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Premenstrual Syndrome and Primary Dysmenorrhoea among Female Medical Students

—A Prospective, Cross-Sectional, Critical Surve

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Abstract

Introduction: For the Arabic-speaking nations, a region with distinctive cultural and social traits that might affect expectations and self-perception of health problems, research on risk factors for premenstrual syndrome (PMS) and primary dysmenorrhoea (PD) is sparse. We investigated the relationship between the frequency of PMS and PD and potential risk factors for the illness. **Aim:** This paper aims to identify the prevalence, risk factors, and impacts of PMS and PD on female medical students' quality of life (QoL) and academic performance. **Subjects and Methods:** A cross-sectional, survey-based study involved 300 undergraduate female medical students (out of 431 female students) at one of the private medical colleges in Jeddah, Saudi Arabia, "The Batterjee Medical College". **Results:** Both PMS and PD are very common among female medical students in Saudi Arabia. The prevalence of PMS was 78.33%, while that of PD was 75.67%. The main predictors for both were young age, unmarried females, exposure to stress, excess unhealthy fatty meals, and coffee intake. Positive family history, nulliparity, and negative Rhesus factor D (RhD) were among the significant associated factors. Non-steroidal anti-inflammatory drugs (NSAIDs) were the common medication used to cope with the problem. **Conclusion:** The high incidence of PMS and PD among female medical students calls for effective measures to minimise their impact on students (physiologically and psychologically) and on their academic performance in medical schools. Educational awareness seminars, the provision of medical healthcare services, and different stress-relieving events such as aerobic exercises are recommended.

Keywords

Premenstrual Syndrome (PMS), Primary Dysmenorrhoea (PD), Quality of life (QoL), Female Medical Students in Saudi Arabia

1. Background

Approximately 1.8 billion women worldwide experience menstruation, which is viewed as a normal physiological process, each month (between menarche and menopause). The average menstrual cycle lasts 3 to 7 days (average 5 days), with a frequency of 22 to 34 days (average 28 days) and a volume of 20 to 80 millilitres (average 50 ml^3) per cycle. While 80% of women suffer PMS and PD, only about 20% of women do not encounter any interruptions to their regular daily activities in the days preceding menstruation [1].

1.1. Premenstrual Syndrome (PMS)

Physical, mental, emotional, and behavioural symptoms throughout the luteal phase of the menstrual cycle are referred to as a premenstrual syndrome (PMS) [2]. The diagnostic standards for PMS were released by the American College of Obstetricians and Gynaecologists (ACOG). It was taken into account if at least one somatic symptom and one emotional symptom in the three previous menstrual cycles were reported five days before the start of menses and went away within four days of the start of menses. Bloating, breast discomfort and swelling, pelvic pain, headaches, skin conditions, changes in bowel habits, and extremity swelling are examples of somatic symptoms. The affective (emotional and behavioural) symptoms may present as irritability, aggression, depression, crying spells, anxiety, angry outbursts, difficult concentrating, sleep disturbance (hypersomnia or insomnia), thirst, change in appetite, specific food cravings, confusion, social withdrawal, change in libido, and poor concentration [3].

The cause of PMS is still up for debate. Hypotheses include the use of oral contraceptives, endocrinological dysfunctions, altered trans-capillary fluid balance, altered endorphin modulation of gonadotropic secretion, biosocial and psychological factors, smoking, alcohol use, and a diet high in fat and beef, refined sugar products, or beverages with caffeine. Despite extensive research, it is still unclear what causes PMS, and more research is required to provide strong support for potential risk factors [4].

How sex hormones interact with brain chemicals appears to be the cause of these symptoms. Gamma-aminobutyric acid (GABA), serotonin, and endorphin alterations in neurotransmitters have all been linked to the PMS, and women with the condition are thought to be more sensitive to cyclical hormonal changes. Evidence for differences, such as a drop in endorphin levels in the blood of symptomatic patients, is contradictory. The luteal phase is linked to lower plasma GABA levels and its receptor sensitivity, according to numerous studies. Sero-

tonin dysregulation with reduced serotonin function in the luteal phase is the most likely explanation. Because selective serotonin reuptake inhibitors (SSRIs) may not always help female patients, it is likely that additional factors are at play. Oestrogen, progesterone, and testosterone levels are all within normal ranges even without the use of sex enhancers; however, women who have PMS may be more susceptible to natural changes [5].

Nearby 3% - 8% of females experience premenstrual syndrome (PMS) in its severe form, premenstrual dysphoric disorder (PMDD), which is accompanied by considerable psychosocial symptoms [6]. According to the ACOG, a woman must have 5 out of 11 symptoms, including mood swings, in order to be diagnosed with PMDD. Symptoms include irritability, melancholy, and excessive tension. These symptoms are frequently so severe that they might result in dysfunction and a poor quality of life. Although the exact origin of PMDD is still unknown, studies have shown that it can be brought on by being single, going through mental distress, having irregular periods, and being in poor health [1].

Due to the severity of the symptoms, PMDD is frequently linked to an elevated sickness burden. The chronic nature of the ailment and the interference with daily tasks, leisure activities, and interpersonal connections can also add to the burden of illness. The majority of women with PMDD are more likely to report taking time off from work, being less productive, having constraints on their job duties, and being less effective. Additionally, PMDD has an economic cost that results from the self-reported decline in productivity rather than from out-of-pocket expenses for medical care [7].

A precise prospective analysis of the symptoms is required to make the diagnosis because PMS symptoms may match those of other disorders, such as depression and anxiety crises. The International Society for Premenstrual Disorders suggests delaying diagnosis confirmation until two consecutive menstrual cycles' have been examined. The most widely accepted and used method is the Daily Record of Severity Problems (DRSP), which is a prospective, self-administered questionnaire. During a clinical appointment, the patient completes the Premenstrual Symptoms Screening Tool (PSST), as a retrospective questionnaire. It is used as a screening method to identify women who have PMS and PMDD. Compared to two cycles of prospective charting, it requires less time and is more beneficial [8]. The retrospective assessment of symptoms has a limited value and requires further confirmation because the PSST may be over-diagnosed as a PMDD or under-diagnosed as a PMS. Henz A. *et al.* (2018) [9], advised using the DRSP to further investigate patients whose PSST results have indicated that they have positive PMS and/or PMDD.

The management of PMS should be in line with the theories surrounding its aetiology. The initial line of treatment for increasing central serotonin transmission should be non-hormonal therapies such as regular cardiovascular activity, muscle building, and slow breathing exercises. These exercises have been demonstrated to cause the production of endorphins [10]. Additionally, symptomatic therapy may help with some PMS symptoms. Selective Serotonin Reuptake Inhib-

itors (SSRI), the most well liked non-hormonal remedy, reduce PMS by boosting serotonin levels in the brain [5]. Women should be informed about the potential negative effects of SSRIs, which might include decreased libido, lethargy, sleepiness, and nausea associated with insomnia with prolonged usage. A number of vitamin deficiencies have also been hypothesised but not proven, including those involving zinc, vitamin A, vitamin E, thiamine, magnesium, and vitamin B6. Oestrogen, Danazol, and Gonadotrophin Releasing Hormone Analogue/Antagonists (GnRHa) are prescribed as a part of hormonal therapy. Cognitive behavioural therapy (CBT) should be routinely explored as a therapeutic option with GnRHa when treating women with PMDD. When medication care has failed, long-term GnRHa is required, or another gynaecological issue warrants surgery, hysterectomy and bilateral oophorectomy (with the use of HRT if she is younger than 45 years) can be considered.

The Health Belief Model (HBM), a groundbreaking study carried out by Khalilzadeh P. *et al.* [11], in 2023, was based on the delivery of five educational sessions. It was suggested to utilise it in conjunction with other healthcare management alternatives during puberty and in schools as a simple, affordable, and successful strategy to lessen the impacts of PMS.

1.2. Primary Dysmenorrhoea (PD)

Primary dysmenorrhea (PD) is extremely underreported, making it difficult to estimate its prevalence because, despite the significant distress it causes, few affected women seek medical attention. Instead, they tend to view the pain it causes as an inevitable part of the menstrual cycle [12].

Globally, the risk of PD ranges from 60.4 to 91% [13]. The risk factors include dietary habits, body mass index, age at menarche, prolonged heavy menstrual periods (due to a higher level of prostaglandin synthesis) [14], nulliparity, smoking habits (since the presence of nicotine causes the pelvic blood vessels to contract), high social level, and a favourable family history (genetic polymorphism) [13] [15].

Primary (*spasmodic*) and secondary (*congestive*) dysmenorrhea are the two subcategories of dysmenorrhea. Muscle cramps are the prevalent symptom. The lower back and lower legs may experience pain radiating from the lower abdomen. 1 - 3 days prior to or throughout the menstrual cycle, pain is possible. The pain is severe for 24 hours following the start of the menstrual cycle and gradually gets better over the next 2 to 3 days. Females with heavy periods, irregular periods, or periods that started before the age of 10 are more likely to have it. Agitation or irritability, lethargy, headache, nausea, vomiting, dizziness, loss of appetite, sweating, polyuria, insomnia, and arthralgia are some of the symptoms of dysmenorrhea [16].

Many theories have been postulated over the years in an effort to determine what causes primary dysmenorrhea. According to Hippocrates, a cervical canal stenosis that results in blood stagnation in the uterus is what causes painful menstruation. The fact that nulliparous women experience more severe pain than mul-

tiparous women do lends credence to the hypothesis. Hyperactivity in the myometrium has also been linked to PD. Menstrual pain has been theorised to have a probable root in increased uterine pressure. The reduced uterine blood flow that results from this causes tissue ischemia and discomfort. There are ovulatory menstrual cycles connected to it. Therefore, since ovulation does not take place soon after menarche, painless menstruation may exist [16].

Stress physically prevents follicle-stimulating hormone (FSH) and luteinizing hormone (LH) from pulsating, which impairs follicular growth [17]. Following ovulation, progesterone synthesis is increased in luteinized follicles; hence, stress-induced follicular development impairment may diminish progesterone production [18].

Prostaglandins significantly induce uterine contractions. The contractions are irregular and non-rhythmic, and they happen frequently-more than 4 - 5 contractions per minute. Because of these contractions, the intrauterine pressure rises and may even approach 400 mmHg. Stretch receptor activation can also be involved [19].

Due to a pelvic disease, secondary dysmenorrhea (*beyond the scope of this study*) develops. Endometriosis, pelvic infections, and leiomyomas are the most frequent causes. Several years following menarche, it frequently affects multiparous women. The lower abdominal discomfort can be localised or widespread, can occur outside of a menstrual cycle, and is frequently accompanied by other symptoms such as menorrhagia or intermenstrual bleeding [18].

Dysmenorrhea has a detrimental effect on patients' quality of life since it interferes with their relationships with friends and family, academic (or professional) performance, and leisure activities. Compared to other times of the menstrual cycle, the quality of sleep decreases during menstruation [16].

2. Aim of the Study

The goals of the current study are to:

1) Detect the prevalence of premenstrual syndrome (PMS) and primary dysmenorrhea (PD) among female medical students at BMC Medical School.

2) List the predictors and risk factors of PMS and PD among undergraduate female medical students.

3) Identify the effects of PMS and PD on the daily activities and academic performance of female medical students.

4) Recognise how female medical students typically cope with pain and discomfort among the available standard coping measures.

3. Subjects and Methods

3.1. Study Design and Setting

This is a prospective, cross-sectional, observational study that included answering online a pre-designed, structured, self-administered questionnaire directed to undergraduate female medical students of the General Medicine Practice Program at the Batterjee Medical College (BMC) in Jeddah, Saudi Arabia. The collection of data extended for five months (from February 1st to June 30th, 2023).

3.2. Criteria for Selection and Exclusion

The selection criteria included all undergraduate female medical students of the General Medicine Practice Program (from the 1st to the 6th medical grades) at BMC, of any nationality (Saudi and non-Saudi), and of any marital status (married or not), for the academic year 2022 - 2023.

