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Effectiveness of a school-based health education program to improve the symptoms of premenstrual syndrome in high school girls in Ilam

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Abstract:

BACKGROUND: The premenstrual syndrome happens periodically and affects both the individual and family. The aim of this study was to determine the effect of the health education program on reducing premenstrual syndrome in high school girls in Ilam.

MATERIALS AND METHODS: This experimental study was conducted in girls' high schools in Ilam, in 2017–2018. In total, 120 students were enrolled in the study (intervention group = 61 and control group = 59) and selected through convenience sampling. In this study, a standard Premenstrual Symptoms Screening Tool (PSST) was used to diagnose students with premenstrual syndrome or Premenstrual Dysphoric Disorder (PMDD). The educational program for the intervention group was held in four sessions of 30 min for 4 consecutive weeks. The obtained data were analyzed by the SPSS statistical software at a significance level of less than 0.05.

RESULTS: The results showed a significant difference in the proportion of cases with moderate and severe PMS and PMDD between intervention and control groups in follow-up ($P < 0.001$). However, these proportions were not significantly different between the two groups in the baseline.

CONCLUSIONS: According to the results, the educational program can be recommended as an effective intervention for girls with moderate-to-severe premenstrual symptoms and premenstrual dysphoric disorder.

Keywords:

Health Education, premenstrual dysphoric disorder, premenstrual syndrome, students

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Introduction

Premenstrual syndrome (PMS) is a cyclical occurrence with physical and emotional symptoms that happens in the days before menstruation. Various definitions for this phenomenon have been reported so far. According to the American College of Obstetricians and Gynecologists (ACOG), PMS is a clinical circumstance that cyclically has somatic and emotional symptoms and is not caused by any disease. These indications are manifested in each of the three previous menstrual cycles over the 5 days before menstruation and vanished 4 days after the beginning of the phenomenon without return.[1,2]

More than 100 physical and psychological symptoms have been documented for PMS; the most popular of these symptoms include headaches, mood swings, bloating, depression, irritability, abdominal cramps, common pains, breast swelling, and anorexia.[3,4]

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Clinical studies show that three-quarters of women have PMS symptoms and about 3 to 8% of them have very severe symptoms of the syndrome.[3] Studies have also shown that at least one of the symptoms of PMS is present in 80 to 90% of women.[5] Studies on the prevalence of PMS have shown that about 50% of women suffer from this complication. Moreover, many studies on the syndrome prevalence in the Middle East region have been carried out during the past two decades. The findings of these studies showed that the prevalence rate of PMS among academic students was 71.9% in Palestine, 92.3% in Jordan, 80.2% in Egypt, and 63% in Lebanon.[3] An international review study reported that the lowest and highest prevalence of premenstrual syndrome was in France (12%) and Iran (98%), respectively.[6] Various studies indicated that the rate of premenstrual syndrome is high among academic students. Longitudinal and epidemiological studies have shown a diverse prevalence of premenstrual syndrome. In studies conducted among high school students in different countries, the prevalence of PMS has been stated to be 32.7–99.5%.[7-10] For example, the PMS prevalence in Japan, Korea, and Ethiopia has been reported to be 84.3%,[11] 42.4%[12], and 75.4%, respectively.[13] Also, a review study on 24 documents expressed that the prevalence of premenstrual syndrome in Iranian high school students was 80.4%.[14]

The severity symptoms of PMS in 2.5% to 3% of women are so high that it affects their social life. This problem is known as premenstrual dysphoric disorder (PMDD), which is one of the most severe forms of PMS and is considered a psychiatric disorder.[5] PMDD affects 3–9% of menstruating women.[15] In another study, overall 3.8% of participants between the age of 17–30 years old suffered from PMDD.[16]

PMS has severely disrupted women's lifestyles, family relationships, quality of life, and social interactions.[17,18] Mood disorders as one of the most important complications resulting from PMS in women[19] and have a negative effect on the presence and academic performance of individuals and their success in school.[20-22]

Different treatment protocols have been recommended because of the unclear pathophysiology of premenstrual syndrome. Many non-pharmacological and pharmacological treatment procedures have been reported to reduce PMS symptoms. Pharmacotherapy, mainly selective serotonin reuptake inhibitors (SSRIs), is employed to treat severe symptoms.[23] Medication is often used as the first step in treating women with PMDD.[24]

