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Impact of an Educational Intervention on Knowledge, Attitude, and Practices Regarding Premenstrual Syndrome Among Female University Students in Quetta, Pakistan: A Quasi-Experimental Pre–Post Study

Maria Tahir*
Department of Pharmacy, Sardar Bahadur Khan Women's University, Quetta, Balochistan, Pakistan
Bibi Bulnista
Department of Pharmacy, Sardar Bahadur Khan Women's University, Quetta, Balochistan, Pakistan
Bakhtawar Muhammad Taqi
Department of Pharmacy, Sardar Bahadur Khan Women's University, Quetta, Balochistan, Pakistan
Laiba Ali
Department of Pharmacy, Sardar Bahadur Khan Women's University, Quetta, Balochistan, Pakistan
Aliza Batool
Department of Pharmacy, Sardar Bahadur Khan Women's University, Quetta, Balochistan, Pakistan
Aqeel Nasim
Provincial Drug Testing Laboratory, Balochistan, Quetta, Pakistan

Author Details

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Corresponding E-mail & Author*:
Maria Tahir*
Email:maria88.sbk@gmail.com

Abstract

Background: Premenstrual syndrome (PMS) is a highly prevalent yet frequently under-recognised condition affecting women of reproductive age. In Pakistan, awareness of PMS — particularly its clinical criteria, risk factors, and evidence-based management — remains markedly limited among young women. This study evaluated the effect of a structured educational intervention on PMS-related knowledge, attitudes, and practices (KAP) among female university students in Quetta, Balochistan.

Methods: A quasi-experimental pretest–posttest study was conducted at Sardar Bahadur Khan Women's University from March to November 2024 (n = 382). A validated, self-administered questionnaire assessed knowledge (30 items), attitude (6 items), and practice (8 items) before and after a single structured PowerPoint-based educational session. Wilcoxon signed-rank tests were used to compare pre- and post-intervention scores.

Results: The median knowledge score increased from 14.0 (IQR 10.0–18.0) to 26.0 (IQR 23.0–28.0), the attitude score from 20.0 to 24.0, and the practice score from 4.0 to 6.0. All improvements were statistically significant ($p < 0.001$). Correct identification of PMS rose from 73.0% to 100%; awareness that PMS may present with a wide range of physical, emotional, and behavioral symptoms

improved from 14.1% to 95.8%. Treatment-seeking intent increased from 40.1% to 48.2%, and family communication about PMS from 47.9% to 62.0%.
Conclusions: A single, structured educational session produced substantial and statistically significant improvements in PMS-related KAP. Scalable health education programmes targeting university-age women in low-resource settings are warranted.

Introduction

Premenstrual syndrome (PMS) is a common cyclical health condition affecting females of reproductive age and is characterized by physical, emotional, behavioral, and psychological symptoms that occur during the luteal phase of the menstrual cycle and usually improve shortly after the onset of menstruation (Zaka & Mahmood, 2012). Common symptoms include abdominal pain, bloating, breast tenderness, acne, food cravings, fatigue, sleep disturbance, irritability, anxiety, mood changes, and reduced concentration. Although mild premenstrual symptoms are frequently experienced, PMS becomes clinically important when symptoms interfere with routine activities, academic performance, social participation, or quality of life (King, 2020). The Royal College of Obstetricians and Gynaecologists reports that around four in ten women experience PMS symptoms, while a smaller proportion experience severe PMS that requires clinical attention (Funnell et al., 2025).

PMS is particularly relevant among university students because this population is exposed to academic pressure, changing lifestyle patterns, irregular sleep, stress, dietary changes, and social adjustment, all of which may influence menstrual health and symptom perception (Hashim et al., 2019). In young women, PMS may affect lecture attendance, examination performance, concentration, interpersonal relationships, physical activity, and participation in social events. Studies among female university students have shown that PMS is not only a reproductive health concern but also an academic and psychosocial issue (Al Sabbah et al., 2024). For example, a study conducted among female university students in Karachi reported that PMS was present among students and highlighted the importance of assessing knowledge and attitude toward PMS in the Pakistani university context (Nandakumar et al., 2023).

Despite its frequency, PMS is often under-recognized and poorly discussed, particularly in conservative settings where menstrual health topics may be considered sensitive. Many students normalize symptoms, rely on informal advice, use self-medication, or avoid professional consultation (Barry, 2016). Inadequate knowledge may lead to misconceptions about PMS, poor symptom recognition, delayed treatment-seeking, inappropriate medicine use, and limited adoption of beneficial lifestyle measures such as exercise, stress control, sleep regulation, and dietary modification. Current clinical guidance emphasizes that PMS and related premenstrual disorders can be managed through evidence-based approaches, including lifestyle measures, psychological interventions, and pharmacological options when clinically indicated (Kamal et al., 2025).

Knowledge, attitude, and practice (KAP) studies are useful for identifying awareness gaps and behavioral patterns related to PMS (Gopika et al., 2025). Previous literature has shown that female students may recognize common symptoms but often have limited knowledge of diagnostic features, risk factors, and management options (Li et al., 2025). A Malaysian undergraduate study reported a significant association between PMS knowledge and practices for symptom relief, suggesting that better awareness may support improved self-care behavior (Min, 2023). Similarly, educational intervention studies have reported that structured teaching programs can improve students' knowledge and attitude regarding PMS (NI, 2024).

