

ORIGINAL ARTICLE

The Relationship of Vitamin B6 Intake with Premenstrual Syndrome in Junior High School Female Students


Hubungan Asupan Vitamin B6 dengan Sindrom Premenstruasi pada Siswi SMP

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ABSTRACT

Background

Many women complain of uncomfortable symptoms a few days before menstruation in the form of emotional problems to discomfort in the abdominal area, this condition is called premenstrual syndrome. Lack of nutrients, one of which is vitamin B6, is a risk factor for premenstrual syndrome. This study was conducted to assess the relationship between vitamin B6 intake and premenstrual syndrome in junior high school students.

Methods

The study used an analytical observational method with a *cross-sectional* design, in 162 students of SMPN 75 Jakarta, which was taken with *cluster random sampling* and *simple random sampling* techniques. Measurement of the incidence of premenstrual syndrome was carried out using sPAF questionnaires and vitamin B6 intake using SQ-FFQ questionnaires. The data from the study were analyzed using the *chi-square* test. The research was conducted after obtaining the approval of the number ethics 7/KER-FK/II/2022.

Results

The results showed that female students who experienced premenstrual syndrome were mostly aged 15-16 years (20.8%), had menarche at the age of under 12 years (16.4%), did less exercise (15.6%), had a body mass index (BMI) in the category of excess nutrition (25.0%), and consumed foods that contained enough vitamin B6 (15.0%). The results of the bivariate analysis between free and dependent variables found no meaningful relationship between premenstrual syndrome and age ($p = 0.054$), menarche age ($p = 0.630$), exercise ($p = 0.726$), BMI ($p = 0.131$), and vitamin B6 intake ($p = 1.000$).

Conclusions

There was no relationship between vitamin B6 intake, sociodemographic characteristics (age, menarche age), exercise, and body mass index (BMI) and premenstrual syndrome.

Keywords: Vitamin B6; Age; Menarche age; Body Mass Index (BMI); Premenstrual syndrome

ABSTRAK**Latar Belakang**

Banyak wanita mengeluhkan gejala tidak nyaman beberapa hari sebelum menstruasi berupa masalah emosi sampai rasa tidak nyaman pada daerah perut, kondisi ini disebut sindrom pramenstruasi. Kurangnya zat gizi salah satunya vitamin B6 merupakan faktor risiko terjadinya sindrom pramenstruasi. Penelitian ini dilakukan untuk menilai hubungan asupan vitamin B6 dengan sindrom pramenstruasi pada siswi SMP.

Metode

Penelitian menggunakan metode observasional analitik dengan desain *cross-sectional*, pada 162 siswi SMPN 75 Jakarta, yang diambil dengan teknik *cluster random sampling* dan *simple random sampling*. Pengukuran kejadian sindrom pramenstruasi dilakukan dengan menggunakan kuesioner sPAF dan asupan vitamin B6 menggunakan kuesioner SQ-FFQ. Data hasil penelitian dianalisis menggunakan uji *chi-square*. Penelitian dilakukan setelah mendapat persetujuan etik nomor 7/KER-FK/11/2022.

Hasil

Hasil penelitian menunjukkan bahwa siswi yang mengalami sindrom pramenstruasi sebagian besar berusia 15-16 tahun (20.8%), mengalami *menarche* pada usia di bawah 12 tahun (16.4%), kurang melakukan olahraga (15.6%), memiliki indeks massa tubuh (IMT) pada kategori gizi berlebih (25.0%), dan mengonsumsi makanan yang mengandung cukup vitamin B6 (15.0%). Hasil analisis bivariat antara variabel bebas dan tergantung didapatkan tidak ada hubungan bermakna antara sindrom pramenstruasi dengan usia ($p=0.054$), usia *menarche* ($p=0.630$), olahraga ($p=0.726$), IMT ($p=0.131$), dan asupan vitamin B6 ($p=1.000$).

Kesimpulan

Tidak terdapat hubungan yang bermakna antara asupan vitamin B6, karakteristik sosio demografi (usia, usia *menarche*), olahraga, dan indeks massa tubuh (IMT) dengan sindrom pramenstruasi.

