ± 31.89 mg/dL respectively, means of both the groups do not differ significantly from each other (P = 0.500) while mean TG level of PMS patients was 164.6 ± 45.8 mg/dL and control was 159 ± 13.2 mg/dL our level of significance was (P = 0.147) which is greater than (P= 0.05). According to our results mean LDL level of PMS cases was 107.5 ± 28.6 mg/dL as compared to control 95.3 ± 31.9 mg/dL (P = 0.11) as represented in Table 4.

Table 4: Association of PMS with haemoglobin and blood cholesterol level.

	Cases (Mean±SD)	**Controls (Mean±SD)**	**Mean difference**	**P-value**
Haemoglobin Level (g/dL)	9.2 ± 1	10.3 ± 1	-1.11	0.000***
Total Cholesterol (mg/dL)	205 ± 37.7	199 ± 31.8	6.36	0.500
LDL Cholesterol (mg/dL)	107.5 ± 28.6	95.35 ± 31.95	12.1	0.114
Triglycerides Level (mg/dL)	164 ± 45.8	159 ± 13.2	5	0.147

Pvalue < 0.05 was considered to be significant

DISCUSSION

In this study 56% females of Gujranwala division Pakistan were reported as having PMS while 18% participants were characterized as patients of PMDD. The prevalence rate of PMS seems to be varied in different populations. This figure is consistent with literature reporting rates between 40 and 60% [11-13]. Moreover, lower prevalence rate (27%) were reported in some previous literature studies [14, 15]. Higher prevalence rate of PMS (80.6%) and PMDD (71.7%) has been identified among university students of Islamabad [16]. It is difficult to directly compare the findings of different studies because of differences in definition of PMS, social and cultural beliefs, target population and screening tools.
The study indicates that most commonly reported physical symptom is lack of energy/fatigue (85.8%). Similar findings were reported in previous studies [2, 17, 18]. Fatigue was third most common symptom demonstrated by Nisar *et al* [12]. Other highly reported somatic complaints among participants were abdominal bloating (63.2%), muscle pain (71.7%), appetite change (79.1%). These findings are in consistent with literature [5, 17]. Major distressing psychological symptoms reported in our study were Irritability (82.3%), anger (74.5%), depression (49%) and anxiety (63.2%).Our study results replicate relatively well with literature reporting that anger feeling, depression, irritability and difficulty in concentration are most common physiological symptoms of PMS [3, 19].
We have assessed that majority of females (93%) considered PMS symptoms as a normal part of menstruation and did not visited gynecologist for a single time to treat PMS, which identifies hesitation to report problems related to menstrual cycle, due to social and cultural beliefs. Other similar studies reported that 52.6% females of Islamabad were aware of PMS and 49.3% females were having treatment of PMS [16]. The current study indicates that a family history of PMS seems to be an important characteristic for women with PMS. It seems that genetics plays an important role in occurrence of different symptoms of PMS. These findings are in agreement with data from other reserchers[12, 20]. Meaningful relationship between PMS and family history of PMS was also observed in literature [18, 21].

According to our data students with menstrual pain or dysmenorrhea were more at risk for development of different symptoms of PMS compared with those who had no dysmenorrhea. The possible explanation of this association might be that dysmenorrhea may aggravates behavioral and emotional responses to menstrual symptomology and leads to likelihood of PMS. These results are in accordance with the studies conducted in Iran, Pakistan, Egypt, India and Ethiopia [2, 6, 22, 23].

As per our analysis the number of sufferers of PMS are significantly higher in urban area (68.9%) as compared to rural area (31%). It seems that healthy environment may help to prevent occurrence of PMS. On the other hand, among college students of Gujarat India, a significant association between residential area and PMS was not reported [3]. The study findings indicate that participants who were engaged in regular physical activity (exercise, yoga, sports, jogging) had lower risk to develop PMS symptoms (25%) as compared to those who had sedentary lifestyle, but a statistically significant association was not confirmed. A study conducted in India reported non-significant (P = 0.11) association between exercise and PMS [3]. But, small trials have suggested aerobic exercise to be beneficial for PMS treatment. Literature reported physical activity/exercise has been associated with decreased stress complaints the association between PMS and exercise needs to be further investigated.

Our results represents that there was not a statistically significant association between obesity and occurrence rate of PMS (P = 0.15), magnitude of PMS was higher in normal weight persons as compared to overweight and obese. This replicates findings of previous studies conducted in Greece and Taiwan [17, 24]. This is also in agreement with a research from India (MR &Suryakantha, 2017) and Karachi, Pakistan [19, 25]. However, our study results are contradictory to other studies reporting, adiposity as a contributing factor to develop PMS symptoms [21, 26, 27]. Previous studies demonstrated that obese women had nearly three-fold (2.8- folds) increased risk of PMS than non-obese women [13] so further studies are needed in order to validate the relationship between obesity and PMS.