Non-pharmacological treatment methods are frequently applied to treat mild symptoms of the syndrome. The most important non-pharmacological treatments include lifestyle changes, such as regular exercise, proper nutrition, regular sleep, hot showers, and using multivitamins.[25-27] Usually the first and best option for treating PMS syndrome is lifestyle alteration, which has a great impact on solving this problem.[23] According to studies, health education through behavioral changes can also play a vital role in preventing premenstrual syndrome or controlling the severity of the syndrome.[19,27,28]

Abootalebi *et al*. (2020)[29] study indicated that the mean severity of the premenstrual syndrome and its physical complaints, level of anxiety, sleep disorder, level of social functions disorders, and depression were significantly lower in the intervention group following group counseling. Also, an educational intervention based on the health belief model (HBM) to improve PMS by Ayaz-Alkaya *et al*. (2020)[19] presented that education had a noteworthy consequence on the studied group.

Given that the most common age of onset of PMS symptoms is adolescence and youth, by introducing PMS, adolescent girls can be encouraged to better understand these symptoms and their management strategies. Due to the negative effects of the syndrome on behavior and performance especially in adolescent girls, the first step in promoting their health is to increase their awareness level through educational programs. Awareness of physiological status and hormonal changes in the body, lifestyle changes (physical activity and nutrition), training to control stress, anger control, and group counseling are effective to reduce mood-behavioral symptoms of this syndrome. In this regard, the present study was carried out to investigate the effect of health education on improving symptoms of premenstrual syndrome in high school girls in Ilam, Iran.

Materials and Methods

Study design and setting

This study was experimental that was performed with two intervention and control groups. The study population consisted of high school girl students in Ilam, west of Iran. These high schools were part of governmental high schools and were located in three different parts of Ilam. They also had the same cultural and economic conditions and represented the girls' high school students in the city of Ilam.

Study participants and sampling

The study sample was selected through convenience sampling, which started in December 2017 and ended in March 2018.

Inclusion criteria were satisfaction with entering the study, being single, ages 15 to 18 years, and regular and

normal menstruation (with intervals of 21 to 35 days and duration of 3 to 7 days) during the last 6 months. Criteria such as known physical and mental illnesses that affect the subject matter, occurrence of stressful events such as the death of loved ones, separation of parents, bankruptcy in the family, accidents from 3 months before the start of the study, participation in other studies, lack of cooperation to continue participating in the study, an incomplete or incorrect record of daily forms, absence from some training sessions were considered as exclusion criteria.

According to the study by Bakhshandehnosrat *et al*.,[30] the sample size required for the intervention study calculated with a prevalence of 22.8%, difference 25%, $\alpha = 0.05$, and $\beta = 0.2$. The required sample of the study was equal to 59 people, which was estimated to be equal to 65 people in each group, taking into account the 10% drop in the study. The study sample was estimated with the following formula:

$$n = \frac{2p(1-p)}{d^2}\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 = \frac{2\times 0.228(1-0.228)}{0.25^2}$$

$$(1.96+12.8)^2 \cong 59\times 10\% \cong 65$$

To diagnose students with PMS and PMDD, the standard Premenstrual Symptoms Screening Tool (PSST) was provided to 330 high school students for two 35-day cycles in two separate stages. The questionnaire was filled out in such a way that each person had to record their mood, behavior, and physical changes from 7 days before menstruation to the fourth day of menstruation in a daily cycle.

Firstly, 295 completed questionnaires were collected from 330 students. According to inclusion and exclusion criteria, 29 students were excluded. Hence, 266 people were sorted according to the mean score of premenstrual syndrome, and the highest scores (129 people) were selected for the study. Out of 129 students, using the random allocation method, 64 people from one high school were assigned to the intervention group and 65 people in the other two schools were assigned to the control group. The flowchart of the study is shown in Figure 1.