In Pakistan, evidence on PMS among university students remains limited, and there is a need for context-specific studies from different provinces and educational settings. Balochistan has distinct cultural, educational, and healthcare access patterns, and

female university students may face unique barriers to discussing menstrual health and seeking care (Nzambimana et al., 2025). Therefore, PMS awareness programs within universities may provide a practical and acceptable strategy to improve reproductive health literacy, reduce misconceptions, and encourage safer self-care and treatment-seeking practices.

Therefore, the present study was conducted to assess the effect of an educational awareness intervention on knowledge, attitude, and practices regarding premenstrual syndrome among female university students at Sardar Bahadur Khan Women's University, Quetta, Pakistan. The study aimed to compare pre-intervention and post-intervention KAP responses and determine whether a structured PMS awareness session could improve students' understanding, attitudes, and self-care-related practices.

METHODS

Study Design and Setting

A quasi-experimental pretest–posttest design was employed to evaluate the effect of a single educational intervention on PMS-related KAP. The study was conducted at Sardar Bahadur Khan Women's University, Quetta, Balochistan, Pakistan, between 15 March 2024 and 15 November 2024. The study comprised two sequential phases: a baseline (pre-intervention) data-collection phase and a post-intervention follow-up phase.

Study Population and Eligibility Criteria

The target population consisted of female students enrolled across all academic departments at SBK University who were of reproductive age. Participants were eligible for inclusion if they were currently enrolled, present on the day of data collection, and willing to provide written informed consent. Students who were absent during the educational session or the post-intervention data-collection visit, or who submitted incomplete questionnaires, were excluded from the final analysis to ensure the integrity of matched pre–post pairs.

Sample Size and Sampling Technique

Sample size was estimated using the Raosoft online calculator, assuming a 50% response distribution, a 95% confidence level, and a 5% margin of error, yielding a minimum requirement of 398 participants. Although the estimated sample size was 398, 382 complete matched pre–post responses were available for final analysis after excluding incomplete/absent cases. This was acknowledged as a limitation.

Study Instrument

Data were collected using a validated, structured, self-administered questionnaire developed following a systematic review of the PMS literature. The instrument comprised four sections: (i) sociodemographic characteristics; (ii) knowledge domain (30 items assessing definitions, symptoms, risk factors, and management of PMS); (iii) attitude domain (6 Likert-scale items evaluating perceptions and social attitudes towards PMS); and (iv) practice domain (8 items on health-seeking behaviour and self-management strategies).

Face and content validity were established through expert review by faculty in pharmacy and related health sciences. A pilot study involving 30 students was conducted to assess comprehension, feasibility, and administration time. Minor wording revisions were made on the basis of pilot feedback. Internal consistency was confirmed using Cronbach's alpha, which exceeded the accepted threshold of 0.70 across all domains.

Educational Intervention

The intervention consisted of a single structured educational session conducted in the Department of Pharmacy using projected slides. Content was developed from evidence-based clinical guidelines and covered: the clinical definition and diagnostic criteria of PMS; the range and chronology of physical and psychological symptoms; established and emerging risk factors; prevalent myths and misconceptions; lifestyle-based preventive strategies; and pharmacological and non-pharmacological management options. The session was designed to deliver standardised information to all participants simultaneously, thereby minimising information bias.

Outcome Measures

The primary outcome was the change in knowledge score from pre- to post-intervention. Secondary outcomes were the change in attitude score and the change in practice score. Scores were computed as the sum of correct/affirmative responses within each domain.

Data Analysis

Data were entered and analysed using IBM SPSS Statistics (Version 26.0). Descriptive statistics — frequencies and percentages for categorical variables, and mean ± standard deviation or median (IQR) for continuous variables — were used to characterise the sample. The Shapiro-Wilk test confirmed non-normal score distributions; accordingly, the Wilcoxon signed-rank test was used to assess the statistical significance of pre–post differences. A two-tailed p-value of < 0.05 was considered statistically significant.

Ethical Considerations

The study protocol received approval from the Institutional Ethics Review Committee prior to data collection. All participation was voluntary. Written informed consent was obtained from each participant before enrolment. Participant data were anonymised and used exclusively for academic and research purposes, in accordance with the Declaration of Helsinki.

RESULTS

Participant Characteristics

A total of 382 subjects were analysed with mean age of 21.26 ± 1.85years. Most participants were aged 21–23 years (n = 183, 47.9%), followed by 18–20 years (n = 152, 39.8%). The majority were unmarried (94.8%). The phase included students from different semesters with a higher number of enrolments from 7th semester (33.2%) followed by 5th semester (31.7%). The academic departments varied widely, with the majority of participants coming from Pharmacy (13.4%), English (9.2%), and Education (8.6%) programs. Pathan (38.0%) was the largest ethnic group, followed by Baloch (24.9%) and Punjabi (13.4%). The majority of respondents were day scholars (75.7%). Concerning family history, more than half (53.4%) answered that family history of PMS was not known. Most (56.0%) had onset of PMS symptoms 3 days prior to menstruation, and onset regularity was evenly distributed (49.2% regular vs. 50.8% irregular pattern)..