The excluding criteria include all undergraduate male medical students of the General Medicine Practice Program, as well as postgraduate doctors of both sexes. Adding all female students who were not willing to participate or to give a signed online consent, as well as those who were pregnant or lactating. Similarly, female students with diagnosed or suspected pelvic pathology (such as endometriosis, pelvic inflammatory disease, and/or leiomyomas) and those who were on any medications for other illnesses (including combined hormonal contraceptives, antipsychotics, antidepressants, sedatives, antispasmodics, and corticosteroids).

3.3. Sample Size Calculation

The minimal sample size required for a valid study was **157** students according to the total number of female students. This calculated online at http://www.calculator.net/ and rechecked by the Raosoft® programme at http://raosoft.com/samplesize.html.

Considering the total population size of 431 female medical students, the percentage of PMS and PD in our community is 80%, at a confidence level of 95% (Z-score 1.96), and the margin of error is ± 5%. By using mathematical equations, we used the following single population proportion formula:

$$n = \frac{z^2 \times p(1-p)}{\varepsilon^2}$$

$$n = \frac{1.96^2 \times 0.80(1-0.80)}{0.05^2} = 245.9$$

where:

n = minimal sample size;

z = z-score of 95% confidence level (1.96);

p = expected population proportion (50%);

ε = margin of error (5%).

Since our population was known (431 total female medical students for the academic year 2022-23), we used the additional correction formula:

$$fn = \frac{P}{1 + P/n}$$

$$fn = \frac{431}{1 + 431/245.9} = 156.7$$

where:

n: minimal sample size;

fn: corrected sample size;

P: known population (431 female students).

We preferred to target a large number of female students and thus increase our sample size for two reasons: firstly, to compensate for a possible 20% non-response rate, and secondly, to minimise the margin of error. Accordingly, the actual number of recruited female students in the current study was 300**,** with a response rate of 69.61% and a margin of error of ± 2.5% (Chart 1).

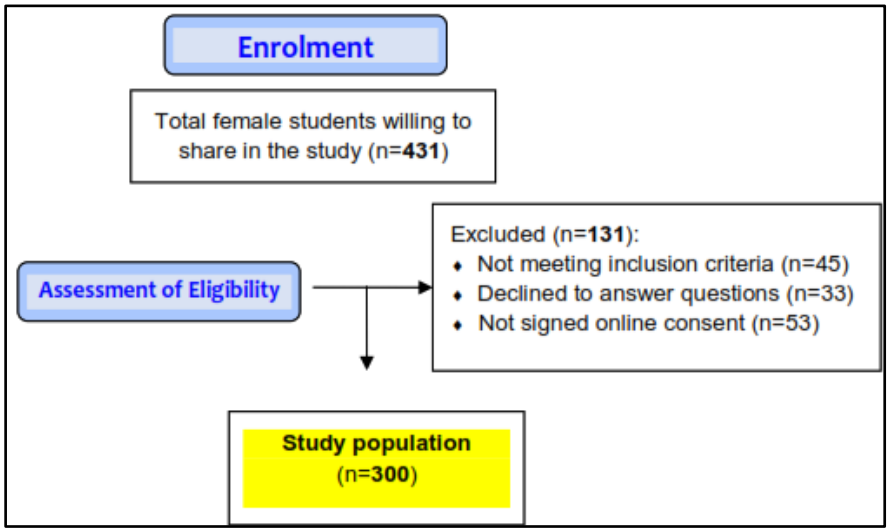

Chart 1. Flow-chart for recruitment of eligible couples for the study.

3.4. Study Tools

An organised, online Google Docs questionnaire sheet was used to collect the data (https://docs.google.com/forms/d/1WjNzHCWt1qrIUW-QRuUZRVxmr5ZVIDpAkcLo7l5Ql88/viewform?edit_requested=true).

An expert reviewer at the BMC used a pilot study on 5 students to validate the survey's questionnaire, and the reliability of each question was determined (Cronbach's alpha = 0.77). The necessary alterations, deletions, and/or additions for some items were made in accordance with the findings of the pilot study. The main study sample did not include the group of students that took part in the pilot study.

The study's questionnaire composed of four major sections. A group of questions to scan for sociodemographic, lifestyle, and reproductive characteristics of participated students. Another group of questions on the perceived symptoms of PMS, a group of questions on the PD, and extra group of questions on the associated drawback effects on the students; that include perceived pain, depression, stress, and impact on the quality of life (QoL).

For every female medical student who fulfilled the study's inclusion criteria and agreed to participate in the current survey (signed informed consent), the following data were collected:

1) Sociodemographic data: such as chronological age (in years), religion, nationality, studying medical year, ethnicity, home residence, living status, positive family history of PMS and PD, annual family income (measured in US Dollars), as well as blood group (A, B, AB, O) and Rh-typing.

2) Lifestyle data: include dietary habits, body height (in meters) and body-weight (in kilograms), habits of medical importance (smoking and/or alcohol intake), drinks (tea, coffee, cola), daily activities, sleeping hours, academic performance (GPA), as well as chronic illness (medical, psychiatry).

3) Reproductive data: include age at menarche, gynaecological age, regularity of menstrual cycles, characteristics of menstruation, marital status, parity and number of children, other symptoms not related to menstrual cycles (as vaginal discharges, or pelvic pains), as well as treatment measures taken by students to relieve the symptoms.

4) Assessment of Premenstrual Syndrome (PMS): A fast initial screening done for all participants by using the Premenstrual Symptoms Screening Tool (**PSST**) as a retrospective recall of symptoms (Appendix 1). For accurate diagnosis of PMS we used prospectively the Daily Record of Severity of Problems (**DRSP**) [8] [9] for three menstrual cycles (Appendix 2). The diagnostic criteria proposed by the Diagnostic and Statistical Manual of Mental Disorder, version-5 (**DSM-V**) and the American College of Obstetricians and Gynecologists (ACOG) then used to collect the affective and somatic symptoms and identify students with mild-moderate PMS, and those with severe PMS which is called PMDD (Appendix 3).

5) Assessment of Primary Dysmenorrhea (PD): By using the **WaLIDD** (Working ability, Location, Intensity, Days of pain, and Dysmenorrhea) score that designed to diagnose dysmenorrhea and predict the needs for a medical leave [20]. The final score ranges from 0-12 points, which is subdivided into mild, moderate, and severe dysmenorrhea (Appendix 4).

Screening for Associated Side-effects:

1) Assessment of Pain: By using a combined 10-scale Visual Analogue Scale (VAS), and numerical Analogue Scale—NAS (Appendix 5).

2) Assessment of Depression: The used scale in our study called The Patient Health Questionnaire (**PHQ-9**). The total score ranges from 0-27, which is subdivided into minimal, mild, moderate, moderately-severe, and severe depression (Appendix 6).

3) Assessment of Stress: By using the Perceived Stress Scale (**PSS-10**). A modification is done for the test where proper scoring is resorted for each question according to the positive and negative statements, which may confuse many researchers during the interpretation of the test. Such modification was termed "***Kamel's Perceived Stress Scale***". Total score ranges from 0 - 40, which is subdivided into low (0 - 13), moderate (14 - 26), and high stress (27 - 40) (Appendix 7).

4) Assessment of Quality of Life (QOL): By using **EQ-5D-5L** questionnaire introduced by the Euro Quality of Life Group in 2009 (Appendix 8). Mobility, self-care, activities, pain or discomfort, and anxiety or depressive symptoms are the five health status variables that are incorporated into the descriptive system. There are five levels for each dimension: none, minor, moderate, major, and extreme difficulties. In each of the five aspects, the patient has been asked to tick the box next to the statement that most accurately characterizes her health. This decision

produces a 1-digit number that represents the level selected for that dimension. The five dimensions' digits can be used to represent the patient's health state as a five-digit number. On a visual analogue scale with endpoints denoted as "*the best health you can imagine*" and "*the worst health you can imagine*," the EQ-VAS captures the respondent's self-rated health.

3.5. Ethical Considerations

The Institutional Review Board (IRB) of the Batterjee Medical College in Jeddah, Saudi Arabia, approved the study. All procedures adhered to the ethical and scientific research committee requirements, as well as the Helsinki Declaration of 1964 and its subsequent updates. All medical students who took part in our study provided informed consent. Data were obtained anonymously, and participants' confidentiality was ensured.

3.6. Data Analysis

The data were statistically analysed using Microsoft Office, Excel® 2016, and IBM's Statistical Package for Social Studies (SPSS®) version 26.0. IBM in Chicago, Illinois, USA, created SPSS. The Pearson Chi-square test, Fisher's exact test for categorical variables, and Student's t-test for continuous data variables were used to assess the effects of various socio-demographic factors and character traits. The significance cut-off was 0.05, and it was used as the *p*-value. Our results are presented using numbers, percentages, mean values, and standard deviations (SD).

4. Results

Premenstrual syndrome (PMS) and primary dysmenorrhea (PD) are two common encountered health problems among young females. In the current study, we sent invitation to all undergraduate female medical students (431 students) to share in the questionnaire (Table 1). The recruited female students from all medical grades (from the 1st to the 6th) were 300 students (in addition to 5 students participated in the pilot study and were not included in our statistics). The response in general was good (300 out of 431) with a percentage of 69.61% (Figure 1).

Table 1. Participated undergraduate female medical students.

Studying Year	Number of the BMC Students	Number of Female Students	Female Participants	Percentage (%)
1st Year	155	108	75	69.44
2nd Year	157	121	90	74.38
3rd Year	104	70	55	78.57
4th Year	69	47	30	63.83
5th Year	61	37	22	59.46
6th Year	67	48	28	58.33
Total	613	431	300	69.61

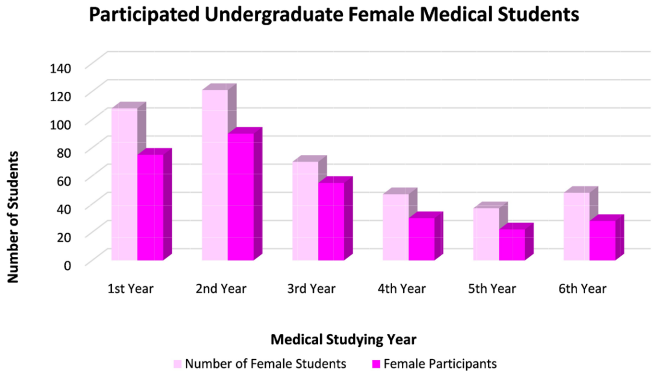

Figure 1. Participated undergraduate female medical students.

The large number of female students shared was from the 2nd medical grade (90 students out of 121, 74.38%), while the highest percentage of participation was from the 3rd medical grade (55 out of 70, 78.57%).

Table 2. Socio-demographic characteristics of the study participants.

Variables Sociodemographic Data		Participated Students (%)	PMS			PD		
			Frequency	X^2 Chi-Square	p value*	Frequency	X^2 Chi-Square	p value*
Chronological Age (Years)	< 20	165 (55.0)	130	0.320	0.956	135	11.76	0.0083*
	20 - < 22	85 (28.33)	65			60		
	22 - < 24	44 (14.67)	35			30		
	≥ 24	6 (2.0)	5			2		
Religion	Muslim	282 (94.0)	221	0.0035	0.953	215	0.842	0.359
	Non-Muslim	18 (6.0)	14			12		
Nationality	Saudi	220 (73.33)	175	0.714	0.398	170	1.156	0.282
	Non-Saudi	80 (26.67)	60			57		
Year of study	1st medical year	75 (25.0)	60	3.418	0.636	65	17.195	0.004*
	2nd medical year	90 (30.0)	70			70		
	3rd medical	55 (18.33)	43			40		
	4th medical year	30 (10.0)	22			20		
	5th medical year	22 (7.33)	20			18		
	6th year (Internship)	28 (9.33)	20			14		
Ethnicity	Arabic	270 (90.0)	210	0.491	0.483	205	0.099	0.754
	Non-Arabic	30 (10.0)	25			22		
Home Residence	City (Urban)	260 (86.67)	225	77.351	< 0.00001*	220	84.811	< 0.00001*
	Village (Rural)	40 (13.33)	10			7		
Living Status	With Parents	205 (68.33)	180	44.127	< 0.00001*	175	42.965	< 0.00001*
	With Spouse	25 (8.33)	15			12		
	With Relative	15 (5.0)	5			5		
	With Friend	35 (11.67)	25			25		
	Alone in Dormitory	20 (6.67)	10			10		
Family History	Mother	200 (66.67)	180	48.749	< 0.00001*	175	46.138	< 0.00001*
	Sisters	70 (23.33)	40			35		
	Cousins	30 (10.0)	15			17		
Annual family income (in USD)	<15,000	55 (18.33)	40	22.309	< 0.00017*	40	20.473	0.000403*
	15,000 - < 20,000	145 (48.33)	120			118		
	20,000 - < 25,000	70 (23.33)	60			55		
	25,000 - < 30,000	25 (8.33)	11			10		
	≥30,000	5 (1.67)	4			4		
Blood Group	A	100 (33.33)	80	0.687	0.876	80	5.478	0.1399
	B	50 (16.67)	40			35		
	AB	25 (8.33)	20			15		
	O	125 (41.67)	95			97		
Rh-Type	+Ve	270 (90.0)	206	6.601	0.0102*	198	7.984	0.0047*
	−Ve	30 (10.0)	29			29		

*Statistical significance ($p < 0.05$).

