

Comparing the Effects of Vitamin B1 and Calcium on Premenstrual Syndrome (PMS) among Female Students, Ilam- Iran

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Abstract

Background

Premenstrual syndrome (PMS) is a combination of physical, psychological and emotional symptoms that occur periodically before menstruation and disappear with the onset of menstruation. There are some therapeutic methods mostly according to the clinical trials that reduce the prevalence and intensity of symptoms of PMS by unknown mechanisms. This study aimed to investigate the effects of Calcium and vitamin B1 on Premenstrual syndrome among female students.

Materials and Methods: This is a triple-blind clinical trial conducted on 210 female students living in dormitories of Ilam University of Medical Sciences who had PMS. PMS symptoms questionnaire was used to investigate the symptoms. Participants were assigned in 3 groups of 70 people with the following regimen: group 1 received one pill containing 100 milligrams vitamin B1, group 2 received Calcium pills and group 3 received placebo. The participants in all groups took medicines for 2 months and then reported the intensity of their symptoms by the questionnaire. The collected data was analyzed by descriptive and inferential statistics, using SPSS-16.

Results: In groups receiving vitamin B1, Calcium and placebo, the intensity of physical and psychological symptoms as well as general symptoms of PMS had a remarkable reduction ($P < 0.05$). However, comparison between intervention and control groups showed that the reduction in intensity of symptoms in groups receiving supplements (vitamin B1 and Calcium) ($P < 0.05$). Vitamin B1 and Calcium had equal effects on improvement of physical symptoms of PMS, but Calcium reduced psychological symptoms better than vitamin B1.

Conclusion: Results of this study showed that both vitamin B1 and Calcium reduce physical symptoms of premenstrual syndrome, but in terms of reducing psychological symptoms Calcium was more effective.

Key Words: Calcium, Female Students, Premenstrual Syndrome, Vitamin B1.

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1- INTRODUCTION

Premenstrual syndrome (PMS) is one of the most prevalent disorders during reproductive age which is seen regularly in most of menstrual cycles and is related to luteal phase of menstruation period (1, 2). This disorder encompasses a group of physical and psychological changes that happen 7 to 14 days prior to menstruation and will disappear with initiation of menstruation. In some cases the intensity of symptoms is such that interferes with personal works, every day activities, social activities and family relationships (3- 5).

The prevalence of PMS has been between 10 to 90 percent in different studies and the main reason of this wide range is the difference in definitions, diagnostic criteria and demographical characteristics (6-8). Some factors like age, menstruation characteristic, socioeconomic status, education level, consumption of hormonal medicines and life style including diet and physical activity may affect PMS (6, 9).

Patients with PMS have reported about 150 physical and psychological symptoms including abdominal discomfort, headache, backache, edema, weight gaining, breast tenderness, bloating, increased appetite, palpitation, restlessness, increased stress, change in sleeping habits, moodiness, isolation and withdrawal, change in everyday activities, absenteeism, lack of concentration, crying, depression, irritability, aggression and so on (10-12). This disorder may also lead to more serious problems like marital relationship disruption, mother- child relationship problems, social isolation, reduced attention, increase in psycho-somatic diseases complains and even criminal behaviors and tend to suicide (13-14). This issue not only leads to anxiety and reduced quality of life for women, it has a negative effect on economic indices directly via increased treatment costs and indirectly via absenteeism and reduced productivity at work; therefore, it is necessary to treat

PMS (15). Because of uncertainty about pathophysiology of this syndrome, many treatment protocols and more than 300 treatments have been recommended to relieve symptoms of this syndrome (16). The treatment recommendations include: treatment with drug (like taking anti-depression and anti-anxiety drugs), taking oral supplements (like Bromocriptine, vitamins, Calcium, Magnesium), consumption of natural products (like herbal extracts and oils such as primrose oil), changing the life style (like having exercise and diet and so on) and behavior therapy (15). The main goal of PMS treatment is controlling symptoms such that patient has a proper function during all levels of menstruation (14).