Data collection tool and technique

To collect the data, questionnaires of demographic characteristics, menstrual information, and menstrual symptoms (PSST) were used. Demographic information included age, educational background, height, weight, parents' education level and occupation, and data related to the socioeconomic status of the family. The menstrual information questionnaire included items about the age of onset of the first menstrual period, pain intensity, and medication used to reduce pain and the length of the period. The PSST questionnaire consisted of 19 items in two parts. The first part included 14 items to measure physical, psychological, and behavioral symptoms such as anger/irritability, anxiety/stress, fatigue, oversleeping, headache, and weight gain and the second part included 5 items to measure the effect of these symptoms on people's lives. These questions are about job/academic efficiency and communication with colleagues. This questionnaire was designed by McMaster University of Canada,[31] and its Persian version was standardized by Siahbazi *et al*.[32] in the Iranian population.[32] In this questionnaire, each item was evaluated on a four-part spectrum at all, mild, moderate, and severe, with a score of zero indicating no symptoms and a score of three indicating severe symptoms that prevented daily activities and the person is required to use painkillers. The PSST converts the DSM-IV classification criteria into a grading scale based on disease severity.[31]

To diagnose moderate-to-severe PMS, the following three conditions must be met at the same time: firstly, from items 1 to 4, at least one case must be moderate to severe; secondly, in addition to the previous case, there should be at least four moderate to severe cases from items 1 to 14 and third, there should be one moderate to severe case in last 5 items (the effect of symptoms on life).[32]

To diagnose PMDD, the following three conditions must be met: at least one case from items 1 to 4 must be severe, at least 4 cases from items 1 to 14 must be moderate to severe in addition to the previous case, and one severe case must be there in the section of the effect of symptoms on the life.[32,33]

To determine the severity of the premenstrual syndrome, the total scores of the severity of premenstrual symptoms from 7 days before menstruation to a maximum of the first 4 days of menstruation were summed and divided by the number of symptomatic days for each person. Then, the obtained numbers were interpreted based on the criteria of the PSST questionnaire.[34] The validity of the questionnaire was previously confirmed by Siahbazi *et al*.[32] for the Iranian population and the reliability of this tool was calculated using Cronbach's alpha coefficient of 0.9.

Using the information obtained from the baseline measurement, a health education program was designed for the intervention group in four 60-minute sessions in consecutive weeks. In the first session topics such as menstrual physiology, premenstrual syndrome (including concept, symptoms, adverse effects on various aspects of life and explaining the ways to

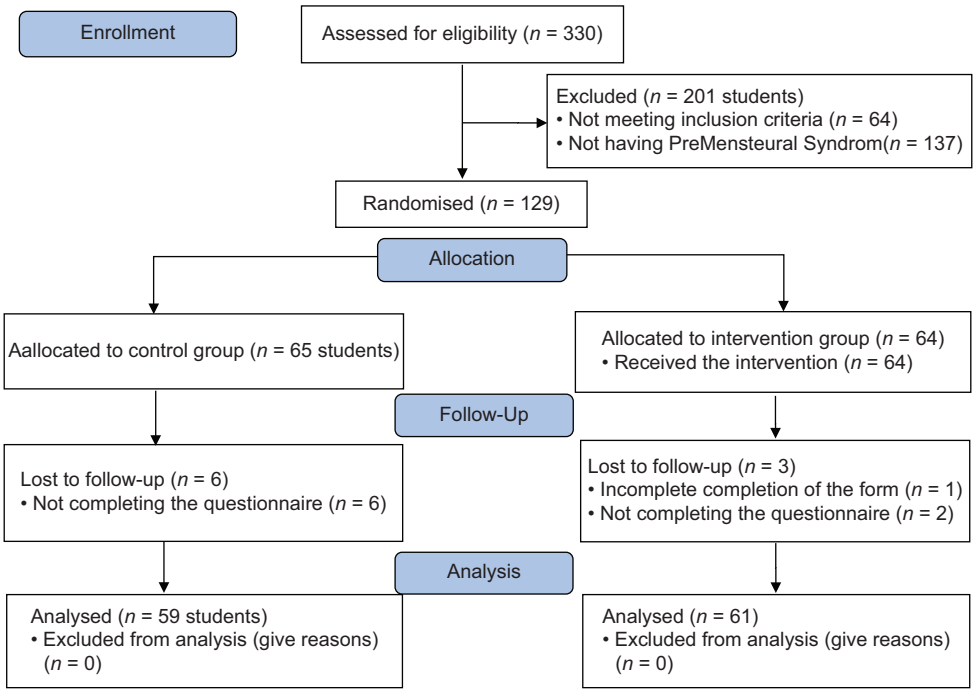

Figure 1: Flow chart for study

overcome them the researcher), expressing the most important points related to diet and physical activity, and their effect on improving premenstrual symptoms were presented. Ways to control stress and anxiety and their relationship with the premenstrual syndrome were discussed in the second session. Depression and negative mood and ways to control it, problem-solving skills and relaxation exercises, and their positive effect on the mind, body, and premenstrual symptoms were explained in the third session. Anger control skills, coping with aggression, time management skills, planning, and prioritizing daily activities, and finally providing appropriate and important solutions using related examples were discussed in the fourth session.