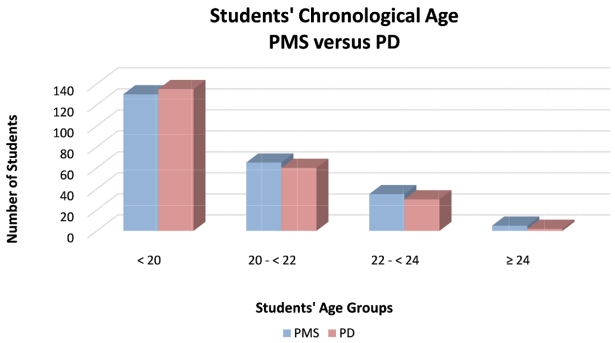

Figure 2. Students' Chronological age: PMS versus PD.

Upon collecting the sociodemographic characteristics of the participated female students (**Table 2**), we found a significant relationship between the chronological age of students and the PD (p-value 0.0083) but not with PMS (p-value 0.956) (**Figure 2**). The same is applied for the studying grade (**Figure 3**), comparing PD and PMS (p-values of 0.004 and 0.636, respectively). For the following predictors, there was a significant correlation between both PMS and PD with variables such as home residence (p-value < 0.00001), living status (p-value < 0.00001), positive family history (p-value < 0.00001), family income (p-value < 0.00017 and 0.000403, respectively), and rhesus blood type (p-value 0.0102 and 0.0047, respectively). All other sociodemographic data have no significant relationship with either PMS or PD.

For the students' lifestyle characteristics (**Table 3**), we recorded a significant relationship between the students' daily activity and PD (p-value 0.000001) but not with PMS (p-value 1.029). The opposite applied for the presence of female chronic illness (such as hypertension, diabetes mellitus, and/or psychiatric illness) and its significant correlation with PMS (p-value 0.0322) but not with PD (p-value 0.0824). For the following predictors, there was a significant correlation between both PMS and PD with variables such as dietary habits (p-value < 0.00001) (**Figure 4**), body mass index (BMI) (p-value < 0.00001) (**Figure 5**), habits of medical importance, such as smoking and alcohol drinking (p-value 0.00019 and 0.0059, respectively), drinks, such as tea, coffee, and cola (p-value < 0.00349 and 0.00139, respectively), sleeping hours (p-value < 0.00001), and academic performance (p-value < 0.000012 and < 0.00001, respectively).

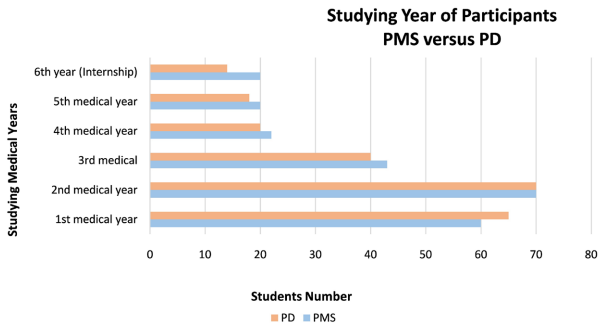

Figure 3. Students' studying medical year: PMS versus PD.

Table 3. Lifestyle characteristics of the study participants.

Variables Lifestyle Data		Participated Students (%)	PMS			PD		
			Frequency	X^2 Chi-Square	p value*	Frequency	X^2 Chi-Square	p value*
Dietary Habits	Oily & fatty foods	150 (50.0)	135	40.753	< 0 0.00001*	132	38.136	< 0.00001*
	Vegetables & Fruits	10 (3.33)	5			5		
	Meat (Beef)	40 (13.33)	30			25		
	Chocolate	50 (16.67)	40			40		
	Dairy products	50 (16.67)	25			25		
Body Mass Index	Underweight < 18.5	75 (25.0)	74	138.135	< 0 0.00001*	70	113.568	< 0.00001*
	Normal 18.5 - 24.9	155 (51.67)	141			137		
	Over weight 25 - 29.9	40 (13.33)	10			10		
	Obese 30 - 34.9	20 (6.67)	5			5		
	Extremely obese ≥ 35	10 (3.33)	5			5		
Habits of medical importance	Smoking	80 (26.67)	75	17.118	0.00019*	70	10.273	0.0059*
	Alcohol intake	10 (3.33)	9			9		
	None	210 (70.0)	151			148		
Drinks	Tea ≥ 3 cups/day	75 (25.0)	65	13.608	0.00349*	65	15.562	0.00139*
	Coffee ≥ 3 cups/day	140 (46.67)	115			110		
	Cola ≥ 3 cups/day	70 (23.33)	45			42		
	None	15 (5.0)	10			10		
Daily Activities	Exercises	50 (16.67)	25	45.733	1.029	25	35.204	0.000001*
	Social	70 (23.33)	60			60		
	Family	50 (16.67)	40			40		
	Academic	60 (20.0)	55			47		
	Extracurricular	20 (6.67)	10			10		
	None	50 (16.67)	45			45		
Sleeping hours	< 6 hours	75 (25.0)	74	31.923	< 0.00001*	74	30.295	< 0.00001*
	6 - 9 hours	125 (41.67)	81			81		
	> 9 hours	100 (33.33)	80			72		
Academic performance (GPA)	< 4.0	120 (40.0)	110	22.586	0.000012*	110	28.351	< 0.00001*
	4.0 - 4.5	120 (40.0)	80			80		
	> 4.5	60 (20.0)	45			37		
Chronic illness	Medical	20 (6.67)	11	6.874	0.0322*	11	4.993	0.0824
	Psychiatric	5 (1.67)	4			4		
	None	275 (91.67)	220			212		

*Statistical significance ($p < 0.05$).

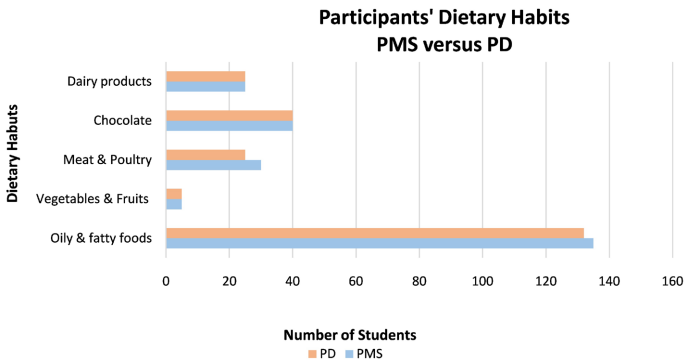

Figure 4. Students' dietary habits: PMS versus PD.

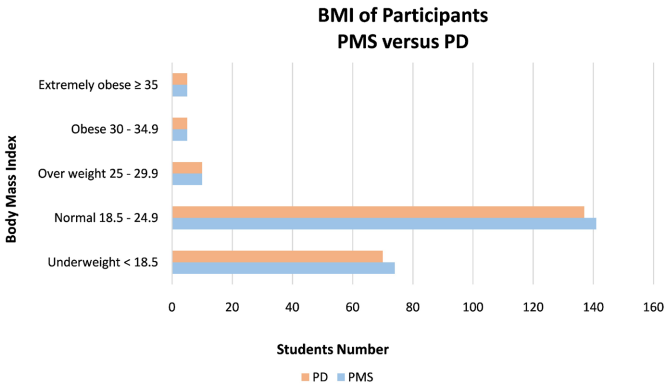

Figure 5. Students' Body mass index: PMS versus PD.

Table 4. Reproductive characteristics of the study participants.

Variables Reproductive Data		Participated Students (%)	PMS			PD		
			Frequency	X^2 Chi-Square	p value*	Frequency	X^2 Chi-Square	p value*
Age of Menarche (in years)	≤ 11	125 (41.67)	120	102.815	< 0.00001*	120	100.422	< 0.00001*
	12	75 (25.0)	70			65		
	13	75 (25.0)	30			27		
	≥ 14	25 (8.33)	15			15		
Gynaecological Age (in years)	≤ 12	240 (80.0)	210	60.229	< 0.00001*	205	62.077	< 0.00001*
	13	45 (15.0)	20			17		
	≥ 14	15 (5.0)	5			5		
Cycle Regularity	Regular	225 (75.0)	180	1.473	0.2249	172	0.296	0.587
	Irregular	75 (25.0)	55			55		
Cycle length (Frequency in days)	≤ 21 days	30 (10.0)	25	59.762	<0 .00001*	20	43.48	< 0.00001*
	22 - 34 (28)	210 (70.0)	185			180		
	≥ 35	60 (20.0)	25			27		
Cycle duration (Menstruation days)	≤ 2 days	25 (8.33)	20	60.393	< 0.00001*	15	46.789	< 0.00001*
	3 - 7 (5)	200 (66.67)	180			175		
	≥ 8	75 (25.0)	35			37		
Blood loss (in ml^3)	≤ 19 (1-2 pad/day)	25 (8.33)	20	60.393	< 0.00001*	15	46.789	< 0.00001*
	20 - 80 (3-5 pad/d)	200 (66.67)	180			175		
	≥ 81 (> 5 pad/day)	75 (25.0)	35			37		
Colour of blood	Bright red	25 (8.33)	20	0.0446	0.8327	20	0.2781	0.5979
	Dark red - Brown	275 (91.67)	215			207		
Aspect of blood	Fluid-like	225 (75.0)	165	13.257	0.000272*	157	16.951	0.000038*
	Viscid with clots	75 (25.0)	70			70		
Marital Status	Single	275 (91.67)	230	54.679	< 0.00001*	222	45.9	< 0.00001*
	Married	25 (8.33)	5			5		
Parity	Nulliparous	280 (93.33)	232	53.294	< 0.00001*	224	45.278	< 0.00001*
	Para-1	15 (5.0)	1			1		
	Para-2	3 (1.0)	1			1		
	Parity ≥ 3	2 (0.67)	1			1		
Other symptoms (not related to cycle)	Vaginal discharges	50 (16.67)	20	61.375	< 0.00001*	17	76.127	< 0.00001*
	Pelvic pains	50 (16.67)	35			30		
	None	200 (66.67)	180			180		
Medications	Not at all	90 (30.0)	30	108.27	<.00001*	22	128.93	<.00001*
	Home remedies	25 (8.33)	24			24		
	Analgesics	50 (16.67)	49			49		
	NSAIDs	75 (25.0)	74			74		
	Hormones	25 (8.33)	24			24		
	Antidepressants	35 (11.67)	34			34		

*Statistical significance ($p < 0.05$).