Vitamin B1 (Thiamin) is one of the oral supplements used to treat PMS. This vitamin may reduce symptoms of PMS via coenzyme function in metabolism of carbohydrates, lipids, proteins and the main amino acids that have a role in incidence of physical and psychological symptoms of PMS (17). In this study, vitamin B1 was in form of pills containing 100 milligram vitamin B1 which was taken twice a day.

Another oral supplement used to treat PMS is Calcium. According to the studies Calcium may affect the physical and psychological aspects of PMS (18). Changes in the cellular Calcium concentration may have some stimulating effect on neuromuscular connections, irritability, fatigue, anxiety, behavioral changes, depression and muscular cramps (19, 20). In this study Calcium supplement was in form of pills containing 500 milligram Calcium carbonate.

Many studies have been conducted on PMS treatment. In the recent studies more attention has been paid to new therapeutic methods that are according to clinical trials and through some unknown mechanisms lead to the reduction in prevalence and severity of disturbing symptoms of PMS.

Prescription of Calcium and various regimens of vitamin B are also among those treatment methods (21). A few studies in Iran have shown the effect of each treatment on reducing PMS symptoms. However these studies have not exactly determined the amount of their effectiveness and also they have not shown the best therapeutic method. Considering the importance of PMS and low cost of its treatment with supplements, this study aimed to compare the effect of Calcium and vitamin B1 on PMS in female students in Ilam city, Iran (**Figure.1**).



Fig.1: Location of Ilam city, Iran

2- MATERIALS AND METHODS

2-1. Study design and Population

This is a triple-blinded clinical trial conducted on female students living in dormitories of Ilam University of Medical Sciences, Iran.

According to the similar studies (23, 24) and by using the following formula, and also considering the 95% confidence interval(CI), 80% test power, $\bar{x}_1 = 12.2$, $SD_1 = 24.1$, $\bar{x}_2 = 1.6$ and $SD_2 = 16.6$, the

sample size was calculated to be 216 people.

$$n = \left(Z_{1-\alpha/2} + Z_{1-\beta} \right) \left(\sigma_1^2 + \sigma_2^2 \right) / \left(\mu_1 - \mu_2 \right)^2$$

where, $\sigma_1 + \sigma_2$ is the difference of variance between two study populations, Z : is the normal distribution, β the chance of type two errors, α : the chance of type one error and $\mu_1 - \mu_2$ the mean difference between two study populations.

At the beginning of the study, 400 students completed the PMS questionnaire that 234 of them had moderate to severe PMS symptoms. 24 students withdrew the study and ultimately 210 students were studied. Participants were randomly assigned in to 3 groups of 70 people including: group 1 receiving tablets containing 100 milligrams vitamin B1 (made in Shimidaroo Company, Tehran, Iran), group 2 receiving tablets containing 500 milligrams Calcium (made in Shimidaroo Company, Tehran, Iran) and group 3 receiving placebo.

It must be mentioned that the placebo was a tablet containing 1 gram starch. Participants did not know in which group they are. Personnel also did not know anything about people in each group and just giving the drugs which were packed in similar packages to the participants.

The first group took a pill containing 500 milligrams of Calcium carbonate once a day, the second group 100 milligrams of vitamin B1 once a day and the third group a placebo containing 1 milligram of starch once a day.

The distribution of supplements and monitoring its consumption was done by trusted personnel and the main executors of the plan by visiting dormitories regularly once a week. According to the formula, the sample size was 216. At the beginning of the study 400 questionnaires were distributed among students and 234 people were diagnosed by PMS.