During the health education program, students' participation was maintained in discussions by colloquy. To facilitate discussions for shy students who were not strong to communicate face to face, telephones and virtual networks such as Telegram and WhatsApp were used. Also, the researcher also held private counseling sessions at the school if needed.

A 1-h session was held for mothers to understand the symptoms of PMS and obtain essential knowledge of how to help their daughters for managing the symptoms. Three months after the end of the health education program, a follow-up measurement of premenstrual symptoms was performed. It is worth mentioning that a health education program with the same content as the intervention group was held for the students in the control group at the end of the study.

Data analysis plan

The data were analyzed by SPSS version 22, IBM CO. New York, (USA). Chi-square, independent sample *t*-test, paired *t*-test, one-way ANOVA, and stepwise regression were used to analyze data at *P* value less than 0.05 (confidence interval: CI = 95%).

Ethical consideration

This study was registered by the ethics committee of Ilam University of Medical Sciences and approved. The objectives of the study were explained to the students, and their written informed consent was obtained. Confidentiality of information was ensured and participants were allowed to withdraw from the study if they encountered a problem that might prevent them to continue the study. This trial was also registered in the Clinical Trial Registration Center of Iran (IRCT2014111519967N1).

Results

In total, 61 people in the intervention group (5% dropout) and 59 people in the control group (9.5% dropout) completed the study. The mean age of students was 16.34 ± 0.94 and their mean menarche age was 13.22 ± 0.98. There was no significant difference between the two groups in terms of demographic variables [Table 1].

The results of the independent *t*-test showed that the intervention and control groups did not have a significant difference in terms of the 19 symptoms of

premenstrual syndrome's mean at baseline ($P > 0.05$). Although there were significant differences in terms of the 19 symptoms of premenstrual syndrome mean between the two groups at follow-up [$P < 0.001$; Table 2].

Table 3 presents the regression model of the factors affecting premenstrual syndrome. The model with group variable, baseline score of PMS, and father's job explained 54.6% of changes in premenstrual syndrome at follow-up. Accordingly, by increasing one point in the baseline total score of PMS, 0.392 was added to the follow-up total score of PMS. Regarding the group variable, it can be inferred that the rate of symptom improvement in the intervention group was 13.59 times that of the control group. Regarding the father's job as a measure of the socioeconomic status of the household, the rate of symptom improvement following intervention in students whose fathers were unemployed was 4.595 times that of students whose fathers were employees. Among these three factors, the strongest effect was related to the group variable (Beta = –0.672, $P < 0.001$), and the lowest was related to the father's job (Beta = 0.278, $P < 0.001$).

The mean change of 19 symptoms of premenstrual syndrome following educational intervention indicated significant differences for the intervention group ($P \leq 0.001$). The most and the least amount of change was related to decreasing interest in social activities and difficulty concentrating respectively [Figure 2].

Table 1: Frequency distribution of demographic characteristics of research samples in control (*n*=59) and intervention (*n*=61) groups

	Intervention *n* (%)	Control *n* (%)	*P*
Grade			0.717
Second	29 (47.5)	30 (50.8)	
Third	32 (52.5)	29 (49.2)	
Fathers' level of education			0.814
Illiterate	7 (11.5)	9 (15.3)	
Diploma and under	43 (70.5)	39 (66.1)	
Academic	11 (18.03)	11 (18.6)	
Mothers' level of education			0.464
Illiterate	6 (9.8)	10 (9.16)	
Diploma and under	49 (80.3)	45 (76.3)	
Academic	6 (9.8)	4 (6.8)	
Father's occupation			0.128
Unemployed	8 (13.1)	3 (5.1)	
Employed	53 (86.9)	56 (94.9)	
Mather's occupation			0.169
Housekeeper	58 (95.1)	52 (88.1)	
Employed	3 (4.9)	7 (11.9)	
Family's socioeconomic status			0.446
Low	16 (26.2)	12 (20.3)	
Moderate/good	45 (73.8)	47 (79.7)	

