Research Article

Relationship between Drug Vitamin D Intake and Pre-menstrual Syndrome among Women of Reproductive Age

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Abstract

Premenstrual Syndrome (PMS) is a common problem among women in reproductive age, typically affecting those between the ages of 15 years-49 years, and often limiting their daily activities. It is characterized by somatic and psychological symptoms that significantly appear during the luteal phase of the menstrual cycle, usually 7 days to 14 days before menstruation begins. These signs cause substantial impairment and decrease functional capacity. Vitamin D therapy is a safe, effective, and affordable option to prevent and overcome this syndrome. Therefore, this research aims to analyze the relationship between vitamin D intake and Premenstrual Syndrome, as well as the role of subject characteristics such as age and menarche age in relation to the complication. Using a cross-sectional and descriptive-analytical approach, a sample of 81 participants was selected through the Consecutive Non-random Sampling technique. The shortened Premenstrual Symptoms Assessment Form (SPAF) was used to assess PMS, and the Semi-quantitative Food Frequency Questionnaire (SQ-FFQ) was used to evaluate vitamin D intake. The results, obtained through Chi-square and Fisher's exact test analysis method, showed a significant relationship between vitamin D intake and PMS (p=0.00; p<0.05). Additionally, a relationship was identified between age and PMS (p=0.045; p<0.05), but no correlation was observed between menarche age and the syndrome (p=0.103; p>0.05). Therefore, it is suggested that increasing vitamin D intake through dietary means may reduce the incidence.

Keywords: Drug vitamin D intake; Reproductive age; Age of menarche; Premenstrual syndrome

Introduction

Premenstrual syndrome (PMS) is a combination of clinically significant somatic and psychological symptoms during the luteal phase of the menstrual cycle, typically 7 days-14 days before menstruation. These signs can substantially impact daily life and functioning and resolve during menstruation or a few days after onset [1,2]. The prevalence of PMS in Indonesia is reported at 23%-24%, with 85% occurring in women of reproductive age of 15 years-49 years [3-5]. This syndrome sufficiently influences the quality of life, economy, and social life of affected individuals, with 23%-31% of women of reproductive age experiencing symptoms that affect their daily life [6].

Symptoms of PMS vary among individuals, including changes in appetite, weight gain, menstrual cramps, back and lower back pain, headaches, breast enlargement and tenderness, nausea, constipation, anxiety, irritability, fatigue, restlessness, mood swings, and easy crying [2]. Menstrual cramps which is termed as dysmenorrhea is the most common symptom among PMS [7]. There is no therapy to treat and prevent this syndrome. Some researchers argue that hormonal agents and a lack of micronutrients might be involved in the development of PMS. 8% of women suffering from PMS seek complementary and alternative therapies, and vitamin D and calcium have recently received special attention for relief PMS symptoms [1]. Vitamin D has been discovered to be a safe, effective, acceptable, low-cost, and convenient option for reducing the intensity and frequency of PMS symptoms compared to Yoga, Cognitive Behavioural Therapy (CBT), and medications such as Fluoxetine [1].

Vitamin D is involved in calcium and phosphorus metabolism. In humans, 80% of the body's daily requirement for this steroid hormone is usually met by 7-Dehydrocholesterol in exposure to ultraviolet B (UVB) rays from the sun, and the remaining 20% is obtained through food intake [1].

Vitamin D deficiency is an emerging mayor public health problem and has important implications [8]. The deficiency occurs in about 50% world's population and can be attributed to various lifestyle factors [9].

Several researches show a relationship between vitamin D intake and PMS. For example, a 2019 study by Heidari H et al. discovered that Vitamin D is effective for PMS sufferers [10]. Additionally, Jarosz AC et al. showed that vitamin D status is associated with the severity of several PMS symptoms such as cramps, nausea, anxiety, confusion, loss of sexual desire, and desire to be alone [11].

Despite vitamin D therapy being used for an adolescent with PMS, Bahrami A et al., in 2018, showed that the serum has no significant relationship with the syndrome [12]. Also, Abdollahia R, Sarbakhshc B.A.P, Kashaniand M, et al. in Iran identified no significant relationship between vitamin D administration and the incidence of PMS [2].

PMS remains a prevalent issue among women of reproductive age, significantly impacting daily activities. Furthermore, the relationship between vitamin D intake and this complication's incidence still has pros and cons. Therefore, this research is conducted to determine the correlation between vitamin D intake and the incidence of PMS.

Methods

This is descriptive-analytic research using a cross-sectional approach. The investigation was conducted online among women of reproductive age and members of the Grogol Congregational Church of God. Samples were taken using Consecutive Non-Random Sampling. A total of 100 individuals were included in the population, and 89 subjects met the inclusion criteria for the study.