2-2. Measuring tools

The PMS symptoms questionnaire was given to the qualified people. The questionnaire was derived from Bakhshae et al.'s study (22) and contained 2 parts. The first part included the demographical questions such as age, field of education and marital status and the second part included 21 self-reporting questions which were assessing the frequency and severity of PMS symptoms, 10 questions about psychological symptoms and 11 questions about physical symptoms of PMS. Items of these questionnaire, is derived from DMS-IV diagnostic criteria for pre-menstruation dysphoric disorder and PMS symptoms and is known as a reliable questionnaire. Students were asked to mark their signs and symptoms during last 2 menstruation cycles and by this way having PMS was proven. In contrast, those who had at least 5 symptoms of PMS with the intensity of moderate and more, form 7 days before to 4 days after menstruation and during last two menstruation cycles were diagnosed as a person with PMS (those who had reported slight symptoms were not considered with PMS).

Participants were asked to take a pill per day from 7 days before to 4 days after the menstruation for two menstruation cycles and then mark the intensity of their symptoms in the questionnaire. At the end of the study questionnaires were collected and the mean of the intensity of symptoms was calculated. The mean intensity of symptoms was calculated by adding the intensity of symptoms from 7 days before to 4 days after menstruation and dividing that to the number of days. The minimum score was 0 and the maximum was 57.

The scoring was according to the intensity of symptoms felt by participants, such that not to feel any symptom was scored zero, slight symptoms 1, moderate symptoms 2, relatively high symptoms 3 and intensive symptoms was scored 4. The Cronbach's alpha coefficient for the questionnaire was

calculated to be 0.8. In order to determine the reliability and also content and face validity of the questionnaire, 11 copies of that was given to 11 specialists in nutrition, midwifery and gynecology to verify the content. Overall each participant took 22 pills during the study and they were asked to consume them in one hour after a meal.

2-3. Inclusion Criteria

Inclusion criteria were: age of 18-30 years old, because normally students at Universities are in this range of age, having normal body mass index (BMI), having regular menstruation every 24-35 days, having PMS symptoms in the second half of the menstruation period and having PMS symptoms in three consecutive cycles.

Lactating mothers, patients with physical and mental diseases, people taking sedative drugs, hormonal drugs and contraceptives continuously, consumers of vitamins, antiepileptic drugs and antidepressant drugs during last 3 months were excluded. Some other exclusion criteria were having especial diets, having cervical and urinary diseases, and having menstruation cycles of less than 24 more than 35 days, smoking and having too much stress during last 3 months.

2-4. Ethical considerations

This study has been approved by ethical committee of Ilam University of Medical Sciences on 9th December 2015 and obtained the permission with the reference number of "ir.medilam.rec.1394.88". The proposal is registered at the international center of Iranian trials with the reference number of IRCT2016011810333N3.

All the information about participants is available with the researcher and the study results have been published without mentioning the patients' names. All of the tests and services have been offered free of charge and patients have paid nothing.

After explaining the objectives of the study, written consent was obtained from all participants.

2-5. Data analyses

The collected data was analyzed by SPSS-16 software. Descriptive statistics were performed to discover means \pm standard deviation (SD) for incessant variables and percentage (%) for definite variables, correspondingly. Kolmogorov-Smirnov test, independent and paired T-test and ANOVA was implemented. The significance level was set at 0.05.

3- RESULTS

24 out of 234 students who had moderate to severe symptoms of PMS, withdrew the study and 210 students were studied. They were assigned into 3 groups of 70 people and received vitamin B1, Calcium and placebo respectively.

24 people of the participants did not continue the study due to various reasons like not to follow the drug consumption order, forget to take drugs and not to complete the questionnaire and therefore information of 186 students was analyzed (**Figure.2**).

The mean age of participants was 20.32 ± 8.92 years, the mean body mass index 22.1 ± 8.92 that falls in the range of normal BMI which is 19.8 to 24.8, the mean menstruation cycle 28.41 ± 3.04 days and the mean menstruation days was 6.38 ± 3.05 days. Most of the participants (89.53%) were single.

The mean intensity of physical, psychological and general PMS symptoms before the initiation of the study in 3 groups of placebo, Calcium and vitamin B1 is illustrated in **Table.1**.