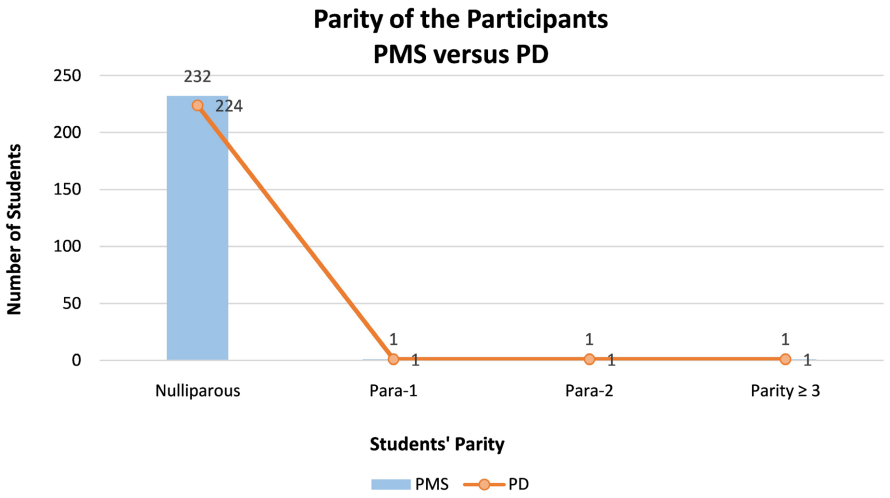

Figure 6. Students' Parity: PMS versus PD.

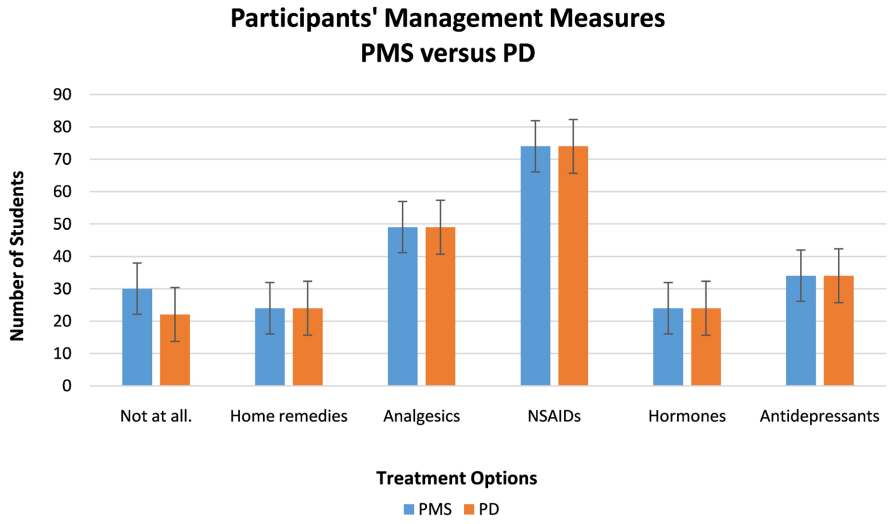

Figure 7. Students' Management Measures: PMS versus PD.

Regarding the reproductive characteristics of participated female medical students (Table 4), there was no significant relation between menstrual cycles' regularity and both PMS and PD. The same was noticed for the colour of menstrual blood. Whereas, there was a significant correlation between both PMS and PD with the following variables: age of menarche (p-value < 0.00001), gynaecological age (p-value < 0.00001), cycle length (p-value < 0.00001), cycle duration (p-value < 0.00001), amount of blood loss during menstruation (p-value < 0.00001), consistency of blood loss (p-value < 0.000272 and <0.000038, respectively), marital status (p-value < 0.00001), students' parity (p-value < 0.00001) (Figure 6), other symptoms that were not related to their menstrual cycles (p-value < 0.00001), as well as the treatment options (p-value < 0.00001) (Figure 7).

After a fast initial screening for all participants by using the Premenstrual Symptoms Screening Tool (**PSST**) as a retrospective recall of symptoms followed by an accurate diagnosis of PMS prospectively by the Daily Record of Severity of

Problems (**DRSP**) for 3 menstrual cycles, the diagnostic criteria proposed by the Diagnostic and Statistical Manual of Mental Disorder, Version 5 (**DSM-V**) were used (Table 5). It revealed that 65 students out of 300 (21.67%) included in our study have no PMS, while the remaining 235 students (78.33%) have PMS of different severity (Figure 8). Most of students were complaining of moderate PMS (75 out of 300, 25%), while the most severe symptoms (PMDD) affected 35 students out of 300 (11.67%).

Table 5. Participants' DRSP Score for diagnosis of PMS and PMDD.

Total Score	Interpretation of DRSP	Frequency	Percentage (%)	X^2 Chi-Square	p value*
1	Not at all	65	21.67		
2	Minimal Symptoms	50	16.67		
3	Mild Symptoms	50	16.67	108.33	< 0.00001*
4	Moderate Symptoms	75	25.00		
5	Severe Symptoms	25	8.33		
6	Extreme Symptoms	35	11.67		
	Total	300		100%	

*Statistical significance ($p < 0.05$).

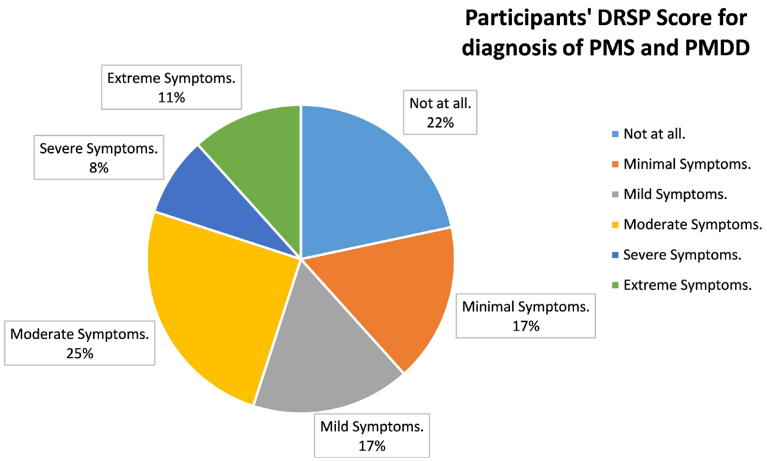

Figure 8. Students' DRSP score for diagnosis of PMS and PMDD.

By using the **WALIDD** (Working ability, Location, Intensity, Days of pain, Dysmenorrhea) score for detection of female students with PD (Table 6), we recorded that 73 students out of 300 (24.33%) included in our study have no PD, while the remaining 227 students (75.67%) have PD of different severity (Figure 9). Most students were complaining of moderate PD (98 out of 300, 32.67%), while the most severe symptoms affected 35 students out of 300 (11.67%).

Table 6. Participants' WALIDD Score for diagnosis of PD.

Total Score	Interpretation of WALIDD	Frequency	Percentage (%)	X^2 Chi-Square	p value*
0	No Dysmenorrhoea	73	24.33		
1 - 4	Mild Dysmenorrhoea	95	31.67	46.4711	< 0.00001*
5 - 7	Moderate Dysmenorrhoea	98	32.67		
7 - 12	Severe Dysmenorrhoea	35	11.67		
	Total	300		100%	

*Statistical significance ($p < 0.05$).

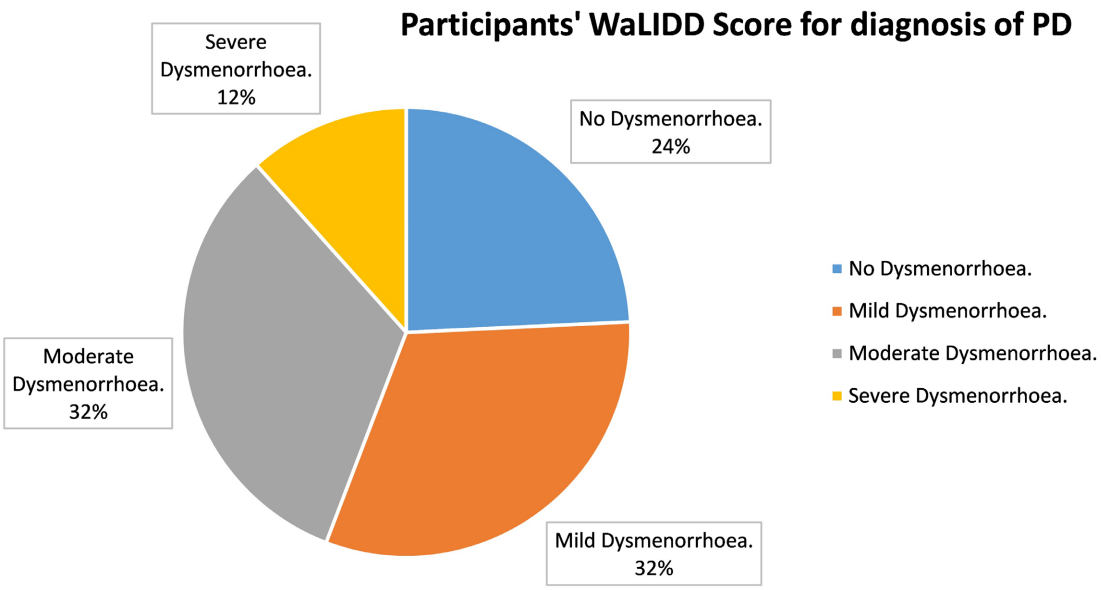

Figure 9. Students' WALIDD score for diagnosis of PD.

When we listed the common symptoms (complaints) of the participated medical students whom suffered from either PMS, PD, or both of them (**Table 7**), we noticed a significant difference between PMS and PD concerning emotional lability as mood swings, feeling suddenly sad or tearful, or increased sensitivity to rejection (p-value 0.000043). For the following somatic symptoms (**Figure 10**), we recorded significant differences between PMS and PD as decreased interest in usual activities (p-value <0.00001), difficulty in concentration (p-value < 0.00001), perception of weakness (p-value < 0.00001), changes in appetite (p-value 0.00379), and disturbed sleep pattern (p-value < 0.00001). Therefore, there were no differences of statistical significance between PMS and PD regarding personal irritability, depressed mood, anxiety, feeling out of control, or any of the physical symptoms (such as breast tenderness or swelling, arthralgia, myalgia, cramping, lower abdominal pain, low backache, pain radiating to the thighs, sense of bloating or weight gain, nausea and vomiting, as well as increased urination).

Table 7. Participants' Symptoms associated with PMS and PD.

Type	Symptoms	PMS Frequency	PD Frequency	X^2 Chi-Square	p value*
Affective Symptoms	Emotional lability: 1. Mood swings. 2. Feeling suddenly sad or tearful. 3. Increased sensitivity to rejection.	185 (61.67)	135 (45.0)	16.741	0.000043*
	Marked irritability: 1. Marked anger. 2. Increased interpersonal conflicts.	135 (45.0)	130 (43.33)	0.169	0.681
	Depressed mood: 1. Feelings of hopelessness. 2. Self-deprecating thoughts.	60 (20.0)	50 (16.67)	1.113	0.2914
	Marked apprehension: 1. Anxiety or Tension. 2. Feelings of being on-edge.	80 (26.67)	61 (20.33)	3.347	0.0673
Somatic Symptoms	Decreased interest in usual activities: 1. University activities. 2. Home activities. 3. Social activities.	135 (45.0)	227 (75.67)	58.94	< 0.00001*
	Subjective difficulty in concentration: 1. Lack of concentration. 2. Difficult class understanding. 3. Poor performance in exam.	60 (20.0)	135 (45.0)	42.735	< 0.00001*
	Perception of weakness: 1. Lethargy. 2. Easy fatigability. 3. Marked lack of energy.	135 (45.0)	227 (75.67)	58.94	< 0.00001*
	Marked change in appetite: 1. Overeating or 2. Loss of appetite. 3. Specific food cravings.	35 (11.67)	61 (20.33)	8.383	0.00379*
	Disturbed Sleep pattern: 1. Hypersomnia. 2. Insomnia.	60 (20.0)	135 (45.0)	42.735	< 0.00001*
	Feeling astonished: 1. Sense of being overwhelmed. 2. Out of control	60 (20.0)	80 (26.67)	3.727	0.0535
	Physical symptoms: 1. Breast tenderness or swelling. 2. Arthralgia and/or Myalgia. 3. Cramping lower abdominal pain. 4. Low backache. 5. Pain radiating to thighs. 6. Sense of "bloating" or weight gain. 7. Nausea and Vomiting. 8. Increased urination.	235 (78.33)	227 (75.67)	0.6023	0.4377

*Statistical significance ($p < 0.05$).

