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# Primary dysmenorrhea with and without premenstrual syndrome: variation in quality of life over menstrual phases

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## Abstract

**Purpose** The majority of studies on quality of life (QoL) of women with menstrual disturbances have not taken menstrual cycle phase into account. We aimed to determine the size of changes in QoL score during perimenstrual week compared to those during late follicular phase in women suffering from dysmenorrhea with or without premenstrual syndrome (PMS) and also to compare the two groups.

**Methods** In this observational analytical study, participants were selected purposively from among single students aged 18–30 years, who were residing at university dormitories in Tabriz, Iran, and had moderate or severe dysmenorrhea. They reported quality of their life during the past week using the Quality of Life Enjoyment and Satisfaction Questionnaire-Short Form (Q-LES-Q-SF) at two time points, days 3–4 and 11–12, of their menstrual cycle.

**Results** Among 52 participants with PMS and 64 without PMS, about half reported severe dysmenorrhea. The mean total quality score was significantly lower during perimenstrual week than during late follicular phase in both group with PMS [48 vs 79, mean difference − 31 (95% confidence interval − 37 to − 26)] and group without PMS [56 vs 78, − 1 (− 27 to − 18)]. The score was significantly lower in the group with PMS than in those without PMS during perimenstrual week [− 8 (− 13 to − 2)] but not during late follicular phase [2.1 (− 2.9 to 7.0)].

**Conclusions** Dysmenorrhea with or without PMS significantly reduces QoL of women during perimenstrual week. The QoL is slightly lower in group with PMS during perimenstrual week but not during late follicular phase.

**Keywords** Primary dysmenorrhea · Premenstrual syndrome · Quality of life · Pain · Menstrual phase

## Introduction

Today, patient-reported outcomes are actually considered as more valuable than most of the other outcomes [1]. Quality of life (QoL) is one of the most important patient-reported outcome measures reported directly by individuals themselves, which can be used to provide more appropriate and patient-centered care [2]. According to the World Health Organization, QoL is "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns" [3].

Primary dysmenorrhea and premenstrual syndrome (PMS) are two of the most common disorders among women of reproductive age, especially among adolescents and adults, which can have a negative impact on the QoL [4].

Primary dysmenorrhea is defined as painful cyclic cramps occurring with menstruation in the absence of organic pathology [5]. Its symptoms usually start a few hours before or with the onset of menstrual bleeding and last for 48–72 h [6]. The reported rate of dysmenorrhea among menstruating women varies across the world from 16 to 91%, with severe pain being reported in 2–29% [7]. A population-based study in Tehran, Iran, reported the prevalence rates of moderate and severe dysmenorrhea as 28% and 22%, respectively [8]. The majority of women with dysmenorrhea have primary dysmenorrhea [9].

Premenstrual syndrome is characterized by a cluster of physical, psychological, and behavioral symptoms, which

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occur during the luteal phase, are resolved until the fourth day of menstrual cycle, and interfere with daily functioning of the women [10]. Data from prospective and retrospective studies have suggested that 5–20% of women with hormonal cycles have moderate-to-severe PMS [11]. It is more prevalent among women suffering from dysmenorrhea [12, 13]. In a population-based study in France, the prevalence of PMS was found to be 26% in women with dysmenorrhea compared to 9% in those without dysmenorrhea [13].

Relatively large number of studies has investigated the effect of dysmenorrhea [14–16] and PMS [12, 16–19] on the QoL. However, the majority of studies did not consider menstrual phase and have often used scales such as SF-36 and SF-12 to assess health-related QoL over the past month [20] or the WHOQOL to assess QoL over the past two weeks [3]. It appears that such scales are not suitable to assess variations in QoL over different phases of the menstrual cycle.

The Quality of Life Enjoyment and Satisfaction Questionnaire-Short Form (Q-LES-Q-SF) is a validated scale to assess the QoL over the past week [21]. Therefore, it could be considered as a suitable scale to assess QoL variations over different phases of menstrual cycle.

We found only one pilot study on 12 women with severe primary dysmenorrhea (≥ 60 mm on a 100-mm VAS) and 9 women with < 30 mm menstrual pain assessing change in the QoL score during perimenstrual (assessed at day 1 of the menstrual cycle) compared to that during the late follicular phase (assessed at days 10–12) [14]. There was another study on 18 women with severe PMS and 18 women with minimal symptoms assessing the change during the mid-follicular phase (assessed at 6–11 days) compared to that during the late luteal phase (assessed at 9–13 days after the luteinizing hormone surge) [22]. Both the studies had used the Q-LES-Q-SF for QoL assessment.