Table 1 Participant Characteristics (n = 382)

Variable	Category	Frequency (n)	Percentage (%)
Age (Mean ± SD)	21.26 ± 1.85 years	—	—
	18–20	152	39.8

	21–23	183	47.9
	24–26	41	10.7
	27–30	6	1.6
Marital status	Married	19	5.0
	Unmarried	362	94.8
	Widow	1	0.3
Semester	1st semester	3	0.8
	2nd semester	38	9.9
	3rd semester	24	6.3
	4th semester	10	2.6
	5th semester	121	31.7
	6th semester	20	5.2
	7th semester	127	33.2
	8th semester	24	6.3
	10th semester	15	3.9
Department	Pharmacy	51	13.4
	Botany	18	4.7
	Zoology	8	2.1
	Biotechnology	5	1.3
	Microbiology	21	5.5
	Environmental Science	16	4.2
	Media and Journalism	10	2.6
	Sociology	2	0.5
	Psychology	18	4.7
	Social Work	12	3.1
	Mathematics	18	4.7
	Computer	13	3.4
	Chemistry	30	7.9
	Physics	11	2.9
	Biochemistry	13	3.4
	BBA	6	1.6
	Economics	8	2.1
	Commerce	8	2.1
	Fine Arts	13	3.4
	Urdu	11	2.9
	Islamiyat	13	3.4
	English	36	9.2
	Pak Studies	9	2.4
	Education	33	8.6
Ethnicity	Punjabi	51	13.4
	Baloch	95	24.9
	Pathan	145	38.0
	Hazara	29	7.6
	Saraiki	14	3.7
	Sindhi	7	1.8
	Balti	8	2.1
	Qandhari	11	2.9
	Others	22	5.8
Living status	Day scholars	289	75.7
	Hostelite	93	24.3

Family history	No	96	25.1
	Yes	82	21.5
	I don't know	204	53.4
On average, how many days before periods do you start experiencing PMS?	Before 1 week	95	24.9
	Before 5 days	73	19.1
	Before 3 days	214	56.0
Regularity of PMS	Regular	188	49.2
	Irregular	194	50.8

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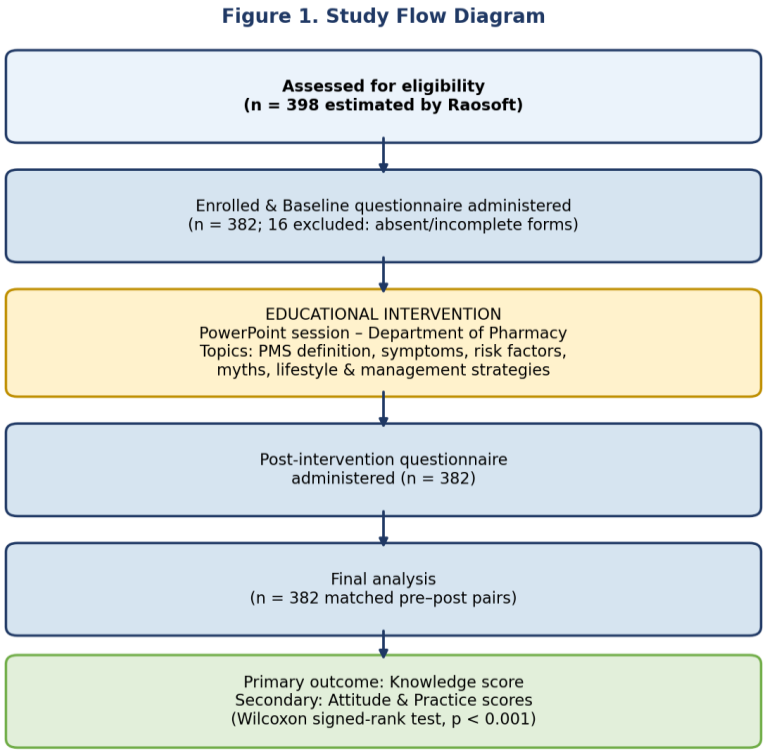

Figure 1. Study Flow Diagram
IQR = interquartile range; KAP = knowledge, attitude, practice; PMS = premenstrual syndrome.

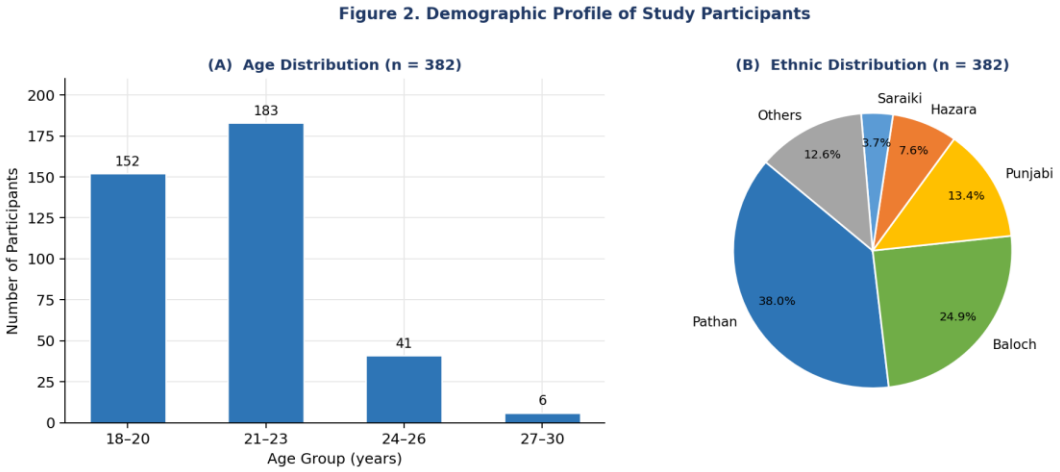

Figure 2. (A) Age Distribution and (B) Ethnic Distribution of Study Participants
IQR = interquartile range; KAP = knowledge, attitude, practice; PMS = premenstrual syndrome.