Kata Kunci: vitamin B6; usia; usia *menarche*; indeks massa tubuh (IMT); sindrom pramenstruasi

INTRODUCTION

Adolescence is a transition from childhood to adulthood, between the ages of 10-19 years, and in adolescent girls is marked by the beginning of the menstrual cycle (*menarche*). *Menarche* will be followed by a menstrual cycle that lasts every month, starting from *menarche* to menopause.¹ At this time, many women complain of uncomfortable symptoms a few days before menstruation, both emotional problems and discomfort in the abdominal area, known as premenstrual syndrome (PMS).² PMS symptoms usually appear about five days before the onset of menstruation, must occur in the previous three menstrual cycles, disappear within four days of the onset of menstruation and do not recur until at least the 13th cycle day.³

Premenstrual syndrome is experienced by more than 90% of adolescent girls worldwide.⁴ Asia is the continent with the highest prevalence of premenstrual syndrome, and the lowest is in Europe.⁵ In Indonesia, based on research sponsored by WHO there are 23% of adolescents experience premenstrual syndrome.⁶ The cause of premenstrual syndrome is an imbalance between levels of the hormones estrogen and progesterone, where levels of the hormone estrogen exceed normal limits, and progesterone decreases. It can also be caused by low levels of the neurotransmitter serotonin.⁷

Many factors influence the occurrence of premenstrual syndrome, including age at menarche, body mass index (BMI), consumption of salty foods, stress, lack of exercise or physical activity, and low intake of vitamins and minerals such as zinc, magnesium, calcium and vitamin B6. Vitamin B6 or pyridoxine plays a role in the biosynthesis of the neurotransmitter serotonin, which is a hormone for controlling feelings and plays an important role in the incidence of premenstrual syndrome. In women with premenstrual syndrome, there is an imbalance between the hormones estrogen and progesterone. Decreased levels of vitamin B6 in the body interfere with serotonin biosynthesis and alter the patterns of estrogen and progesterone. The occurrence of fluctuations in estrogen will reduce serotonin levels that trigger PMS symptoms. Therefore, adequate intake of vitamin B6 is required to control serotonin production, and vitamin B6 has been shown to relieve symptoms of premenstrual syndrome.^{8,9}

The purpose of this study was to assess whether there is a relationship between vitamin B6 intake and premenstrual syndrome.

METHODS

This research has received ethical approval (Ethical Clearance) from the Research Ethics Commission of the Faculty of Medicine, Trisakti University, number 7/KER-FK/II/2022. In addition, all respondents have signed the informed consent agreement. The study used an observational analytic study and a cross-sectional design on 162 students of SMPN 75 Jakarta. Research subjects were selected using the cluster random sampling method to determine the number of subjects from classes VIII and IX, followed by a simple random sampling method in each predetermined cluster. The research subjects met the inclusion criteria in the form of female students who had experienced menstruation and excluded female students who had been diagnosed or had a history of endometriosis, ovarian cysts, and hypothyroidism, which were exclusion criteria.

Data were collected using SQ-FFQ (Semi-Quantitative Food Frequency Questionnaire) on vitamin B6 intake and sPAF (Shortened Premenstrual Assessment Form) to collect data on premenstrual syndrome. Furthermore, the data of the two variables were categorized and analyzed using the chi-square test, with a significance value of 95%. Moreover, data on respondent characteristics in the form of age and age of menarche, BMI, exercise habits, and vitamin B6 intake was also associated with the dependent variable of premenstrual syndrome using the chi-square test. In addition, a T-test was conducted to see the difference between the two categories of premenstrual syndrome dependent variables.

RESULTS

The mean age of the respondents in this study was 14.40 ± 0.654 years; most of them were 13-14 years old (55.6%), experienced menarche at the age of > 12 years (58.6%), did not do sports (59.3%), have a normal BMI (85.2%), eat foods that contain enough vitamin B6 (86.4%), and only 14.8% have premenstrual syndrome.