As it is shown, the intensity of symptoms in all groups has been almost equal and results of comparing the intensity of PMS symptoms by statistical tests also show

that before intervention, there has been no statistically significant difference between groups ($P > 0.05$). The effect of intervention on intensity of PMS symptoms in groups receiving vitamin B1, Calcium and placebo is shown in **Table.2**. The mean intensity of physical, psychological and general PMS symptoms in each group before and after intervention was compared.

The results showed a statistically significant difference between groups ($P < 0.001$). In other words, after intervention, the intensity of physical, psychological and general PMS symptoms had a remarkable reduction in all groups (**Table.2**).

As it is shown in **Table.2**, vitamin B1 has reduced the intensity of physical, psychological and general PMS symptoms more than placebo and this reduction is statistically significant ($P < 0.001$).

Table.4 shows the comparison between the mean intensity of PMS symptoms between groups of Calcium and placebo after intervention. In this case also the difference was statistically significant ($P < 0.001$). In other words, taking Calcium has reduced the physical, psychological and general symptoms of PMS much more than placebo.

Results of this study show that the reduction of physical symptoms of PMS in groups receiving vitamin B1 and Calcium is almost equal.

Therefore we may say that these two supplements have the same effect on improvement of physical symptoms of PMS but Calcium reduces the psychological symptoms more than vitamin B1.

Overall, calcium is more effective on reduction of general symptoms of PMS but these results are not statistically significant ($P > 0.05$).

Table-1: Demographic characteristics of children in control (n=40) and interventional (n=40) groups

Variables	Interventional Group	Control Group	P- value
	N (%) or Mean(SD)	N (%) or Mean(SD)	
Gender			
Male	20 (46.5%)	23 (53.4%)	0.501
Female	20 (54%)	17 (46%)	
Age			
3 years	18 (64.2%)	10 (35.8%)	0.249
4 years	9 (37.5%)	15 (62.5%)	
5 years	8 (50%)	8 (50%)	
6 years	5 (41.6%)	7 (58.4%)	
Weight	14.40±1.676	14.02±1.625	0.313
Time of venipuncture	4.92±1.071	4.70±0.966	0.327

Table 2: Comparison the pain mean during the intervention in control and interventional groups

Pain	Mean (SD)	Independent t-test	P- value
Control group	7.95 (1.084)	17.505	0.001
Interventional group	2.65 (1.577)		

Table 3: Comparison the categorical pain intensity during the intervention in control and interventional groups

Pain Intensity	Control group N (%)	Interventional group N (%)	P- value
Low (0-3)	0	31 (77.5%)	0.001
Average (4-7)	11 (30%)	9 (22.5%)	
High (8-10)	29 (70%)	0	

4- DISCUSSION

Pre-menstruation syndrome is one of the most common disorders among women in reproduction age and is one of the most prevalent causes of their referring to the clinics which is seen in 85 to 90% of them with different degrees (14, 17). Until now there has been no unanimously accepted therapeutic method to improve PMS symptoms. Therefore we decided to investigate the effect of two common supplements (Calcium and vitamin B1) in reducing PMS symptoms.

The difference between the mean general intensity of symptoms before and after intervention showed that both Calcium and vitamin B1 significantly reduce the overall intensity of PMS symptoms more than placebo ($P < 0.001$). However, the amount of reduction of the intensity of PMS symptoms in the group receiving Calcium was more. This result is consistent with the

results of other studies conducted on the effectiveness of Calcium. In a study conducted by Thys-Jacobs et al. on 441 women with PMS, daily consumption of calcium carbonate had a significant effect on reduction of intensity of the PMS symptoms in comparison with placebo (48% vs. 30%) (18). In another study conducted by Akhlaghi et al. on 100 students living in the dormitory, after treatment with Calcium, 62% reduction in psychological symptoms and 61% reduction in physical symptoms was reported (25). Studies conducted by Bertone-Johnson and Bebdich also reported the positive effect of Calcium supplements on reduction of PMS symptoms (26, 27).