Attitude Towards PMS: Pre- vs Post-Intervention

At baseline, attitudes were broadly positive: 79.0% of students agreed or strongly agreed that PMS is a significant issue requiring open discussion, 72.5% expressed willingness to seek or encourage treatment, 74.6% acknowledged PMS as affecting normal female life, and 68.6% supported the provision of institutional PMS leave. Following the educational session, positive attitudes improved across all six attitude items (all $p < 0.001$). The greatest absolute improvement was in perceived academic impact (+13.4 percentage points) and institutional leave support (+11.3 percentage points). Table 2 and Figure 4 present these comparisons in detail.

Table 2. Pre- vs Post-Intervention Attitude Scores (n = 382)

Statement	Pre (% Agree+)	Post (% Agree+)	Change	p-value
PMS is a significant issue to be discussed	79.0	87.7	**+8.7**	<0.001
Would seek treatment or encourage others	72.5	79.8	**+7.3**	<0.001
Challenging to manage academic workload during PMS	62.3	75.7	**+13.4**	<0.001
PMS symptoms disturb routine	69.6	75.2	**+5.6**	<0.001
PMS affects normal life of females	74.6	84.0	**+9.4**	<0.001
PMS leave (≥1 day) should be available in institutions	68.6	79.9	**+11.3**	<0.001

Note. Values represent percentage of respondents selecting 'Agree' or 'Strongly Agree'. p-values from Wilcoxon signed-rank test.

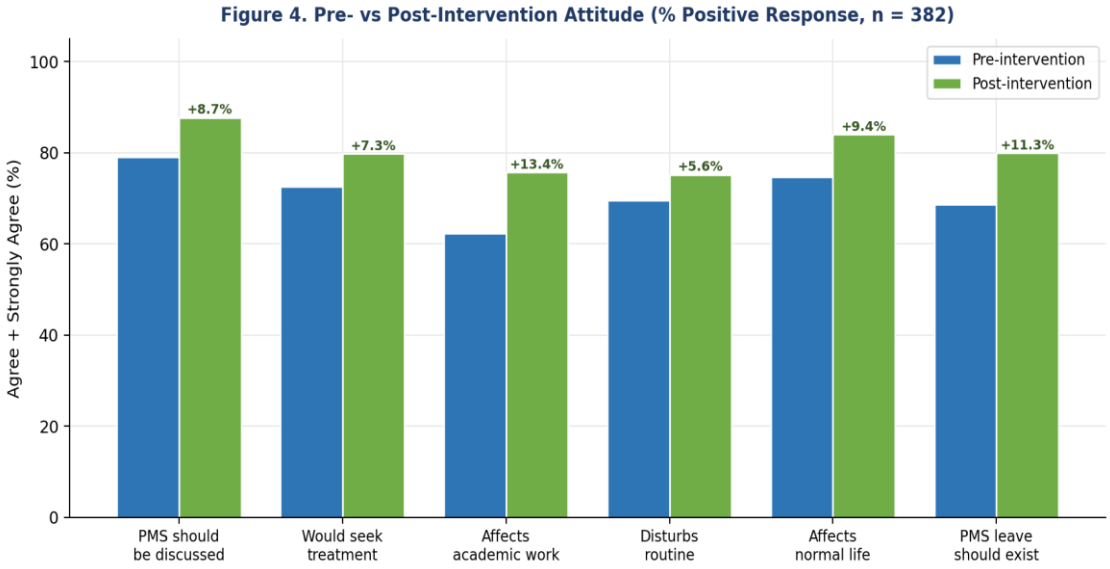

Figure 4. Pre- vs Post-Intervention Positive Attitude Responses (%)
IQR = interquartile range; KAP = knowledge, attitude, practice; PMS = premenstrual syndrome.

Knowledge of PMS: Pre- vs Post-Intervention

Baseline knowledge was partial. While 73.0% correctly identified the PMS acronym and 64.9% recognised abdominal pain as a symptom, awareness was strikingly limited for more technical aspects: only 14.1% knew that PMS may present with a wide range of physical, emotional, and behavioral symptoms, and only 23.0% were aware that symptom recurrence across three consecutive cycles constitutes a

diagnostic criterion. Knowledge of management options — including the roles of oral contraceptive pills (24.9%) and calcium/vitamin D supplementation (24.3%) — was also poor.

Following the intervention, all 30 knowledge items showed statistically significant improvement ($p < 0.001$). Recognition of PMS rose to 100%; awareness of the >200 symptoms criterion improved from 14.1% to 95.8% (+81.7 percentage points). Knowledge of OCP use increased from 24.9% to 63.1%, and calcium/vitamin D awareness from 24.3% to 64.1% — representing the smallest absolute gains, yet remaining clinically meaningful. Table 3 and Figure 3 summarise findings for the 12 most informative items.