In the bivariate analysis, as shown in table 2, it can be seen that the respondents who experienced premenstrual syndrome were respondents aged 15-16 years (20.8%), experienced menarche at the age of < 12 years (16.4%), lacked exercise (15,6%), have a BMI category of excess

Table 1. Frequency Distribution of Age, Age of Menarche, Exercise, Body Mass Index, Vitamin B6 Intake, and Premenstrual Syndrome

Distribution	Frequency (n)	Percentage (%)
Age		
13-14 years old	90	55.6
15-16 years old	72	44.4
Age of menarche		
Early Menarche (< 12 years old)	67	41.4
Not early menarche (\geq 12 years old)	95	58.6
Exercise		
Good	66	40.7
Less	96	59.3
Body Mass Index (BMI)		
Normal	138	85.2
Over	24	14.8
Vitamin B6 intake		
Good	140	86.4
Low	22	13.6
Premenstrual Syndrome (PMS)		
Without PMS	138	85.2
PMS	24	14.8

Note: n=frequency; %=percentage

(25%), and adequate intake of vitamin B6 (15%). However, the results of statistical tests between the independent variables (age, age of menarche, exercise habits, BMI, vitamin B6 intake) and the dependent variable of premenstrual syndrome all showed $p > 0.05$, meaning there was no significant relationship between the two.

Table 2. Relationship of age, age at menarche, exercise, body mass index, intake of vitamin B6 with premenstrual syndrome

Variable	Premenstrual Syndrome (PMS)		p-value
	Without PMS	PMS	
	n (%)	n (%)	
Age			
13-14 years old	81 (90.0)	9 (10.0)	0.054
15-16 years old	57 (79.2)	15 (20.8)	
Age of menarche			
Early Menarche (< 12 years old)	56 (83.6)	11 (16.4)	0.630
Not early menarche (\geq 12 years old)	82 (86.3)	13 (13.7)	
Exercise			
Good	57 (86.4)	9 (13.6)	0.726
Less	81 (84.4)	15 (15.6)	
Body Mass Index (BMI)			
Normal	120 (87.0)	18 (13.0)	0.131
Over	18 (75.0)	6 (25.0)	
Vitamin B6 intake			
Good	119 (85.0)	21 (15.0)	1.000
Less	19 (86.4)	3 (13.6)	

Note: n=frequency; %=percentage; Chi-square test

The results of the T-test (table 3) showed that there was no significant difference between the group of respondents with premenstrual syndrome and those without the premenstrual syndrome in the age category ($p=0.140$), age of menarche ($p=0.630$), vitamin B6 intake ($p=0.767$). However,

although there was a statistically significant difference in the BMI category, both groups who had premenstrual syndrome or not, had a BMI that was still in the normal category (19.5 and 21.2).

Table 3. T-test

Variable	Premenstrual syndrome	Mean	SD	p-value
Age	Without PMS	14.37	0.64	0.140
	PMS	14.58	0.72	
Age of menarche	Without PMS	11.81	0.99	0.630
	PMS	11.71	0.86	
Body Mass Index	Without PMS	19.55	3.63	0.047*
	PMS	21.19	4.12	
Vitamin B6	Without PMS	5.70	6.86	0.767
	PMS	5.27	3.97	

Note: *: $p < 0.05$; significant difference

DISCUSSION

Relationship between age characteristics and premenstrual syndrome

The respondents of this study were teenagers whose average age was 14.40 ± 0.654 years, and more than half were between 13-14 years old. The respondent's age range is not much different, making the respondent's age homogeneous. The bivariate test results showed no significant difference ($p > 0.05$) between age and premenstrual syndrome, one of which might be due to this. The T-test also found that the average age in the group of respondents who experienced PMS was 14.58 ± 0.72 , almost the same as the average age of the group of respondents who did not experience PMS, which was 14.37 ± 0.64 .