The study findings admit a statistically significant association between low blood haemoglobin level and occurrence of PMS. Literature also said that presence of anemia is significantly associated with PMS [28, 29]. Estimation of Hb level may emerge as an important inclusion criteria for diagnosis of PMS [30].

This study indicates that there is not a statistically significant difference between PMS sufferers and control group in terms of blood cholesterol level. Our results are contradictory to a study conducted in Taiwan, demonstrating positive relation between PMS and high serum cholesterol levels [17]. However, another researcher reported, levels of LDL (99.21 mg/dL) cholesterol were low in females with PMS as compared to females without PMS (LDL = 102.73 mg/dL) and level of TG was higher (57.89 mg/dL) in PMS patients as compared to subjects without PMS (53 mg/dL) [24].

CONCLUSION

In conclusion we report that PMS and PMDD are highly prevalent among females of Gujranwala division Pakistan. This study revealed that age, residential area, dysmenorrhea, family history of PMS and fatigue act as risk factors to develop various symptoms of PMS. The results of our study purposed that anemia could be a major contributing factor to develop various symptoms of PMS whereas blood cholesterol level and obesity were not significantly associated with PMS in our population. This study will be helpful to create awareness regarding diagnosis, assessment and treatment among general population as it was seen that menstrual issues are traditionally seen as source of shame in underdeveloped countries.

HUMAN AND ANIMAL RIGHTS

No animals were used in this study. The study on humans was conducted in accordance with the ethical rules of the Helsinki Declaration and Good Clinical Practice.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

None.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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REFERENCES

1. Chumpalova P, Iakimova R, Stoimenova-Popova M, Aptalidis D, Pandova M, *et al*. Prevalence and clinical picture of premenstrual syndrome in females from Bulgaria. Annals of General Psychiatry 2020; 19 (1): 1-7. doi:10.1186/s12991-019-0255-1
2. Minichil W, Eskindir E, Demilew D, Mirkena Y. Magnitude of premenstrual dysphoric disorder and its correlation with academic performance among female medical and health science students at University of Gondar, Ethiopia, 2019: a cross-sectional study. BMJ Open 2020; 10 (7): 1-9. doi:10.1136/bmjopen-2019-034166
3. Raval CM, Panchal BN, Tiwari DS, Vala AU, Bhatt RB. Prevalence of premenstrual syndrome and premenstrual dysphoric disorder among college students of Bhavnagar, Gujarat. Indian Journal of Psychiatry 2016; 58 (2): 164. doi: 10.4103/0019-5545.183796
4. Ashfaq R, Jabeen S. Association between the prevalence of premenstrual syndrome and weight status of adolescent girls (11-21years). AdvancesinObesityand Weight Management Control 2017; 6: 1-4. doi: 10.15406/aowmc.2017.06.00140
5. Brahmbhatt S, Sattigeri B, Shah H, Kumar A, Parikh D. A prospective survey study on premenstrual syndrome in young and middle aged women with an emphasis on its management. InternationalJournalofResearchinMedicalSciences 2013; 1 (2): 69-72. doi: 10.5455/2320-6012.IJRMS20130506
6. Seedhom AE, Mohammed ES, Mahfouz EM. Life style factors associated with premenstrual syndrome among El-Minia University Students, Egypt. International Scholarly Research NotesPublic Health 2013; 6. doi: 10.1155/2013/617123
7. Abeje A, Berhanu Z. Premenstrual syndrome and factors associated with it among secondary and preparatory school students in Debremarkos town, North-west Ethiopia, 2016. BMC Research Notes 2019; 12 (1): 1-5. doi: 10.1186/s13104-019-4549-9
8. Mohammadi A. Correlation between High Body Mass Index and Premenstrual Syndrome in Iranian University Students. Asian Journal of Pharmaceutics 2019; 13 (3): 4489. doi: 10.22377/ajp.v13i3.3288
9. Reed BG, Carr BR. The normal menstrual cycle and the control of ovulation. PublicLibraryofSciences 2015; 12(10): 163.