Table 3. Pre- vs Post-Intervention Knowledge Responses for Selected Items (n = 382)

Knowledge Item	Pre (% Yes)	Post (% Yes)	Δ (%)	p-value
PMS stands for premenstrual syndrome	73.0	100.0	**+27.0**	<0.001
Clinical definition of PMS (onset & resolution)	48.7	99.0	**+50.3**	<0.001
Symptoms resolve within 4 days of bleeding onset	47.1	97.4	**+50.3**	<0.001
PMS can present with >200 symptoms	14.1	95.8	**+81.7**	<0.001
Symptoms recurring over 3 cycles = diagnostic criterion	23.0	91.6	**+68.6**	<0.001
Abdominal pain/cramps are a PMS symptom	64.9	96.9	**+32.0**	<0.001
Stress worsens PMS symptoms	50.5	95.0	**+44.5**	<0.001
Lifestyle factors worsen PMS	43.5	94.5	**+51.0**	<0.001
Hormonal imbalance causes PMS	53.4	93.7	**+40.3**	<0.001
Exercise (yoga/walking) reduces PMS	43.5	90.8	**+47.3**	<0.001
OCP helps with PMS symptoms	24.9	63.1	**+38.2**	<0.001
Calcium/Vitamin D reduces PMS	24.3	64.1	**+39.8**	<0.001

Note. Values represent percentage of respondents answering 'Yes' (correct). Δ = post minus pre. OCP = oral contraceptive pill.

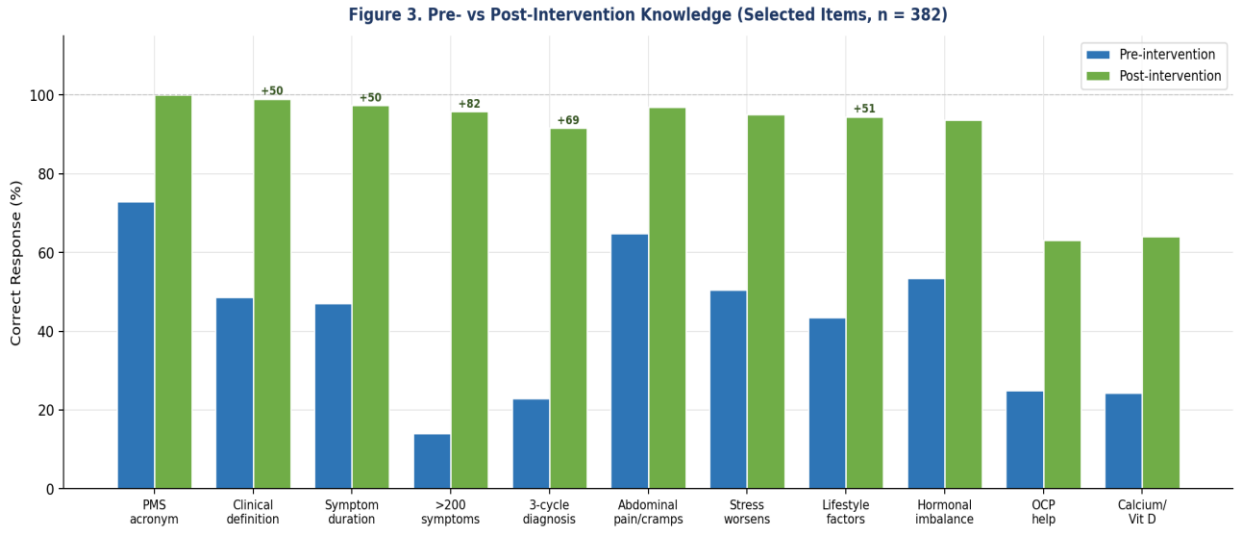

Figure 3. Pre- vs Post-Intervention Knowledge Correct-Response Rates for Selected Items

IQR = interquartile range; KAP = knowledge, attitude, practice; PMS = premenstrual syndrome.

3.4 Practices and Treatment-Seeking Behaviour: Pre- vs Post-Intervention

At baseline, formal help-seeking was limited: only 40.1% expressed intent to consult a physician, and only 47.9% discussed PMS with family members. The most commonly used analgesic was Panadol (22.2%), followed by Ponstan (16.4%), while 38.4% reported using no painkiller. The most frequent approach to overall symptom relief was analgesics (31.6%), followed by herbal medicines (20.3%) and doing nothing (19.2%).

Post-intervention, family communication regarding PMS increased to 62.0% and physician consultation intent to 48.2%. The proportion using analgesics shifted substantially, with ibuprofen becoming the most common choice (30.4% post vs 8.8% pre), likely reflecting educational emphasis on evidence-based first-line analgesic therapy. Use of exercise (14.5% both time-points) remained stable, while the proportion doing nothing fell sharply from 19.2% to 7.8%. Table 4 and Figure 5 display the key practice comparisons.

Table 4. Pre- vs Post-Intervention Practice and Treatment-Seeking Responses (n = 382)

Practice Indicator	Pre (% Yes)	Post (% Yes)	Δ (%)	p-value
Discusses PMS with family	47.9	62.0	**+14.1**	<0.001
Likely to consult a physician for PMS symptoms	40.1	48.2	**+8.1**	<0.001
PMS disturbs normal routine	51.3	59.4	**+8.1**	0.002
Has missed social events due to PMS	51.8	59.9	**+8.1**	0.002

Note. p-values from Wilcoxon signed-rank test.