As it was mentioned, results of this study indicate the effect of Calcium on the reduction of physical and psychological

symptoms of PMS. However, the mean intensity reduction of PMS psychological symptoms in the group receiving Calcium was more than the other groups. Therefore we may say that calcium consumption has had more effect on the reduction of psychological symptoms of PMS. This result is consistent with the results of other studies. Ghanbari et al. showed that the amount of reduction in psychological symptoms of PMS including fatigue, negative changes and depression among women receiving Calcium was significantly more than those who had received placebo ($P < 0.002$) (20). The research conducted by Thys-Jacobs et al. showed that Calcium is effective to control psychological symptoms of PMS. They reported 45% reduction in depression among women receiving Calcium versus 28% in the group receiving placebo (28). In another study, Penland and Johnson found out that Calcium consumption remarkably reduces problems of concentration, fatigue and behavioral changes related to psychological symptoms of PMS ($P = 0.01$) (29).

The positive effect of Calcium in reduction of PMS related behavioral disorders has been reported in another study ($P = 0.045$) (30). It has been claimed that changes in Calcium concentration inside and outside cells may have stimulating effects on neuromuscular junctions and incidence of psychological symptoms of PMS (19, 20). Overall, results of these studies show that treatment by Calcium supplements is a beneficial method to reduce psychological symptoms of PMS. As no side effect and allergic reaction has been reported in previous studies, in this study also no side effect related to taking this medicine was observed. Results of this study indicate the positive effect of vitamin B1 on treatment of PMS symptoms as well and this result is consistent with the result of other studies. Results of Abdollahi et al.'s study showed that consumption of vitamin B1

significantly reduces the physical and psychological symptoms of PMS (17). The mean reduction in the intensity of symptoms was 25.09 ± 0.73 which is more than the result observed in the present study. May be its because of taking two pills per day and continue of interventions for 3 menstruation cycles in their study while in this study participants took one pill per day for 2 months. In another study on the effect of vitamin B1, Zafari and Aghamohammadi found out that taking this medicine has been beneficial to treat physical and psychological symptoms of Dysmenorrhea (33). Gabriel et al. also showed that vitamin B1 consumption can reduce all symptoms of PMS (34).

In some other studies it was proven that absorption of vitamin B1 from food sources, is related to the remarkable reduction in PMS symptoms (35, 36). It has been proven that vitamin B1 leads to the promotion of women's quality of life via coenzyme formation during metabolism of carbohydrates, lipids, proteins and amino acids and therefore reduction in physical and psychological symptoms of PMS like fatigue, depression, stress, anger, sleeping disorders, reduced muscular cramps and pain and release of energy (37-39).

In this study, no side effect related to consumption of this medicine was observed. According to the studies conducted on treatment of PMS symptoms with supplements, many confounding factors may affect the results. These factors include age, education level, economic status, living place and stress. We tried to minimize the effect of these factors by conducting a triple-blind random study on students living in dormitory who were similar in terms of age, education level and living place. By excluding the students taking daily nutritional supplements, we tried to perform a standard intervention in which all participants have the same situation.

However, they were different in the intensity of PMS symptoms and need to be treated and perhaps this has affected the results. Strengths and limitations of this study were mentioned above.

4-1. Limitations of the study

Lack of motivation among students and problems in convincing them about benefits of participating in this study.

5. CONCLUSION

This study showed that both studied supplements (Calcium and vitamin B1) have positive and significant effects on improvement of physical, psychological and general symptoms of PMS. The effect of treatment with Calcium on reducing PMS symptoms especially on psychological symptoms was more than vitamin B1. No adverse effect was observed in those took these two supplements. Therefore it is recommended to consume both supplements especially Calcium to treat PMS.

6- CONFLICT OF INTEREST: None.

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