The study employed the Shortened Premenstrual Symptoms Assessment Form (SPAF) to evaluate the incidence of PMS and the Semi-quantitative Food Frequency Questionnaire (SQ-FFQ). It is used to assess vitamin D intake as well as questions regarding the subject socio-demographics such as age, weight, height, menarche age and consumption habits of vitamin D supplements, menstrual cycle, smoking history, history of PMS in the family (mother), and history of caffeine consumption. Furthermore, the SPAF and SQ-FFQ vitamin D questionnaires were valid and reliable. This research excluded participants with obesity, maternal history of PMS, caffeine consumption of ≥ 2 cups per day, irregular menstruation, and smoking as confounding factors.

SPAF was used to evaluate the incidence of PMS by asking for and assessing the symptoms in subjects within 3 consecutive cycles. This questionnaire consisted of 10 questions assessing signs such as Tense breasts, pain, and swelling, difficulty concentrating, feeling of depression, irritability and anger, sadness, depression, muscle and joint pain, weight gain, discomfort, stomach fullness or pain, swelling (edema) in the legs, and stomach bloating. The symptoms were rated from 1-6, where 1, 2, 3, 4, 5, and 6 indicate no

symptoms, mild symptoms, moderate symptoms but do not interfere with activities, moderate symptoms and interfere with activities, severe symptoms, and very severe symptoms. A score of 1-10 represents no PMS, while values >10 indicate the presence of the syndrome.

The SQ-FFQ questionnaire consisted of 10 foods containing vitamin D, namely, sardines, mackerel, salted fish, nuts, beef, milk, margarine, oranges, eggs, and milkfish. Respondents were asked to report their typical consumption for each type of food. The quantity of vitamin D intake was obtained by summing the amount from supplements and daily food. A score of <25 mcg was categorized as sufficient, while ≥ 25 mcg was categorized as sufficient. The study received approval from the Research Ethics Committee of the Faculty of Medicine, Trisakti University, with the ethical number 38//KER-FK/IX/2021.

Results

Table 1 shows that 63% of respondents were aged 12 years-25 years, with the range of 15-45 in this study. The normal age distribution for menarche is between 9 years-14 years, as observed in 96.6% of respondents. In terms of vitamin D intake, 69 out of the total subjects were classified as insufficient. Finally, it is observed that 79.8% of the respondents had PMS.

Table 1: Distribution of Subject Characteristics

Frequency	Frequency (n)	Percentage (%)
Respondent Characteristic Age		
Adolescent (12 years-25 years)	56%	62.9
Adult (26 years-45 years)	33%	37.1
Menarche Age		
Normal Menarche (9 years-14 years)	86%	96.6
Abnormal Menarche	3%	3.4
Vitamin D Intake		
Adequate	2%	22.5
Lacking	69%	77.5
Premenstrual Syndrome		
No PMS	18%	20.2
PMS	71%	79.8

According to Table 2, the distribution of menarche age is in-between 10 years-15 years. The average menarche age and vitamin D intake use the median because the data are not normally distributed. Furthermore, both were reported in this study to be 12 years and 3.4 mcg. The majority of adequate vitamin D is obtained by additional supplementation, as presented in Table 3

Table 2: Distribution of menarche age

Menarche age (years)	Total Respondent
10	14
11	21
12	22
13	12
14	17
15	3

Table 3: Median of menarche age and vitamin D intake

Variable	Median	Minimum	Maximum
Menarche Age	12	10	15
Vitamin D intake	3.4	1.39	9,3

Despite a majority of 27 subjects consuming vitamin D supplements, (Table 4). The highest food source of vitamin D was obtained from consuming milkfish 2 times a week, in a serving measuring 40 grams. However, this was consumed by a small number of subjects. Meanwhile, the most consumed is beef given 2 times per day, in a serving of 2 pieces of 100-gram size and 1 tablespoon of butter daily.

Based on the SPAF assessment, the incidence of PMS is divided into 2 categories of scores in-between 1-10 and >10, indicating individuals with and without the syndrome, respectively. Finally, 18 and 71 subjects were with and without PMS, respectively.

Table 5 presents the results of the chi-square statistical test assessing the relationship between age and the incidence of PMS in women of reproductive age, showing a significant relationship (p=0.045, p<0.05). The statistical test for the menarche age on the PMS incidence because there was a variable with an expected count of less than 5, Fisher's exact test was conducted. It showed no significant relationship between the menarche age and the PMS incidence (p=0.103 p>0.05).

Table 4: Consumption of vitamin D supplement

Amount of vitamin D supplement per day (IU)	Total Respondent
5000	2
2000	1
1000	14
400	10
0	62

Table 5 presents the results of a chi-square statistical test evaluating the relationship between vitamin D intake and the incidence of PMS. As there was a variable with an expected count of less than 5, Fisher's exact test was conducted, and it indicated no significant relationship between vitamin D intake and the PMS incidence (p=0.000 p<0.05).