Therefore, we conducted the present study to determine the size of changes in total QoL score, and its physical and psychosocial dimensions, during the perimenstrual week compared to those during the late follicular phase in women suffering from primary dysmenorrhea with or without PMS and also to compare the two groups with each other.

## Methods

This report is the first part of a study aimed at examining the variations in QoL over different menstrual phases and the effect of *Echium amoenum* on the intensity of menstrual pain and the quality of life in women with primary dysmenorrhea. For this observational analytical part, data were collected at two time points from eligible students residing at 18 dormitories affiliated to the universities in Tabriz, Iran (4 governmental and 14 non-governmental dormitories). About 1960 female students of various educational levels, ranging from BSc to PhD (about two-third are BSc students), live in the dormitories, of whom about half live in governmental dormitories.

Inclusion criteria were being single, aged 18–30 years, experiencing moderate or severe menstrual pain (> 45 on 100-mm VAS) with or without PMS, and having regular menstrual cycles of 21–35 days and normal amount of menstruation over the past six cycles. Exclusion criteria were secondary dysmenorrhea, known psychiatric diseases, known chronic diseases (e.g., seizures, diabetes, cardiovascular, or renal diseases), sensitivity to NSAIDs, taking contraceptive hormones, smokers, and drug and alcohol abusers. In addition, those with a suspicious, but no definite, diagnosis of PMS (based on the reported symptoms) were excluded from this part of the study.

Purposive sampling was used in this study. The principal investigator (FQ) visited the dormitories at afternoons, when there was more possibility to access the students. She visited three to more than ten times (depending on the number of students at a dormitory) each dormitory to approach the students at their dormitory rooms. After explaining the study objective, she asked eligible students to sign a written informed consent and participate in the study. The investigator checked the eligibility criteria of those who could not be attended at their own dormitories over the phone and arranged a visiting time with the potentially eligible ones.

The 100-mm visual analog scale (VAS) with "0 = no pain" and "100 = worst imaginable pain" was used to assess pain intensity. This is a validated scale commonly used to assess pain [23].

We used the ACOG criteria to diagnose PMS [24]. Women were allocated into the PMS group if they reported at least one of the affective and one of the physical symptoms during the 5 days before the onset of menses in at least three past consecutive cycles that interfere with some aspects of their normal activities and reported none of the symptoms from the fourth to at least the thirteenth day of the cycles.

Data were collected by self-administered questionnaire including some closed questions about general socio-demographic, reproductive and menstrual cycle characteristics, the VAS, PMS symptoms, and the Q-LES-Q-SF. All parts, except the Q-LES-Q-SF, were filled in during the first visit.

The participants were asked to fill in the Q-LES-Q-SF at two time points (days 3–4 and 11–12) of the menstrual cycle of the following usual cycle, which was not during their college examination period. In case of the occurrence of any unusual event in the following cycle, they repeated it in the next cycle.

The questionnaire is a validated self-administered scale that evaluates individual satisfaction on various areas of life during the past week. It has 16 items with five-point options, ranging from 1 = "very poor" to 5 = "very good," with higher

scores indicating better enjoyment and satisfaction with life. The last two items are not considered in the calculation of the total score [21, 25]. In this study, the raw total score was calculated by summing the first 13 items, excluding item 9 (sexual drive), which was not assessed, because the participants were single and there were cultural limitations to assess sexual function among singles in the study setting. Therefore, the possible range of the raw total score was 13–65. The raw total score was converted into percentage of the total possible score [(raw total score − 13)/(65 − 13) × 100]. We also used the two dimensions of this scale, which were identified by Lee et al. [26], i.e., psychosocial dimension consisting of items 2–11 and physical dimension consisting of items 1, 12, 13, and 14. The validity and reliability of this questionnaire have been confirmed on Iranian students [27]. In our study, the internal consistency of the questionnaire according to the study groups at the two phases measured by Cronbach's α coefficient was high (α = 0.887–0.937).

We gave 12 ibuprofen capsules (400 mg) to each participant and asked them to take the capsules only for menstrual pain relief just before or during the study cycle, unless they did not get enough pain relief with the capsules. We also asked them to record the number of capsules and any other drugs taken in a daily diary.