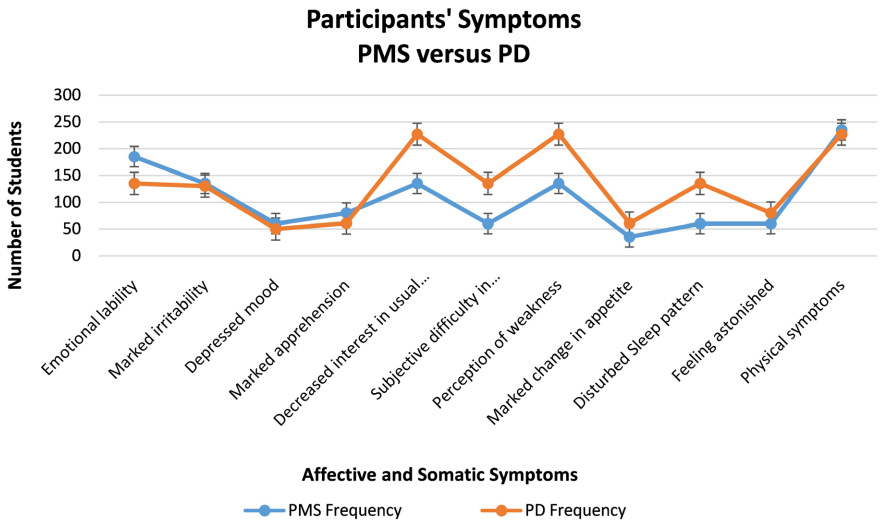

Figure 10. Students' symptoms: PMS versus PD.

Table 8. Assessment of participants' Depression by PHQ-9.

Total Score	Interpretation of PHQ-9	Frequency	Percentage (%)	X^2 Chi-Square	p value*
0	No Depression	65	21.67	108.33	<.00001*
1 - 4	Minimal Depression	50	16.67		
5 - 9	Mild Depression	50	16.67		
10 - 14	Moderate Depression	75	25.00		
15 - 19	Moderately Severe Depression	25	8.33		
20 - 27	Severe Depression	35	11.67		
	Total	300		100%	

*Statistical significance ($p < 0.05$).

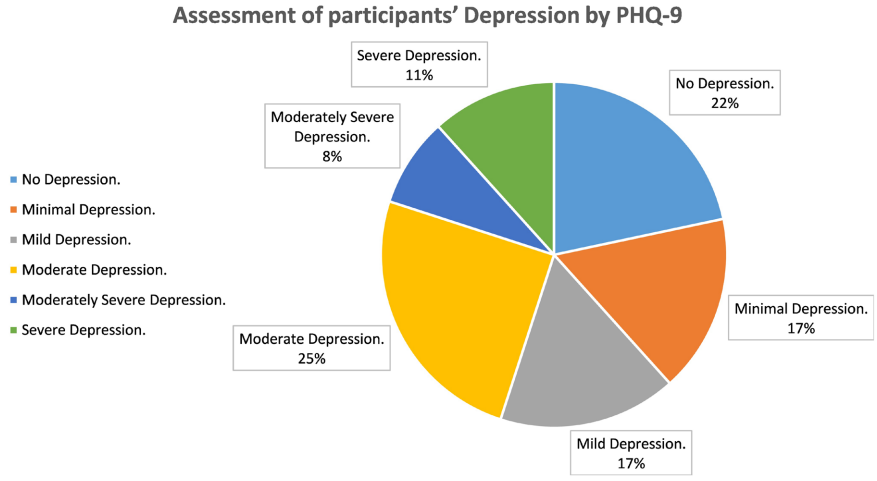

Figure 11. Students' PHQ-9 score for assessment of depression.

The scale used in our study to assess the students' depression was called Patient Health Questionnaire (**PHQ-9**). No depression was noticed in 65 students out of 300 (21.67%) (Table 8), while the remaining 235 students out of 300 (78.33%) were suffering from depression with different grades. Most of the students were complaining of moderate depression (75 out of 300, 25%), while the most severe depression affected 35 students out of 300 (11.67%) (Figure 11).

The scale used to assess the students' stress was called the Perceived Stress Scale (**PSS-10**). Its modified form was termed "***Kamel's Perceived Stress Scale***". No stress was noticed in 115 students out of 300 (38.33%), while the remaining 185 students (61.67%) suffered from stress of different levels (Table 9). Most students were complaining of low stress (125 out of 300, 41.67%), while high stress affected 35 students out of 300 (11.67%) (Figure 12).

Table 9. Assessment of participants' Stress by Kamel's PSS-10.

Total Score	Interpretation	Frequency	Percentage (%)	X^2 Chi-Square	p value*
0	No Stress	115	38.33	145.778	<.00001*
1 - 13	Low Stress	125	41.67		
14 - 26	Moderate Stress	25	8.33		
27 - 40	High Stress	35	11.67		
Total		300	100%		

*Statistical significance ($p < 0.05$).

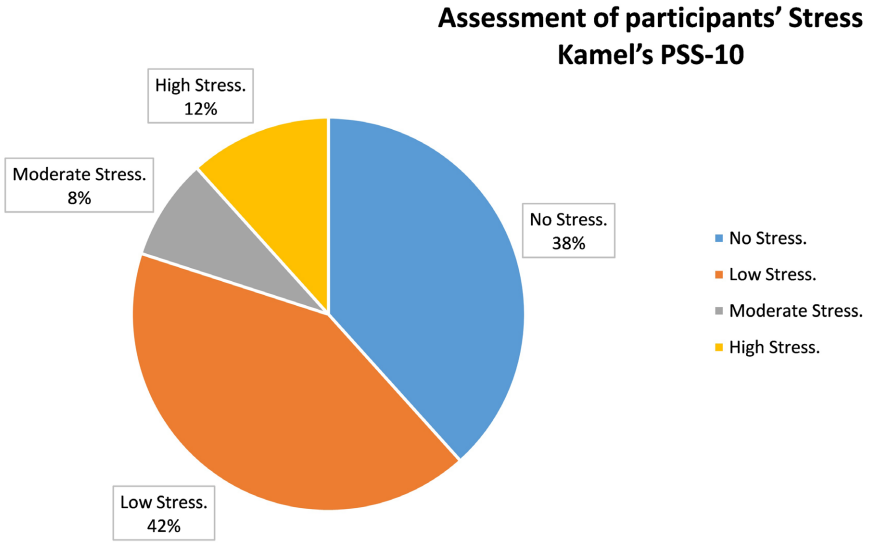

Figure 12. Students' Kamel's PSS-10 score for assessment of stress.

As the **EQ-5D-5L** section of our questionnaire was aiming to evaluate the impact of both PMS and PD on students' quality of life (QoL), we focused on the students' academic outcomes as a reflection of the negative effect of PMS and PD on students' performance (Table 10). All academic activities within the medical

college were affected by both PMS and PD at a significant level (p-value <0.00001). This included low performance in classrooms, a high percentage of absenteeism, poor extracurricular activities, delays in the submission of assignments, and low exam performance (Figure 13).

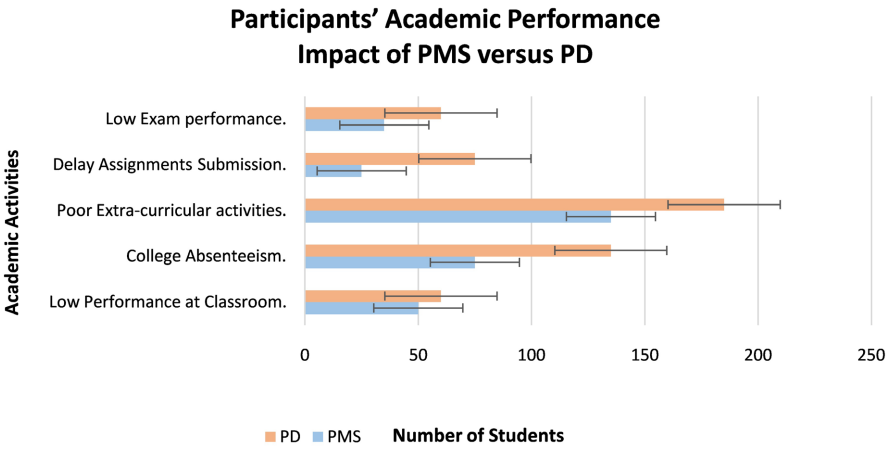

Figure 13. Students' academic performance: PMS versus PD.

Table 10. Impact of PMS and PD on participants' academic performance.

	Academic Activities	PMS			PD		
		Frequency	X^2 Chi-Square	P value*	Frequency	X^2 Chi-Square	p value*
1	Low Performance at Classroom	50 (16.67)	153.34	< 0.00001*	60 (20.0)	180.82	< 0.00001*
2	College Absenteeism	75 (25.0)			135 (45.0)		
3	Poor Extra-curricular activities	135 (45.0)			185 (61.67)		
4	Delay Assignments Submission	25 (8.33)			75 (25.0)		
5	Low Exam performance	35 (11.67)			60 (20.0)		

*Statistical significance ($p < 0.05$).

5. Discussion

Numerous studies have been conducted to determine the impact of menstrual-related symptoms on university female students because study stress and menstrual disorders are the most common complaints among this age group. The impact of PMS and PD on students' mental health and academic performance varies.

5.1. Premenstrual Syndrome (PMS)

In our study, 230 students, or 76.67% of the total, were unmarried and belonged to the age group of students with PMS who were younger than 20 years old. 70 students (23.33%) participated from the second medical grade, and 60 students (20.0%) participated from the first medical grade. 180 pupils (or 60.0%) of the class have PMS and live with their families. 15 pupils (5.0%) had a chronic ailment, such as diabetes mellitus, hypertension, or a mental health issue. The majority of

female students with PMS (141 students, or 47.0%) had a normal BMI, compared to 74 students (24.67%) who were underweight and 20 students (6.67%) who were overweight.

According to Mitsuhashi R. *et al.* [21], the prevalence of PMS was found to be significantly correlated with physical characteristics like age and BMI, menstrual characteristics like longer menstrual periods and irregular cycles, family history, and lifestyle factors like smoking, sleeping patterns, and stress. In our study, sociodemographic characteristics such as city residency, parent-child living arrangement, favourable family history, median family income, and Rh-ve blood type were strongly correlated with the occurrence of PMS. Students' age, religion, country, ethnicity, year of study, and ABO blood grouping were not shown to be significantly related. Additionally, there was a strong relationship between the occurrence of PMS and lifestyle factors such as eating too many fatty and oily foods, having a high body mass index, smoking, drinking too much tea or coffee, sleeping too much, doing poorly in school, and having a chronic condition. There was no discernible connection to daily activity. Regarding reproductive characteristics, PMS was substantially connected with students' marital status, parity, age at menarche, gynaecological age, cycle length, cycle duration, amount, and type of blood loss. No conclusive relationship was found between cycle regularity and blood loss colour.

In Rasheed P. and Al-Sowielem LS's study [4], carried out in Dammam, Saudi Arabia, the premenstrual syndrome (PMS) frequency was found to be substantially correlated with a mother's prior history of the condition, as well as with one's own impression of mental stress, physical activity, consumption of fatty foods, and coffee. Similar findings were found in the study done by Seedhom AE *et al.* [3], which found that 80.2% of the participants had experienced varying degrees of PMS symptoms. These symptoms were significantly correlated with family history of the condition, physical inactivity, habitual excessive coffee consumption, BMI, frequent fast food consumption, and smoking. All of these results concurred with our own study, with the exception of physical activity (p-value: 1.029).

Salem IM, *et al.* [22], conducted a study on 400 high-school female students with a mean age of 16.7 ± 1.16 years old in Jeddah city in 2020 to estimate PMS at younger ages in Saudi females. A 37.0% prevalence of PMS was observed. The PMS group included 55.4% more Saudis than non-Saudis (44.4% versus 55.4% Saudis). Since our study was conducted in a medical school, the average age of the participants was higher (22.5 ± 1.2), and Saudi women had a higher prevalence of PMS than non-Saudi women (175 out of 220, 79.55% versus 60 out of 80, 75.0%, respectively).

The study by Dinh Trieu Ngo V, *et al.* [23], published in 2023, identified the negative Rhesus blood type as a new risk factor for PMS. This was also supported by our study, where we found that 206 out of 270 participants (76.3%) with positive Rhesus blood type had PMS, compared to 29 out of 30 students (96.67%) with negative Rhesus blood type.