Figures 3 and 4 show the proportion of cases with PMS and PMDD in baseline and follow-up. As can be seen, there was a 35% decrease in the proportion of cases with moderate to severe PMS ($P < 0.001$) and a 7% decrease in the proportion of cases with PMDD ($P < 0.05$) in the intervention group. The proportion of cases with moderate-to-severe PMS and PMDD did not change significantly in the control group.

Discussion

PMS is a health problem for many women, but they can experience this period with less difficulty by making changes in their lifestyle. There is no definite treatment for PMS, and the focus is often on non-pharmacological treatments that can be effective while having fewer side effects.[19,35]

The decrease in the proportion of cases with PMS from 47% before the health education program to 12% after that (equivalent to 35%) in the intervention group is consistent with previous studies including those by Dehnavi, Taghizadeh, Izadi, and Ather that used health education program and counseling to reduce the severity of the premenstrual syndrome.[27,36-38] It seems that the use of various methods of face-to-face and group health education, as well as counseling, can be very effective in reducing the symptoms of premenstrual syndrome. For example, Taghizadeh *et al*. (2013), had reported that group counseling could reduce the overall severity of PMS, and physical, psychological, and mood symptoms associated with PMS. A positive effect on depression has been reported following the

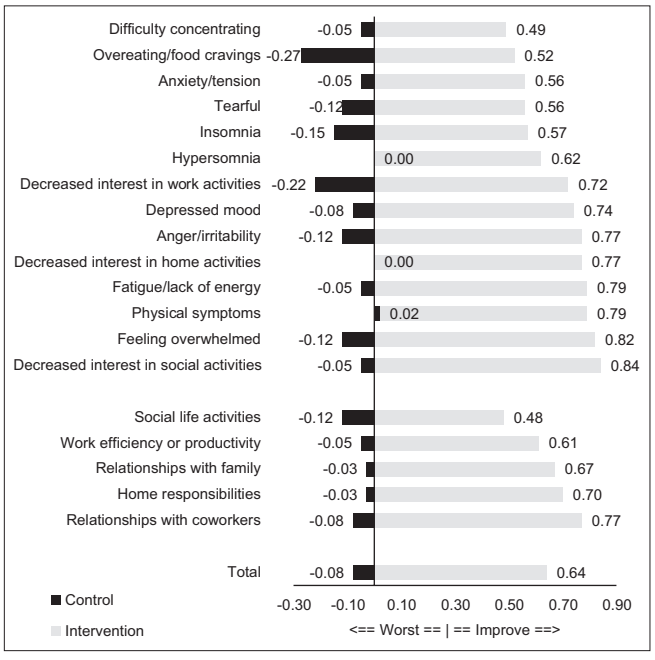

Figure 2: Mean changes of premenstrual syndrome's symptoms in the intervention and control groups

Table 2: Mean and standard deviation of symptoms of PMS in the intervention and control groups at baseline and follow-up