Sample size was calculated using G-power. Considering a mean Q-LES-Q-SF score of 80 in the group without PMS, SD1 = 14, SD2 = 18 extracted from a similar study conducted by Lacovides et al. [14], a significance level of 0.05, and a power of 80%, 51 individuals per group were needed to identify a 10% mean difference between-group comparisons. This sample size had a > 95% power to identify within-group comparisons of mean differences.

The data were analyzed using SPSS-version 21. One-sample Kolmogorov–Smirnov test was used to examine normal distribution of quantitative variables by the two study groups. We used two-way repeated-measures ANOVA for between- and within-group comparisons adjusted for the age of the participants. Since the effect of the phase and the interaction effect of the phase and group were significant, we used a paired *t* test for within-group comparisons and a univariate general linear model (ANCOVA) with age as a covariate for between-group comparisons in terms of mean total and each component quality score. Bonferroni correction was applied for multiple comparisons. The Wilcoxon signed-rank test was used for within-group comparisons of the rate of "overall life satisfaction and contentment during the past week."

## Results

We could approach 1592 (81%) of all students at the study settings during October 2016–July 2017. Among about 180 eligible women, 120 signed the written informed consent and were recruited into the study. Four of the recruited students were excluded from analysis; two of them (one from each group) could be followed up at none of the two time points and two (one from each group) were assessed only at one of the two time points. Finally, 52 students with PMS and 64 students without PMS were analyzed.

The two groups were similar in terms of all the sociodemographic and menstrual characteristics, except their age. The average age of the students with PMS was slightly lower than the average age of students without PMS (23.1 vs 24.3 years, $p = 0.034$). The mean age of the participants at the onset of dysmenorrhea was 15.1 (SD 2.8) years, and the body mass index was 21.0 (SD 3.3) kg/m$^2$. The reported menstrual pain intensity over the past six cycles and the number of ibuprofen capsules used during the study cycle were similar in the groups. The mean pain was 74.0 (SD: 14.1) on the 100-mm VAS. Eight students with PMS vs two without PMS used painkillers other than the ibuprofen capsules given to them ($p = 0.018$) (Table 1).

Among those with PMS, the most common reported symptoms with moderate severity that resulted in marked limitation of daily activity were irritability (59%), angry outbursts (57%), and fatigue (54%). Severe symptoms were reported by a few participants (Table 2).

The most common very poor/poor satisfaction was reported in "mood" and "leisure time activities" items of the Q-LES-Q-SF during the perimenstrual week (69% and 50% in those with PMS and 34% and 33% in those without PMS, respectively). Very poor or poor overall life satisfaction and contentment was reported by 13% of the students with PMS and 14% of those without PMS during the perimenstrual week, but by none of the students during the late follicular phase (Table 3). There was no statistically significant association between the participant group and the score of overall life satisfaction and contentment in any of the phases ($p = 0.650$ and $p = 0.741$, respectively). In within-group comparisons, the score was statistically lower during the perimenstrual week than during the late follicular phase in both groups ($p < 0.001$).

There was no significant relationship between some characteristics (age at menarche, interval between menarche and onset of dysmenorrhea, body mass index, menstrual pain intensity, and family history of dysmenorrhea) and the total Q-LES-Q-SF score in any of the phases. The score was significantly lower during the perimenstrual week in women aged < 25 years than in those aged ≥ 25 years ($p = 0.027$) but not during the late follicular phase ($p = 0.263$) (Table 4).

In both groups, the mean total quality score was significantly lower during the perimenstrual week than during the late follicular phase, with the score in women with PMS being 48 vs 79 [mean difference (MD) − 31, 95% confidence interval (CI) − 37 to − 26] and that of the group without PMS being 56 vs 78 (MD − 22, 95% CI − 27 to − 18). In