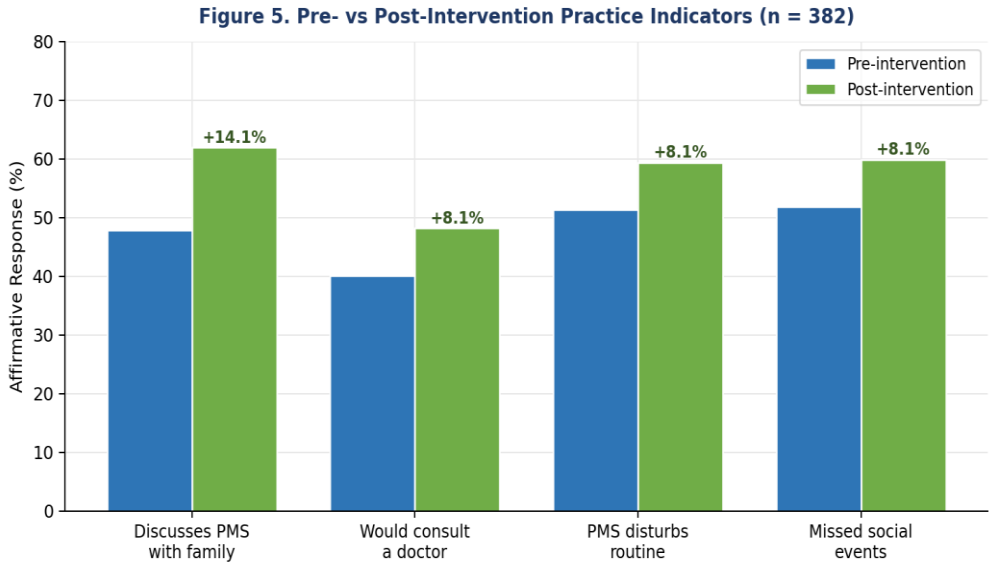

Figure 5. Pre- vs Post-Intervention Key Practice Indicators (%)

IQR = interquartile range; KAP = knowledge, attitude, practice; PMS = premenstrual syndrome.

Overall KAP Score Comparison

The Wilcoxon signed-rank test demonstrated statistically significant improvement in all three KAP domains following the educational intervention (Table 5; Figure 6). The median knowledge score increased from 14.0 (IQR 10.0–18.0) to 26.0 (IQR 23.0–28.0; Z = −15.821, p < 0.001), representing a near-doubling of the baseline median. Attitude scores increased from 20.0 (IQR 17.0–23.0) to 24.0 (IQR 22.0–27.0; Z = −9.734, p < 0.001), and practice scores from 4.0 (IQR 3.0–5.0) to 6.0 (IQR 5.0–7.0; Z = −6.482, p < 0.001). The effect was largest in the knowledge domain, consistent with the information-intensive nature of the intervention.

Table 5. Wilcoxon Signed-Rank Test: Pre- vs Post-Intervention KAP Scores (n = 382)

Domain	Pre-Intervention Median (IQR)	Post-Intervention Median (IQR)	Z	p-value	Interpretation
Knowledge	14.0 (10.0–18.0)	26.0 (23.0–28.0)	-15.821	**<0.001**	Significant improvement
Attitude	20.0 (17.0–23.0)	24.0 (22.0–27.0)	-9.734	**<0.001**	Significant improvement
Practice	4.0 (3.0–5.0)	6.0 (5.0–7.0)	-6.482	**<0.001**	Significant improvement

Note. IQR = interquartile range. Z = Wilcoxon test statistic (negative ranks). All comparisons two-tailed.

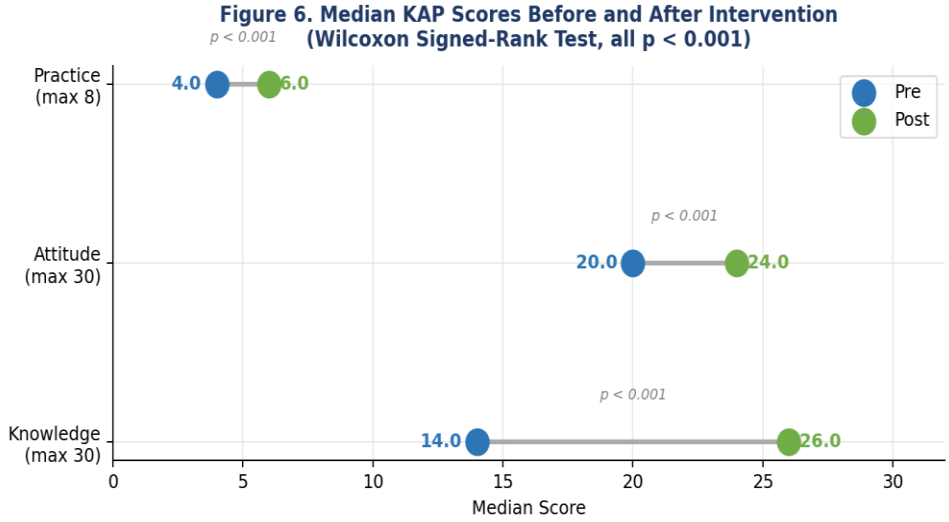

Figure 6. Median KAP Scores Before and After the Educational Intervention (Wilcoxon Signed-Rank Test)

IQR = interquartile range; KAP = knowledge, attitude, practice; PMS = premenstrual syndrome.