10. Hantsoo L, Epperson CN. Premenstrual dysphoric disorder: epidemiology and treatment. Current Psychiatry Reports 2015; 17 (11): 1-9. doi: 10.1007/s11920-015-0628-3
11. Derman O, Kanbur NÖ, Tokur TE, Kutluk T. Premenstrual syndrome and associated symptoms in adolescent girls. European Journal of Obstetrics & Gynecology and Reproductive Biology 2004; 116 (2): 201-206. doi: 10.1016/j.ejogrb.2004.04.021
12. Nisar N, Zehra N, Haider G, Munir AA, Sohoo NA. Frequency, intensity and impact of premenstrual syndrome in medical students. Journal of College Physicians Surgeons Pakistan 2008; 18 (8): 481-484.
13. Masho SW, Adera T, South-Paul J. Obesity as a risk factor for premenstrual syndrome. Journal of Psychosomatic Obstetrics & Gynecology 2005; 26 (1): 33-39. doi: 10.1080/01443610400023049
14. Haq NU, Gill S, Nasim A, Tahir M, Yasmin R, Batool F. Prevalence and impact of premenstrual syndrome among the female nursing students of Questa. AsiansJournalofNursingEducationand Research 2019; 9 (2): 239-242. doi: 10.5958/2349-2996.2019.00050.8
15. Shamnani G, Gupta V, Jiwane R, Singh S, Tiwari S, Bhartiy SS. Prevalence of premenstrual syndrome and premenstrual dysphoric disorder among medical students and its impact on their academic and social performance. National Journal of Physiology, Pharmacy and Pharmacology 2018; 8 (8): 1205-1208. doi: 10.5455/njppp.2018.8.0415728042018
16. Majeed S, Moin H, Shafi R, Irshad K, Ashraf I, Janjua K. Prevalence, knowledge, attitude and practices towards premenstrual syndrome among university students in Islamabad and its impact on their daily life. Rawal Medical Journal 2019; 44 (3): 588-593.
17. Cheng S-H, Shih C-C, Yang Y-K, Chen K-T, Chang Y-H, Yang Y-C. Factors associated with premenstrual syndrome—A survey of new female university students. The Kaohsiung Journal of Medical Sciences 2013; 29 (2): 100-105. doi: 10.1016/j.kjms.2012.08.017
18. Kamat SV, Nimbalkar A, Phatak AG, Nimbalkar SM. Premenstrual syndrome in Anand District, Gujarat: A cross-sectional survey. Journal of Family Medicine and Primary Care 2019; 8 (2): 640. doi: 10.4103/jfmpc.jfmpc-302-18
19. Tolossa FW, Bekele ML. Prevalence, impacts and medical managements of premenstrual syndrome among female students: cross-sectional study in college of health sciences, Mekelle University, Mekelle, Northern Ethiopia. BMC Women's Health 2014; 14 (1): 1-9. doi: 10.1186/1472-6874-14-52
20. Nourjah P. Premenstrual syndrome among teacher training university students in Iran. TheJournalofObstetricsandGynaecologyofIndia 2008; 58 (1): 49-52.
21. Rad M, Sabzevary MT, Dehnavi ZM. Factors associated with premenstrual syndrome in female high school students. Journal of Education and Health Promotion 2018; 7. doi: 10.4103/jehp.jehp-126-17
22. Pal SA, Dennerstein L, Lehert P. Premenstrual symptoms in Pakistani women and their effect on activities of daily life. Journal of the Pakistan Medical Association 2011; 61 (8): 763.
23. Hashim R, Ayyub A, Hameed S, Qamar K, Ali S, Raza G. Premenstrual syndrome: messes with my academic performance. PakistanArmedForcesMedical Journal 2014; 64 (2): 199-203.
24. Stamatelopoulos KS, Georgiopoulos G, Papaioannou T, Lambrinoudaki I, Kouzoupis A, *et al*. Can premenstrual syndrome affect arterial stiffness or blood pressure? Atherosclerosis 2012; 224 (1): 170-176. doi: 10.1016/j.atherosclerosis.2012.05.037
25. Akbari R, Sudharani M, Kallupurackal SJX, Ramya V, MR NG, Suryakantha A. Prevalence of premenstrual syndrome among medical students. National Journal of Community Medicine 2017; 8 (06): 292-294.
26. ELBanna MM, ELBbandrawy AM, Elhosary EA, Gabr AA. Relation between body mass index and premenstrual syndrome. Current Science International 2019; 8 (2): 394-

402.Bertone-Johnson ER, Hankinson SE, Willett WC, Johnson SR, Manson JE. Adiposity and the development of premenstrual syndrome. Journal of Women's Health 2010; 19 (11): 1955-1962. doi: doi.org/10.1089/jwh.2010.2128.

27. Chowdhary N, Patel V. The effect of spousal violence on women's health: Findings from the Stree Arogya Shodh in Goa, India. Journal of Postgraduate Medicine 2008; 54 (4): 306. doi: 10.4103/0022-3859.43514
28. Silotry N, kumari Nimmagadda H, Kumari R. A comparision of haemoglobin levels in women with and without premenstrual syndrome during premenstrual, menstrual and postmenstrual stages. International Journal ofBiology and Medical Research 2011; 2 (4): 1017-1022.
29. Chocano-Bedoya PO, Manson JE, Hankinson SE, Johnson SR, Chasan-Taber L, *et al*. Intake of selected minerals and risk of premenstrual syndrome. American Journal of Epidemiology 2013; 177 (10): 1118-1127. doi: 10.1093/aje/kws363.