**Table 1** Characteristics of the students by the study groups

| Characteristics | Dysmenorrhea with PMS ($n=52$) | Dysmenorrhea without PMS ($n=64$) | $p$ value |
|---|---|---|---|
| Age (years) | 23.2 ± 2.7 | 24.3 ± 3.0 | 0.034* |
| Body mass index (kg/m$^2$) | 21.4 ± 3.2 | 22.3 ± 3.4 | 0. 274* |
| Age at menarche (years) | 13.5 ± 1.2 | 13.4 ± 1.7 | 0.562* |
| Age at onset of dysmenorrhea (years) | 14.9 ± 2.7 | 15.3 ± 2.9 | 0.450* |
| Length of usual menstruation period (days) | 6.2 ± 1.0 | 6.0 ± 1.1 | 0.374† |
| Family history of dysmenorrhea | 30 (64%) | 46 (72%) | 0.110‡ |
| Medical sciences students | 30 (58%) | 38 (59%) | 0.855‡ |
| Live in governmental dormitory | 25 (48%) | 32 (50%) | 0.837‡ |
| Education | | | 0.268† |
| Bachelor of Science | 39 (75%) | 46 (66%) | |
| Master of science | 10 (19%) | 16(25%) | |
| PhD/ General physician | 3 (6%) | 6 (10%) | |
| Regular exercise (yes) | 15 (29%) | 20 (31%) | 0.779‡ |
| Menstrual pain intensity in the last 6 cycles (using 100 mm VAS) | | | |
| Moderate (45–70) | 27 (52%) | 29 (45%) | 0.480‡ |
| Severe (> 70) | 25 (48%) | 35 (55%) | |
| Average menstrual pain | 74.0 ± 14.1 | 73.8 ± 14.3 | 0.928* |
| Ibuprofen use during the study cycle (Yes)¥ | 43 (83%) | 52 (81%) | 0.841‡ |
| Number of ibuprofen used | 2.1 ± 2.2<br>1 (1–3)§ | 2.0 ± 2.2<br>1 (1–3)§ | 0.559† |
| Use of other painkillers (Yes)¥ | 8 (16%) | 2 (3%) | 0.018 |

Data represent *n* (%), mean ± SD unless otherwise mentioned or; *PMS* premenstrual syndrome

*Independent two-tailed t-test

†Mann Whitney

‡Chi-squared test

§median (Q1–Q3)

¥All participants were asked to try to take only the 400 mg ibuprofen capsules for menstrual pain relief during the study cycle, if needed. The capsules were given to them by the investigator. They were asked to take other painkillers only in case of no pain relief with the ibuprofen capsules

both groups, such significant differences existed in both the physical and the psychosocial dimensions of QoL (Table 5 and Fig. 1).

In between-group comparisons, there were no significant differences between the groups at the late follicular phase in terms of any of the total and the dimensions of the QoL scores. During the perimenstrual week, the total score was significantly lower in the group with PMS (adjusted MD − 8, 95% CI − 13 to − 2); the component scores were also significantly lower in the group with PMS (Table 5 and Fig. 1).

## Discussion

The total Q-LES-Q-SF sore, also the scores of its two physical and psychosocial dimensions, were significantly lower over the perimenstrual week than during the late follicular phase in both groups of women suffering from dysmenorrhea with or without PMS. The scores were significantly lower in the group with PMS than in the group without PMS during the perimenstrual week but not during the late follicular phase.

Our study results are consistent with those of the pilot study conducted by Lacovides et al. [14]. They also showed that the mean Q-LES-Q-SF score in women with severe dysmenorrhea (≥ 60 mm on a 100-mm VAS) in the perimenstrual week was significantly lower than their own score during the late follicular phase (54 ± 18 vs 80 ± 14). The mean (SD) Q-LES-Q-SF scores in the study by Lacovides et al. were highly similar to those obtained during the perimenstrual phase in the group without PMS (55 ± 15) and also to scores during the late follicular phase in both groups with (79 ± 13) and without PMS (78 ± 13) in our study. However, the score was slightly greater than the score in the perimenstrual week in the group with PMS in our study. The study conducted by Lacovides et al. did not assess the PMS condition in the study participants.