In 2018, Rafique N. and Al-Sheikh M. [24] at Immam Abdulrahman Bin Faisal University in Dammam, Saudi Arabia, found a high correlation between stress and the two most common menstrual disorders in the target population: PMS and PD. In the study by Syed A and Rao SB [2], in 2020, irritation (35% of affective symptoms) and breast soreness (41% of symptoms) were the most prevalent somatic symptoms of PMS in their study. Al-Shahrani AM, *et al.* [25], found a 64.9% prevalence of PMS in Bisha city, Saudi Arabia, in 2021. In 2022, Altamimi LA *et al.* [26], observed that the physical symptoms were recorded more frequently than the psychological symptoms at King Saud University in Riyadh, Saudi Arabia. Similar to our findings, breast pain with swelling was the most common somatic symptom of PMS (78.33%), and emotional lability was the most common affective symptom (61.67%).

In a systematic review and meta-analysis conducted by Mitsuhashi R. *et al.* [21], in 2023, the following symptoms were listed as being experienced by women with PMS in descending order of frequency: irritability, fatigue, anxiety-tension, fatigue, changes in appetite, changes in sleep, breast tenderness, headache, decreased concentration, abdominal pain, low back pain, tearfulness, inflammation of the skin, oedema, decreased interest, abdominal distension, nausea, mood elevation In contrast, our study discovered that the following PMS symptoms appeared less frequently, in descending order of severity: breast tenderness with swelling, arthralgia, myalgia, lower abdominal cramping pain radiating to the thighs, low backache, mood swings, tearfulness, irritability, decreased interest in academic and social activities, lethargy with easy fatigue, anxiety, feeling hopeless, depressed thoughts, lack of concentration, poor performance in exams, hypersomnia, and a sense of being overwhelmed.

The prevalence of PMS was reported to be 39% in a 2019 study by Suboohi S. *et al.* [27]. Of those, 79.31% had mild symptoms, 17.24% had moderate symptoms, and 3.44% had severe PMS. In Pakistan, Yunus S. *et al.* [28], discovered in 2020 that 19.2% of undergraduate medical students had PMS. Undergraduate medical students ranged in age from 18 to 25 years old. BMI was 19.9 kg/m2 on average. Ten (6.2%) students were married. Among 31 females (19.2%), PMS was discovered to be mild in 4.3% of cases, moderate in 8.1%, and severe in 6.8%. In Iraq in 2023, Hussein EA, *et al.* [29], evaluated PMS symptoms and cycle regularity in 1270 female university students during the COVID-19 epidemic (viewing it as a stressful factor). 76.6 percent of subjects reported having PMS. 36.9% of individuals reported having moderate PMS symptoms. In addition, respondents reported worsening PMS (26.3%) and worsening menstrual discomfort (18.3%), respectively. Comparable to our data, the prevalence of PMS was 78.33%, and according to the DRSP grading method, 16.67% of these individuals displayed minimum symptoms, 16.67% mild symptoms, 25.0% moderate symptoms, 8.33% severe symptoms, and 11.67% extreme symptoms. The frequency of the severe type of PMS (PMDD) was 11.67% in our study.

According to Yanjmaa E. *et al.* [30], moderate to severe PMS and PMDD were

prevalent among Mongolian college students in 2022 at a rate of 23.8% and 4.7%, respectively. The signs that appeared most frequently were lethargy or lack of energy, rage or irritation, crying, difficulty concentrating, and anxiety or tension. Therefore, with identical presentation symptoms, the prevalence of moderate to severe PMS was 33.33% in our sample, while that of PMDD was 11.67%.

According to a study conducted in Nigeria in 2023 by Monday N. *et al.* [5], the prevalence of PMS among university students was high, at 59.4%. Individual symptom evaluations showed that cognitive difficulties, bed rests (90.3%), wanting to stay at home (86.0%), and irritation (85.9%) were the most frequently reported symptoms. While Govind LKV and Chellamma VK. [31], discovered in 2023 that PMS and PMDD were common in a considerable number of medical colleges (89 out of 318, 27.99%), and that they had a significant detrimental impact on behaviour, emotional health, and academic performance, A total of 44 students (13.84%) who reported feeling angry, upset, anxious, or depressed met the criteria for PMDD. Contrary to our findings, the prevalence of PMS was higher (235 students out of 300, 78.33%) while the prevalence of PMDD was lower (35 students out of 300, 11.67%) among female medical students at BMC.

The largest incidence was PMS (28%) and PD (25%). 38% of participants reported missing household activities as a result of them, and 31% said they had to take a sick day because of menstrual problems. In 2022, Mohamed AA *et al.* [32], who did a cross-sectional survey at the University of Hail in Saudi Arabia, found that the majority (95.3%) of the female students were single and that 55.8% of them were enrolled in medical schools. The majority of individuals (78.33%) claimed that PMS interfered with their regular routine. However, in our study, Batterjee Medical College (BMC) had a higher than average prevalence of PMS (78.33%) with a significant impact on students' academic performance (p-value < 0.00001).

In regards to the severe type of PMS, a 2016 study in Makkah by Goweda R. *et al.* [6], found that 36.6% of students had PMDD. A study conducted by Minichil W. *et al.* [33], at the University of Gondar in Ethiopia in 2019 found that the prevalence of PMDD was 34.7%. In 2022, Alshammari E. and Aldossary K. [7], attempted to gauge the prevalence of PMS in Riyadh, Saudi Arabia. 10.7% were noted to have PMDD. In contrast to our findings, 11.67% (35 out of 300) of female medical students at BMC reported having PMDD.

Tolossa FW and Bekele ML. [34], in 2014, found that 144 medical students (83.2%) in Ethiopia had at least one PMS symptom along with their menstrual cycle at Mekelle University College of Health Sciences. Regarding 28.3% of respondents, 9.8% said they frequently missed classes, 8.1% said they had inadequate grades, and 1.7% said they had stopped trying to study. Only 48.0% of individuals got help for their PMS from a doctor. Painkillers (36.4%), hot beverages including coffee and tea (7.5%), massage therapy, and exercise (4.0%) were the treatment techniques used. In Jordan, Alshdaifat E. *et al.* [35], discovered that in 2022, the majority of students were in their fifth and sixth years of college, 75.4%

of whom reported experiencing dysmenorrhea, 45.8% of whom used pharmacological painkillers, and 54.2% of whom used non-pharmacological painkillers. Akpoigho EC and Ukamaka NC. (10), conducting an observational study at the University of Benin in Nigeria, found that the majority (88.3%) of people engaged in unhealthy health-seeking behaviours and that the most popular coping mechanisms were resting (66.9%), sleeping (64.7%), and embracing the process as natural. Compared to our findings, we found that 8.33% of assignments were submitted late and that 16.67% of students performed poorly on exams. We also found that 25.0% of college students were absent from class, 45.0% had poor extracurricular activities, and 8.67% had poor classroom performance. Thirty students (ten percent) did not receive any treatment for PMS, while 24 students (eight percent) used hot water bottles and herbal teas, 49 students (16.33 percent) used analgesics, 74 students (24.6 percent) used NSAIDs, 24 students (eight percent) used combined oral contraceptives, and 34 students (eleven percent) used antidepressants.

In the study by Mohamed MA *et al.* [36], conducted in 2021, the prevalence of PMS among the Jouf University College of Pharmacy was close to 35%. The academic performance of students seemed to be negatively impacted by the severity of premenstrual psychological and physical symptoms. For the most part, analgesics and/or hot beverages were used to treat severe PMS symptoms. Therefore, Maity S. *et al.* [1], observed a significant frequency of PMS and dysmenorrhea among female medical students in a comprehensive review and meta-analysis they conducted in 2022. However, in the same demographic, the prevalence of PMDD is quite low. Menstrual symptoms affect the academic and social quality of life for the majority of female students in the reproductive age group. The menstrual abnormalities may be influenced by lifestyle, sociodemographic, genetic, and psychological variables. In our general medicine programme, the frequency was 78.33%, and NSAIDs were the most often prescribed drug (74 out of 300 students, or 24.67%).

5.2. Primary Dysmenorrhoea (PD)

Recent studies have demonstrated that, both locally and worldwide, PD is common. While national studies in Saudi Arabia have revealed an incidence of 60.9–89.7% among students [24] [37]-[41], international research has shown a prevalence ranging from 56 to 80% [37] [38]. The quality of life and mental health of women can be impacted by PD, according to earlier studies [42]. For instance, research at King Saud University found that 80.1% of the students there had dysmenorrhea, and it also revealed the detrimental effects it had on their academic performance, such as lower involvement and attendance [40]. A study conducted in India likewise revealed a high frequency of PD (71.96%) and showed a substantial relationship between dysmenorrhea and psychiatric symptoms, including depression [43]. There isn't much research in the literature that examines the prevalence of PD and its connection to depression [37] [43] [44]. However, the major-

ity of these were either conducted abroad or lacked a dysmenorrhea tool that had been approved [41].

In the study of Fathi M. *et al.* [45], PD prevalence was 83.6% in 2022. In the current study, 227 out of 300 students (75.67%) had PD of varying severity, which was assessed using the WaLIDD grading system with sensitivity (63.7%) and specificity (72.2%).

According to a study done on teenagers in Assiut City, Egypt, there are substantial correlations between dysmenorrhea and earlier menarche, longer cycles, excessive bleeding, and irregular cycles [46]. Another study from Jordan focused on the connection between family history and dysmenorrhea [47]. Hormonal contraception, higher parity, and giving birth to the first child at a younger age all contributed to risk reduction. According to Bakhsh H. *et al.*'s study [19], there was no correlation between the incidence of PD and age group or marital status among Saudi women of reproductive age in 2022; however, there was an increasing prevalence of non-pathological dysmenorrhea (92.3%). In our research, we discovered significant correlations between menarchal age (p-value < 0.00001), cycle length (p-value < 0.00001), cycle duration (p-value < 0.00001), amount of blood loss (p-value < 0.00001), marital status (p-value < 0.00001), and parity (p-value < 0.00001) and dysmenorrhoea. PD and cycle regularity did not significantly correlate with one another (p-value 0.587).

Since a link between a high stress score and dysmenorrhea cannot be established, additional research is necessary to see whether there are other factors that affect menstrual function. Sima R-M. *et al.* [16], gathered information from 1720 students (at five university sites in Romania) in 2022 and calculated the prevalence of PD to be 78.4%. Most female students reported feeling more anxious or apprehensive (72.7%), more exhausted (66.9%), as though they had less energy for everyday activities (75.9%), and severely stressed (57.9%) during their menstrual cycle. Similar results were seen in our study, where 227 out of 300 students (75.67%) had PD. Female medical students who had PMS or PD reported stress, but there was no statistically significant difference (p = 0.0673). Tension with anxiety was at 20.33%, easy fatigability was at 75.67%, and irritability was at 43.33%.

The majority of the female medical students in research by Kannan LS *et al.* [12], at Imam Abdulrahman Bin Faisal University in Saudi Arabia in 2020 were single (73.97%) and living with their families (90.4%), according to an analysis of demographic characteristics. These results agreed with those of Ibrahim NK *et al.* (39), who conducted their study in 2015. After PD symptoms and indicators were evaluated, abdominal pain was shown to be the most common result in 73.28% of the female medical sciences students. With a p-value of ≤ 0.05, it was determined to be very statistically significant. This conclusion is consistent with those of Yesuf TA *et al.* [48], who reported that 67.4% of university students reported having abdominal pain as a result of PD in 2018. Additionally, 64% of female students studying medical sciences cited dysmenorrhea as a notable side effect. This conclusion is corroborated by a study conducted in Saudi Arabia, which found that

dysmenorrhea caused sleep disturbances in 54% of female medical students [39] The same survey also revealed that 67.5% of the individuals reported having emotional instability.

Only unmarried, healthy, nulliparous Nepalese female medical students in the age range of 16 to 24 years were included in the study by Katwal PC *et al.* [18], conducted in the School of Medical Sciences at Kathmandu University in 2016. Sixty-seven percent of the subjects had dysmenorrhea. Nine out of ten women reported that the intensity and duration of their dysmenorrhea increased after enrolling in medical school, and 65% of participants thought that medical school was stressful.