DISCUSSION

The present quasi-experimental pretest–posttest study demonstrated that a structured educational awareness session significantly improved knowledge, attitude, and practice regarding premenstrual syndrome (PMS) among female university students in Quetta, Pakistan. In the current study, the median knowledge score increased from 14.0 before the intervention to 26.0 after the intervention, while attitude and practice scores increased from 20.0 to 24.0 and from 4.0 to 6.0, respectively. The Wilcoxon signed-rank test showed statistically significant improvement in all three domains (p < 0.001), indicating that the educational intervention had a positive effect on PMS-

related awareness and self-care behavior among the participants. These findings are consistent with previous educational intervention studies, which have reported that structured teaching programs can significantly improve students' knowledge, attitudes, and preventive or self-care practices regarding PMS (Ahmed & Saeed, 2021; Ahmed, 2019).

At baseline, participants showed partial knowledge of PMS. Most students correctly identified PMS as premenstrual syndrome, and many recognized common symptoms such as abdominal pain, cramps, acne, insomnia, bloating, and confusion. However, knowledge was weaker regarding the broader clinical features of PMS, diagnostic recurrence, lifestyle-related worsening factors, and management options. For example, only 14.1% knew that PMS may include more than 200 symptoms, 23.0% recognized the importance of repeated symptoms over previous cycles, and many students selected "I don't know" for items related to oral contraceptive pills, calcium and vitamin D, smoking/vaping, caffeine, and lifestyle influences. This pattern is comparable with the studies from other university settings have reported that students often recognize common menstrual symptoms but lack complete understanding of PMS diagnosis, risk factors, and evidence-based management (Arbi et al., 2024; Rizvi & Ali, 2016).

Following the awareness session, knowledge improved markedly across almost all PMS-related items. All students correctly identified the full form of PMS after the intervention, and more than 90% correctly recognized several important concepts, including the clinical timing of PMS, resolution of symptoms after menstruation begins, presence of multiple symptoms, recurrent symptom pattern, reproductive-age association, stress-related worsening, exercise benefit, abdominal pain, bloating, insomnia, food cravings, acne distribution, and hormonal imbalance. These findings support the role of targeted health education in correcting misconceptions and improving reproductive health literacy among young women. Similar improvements were reported in an academic educational program among students, where post-intervention knowledge and attitude improved after PMS-focused teaching (Daneshvar et al., 2023; Etebari et al., 2026). Comparable results were also reported in health-belief-model-based educational interventions, where education improved knowledge, attitudes, and PMS-related preventive behaviors among adolescent or young female students (Franco-Antonio et al., 2025).

Despite the strong overall knowledge gain, comparatively lower awareness remained after the intervention regarding oral contraceptive pills and calcium/vitamin D. This finding is important because these topics require more careful explanation than general symptom recognition. Current clinical guidance supports several evidence-based treatment options for premenstrual disorders, including selective serotonin reuptake inhibitors for affective symptoms, combined oral contraceptives for overall premenstrual symptoms, and cognitive behavioral therapy for affective symptoms; however, such options require clinical evaluation and individualized counseling rather than unsupervised use (ACOG, 2023)(Al-Washali, 2024). Calcium and vitamin D have also been discussed in the literature in relation to PMS, with systematic review evidence suggesting that low calcium and vitamin D levels may contribute to or worsen PMS symptoms, although treatment recommendations should still be applied carefully according to individual needs (Abdi et al., 2019). Therefore, the lower post-intervention response for these items suggests that future educational sessions should include a clearer section on safe, evidence-based PMS management, including when to seek professional care (Arab et al., 2019).

The attitude of participants toward PMS was already relatively supportive at baseline and improved further after the awareness session. Before the intervention, many students agreed that PMS is a significant issue, affects academic workload, disturbs routine, affects the normal life of females, and should be discussed more openly. After the intervention, agreement increased across these attitude items, including

willingness to seek or encourage treatment and support for PMS leave in female institutions, workplaces, or universities. This finding indicates that the intervention strengthened students' perception of PMS as a legitimate health and academic concern rather than a minor or purely personal discomfort (Khalilzadeh et al., 2023). These results are aligned with the reported PMS among female university students was associated with awareness and attitude-related concerns, and with other studies showing that PMS may interfere with academic engagement, social participation, physical activity, and daily functioning among students (Szűcs et al., 2017).

The practice and treatment-seeking findings showed moderate improvement after the intervention, although the magnitude of change was smaller than that observed for knowledge. After the session, more students reported discussing PMS with family members, considering doctor consultation, and recognizing supplements as a possible treatment option. However, professional consultation remained limited, as more than half of the students still reported that they were not likely to consult a doctor for PMS symptoms. This suggests that knowledge improvement alone may not be sufficient to fully change help-seeking behavior (Funnell et al., 2025). Cultural hesitation, normalization of menstrual symptoms, embarrassment, fear of stigma, limited access to female healthcare providers, and preference for self-medication or family advice may continue to influence behavior. Similar barriers have been discussed in the broader literature, where PMS and PMDD-related symptoms are common among university students but formal help-seeking remains variable and often limited (Buddhabunyakan et al., 2017).