**Table 2** Prevalence of premenstrual physical and emotional symptoms among students with PMS ($n=52$)

| Symptoms | Total | Severity of symptoms[b] | | |
|---|---|---|---|---|
| | Prevalence | Mild | Moderate | Severe |
| Emotional | | | | |
| Depression | 35 (67%) | 15 (29%) | 20 (38%) | 0 |
| Angry outbursts | 47 (90%) | 17 (33%) | 30 (57%) | 0 |
| Irritability | 48 (92%) | 17 (33%) | 31 (59%) | 0 |
| Crying spells | 36 (69%) | 14 (27%) | 21 (40%) | 0 |
| Anxiety | 12 (23%) | 9 (17%) | 3 (6%) | 0 |
| Confusion | 17 (33%) | 14 (27%) | 3 (6%) | 0 |
| Social withdrawal | 26 (50%) | 14 (27%) | 12 (23%) | 0 |
| Poor concentration | 18 (35%) | 13 (25%) | 5 (10%) | 0 |
| Insomnia | 6 (12%) | 1 (2%) | 5 (10%) | 0 |
| Increased nap taking | 27 (52%) | 5 (10%) | 22 (42%) | 0 |
| Changes in sexual desire | 16 (31%) | (23%) | 4 (8%) | 0 |
| Physical | | | | |
| Thirst and appetite changes | 28 (54%) | 20 (39%) | 8 (15%) | 0 |
| Breast tenderness | 40 (77%) | 32 (62%) | 7 (13%) | 1 (2%) |
| Bloating and weight gain | 28 (54%) | 23 (44%) | 5 (10%) | 0 |
| Headache | 7 (14%) | 2 (4%) | 5 (10%) | 0 |
| Swelling of the hands or feet | 13 (25%) | 11 (21%) | 2 (4%) | 0 |
| Aches and pains | 32 (62%) | 11 (21%) | 19 (37%) | 2 (4%) |
| Fatigue | 43 (83%) | 14 (27%) | 28 (54%) | 1 (2%) |
| Skin problems | 30 (58%) | 27(52%) | 3 (6%) | 0 |
| Gastrointestinal symptoms | 10 (19%) | 9 (17%) | 1 (2%) | 0 |
| Abdominal pain | 14 (27%) | 6 (12%) | 8 (15%) | 0 |

Data are presented as number (%), *PMS* premenstrual syndrome

On the basis of self-rating by participants, mild: no limitation of daily activity, moderate: marked limitation of daily activity, and severe: unable to carry out daily activity without discomfort

Our study results are also consistent with those of the study conducted by Baker et al. [22], which indicated a lower Q-LES-Q-SF score in women with severe PMS over the late luteal phase (assessed at 9–13 days after the luteinizing hormone surge flow) than that during their own follicular phase (assessed at 6–11 days of the cycle) ($48 \pm 7$ vs $54 \pm 6$). However, in the study by Baker et al. the size of the difference between the two phases appeared to be lower than the size in our study and the study by Lacovides et al. This may be related to the difference in the assessment time points.

When we reviewed the literature, we found no other study comparing QoL in the symptomatic phase with that in the non-symptomatic phase of women suffering from dysmenorrhea with or without PMS. However, some studies have assessed QoL at one time point in the cycle without taking menstrual phase into consideration, which indicated a negative effect of moderate and severe dysmenorrhea and PMS on the QoL of affected people. A large study conducted on 4032 women aged 15–45 years from 19 countries in different parts of the world [18] and another study in India conducted on 489 college students [19] showed increased work or school absenteeism and work productivity impairment in women with moderate-to-severe PMS.

Two cross-sectional studies conducted in Turkey showed significantly lower QoL in university students suffering from PMS than in those without PMS in terms of all the eight dimensions of QoL assessed by SF-36 [12] and also lower QoL in students suffering from dysmenorrhea in all but two dimensions (i.e., physical health and emotional role) and a negative relationship between the intensity of PMS and the QoL score [16].

Some cross-sectional studies conducted in Iran also showed significantly lower QoL in students suffering from PMS with PMDD than in those with PMS without PMDD in all the eight dimensions assessed by SF-36, except physical health dimension [28], and a significantly lower score in two of four dimensions of QoL (mental health and environmental) assessed by WHOQOL-BREF in university students with moderate or severe PMS [17].

Some studies have reported an association between dysmenorrhea and PMS [12, 29]. Previous studies [14, 22] have examined only a small number of participants affected with only one of the conditions. Our study has the strengths of analyzing two groups of women suffering from dysmenorrhea with or without PMS and the relatively large number of participants.

In this study, we diagnosed PMS based on retrospective symptoms reported by the participants instead of a prospective assessment of the symptoms. This may induce some errors in the differential diagnosis of subjects with and without PMS due to recall bias. To minimize the effect of such an error, we excluded those subjects with suspicious symptoms of PMS from the study.

In our study, participants were selected from among single dormitory students aged 18–30, and only a few participants reported severe symptoms of PMS. Therefore, the results might not be applicable to all women, especially those with severe PMS.