	Baseline			Follow-up		
	Intervention	Control	*P*	Intervention	Control	*P*
Anger/irritability	1.92±0.64	2.00±0.87	0.557	1.15±0.54	2.12±0.72	<0.001
Anxiety/tension	1.67±0.79	1.83±0.89	0.305	1.11±0.64	1.88±0.72	<0.001
Tearful	1.67±0.72	1.63±0.93	0.767	1.11±0.78	1.75±0.96	<0.001
Depressed mood	1.82±0.81	1.83±0.83	0.942	1.08±0.64	1.92±0.75	<0.001
Decreased interest in work activities	1.77±0.82	1.80±0.87	0.866	1.05±0.64	2.02±0.75	<0.001
Decreased interest in home activities	1.93±0.75	1.93±0.74	0.987	1.16±0.58	1.93±0.72	<0.001
Decreased interest in social activities	1.79±0.69	1.78±0.77	0.957	0.95±0.59	1.83±0.70	<0.001
Difficulty concentrating	1.98±0.76	2.00±0.87	0.913	1.49±0.81	2.05±0.75	<0.001
Fatigue/lack of energy	2.03±0.63	2.12±0.74	0.497	1.25±0.54	2.17±0.65	<0.001
Overeating/food cravings	1.44±0.72	1.22±0.91	0.140	0.92±0.69	1.49±0.88	<0.001
Insomnia	1.56±0.72	1.34±0.94	0.155	0.98±0.67	1.49±0.86	<0.001
Hypersomnia	1.69±0.76	1.68±1.07	0.951	1.07±0.77	1.68±0.94	<0.001
Feeling overwhelmed	1.80±0.77	1.66±0.86	0.343	0.98±0.53	1.78±0.77	<0.001
Physical symptoms	2.08±0.74	1.98±0.86	0.500	1.30±0.69	1.97±0.76	<0.001
Work efficiency or productivity	1.61±0.76	1.64±0.78	0.790	1.00±0.68	1.69±0.81	<0.001
Relationships with coworkers	1.69±0.74	1.53±0.70	0.220	0.92±0.64	1.61±0.79	<0.001
Relationships with family	1.74±0.75	1.66±0.82	0.594	1.07±0.70	1.69±0.77	<0.001
Social life activities	1.56±0.72	1.53±0.70	0.806	1.08±0.64	1.64±0.69	<0.001
Home responsibilities	1.74±0.68	1.63±0.85	0.432	1.03±0.63	1.66±0.82	<0.001
Total	33.49±6.80	32.78±7.65	0.590	20.70±7.25	34.37±7.76	<0.001

Table 3: Stepwise linear regression analysis: major predictors of PMS after intervention

Model	Unstandardized coefficients		Standardized coefficients	*t*	Sig.
	B	Std. error	Beta		
(Constant)	-6.204	17.473		-0.355	0.723
Group	-13.591	1.379	-0.672	-9.854	0.000
Father's occupation	4.595	2.258	0.131	2.035	0.044
Baseline's Score	0.392	0.091	0.278	4.312	0.000

Group (control=0, intervention=1); Father's occupation (unemployed=0, employed=1); Baseline score (0-57); R^2=0.546

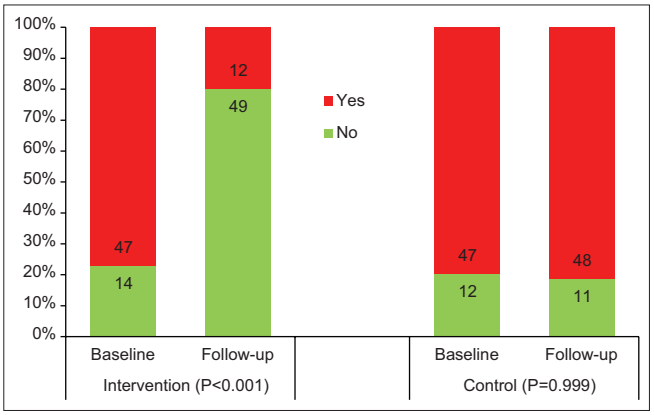

Figure 3: Frequency distribution of PMS in the intervention and control groups at baseline and follow-up

health education program in the present study, but it was not reported by Tghizadeh *et al*.[36] One of the differences between the two studies was the educator. In the Taghizade study, the intervention was provided by professional health care staff including a nurse or midwife but in the present study, a health educator performed the intervention under the supervision of a psychologist and midwife. Also, the content of the intervention on the subject of depression was not the same in both studies. This point could also lead to different results of two studies on depression. Another explanation for this may be the season in which the measurements and intervention were performed, as the time of measurements and intervention may be different in the two studies. Another study has shown an association between depressive symptoms and seasonal patterns in young people.[39]

Also in this study, the proportion of PMDD cases decreased by 7% in the intervention group and increased by 3% in the control group. Considering that the intervention group received the health education program, it can be concluded that the health education provided in this study has led to a reduction in cases of PMDD. Weise *et al*.[40] conducted a study in which internet-based educational intervention focusing on various aspects of premenstrual syndrome such as cognitive, psychological, and lifestyle was presented. They reported a significant reduction in PMDD symptoms in the intervention group compared to the control group, which is consistent with the results of the present study. Similarly, in the present study, the cognitive, psychological, and lifestyle aspects of premenstrual syndrome were discussed during the health education intervention. Therefore, the similarity in focusing on the issues raised in the educational