An important finding of the present study was that PMS continued to affect routine activities and social participation even after the awareness session. The proportion of participants reporting that PMS disturbed their normal routine and caused missed social events remained high after the intervention. This should not necessarily be interpreted as a harmful effect of the intervention. Rather, the awareness session may have improved students' ability to recognize and report PMS-related functional impairment. Previous studies have similarly shown that PMS can negatively affect academic performance, physical activity, extracurricular participation, quality of life, and daily activities among students (Elvan, 2023; Victor et al., 2019). Therefore, the current findings reinforce the need for university-level menstrual health support systems, including awareness sessions, counseling, referral pathways, and academic flexibility for students with severe symptoms.

The pattern of self-care practices also deserves attention. In the current study, students reported using painkillers, herbal medicines, exercise, yoga, vitamins, and other approaches for symptom relief. After the intervention, use of some self-care and medication-related options changed, but a proportion of students still reported doing nothing for symptom relief. These findings are consistent with the understanding that PMS management is often a mixture of informal care, lifestyle strategies, over-the-counter medication, and occasional professional advice. Evidence from a systematic review and meta-analysis among female college students suggests that higher physical activity is associated with reduced risk of PMS, supporting the inclusion of exercise, walking, yoga, and stretching in educational messages (Ranjan et al., 2022; Tsai, 2016). However, the reported use of hypnotics and analgesics also highlights the need for responsible medication education, because students should be guided on safe analgesic use, avoidance of unnecessary sedatives, and the importance of consulting healthcare professionals when symptoms are severe, persistent, or associated with marked mood disturbance (Sanchez et al., 2023).

The greatest improvement was observed in the knowledge domain, followed by attitude and practice. This pattern is expected in short-term educational interventions, because knowledge is usually the most immediate outcome of a teaching session, while attitude and practice require repeated reinforcement, supportive environments, and time for behavioral adoption. The findings are consistent with educational

intervention literature showing that awareness sessions can significantly improve PMS-related knowledge and attitudes, but sustained practice change may require more comprehensive interventions, follow-up counseling, and behavior-focused strategies (Niriksha & Bhagat, 2025). Therefore, future PMS programs in university settings should not rely only on one-time lectures. Instead, they should include repeated sessions, printed or digital educational materials, peer-group discussions, confidential counseling, and referral links with gynecology or student health services.

The study has important implications for female university students in Quetta and similar educational settings in Pakistan. PMS is not only a reproductive health issue but also an academic and psychosocial concern. Because the participants were young women in a university environment, improved PMS awareness may help them recognize symptoms earlier, adopt safer self-care measures, reduce myths and misconceptions, discuss symptoms with trusted family members or healthcare professionals, and seek timely treatment when needed. The findings also support the role of pharmacy departments and university health units in delivering menstrual health education. Given that ACOG and other clinical sources emphasize evidence-based and individualized management of premenstrual disorders, university-level awareness programs should include both non-pharmacological approaches and clear guidance on when medical evaluation is required (ACOG, 2023).

This study also has limitations that should be acknowledged. First, the quasi-experimental pretest–posttest design lacked a control group, so improvements cannot be attributed to the intervention with the same level of certainty as a randomized controlled trial. Second, convenience sampling from a single women's university limits generalizability to all female students in Quetta, Balochistan, or Pakistan. Third, the data were based on self-reported responses, which may be affected by recall bias and social desirability bias. Fourth, the post-intervention assessment measured short-term improvement; therefore, long-term retention of knowledge and sustained behavioral change could not be confirmed. Fifth, although the study reported significant KAP score improvement, future research should clearly report scoring criteria, internal consistency values, normality assessment, and justification for using non-parametric tests.

Limitations

Several limitations must be acknowledged. First, the absence of a concurrent control group precludes definitive attribution of observed improvements to the intervention alone; maturation, attention (Hawthorne) effects, and seasonal variation in symptoms cannot be ruled out. Second, convenience sampling at a single women's university limits generalisability to male students, rural populations, and women outside higher education. Third, the study assessed self-reported intentions and knowledge rather than objectively verified behaviour change, and the post-intervention assessment was conducted immediately after the session, without longitudinal follow-up to evaluate retention. Fourth, Cronbach's alpha values, while reportedly acceptable, are not presented numerically. Future studies should employ randomised controlled designs, include objective behavioural outcomes, and incorporate a minimum three- to six-month follow-up interval.

CONCLUSIONS

The intervention improved PMS-related knowledge, attitudes, and self-reported intended practices in the short term. The intervention was particularly effective in addressing gaps in clinical and diagnostic knowledge, and in encouraging proactive self-management and help-seeking behaviour. Given the low cost, scalability, and measurable impact of this approach, integration of PMS health education into university orientation programmes and student health services across Pakistan is strongly recommended. Future work should evaluate the durability of these gains and

test multi-session or digital delivery formats.

DECLARATIONS

Ethics Approval and Consent to Participate: Ethical approval was obtained from the Institutional Ethics Review Committee of Sardar Bahadur Khan Women's University, Quetta. Written informed consent was obtained from all participants prior to enrolment.

Availability of Data: Anonymised data supporting the findings of this study are available from the corresponding author upon reasonable request.

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