Moreover, we did not include a healthy control group with no or mild menstrual pain and without PMS. Therefore, we could not judge confidently about the QoL of the affected people in different phases of menstrual cycle compared with those not affected. This can be considered as a limitation of this study. The previous study results indicate no significant difference in QoL in subjects without dysmenorrhea [14] and in those without PMS [22] in the late luteal phase or the first cycle days compared to the QoL during their own late follicular phase, as well as no significance difference between the affected and the healthy control groups during

**Table 3** Percentage of very poor/poor and fair satisfaction for each item of Q-LES-Q-SF reported by the participants

| Items | Dysmenorrhea with PMS ($n=52$) | | Dysmenorrhea without PMS ($n=64$) | |
|---|---|---|---|---|
| | Perimenstrual week | Late follicular phase | Perimenstrual week | Late follicular phase |
| 1. Physical health | 38%, 34% | 2%, 11% | 27%, 39% | 3%, 6% |
| 2. Mood | 69%, 21% | 0%, 11% | 34%, 42% | 0%, 13% |
| 3. Work | 25%, 52% | 0%, 10% | 25%, 44% | 3%, 17% |
| 4. Household activities | 39%, 42% | 0%, 21% | 30%, 41% | 3%, 20% |
| 5. Social relationships | 33%, 42% | 0%, 15% | 23%, 39% | 0%, 9% |
| 6. Family relationships | 39%, 40% | 0%, 15% | 17%, 38% | 0%, 9% |
| 7. Leisure time activities | 50%, 33% | 0%, 19% | 33%, 39% | 5%, 17% |
| 8. Ability to function in daily life | 35%, 46% | 2%, 8% | 30%, 44% | 2%, 17% |
| 9. Sexual drive, interest, and/or performance | – | – | | – |
| 10. Economic status | 17%, 44% | 0%, 27% | 9%, 36% | 2%, 31% |
| 11. Living/housing situation | 17%, 48% | 0%, 19% | 11%, 42% | 2%, 16% |
| 12. Ability to get around physically without feeling dizzy or unsteady or falling | 23%, 40% | 2%, 17% | 11%, 42% | 0%, 14% |
| 13. Vision in terms of ability to do work or hobbies | 8%, 15% | 4%, 4% | 2%, 9% | 2%, 5% |
| 14. Overall sense of wellbeing | 23%, 52% | 0%, 10% | 11%, 50% | 0%, 19% |
| 15. Drug | 23%, 54% | | 4%, 10% | |
| 16. Overall life satisfaction and contentment during the past week | 13%, 52% | 0%, 12% | 14%, 56% | 0%, 5% |
| Raw sum score (13–65), median (Q1-Q3) | 38 (34–43) | 54 (50–59) | 42 (37–47) | 53 (50–58) |
| Percentage sum score, median (Q1-Q3) | 48 (40–58) | 79 (72–88) | 56 (46–65) | 78 (71–88) |

Data present % of very poor/poor, % of fair satisfaction unless otherwise indicated, the % of good and very good not shown

Q-LES-Q-SF: quality of life enjoyment and satisfaction questionnaire-short form, PMS: premenstrual syndrome

In the sum scores, higher scores indicating better enjoyment and satisfaction with life

Raw sum score was calculated by summing the first 14 items, except item 9 (sexual drive) which was not assessed and not included in any analyses, because the participants were single and there are cultural limitations to assess sexual function among singles

The percentage sum score was calculated using (raw sum score − 13)/(65–13) × 100

the late follicular phase. Therefore, it may be concluded that dysmenorrhea with or without PMS significantly reduces the QoL of affected women during the symptomatic days and may have no significant effect on QoL during symptom-free days. However, due to the indirectness and few number of studies with a low sample size resulting in imprecision of the results, the level of evidence in this area is very low.

Future studies using a more representative sample, with more comparison arms, including a healthy control group, with more frequent QoL assessments, and also assessment of other subjective and objective aspects of the quality, could provide higher level of evidence in this area.

## Conclusions

Dysmenorrhea with or without PMS significantly reduces QoL of women during the perimenstrual week. The QoL is slightly lower in group with PMS during the perimenstrual week but not during the late follicular phase. Further studies using a more representative sample, including a healthy control group and more frequent assessments of subjective and objective aspects of QoL, are needed to better clarify the impact of the condition on the affected people.