In our study, there were 175 students (58.33%) who were living with their parents and 222 students (74.0%) who were unmarried students with PD. Similarly, 227 students (75.67%) reported abdominal pain that was primarily accompanied by a little backache, with a *p*-value of <0.00001. Otherwise, 146 pupils (48.67%) reported having a sleep issue. According to a study by Mitsuhashi R. *et al.* [21] published in 2023, identifying risk variables might be used to develop a suitable strategy for enhancing menstruation symptoms and promoting women's health.

According to a study conducted in 2015 at King Abdul-Aziz University in Jeddah, Saudi Arabia, by Ibrahim NK *et al.* [39], the prevalence of PD was 60.9% and the prevalence of severe dysmenorrhea among those affected was 38.6%. The most prevalent symptom of PD (80.8%) was a depressed mood. As a result, 67.5% of the patients experienced emotional instability, and 28.3% reported being absent from school. The frequency of PD, however, was 75.67% in our sample, whereas the prevalence of its severe form was 11.67%. Reduced interest in routine tasks and a sense of weakness were the most prevalent manifestations (75.67%). College absence rates and reported emotional lability both came in at 45.0%.

According to a cross-sectional study done in 2012 by Amaza DS *et al.* [49], among medical sciences students in Nigeria, dysmenorrhea is quite common among medical students and is associated with obesity, socioeconomic status, physical activity, and eating habits. In 2016, Mohapatra D. *et al.* [50], demonstrated that those with a lower BMI felt more pain. The BMI of the subjects in the survey by Ju H. *et al.* [51], was comparable. In contrast to earlier studies, the study by Hashim RT *et al.* [40], conducted at King Saud University in 2020, found no connection between BMI, diet, and PD. All of those conclusions agreed with ours, with the exception of the link to obesity, as the majority of our students with PD (137 students, 45.67%) had normal BMIs, which was also true of previous studies [52].

The majority (64.7%) of female students at Haramaya University in eastern Ethiopia reported having dysmenorrhea. Early menarche, tea use (4 glasses per day), consumption of fat- and oil-containing foods, and consumption of meat-based foods were all strongly linked to dysmenorrhea [53], according to research. These results concurred with what we found. This may be explained by the fact that drinking tea and eating a lot of fattening foods are linked to high levels of oestrogen production. As oestrogen levels rise, the endometrium is stimulated and multiplies more, resulting in menstrual pain.

The first predictor of dysmenorrhea in the study conducted by Ibrahim NK *et al.* (39), in 2015 was a heavy period. Likewise, a study from Athens, Greece, discovered a strong connection between painful and heavy periods [54]. Other investigations examining cycle irregularities showed findings that were comparable [52] [55]. The majority of students (175, 58.33%) in our study had average blood loss (20–80 ml3/cycle); hence, there was no association between blood loss and PD.

A statistical correlation between family history of dysmenorrhea and the occurrence of PD in students was discovered (p-value < 0.00001), which is consistent with findings from Iran [55] and Dammam [56]. According to our findings, dysmenorrhea was more common among non-smokers than smokers ($p = 0.0059$). This result is different from those from Turkey [57], and it could be because fewer students smoke in the current study than in Turkey.

In contrast to Dammam's [56] findings, the current study demonstrated a significant relationship between the age of menarche and dysmenorrhea (p-value < 0.00001). Our results, however, were consistent with those from Egypt [58]. Premenstrual symptoms were 75.67% common in the current study, which is consistent with research from Jordan [59] and Spain [60]. Tabassum S. *et al.* [61] from Pakistan, on the other hand, reported a lower rate (53%).

In terms of the effects of dysmenorrhea, Hillen TIJ *et al.* [62], discovered that 53% of young Western Australian girls who experienced it were limited in their activities, which is consistent with the findings of our study (44.33%). Additionally, Bergsj *et al.*'s [63] findings from an earlier study are supported by the findings of our investigation, which revealed a rate of absence owing to dysmenorrhea of 45.0%. However, given the disparities between the two target populations, this incidence is significantly lower than the rate among adolescent girls in the USA [64]. In the present study, only 11.67% of students sought medical treatment for dysmenorrhea, which is significantly less than the rate of 18% reported from Australia [62]. This could be due to the students' lack of confidence in visiting a gynaecologist or the fact that they think painful periods are normal and don't require medical attention [65] [66].

The study by Alateeq D. *et al.* [14], conducted in 2022 at Princess Norah bint Abdulrahman University in Saudi Arabia, supported our findings by reporting that younger female age and earlier menarche were significant predictors of severe dysmenorrhea. The WaLIDD scale was used and the levels of dysmenorrhea were severe, moderate, and mild (45.6%, 39.8%, and 14.6% respectively) [14]. Studies conducted domestically and abroad report varying degrees of dysmenorrhea [39] [40] [67]. The prevalence of severe dysmenorrhea among students in our study (11.67%) was lower than the prevalence of the condition among students at King Abdul-Aziz University and Al-Jouf University (34% and 29%, respectively) in local studies [39] [41]. Additionally, it was lower than the published results among teenagers in Jordan and Iraq (32.9% and 19.85%, respectively) [67] [68] In contrast, research from Greece found that a higher number of nursing students

(52.5%) had severe dysmenorrhea [69].

Varying percentages between ethnicity and pain perception may be influenced by the different scales used to gauge the severity of dysmenorrhea and the different target women [40] [70]. Similar to this, a study done in Georgia found a strong link between PD and depression. Additionally, it was discovered that women with mental illnesses typically have lower pain thresholds [71].

Joshi T. *et al.* [72], reported that dysmenorrhea has a detrimental effect on quality of life (QoL), which is consistent with our study. Physical activity considerably decreased pain related to dysmenorrhea, according to a clinical trial by Kannan P. *et al.* [73], even if it had no impact on the occurrence of discomfort. Exercise and physical activity were found to lessen the severity of menstrual pain and other symptoms, according to a meta-analysis study [74]. According to Ortiz MI *et al.* [75], 50 minutes of exercise three times a week may help to lessen menstrual pain. Home exercise was found to significantly improve the quality of life (QoL) for patients with dysmenorrhea in terms of their health and pain, according to another study [76].

According to a study conducted in 2014 by Rakhshaee Z *et al.* [77], severe dysmenorrhea reduced people's daily and social activities as well as increased absences from school. In the current study, 45.0% of college absences were attributable to PD.

In a 2018 study by Alsaleem MA. [78], conducted in Abha, Saudi Arabia, respondents reported experiencing severe pain 35.2% of the time. Two-thirds of the respondents said they took prescription painkillers, while the use of herbal remedies was also extremely common (69.1%). In the study, 64.7% of participants admitted to taking NSAIDs for pain management. In a study from Iran that was published, similar outcomes were attained [77]. In contrast, an Indian study from 2016 found that the majority of girls relied on herbal remedies and other non-pharmacological pain relief techniques, with only a small percentage of females (25.5%) seeking pharmacological care [79]. In the majority of published research, female students frequently sought out herbal medicines [80]-[82]. 218 females (63.7%) out of 342 participants, according to Gupta S. *et al.* [83], had a history of dysmenorrhea in 2018. Mefenamic acid was the most often prescribed drug (90.5%). Only 30.2% of females took medications on a doctor's instruction, whereas the majority of females (69.8%) self-medicated.

According to Syed A and Rao SB's article [2] published in India 2020, NSAIDs used to treat dysmenorrhea can raise the risk of heart attack, stroke, gastrointestinal bleeding, kidney, liver, and heart failure, anaemia, asthma attacks, and allergic responses. The frequency of PD was 91.5%, according to a study by Durand H. *et al.* [84], which was published in 2021. The most widely used non-pharmacological management techniques were warm water bottle, rest, hot shower, and exercise. The percentage of our PD students who did not take any medication was 22 students (9.69%), while the percentage who used home remedies, analgesics, preferred NSAIDs, hormonal treatment, and antidepressants was 24 students (10.57%), 49 students (21.59%), 74 students (32.6%), and 34 (14.98%).

6. Strengths of the Study

1) To avoid recall bias, which is a problem with all questionnaire-based studies, and in accordance with the recommendations of the Royal College of Obstetricians and Gynaecologists (RCOG) and the American College of Obstetricians and Gynaecologists (ACOG), the symptoms of PMS and dysmenorrhea were collected prospectively for three menstrual cycles rather than retrospectively.

2) The study places particular emphasis on the detrimental consequences of PMS and PD among female medical students since they are more likely to experience depression, stress, and other related symptoms. Due to the extensive course content, it further increases the already high levels of tension among medical students.

3) The results of this study highlight the significance of encouraging female students to seek early medical attention to identify and stop additional emotional issues and to manage unpleasant cycles.

4) This study might be the first study that investigates both PMS and PD together with exploring their negative impacts on female medical students as depression, stress and quality of life including their academic performance.

5) The introduction of Kamel's perceived stress scale (**Kamel's PSS-10**) for easy recording and interpretation by researchers.

7. Limitations of the Study

1) Though participants in this study represented a high percentage of undergraduate female medical students at one of private medical colleges in Saudi Arabia (300 out of total 431 female students with a percentage of 69.61%), they may not be representative of their classmates or medical students elsewhere at any other medical schools.

2) Another challenging aspect of our study is that most of the questions used in the surveys were closed in nature, thus not allowing female participants to customize their own personal answers.

8. Evidence-Based Recommendations (A Call for Action)

1) Raise the knowledge of risk factors, possible underlying causes, and available management choices via open social media and television is crucial to avoid a negative impact on women's mental health and life quality.

2) Recognize and address the menstrual experiences of university students may inspire necessary curriculum adjustments that will better prepare students to manage their menstrual and academic demands.

3) Conduct educational programs in medical schools to improve the knowledge of female students about how to cope with emotional issues by learning adaptive coping mechanisms (such as stress management courses) and making efficient medications available in the college's clinic to improve their quality of life and academic performance.

4) Introduction and implementation of WaLIDD Score in the educational institutes as a screening method for dysmenorrhea and as indicative tool for ap-

proval of students' medical leave.

5) Further studies are necessary to examine all female students regardless of the programs they are enrolled in at various colleges and universities in Saudi Arabia.

9. Conclusion

Regardless of age, race, or location, menstrual women's quality of life is nevertheless impacted by PMS and PD each month, despite substantial studies on their causes and treatments. In Saudi Arabia, the frequency is particularly high among female medical students. In our survey, the prevalence of PMS was 78.33% compared to 75.67% for PD. The effects were primarily emotional rather than physical. This result may have a detrimental effect on how well female medical students learn. Additionally, the appropriate steps must be taken to mitigate these impacts. Recognising the issue and getting the required assistance are the two most important steps.

Authors' Contributions

Remah M. Kamel: The main author who generated the idea and design of this study, and carried out literature research, statistical analysis, interpretation of data, writing of the manuscript, critical review, and submission for publication.

Lama A. Mandourah, Ghazal A. Gari, Ibtihal S. Moujahed, Ayah N. Al-Jehani, and Mohammad A. Abuhashish: All contributed by sharing the link to the survey questionnaire across different social media platforms and collecting the participants' responses and feedback.

Institutional Review Board Statement

The study protocol was approved by the Ethical Committee of the Batterjee Medical College (BMC) Research Unit (Registration number for ethical permission: RES/73/2023). All data were collected and analysed in accordance with the Declaration of Helsinki. Participation was voluntary and unpaid, and informed, signed consent was provided by all participants.

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Conflicts of Interest

The authors have no conflicts of interest.

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Appendix 1

Premenstrual Symptoms Screening Tool (PSST)

1) Please mark (**X**) in the appropriate box.

2) Do you experience some of any of the following pre-menstrual symptoms (which start before your period) and stop within a few days of bleeding?

SN	Symptoms	Not at all	Mild	Moderate	Severe
1	Anger, irritability.				
2	Anxiety, tension.				
3	Tearful, increased sensitivity to rejection.				
4	Depressed mood, hopelessness.				
5	Decreased interest in work activities.				
6	Decreased interest in home activities.				
7	Decreased interest in social activities.				
8	Difficulty concentrating.				
9	Fatigue, lack of energy.				
10	Overeating, food craving.				
11	Insomnia.				
12	Hypersomnia (need more sleep).				
13	Feeling overwhelmed or out of control.				
14	Physical symptoms (breast tenderness, headache, joint or muscle pain, bloating, and weight gain).				