Table 5: Co Relationship between subject characteristics, vitamin D intake and the PMS incidence

Variable	PMS Incidence		P
	No PMS	PMS	
Age			
Adolescent (12 years-25 years)	15	41	0.045*
Adult (26 years-45 years)	3	30	
Menarche Age			
Normal Menarche (9 years-14 years)	16	70	0.103**
Abnormal Menarche	2	1	
Vitamin D Intake			
Adequate	13	7	0.000**
Lacking	6	69	
*Chi-squar, **Fisher's exact test*			

PMS was discovered to be prevalent in the adolescent age group at 73.2% and among adults at 91%. Similarly, subjects with normal menarche age, specifically within the range of 9 years-14 years, dominated 78.7%. Meanwhile, those with abnormal menarche did not have PMS at 66.7%. Subjects with sufficient and insufficient vitamin D had a prevalence of 65% and 49.3%.

Discussion

Relationship between age and the PMS incidence

This research discovered a significant relationship between age and PMS incidence. Also, Khodjaeva N. et al, [13]. identified a considerable correlation because the older the age, the closer the menopause. A few years before menopause, a transition phase called perimenopause generally starts at age 40 but can also occur at the end of 30. During the perimenopause phase, hormone levels in the body become increasingly unstable and can fluctuate, increasing the risk of PMS. Furthermore, estrogen significantly decreases to very low levels, and there is a dominance of the progesterone hormone, which plays a role in the occurrence of this syndrome [14].

Relationship between the menarche age and the PMS incidence

The distribution of subjects who experienced menarche at an abnormal age, specifically <9 or ≥ 15 years, was only a small proportion of 3 out of 89, covering both the early and late phases, according to Khodjaeva N, et al, [13]. Furthermore, Kamilah ZD, et al. showed that there is no significant relationship between the menarche age and the PMS incidence [15].

According to a study by Lu et al. in 2020, menarche age is inversely related to premenstrual complaints. Late onset of menarche is significantly associated with mild PMS complaints and an increased risk of Premenstrual Disorder (PMD) later in life. Meanwhile, its early phase is not significantly related to premenstrual complaints. This can be attributed to lifestyle during childhood, such as lack of exercise, which can impact puberty and hormone functions and, in turn, increase the risk for PMS [15]. Other factors, such as absorption and metabolism of vitamin D, sun exposure, and melanin levels in the skin, also influenced the incidence of PMS and were not assessed in this study. Due to these complexities, there is no significant relationship between menarche age and PMS incidence.

Relationship between vitamin D intake and the PMS incidence

Vitamin D intake has been discovered to have a significant correlation with PMS incidence, as established by a study conducted by Heidari, et al. and Jarosz AC, et al. [10,11]. This is attributed to the increased vitamin D intake, as its elevated level plays a role in calcium and phosphate absorption, particularly in the luteal phase of the menstrual cycle. Due to a sufficient level of this steroid hormone,

there is no decrease in serum calcium, contributing to PMS symptoms. The serum calcium level is directly proportional to the imbalance in the metabolism of serotonin and tryptophan. The decreased quantity of serotonin in the brain causes signs associated with emotions, including depression, difficulty concentrating, irritability, feeling depressed, and sad [16,17]. Additionally, vitamin D being a steroid hormone, can also stabilize progesterone (sex steroid hormone), which tends to increase in individuals suffering from this syndrome [10,18].

Vitamin D can come from sunlight, food, or supplements. Despite most (90%) of vitamin D in the body being obtained from the synthesis in the skin through exposure to UVB rays, supplementation and food also play a crucial role in ensuring adequate levels based on the Nutrition Adequacy Rate (NAR) and, ultimately influencing the incidence of PMS. In this research, the daily vitamin D requirement is met through supplementation of 1000 IU, but additional sources were still required. Additionally, despite the average vitamin D level from daily food consumption being 3.4 mcg, it also plays a role in meeting the needs with 400 IU supplementation and affects the incidence of this syndrome. Therefore, it can be inferred that food and supplements containing vitamin D affect the prevalence.

Limitations

This research examines vitamin D using the SQ-FFQ eating habits questionnaire, which requires the subjects' memory of the type and frequency of food consumed. Furthermore, this method has limitations as it could be affected by the subjectivity of the answer provided. The measurement of vitamin D levels in the blood was not taken. This could confound the results as other factors, such as absorption and metabolism, sun exposure, melanin levels in the skin, and other diseases that could affect vitamin D levels, were not assessed. The study also did not have a way to evaluate genetic factors that could affect PMS incidence directly. Additionally, the subjects in this research collected data from their teens to adulthood, while there was no initial elderly category that included women of reproductive age up to 49 years.

Conclusion

Most women of reproductive age still experience a deficiency of drug vitamin D intake and its average consumption from daily food; hence, they still do not meet the Adequacy of Nutrition. Research shows a significant relationship between age, vitamin D intake, and PMS incidence. Meanwhile, there is no considerable relationship between menarche age and this syndrome. This indicates that relying solely on supplementation is insufficient to meet the needs for vitamin D intake. Therefore, increasing the intake of this steroid hormone through daily diets is recommended to reduce the prevalence of PMS.

Acknowledgement

Conflict of Interest

Authors have no conflict of interest to declare.

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