**Table 4** Relationship between some of participant characteristics and the total scores of Q-LES-Q-SF during two phases of menstrual cycle

| Characteristics | *n* | Perimenstrual | | Late follicular | | Change between two phases | |
|---|---|---|---|---|---|---|---|
| | | Mean (SD) | AMD* (95% CI), *p* | Mean (SD) | AMD (95% CI), *p* | Mean (SD) | AMD (95% CI), *p* |
| Age group (years) | | | | | | | |
| <25 | 79 | 53.8 (15.0) | 6.7 (0.8–12.5)* | 77.8 (13.2) | − 2.9 (− 8.0 to 2.2) | 23.9 (18.2) | −9.6 (− 16.8 to − 2.3)* |
| 25+ (Ref.) | 37 | 47.8 (15.8) | 0.027* | 80.4 (11.8) | 0.263 | 31.5 (19.0) | 0.010* |
| Age at menarche (years) | | | | | | | |
| ≤13 | 62 | 54.3 (15.1) | 4.2 (− 1.3 to 9.7) | 79.4 (12.5) | 1.9 (− 2.9 to 6.6) | 25.1 (17.9) | − 2.3 (− 9.2 to 4.5) |
| 14+ (Ref.) | 54 | 49.9 (15.4) | 0.131 | 77.6 (13.1) | 0.436 | 27.7 (20.2) | 0.500 |
| Interval between menarche and onset of dysmenorrhea (years) | | | | | | | |
| ≤1 | 68 | 54.3 (14.1) | 5.3 (− 0.2 to 10.8) | 79.1 (12.8) | 1.2 (− 3.6 to 6.0) | 24.8 (18.1) | − 4.1 (− 11.0 to 2.8) |
| 2+ (Ref.) | 48 | 49.4 (16.7) | 0.060 | 77.9 (12.9) | 0.624 | 28.4 (20.2) | 0.243 |
| Body mass index (kg/m$^2$) | | | | | | | |
| <25 | 98 | 52.6 (15.7) | 3.9 (− 3.6 to 11.8) | 78.7 (13.1) | − 2.1 (− 7.1 to 2.9) | 25.2 (19.1) | − 2.1 (− 9.4 to 5.2) |
| 25+ (Ref.) | 18 | 50.6 (13.3) | 0.295 | 80.0 (12.2) | 0.410 | 28.6 (18.7) | 0.573 |
| Menstrual pain intensity | | | | | | | |
| Moderate (45–70) | 56 | 52.5 (14.8) | 1.1 (− 4.5 to 6.6) | 77.6 (11.9) | − 2.0 (− 6.8 to 2.8) | 25.1 (18.7) | − 3.0 (− 9.9 to 3.8) |
| Severe (> 70) (Ref.) | 60 | 52.0 (15.9) | 0.705 | 79.5 (13.6) | 0.413 | 27.5 (19.3) | 0.383 |
| Family history of dysmenorrhea | | | | | | | |
| Yes | 76 | 52.7 (15.9) | − 0.2 (− 5.9 to 5.9) | 77.8 (13.1) | − 2.1 (− 7.1 to 2.9) | 25.2 (19.1) | − 2.1 (− 9.4 to 5.2) |
| No (Ref.) | 40 | 51.5 (14.5) | 0.995 | 80.0 (12.2) | 0.410 | 28.6 (18.7) | 0.573 |

*p < 0.05

*AMD* adjusted mean difference, adjusted for the group (with/without premenstrual syndrome), applying Bonferroni correction for the multiple adjustment, *Q-LES-Q-SF* quality of life enjoyment and satisfaction questionnaire-short form