Have your symptoms, as listed above, interfered with:

SN	Impact of Symptoms	Not at all	Mild	Moderate	Severe
A	Your school, work efficiency or productivity.				
B	Your relationships with friends, classmates, or co-workers.				
C	Your relationships with family.				
D	Your social life activities.				
E	Your home responsibilities.				

Scoring:

The following criteria must be present for a diagnosis of Moderate to Severe PMS:

1) One of symptoms: 1, 2, 3, or 4 is moderate to severe.

2) Four symptoms from 1 to 14 are moderate to severe.

3) One of its negative impact: A, B, C, D, or E is moderate to severe.

The following criteria must be present for diagnosis of PMDD:

1) One of symptoms: 1, 2, 3, or 4 is severe.

2) Four symptoms from 1 to 14 are moderate to severe.

3) One of its negative impact: A, B, C, D, or E is severe.

Appendix 2

Daily Record of Severity of Problems (DRSP)

INSTRUCTIONS

Print off as many copies as you need to complete a **full two months** worth of tracking. Begin tracking your premenstrual symptoms with this chart today. Fill it out **daily** (preferably at the end of your day). Two full months of menstrual cycle charting will allow for a more accurate assessment.

Each evening note the degree to which you experienced each of the problems listed below. Put an "x" in the box which corresponds to the severity:
1 - not at all **2 - minimal** 3 - mild **4 - moderate** 5 - severe **6 - extreme**

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	Enter day of the week (e.g. Monday = 'M')																															
	Note any spotting by entering 'S'																															
	Note menstrual bleeding by entering 'M'																															
	Date (i.e. 1 = 1st of the month)																															
SYMPTOMS	1. Felt depressed, sad, "down,", or "blue" or felt hopeless; or felt worthless or guilty	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	2. Felt anxious, tense, "keyed up" or "on edge"	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	3. Had mood swings (i.e., suddenly feeling sad or tearful) or was sensitive to rejection or feelings were easily hurt	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	4. Felt angry, or irritable	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	5. Had less interest in usual activities (work, school, friends, hobbies)	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	6. Had difficulty concentrating	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	7. Felt lethargic, tired, or fatigued; or had lack of energy	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	8. Had increased appetite or overate; or had cravings for specific foods	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	9. Slept more, took naps, found it hard to get up when intended; or had trouble getting to sleep or staying asleep	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	10. Felt overwhelmed or unable to cope; or felt out of control	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	11. Had breast tenderness, breast swelling, bloated sensation, weight gain, headache, joint or muscle pain, or other physical symptoms	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
IMPACT	At work, school, home, or in daily routine, at least one of the problems noted above caused reduction of production of efficiency	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	At least one of the problems noted above caused avoidance of or less participation in hobbies or social activities	6																														
		5																														
		4																														
		3																														
		2																														
		1																														
	At least one of the problems noted above interfered with relationships with others	6																														
		5																														
		4																														
		3																														
		2																														
		1																														

Adapted from Jean Endicott and Wilma Harrison version.

Appendix 3

DSM-V: Diagnostic Criteria for PMS and PMDD

1) Please mark (**X**) in the appropriate box.

2) Do you experience some of any of the following pre-menstrual symptoms (which start before your period) and stop within a few days of bleeding?

Type	SN	Symptoms	Check (X)
Affective	1	Marked affective lability (e.g., mood swings, feeling suddenly sad or tearful, or increased sensitivity to rejection).	
	2	Marked irritability or anger or increased interpersonal conflicts.	
	3	Markedly depressed mood, feelings of hopelessness, or self-deprecating thoughts.	
	4	Marked anxiety, tension, and/or feelings of being keyed up or on edge.	
Somatic	1	Decreased interest in usual activities.	
	2	Subjective difficulty in concentration.	
	3	Lethargy, easy fatigability, or marked lack of energy.	
	4	Marked change in appetite; overeating or specific food cravings.	
	5	Hypersomnia or insomnia.	
	6	A sense of being overwhelmed or out of control	
	7	Physical symptoms such as breast tenderness or swelling; joint or muscle pain, a sensation of "bloating" or weight gain.	

For diagnosis of PMDD:

1) At least **5 symptoms** (one or more from each section) must be present in the final week before the onset of menses, start to improve within a few days after the onset of menses, and become minimal or absent in the week after.

2) The symptoms are associated with clinically significant distress or interference with work, school, usual social activities, or relationships with others.

3) Exclude other psychiatric problems such as major depressive disorder, panic disorder, or personality disorders, and be sure that somatic symptoms are not related to medical illness such as hyperthyroidism or drug abuse.

Appendix 4

Screening for Primary Dysmenorrhoea (WaLIDD Score)

SN	WaLIDD	0	1	2	3
1	Working ability	None	Almost never	Almost always	Always
2	Location	None	1 site	2 - 3 sites	≥ 4 sites
3	Intensity	Doesn't hurt	Hurts a little bit	Hurts a little more- even more	Hurts a whole lot-hurts worst
4	Days of pain	0 day	1 - 2 days	3 - 4 days	≥ 5 days

Score Interpretation:

0	No Dysmenorrhoea.
1 - 4	Mild Dysmenorrhoea.
5 - 7	Moderate Dysmenorrhoea.
7 - 12	Sever Dysmenorrhoea.

Appendix 5

Combined Visual & Numerical Rating Scales for Functional Pain

Grades	VRS	NRS	Descriptive words	Treatment options
Mild		0 No Pain	No perception of any pain.	Acceptable level of pain. Non-pharmacological measures may be used.
		1 Minimal	Hardly noticeable without impact on daily activities.	
		2 Mild	Noticed pain that does not interfere with activities.	
		3 Uncomfortable	Pain is mild and sometimes distract me.	
Moderate		4 Moderate	Pain is moderate distract me, I can do my usual activities.	Analgesics and NSAIDs ± Oral opioids.
		5 Distracting	Interrupts some activities.	
		6 Distressing	Pain is hard to ignore, avoid usual activities.	
Severe		7 Unmanageable	Focus of attention, prevents me doing daily activities.	IV Opioids may be needed for fast relief.
		8 Intense Pain	Awful, hard to do anything without assistance.	
		9 Severe Pain	I can't bear the pain, unable to do anything.	
		10 Immobilizing	As bad as it could be, nothing else matters.	

VRS: Visual Rating Score.

NRS: Numerical Rating Scale.

Appendix 6

Patient Health Questionnaire (PHQ-9) for Assessment of Depression

SN	Item (Question)	Not at all	Several Days	More than half the days	Nearly Everyday
1	Little interest or pleasure in doing things.	0	1	2	3
2	Feeling down, depressed, or hopeless.	0	1	2	3
3	Trouble falling or staying asleep, or sleeping too much.	0	1	2	3
4	Feeling tired or having a little energy.	0	1	2	3
5	Poor appetite, or Overeating.	0	1	2	3
6	Feeling bad about yourself, or that you are a failure, or have let yourself or your family down.	0	1	2	3
7	Trouble concentrating on things, such as reading the newspaper or watching television.	0	1	2	3
8	Moving or speaking so slowly that other people could have noticed. Or the opposite, being so fidgety or restless that you have been moving around a lot more than usual.	0	1	2	3
9	Thoughts that you would be better off dead, or of hurting yourself.	0	1	2	3
	Total Score			0 - 27	

1) The patient has to fill up the above questionnaire during any of her 3 menstrual cycles (not retrospectively) by encircling the corresponding number to her answer.

2) If there are at least 4 circles in the shaded section by yellow (including questions 1 and 2), consider a **depressive disorder**. If there are 5 circles or more in the shaded section (including question 1 or 2), consider **major depressive disorder**. The final diagnosis should be verified by clinical assessment.

Score Interpretation

0	No Depression.	No treatment is needed.
1 - 4	Minimal Depression.	
5 - 9	Mild Depression.	Watchful waiting and follow-up.
10 - 14	Moderate Depression.	Consider counselling, follow-up ± Antidepressants.
15 - 19	Moderately Severe Depression.	Use Antidepressants and/or Psychotherapy.
20 - 27	Severe Depression.	Immediate Antidepressants + Psychotherapy.

Assessment of its impact on Quality of Life:

Item (Question)	Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
How difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?				

Appendix 7

Kamel's Perceived Stress Scale (PSS-10) for Assessment of Stress

The patient has to fill up this part of questionnaire during any of her 3 menstrual cycles (not retrospectively) by encircling the corresponding number to her answer.

How often have you…

Domain	SN	Item (Question)	Never	Almost Never	Sometimes	Fairly Often	Very Often
Lack of Control (Helplessness)	1	Been upset because of something that happened Unexpectedly?	0	1	2	3	4
	2	Felt that you were unable to control the important things in your life?	0	1	2	3	4
	3	Felt nervous and "stressed"?	0	1	2	3	4
	4	Found that you could not cope with all the things that you had to do?	0	1	2	3	4
	5	Been angered because of things that were outside of your control?	0	1	2	3	4
	6	Felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4
Lack of Self-efficacy	7	Felt confident about your ability to handle your personal problems?	4	3	2	1	0
	8	Felt that things were going your way?	4	3	2	1	0
	9	Been able to control irritations in your life?	4	3	2	1	0
	10	Felt that you were on top of things?	4	3	2	1	0
		Total PSS-10 Score			0 - 40		

Score Interpretation

0	No Stress.
1 - 13	Low Stress.
14 - 26	Moderate Stress.
27 - 40	High Stress.

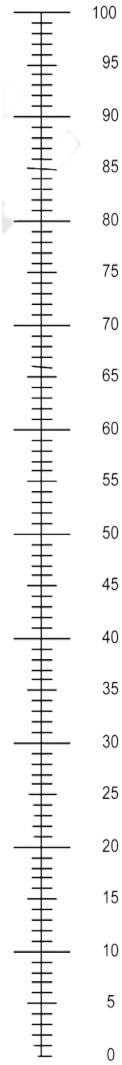
Appendix 8

Perceived Quality of Life (EQ-5D-5L)

1) The patient has to fill up this part of questionnaire during any of her 3 menstrual cycles (not retrospectively) by tick ONE box (**X**) under each domain that best describe her health.

2) For visual scale, the patient make a mark opposite to level of her health, considering score **100** is the best state of health and score **0** means the worst health she can imagine.

How often have you…

Domain	SN	Item (Question)	Problem Level	Please check (X)	Visual Scale
Mobility	1	I have no problems in walking about.	No		
	2	I have slight problems in walking about.	Slight		
	3	I have moderate problems in walking about.	Moderate		
	4	I have severe problems in walking about.	Severe		
	5	I am unable to walk about.	Extreme		
Self-Care	1	I have no problems washing or dressing myself.	No		
	2	I have slight problems washing or dressing myself.	Slight		
	3	I have moderate problems washing or dressing myself.	Moderate		
	4	I have severe problems washing or dressing myself.	Severe		
	5	I am unable to wash or dress myself.	Extreme		
Usual Activities	1	I have no problems doing my usual activities.	No		
	2	I have slight problems doing my usual activities.	Slight		
	3	I have moderate problems doing my usual activities.	Moderate		
	4	I have severe problems doing my usual activities.	Severe		
	5	I am unable to do my usual activities.	Extreme		
Pain or Discomfort	1	I have no pain or discomfort.	No		
	2	I have slight pain or discomfort.	Slight		
	3	have moderate pain or discomfort.	Moderate		
	4	I have severe pain or discomfort.	Severe		
	5	I have extreme pain or discomfort.	Extreme		
Anxiety or Depression	1	I am not anxious or depressed.	No		
	2	I am slightly anxious or depressed.	Slight		
	3	I am moderately anxious or depressed.	Moderate		
	4	I am severely anxious or depressed.	Severe		
	5	I am extremely anxious or depressed.	Extreme		

Score of Health Status: Record the number of item per each domain that checked by the patient.

Visual Score: Record the number of scale that checked by the patient.