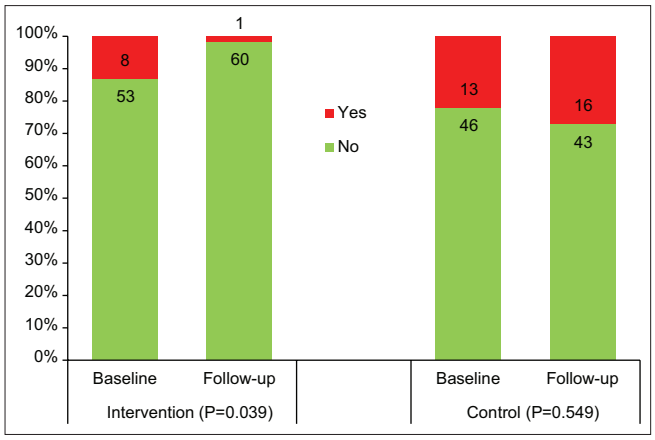

Figure 4: Frequency distribution of PMDD in the intervention and control groups at baseline and follow-up

intervention between the two studies can be the reason for the similarity of the results obtained.

The severity of physical, psychological, and behavioral symptoms associated with premenstrual syndrome was significantly reduced in the intervention group. In this study, despite the similar results of the fourteen premenstrual symptoms between the two groups in the baseline, a significant difference was found between the intervention and control groups in the follow-up. The fourteen premenstrual symptoms decreased significantly after the health education program in the intervention group. These results are consistent with that of the study by Alkaya *et al*.[19] These findings suggest that health education is effective in changing lifestyle, improving the symptoms, and finally coping with PMS.

The present study focused on dietary changes including reducing caffeine, salt, and simple sugars, and increasing the ratio of complex carbohydrates and vitamin B6 in the diet on days close to menstruation as an essential component of educational content. It seems that the recommendations have played a positive role in reducing the severity of the symptoms.

Dietary change is based on the theory that increasing the intake of complex carbohydrates in comparison with other circulating neutral amino acids increases the ratio of the amino acid tryptophan. This amino acid is one of the precursors of serotonin that increases the serum level of serotonin and leads to improved mood in patients.[36] The direct relationship between dietary changes and the reduction of premenstrual syndrome symptoms has been reported by other studies.[21,41]

In assessing 14 PMS symptoms in this study, the highest and the lowest improvements by health education intervention were related to the decrease in interest in social activities and difficulty concentrating, respectively. Also, in the last 5 items, the highest and the lowest effect was related to communication with colleagues and social life, respectively. Unfortunately, we could not up to this time find a similar intervention study in the field of health education based on which the results of the two studies could be compared.

In the present study, the highest rate of improvement in total PMS was observed in the intervention group (13.59 times). Also, those students whose fathers were unemployed reported a greater improvement in premenstrual symptoms (4.55 times) than students whose fathers were employed. In other words, students with lower socioeconomic status were more affected by this program than other students. Hence, the acquisition of information provided the basis for a change in their attitudes and behavior. The results of the present study showed the positive effect of the health education program on promoting students' health behaviors and subsequently improving symptoms and reducing the severity of the premenstrual syndrome.

Limitation and recommendation

Prospective recording of premenstrual symptoms is one of the strengths of this study. There were also limitations in this study. These limitations include the self-reporting nature of the collected data which was inevitable, and for this reason, there was a possibility of inaccuracy in completing the forms. However, the researcher tried to control this limitation with regular monitoring and detailed explanations on how to complete this form. The data obtained from this study is not random and it can vary from one individual, culture, and community to another individual, culture, and community. Hence, it cannot be generalized.

Conclusion

In general, the findings showed that the proposed educational program could reduce the severity of premenstrual syndrome in high school adolescent girls. Because premenstrual syndrome is a disorder with widespread symptoms, comprehensive interventions should be implemented for its prevention and treatment. It would be valuable to conduct a similar study with a long-term follow-up to assess the long-term effectiveness. Also, similar interventions can be applied to other groups of students with different socio-cultural situations and students with special diseases to increase the reliability of findings to generalize to other situations.

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Conflicts of interest
There are no conflicts of interest.

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