**Table 5** Between and within groups comparison of scores of Q-LES-Q-SF during two phases of menstrual cycle

| | Dysmenorrhea with PMS (*n* = 52) | Dysmenorrhea with no PMS (*n* = 64) | Between groups comparison | |
|---|---|---|---|---|
| | | | MD (95% CI) | *p* value |
| Total quality | | | | |
| Perimenstrual | 48.0 ± 14.8 | 55.7 ± 15.0 | − 8.9 (− 14.4 to − 3.3) | 0.002 |
| Late follicular | 79.2 ± 13.0 | 78.0 ± 12.7 | 1.4 (− 3.8 to 6.3) | 0.563 |
| Within-group comparison | − 31.2 (− 36.6 to − 25.8) | − 22.4 (− 26.8 to − 17.9) | | |
| Physical dimension | | | | |
| Perimenstrual | 55.0 ± 16.4 | 61.7 ± 13.3 | − 7.5 (− 13.0 to − 1.9) | 0.009 |
| Late follicular | 80.2 ± 14.5 | 79.9 ± 13.6 | 0.2 (− 5.2 to 5.2) | 0.995 |
| Within-group comparison | − 25.1 (− 30.8 to − 19.4) | − 18.3 (− 22.2 to − 14.2) | | |
| Psychosocial dimension | | | | |
| Perimenstrual | 44.9 ± 15.7 | 53.0 ± 16.8 | − 9.5 (− 15.5 to − 3.4) | 0.002 |
| Late follicular | 78.8 ± 13.3 | 77.1 ± 13.1 | 2.1 (− 2.9 to 7.0) | 0.415 |
| Within-group comparison | − 33.9 (− 39.6 to − 28.2) | − 24.2 (− 29.2 to − 19.2) | | |

*Q-LES-Q-SF* quality of life enjoyment and satisfaction questionnaire-short form, *PMS* premenstrual syndrome

The scores indicate percentage of the total possible score with higher scores indicating better enjoyment and satisfaction with life

Two-way repeated-measures ANOVA (adjusted for age and for multiple comparison using Bonferroni) was used for between and within groups comparisons, Wilks' Lambda showed a significant effect of phase ($p < 0.001$ in total and the both dimensions) and phase *Group ($p = 0.012$ in total, $p = 0.045$ in physical and $p = 0.011$ in psychosocial dimension). Therefore, between groups comparisons were done using univariate general linear model (ANCOVA) with age as covariate, adjusted for multiple comparison using Bonferroni. Within-group comparisons was done using paired t-test

The data are presented as mean ± SD, unless otherwise indicated; Results of within-group comparisons are presented as MD (95% CI), $p < 0.001$ in all within-group comparisons

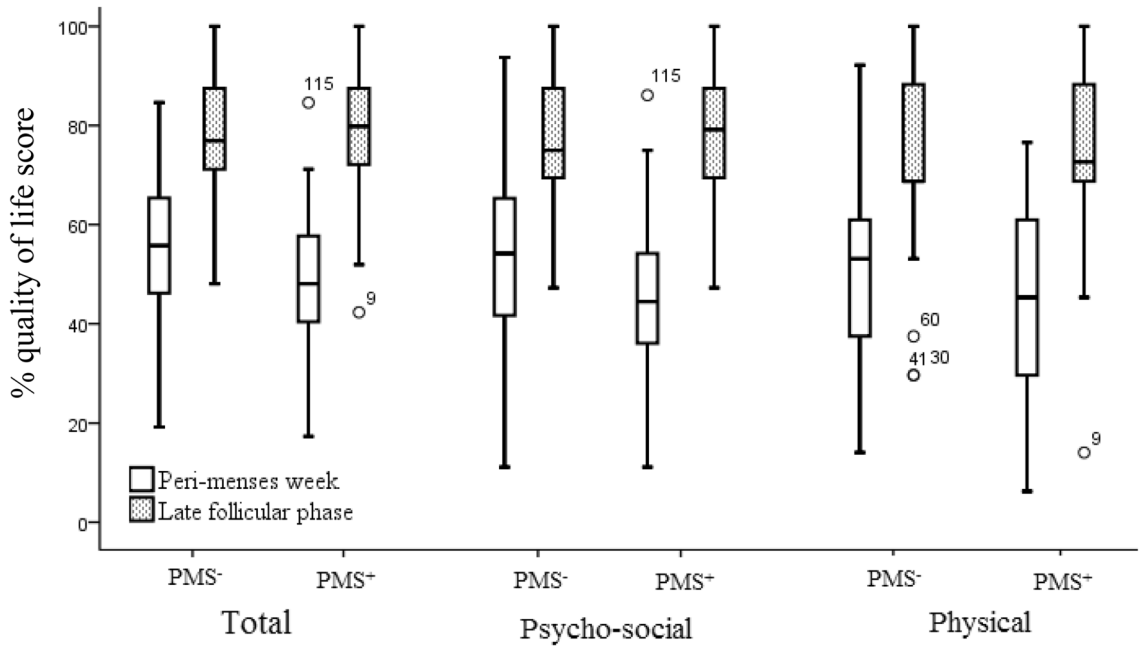


**Fig. 1** Comparison of total and dimensions of Q-LES-Q-SF score during two phases of menstrual cycle by study groups

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