These results are in accordance with research conducted by Kushartanti R, which stated that there was no relationship between age and premenstrual syndrome ($p > 0.05$).¹¹ Different results were obtained from research conducted by Abeje A et al.; namely, there was a relationship between age and premenstrual syndrome ($p < 0.05$).¹² The difference in the results of this study could be because, in the study of Abeje A et al., the comparison of the age range of the subjects was greater, namely at the age of 10-14 years, 15-19 years, and 20-24 years.¹²

The relationship between the characteristics of the age of menarche and the premenstrual syndrome

The results of the bivariate analysis showed that there was no relationship between the age of menarche and premenstrual syndrome ($p = 0.630$), but respondents who experienced menarche at the age of < 12 years were more likely to experience premenstrual syndrome (16.4%) compared to respondents who experienced menarche at the age of > 12 years. These results indicate that the younger the age of menarche, the more people experience premenstrual syndrome. This follows the theory that one of the causes of premenstrual syndrome is an imbalance of reproductive hormones, namely estrogen and progesterone. Individuals who menstruate faster will experience earlier and more frequent hormonal imbalances. In addition, young age is also associated with

immature emotional control. Individuals who menstruate faster can have less good emotional control. This results in increased stress that it can cause premenstrual syndrome.¹³

The absence of a relationship between the age of menarche and premenstrual syndrome was obtained; it could be due to the difference in the age range of the two groups, which was almost the same, as shown in the results of the T-test, namely 11.81 ± 0.99 years in the non-PMS group and 11.71 ± 0.86 in the PMS group.

Research conducted by Demilew D *et al.* also stated that there was no relationship between the age of menarche and premenstrual syndrome ($p > 0.05$).¹⁴ However, research conducted by Abeje A *et al.* found a relationship between the age of menarche and premenstrual syndrome ($p < 0.05$).¹² Respondents with menarche age less than 12 years are more at risk of experiencing premenstrual syndrome. The difference in the results of this study can be caused because, in the study of Abeje A *et al.*, the age range of the subject is larger, namely 10-24 years.¹²

Relationship between exercise habits and premenstrual syndrome

This study found no significant relationship between exercise habits and premenstrual syndrome ($p = 0.726$). However, it was also found that respondents who did enough exercise had fewer premenstrual syndromes.

Exercise is said to be sufficient if it is done for 30 minutes at least three times in 1 week.¹⁵ If you do not exercise enough, the perceived benefits will be less than optimal. This causes respondents in this study who are less exercising more experiencing premenstrual syndrome (15.6%) more than respondents who do enough exercise (13.6%). Exercise can increase the release of endorphins which are natural analgesics, so pain due to premenstrual syndrome can be reduced.¹⁶ Exercise also increases the amino acid tryptophan production, a serotonin synthesis precursor. Serotonin plays a role in relieving the symptoms of premenstrual syndrome, which include depression, mood swings, irritability, sleep disturbances, anxiety, aggression, and difficulty concentrating.¹⁷

The results of this study follow research conducted by Yasmin KN *et al.*, which stated that there was no relationship between sports activities and premenstrual syndrome ($p > 0.05$).¹⁸ Pratiwi AM's research stated that there was a relationship between sports activities and premenstrual syndrome ($p < 0.05$), respondents who did enough exercise had fewer premenstrual syndromes.¹⁶

Relationship between body mass index and premenstrual syndrome

Table 2 shows no relationship between body mass index (BMI) and premenstrual syndrome ($p = 0.131$). Although the results of the T-test table 3 showed $p < 0.05$, the mean BMI in the premenstrual group (21.19) was slightly higher than the mean in the non-premenstrual group (19.5), but the mean BMI in both groups was in the normal category. In table 2, it can also be seen that the actual number of respondents who experienced PMS was more in the category of excess nutritional status (25%) than those with normal nutritional status (13%).

These results can be explained that the accumulation of fat in the body can cause an increase in the amount of blood estrogen. An increase in the amount of estrogen will cause a decrease in the secretion of the FSH hormone through a negative feedback mechanism. The decrease in FSH

secretion impacts the disruption of follicular proliferation so that mature follicles do not form. This is what underlies the occurrence of premenstrual syndrome.¹⁹ Excess body weight can also reduce serotonin levels in the brain. Serotonin is a hormone to control feelings and plays an important role in the incidence of premenstrual syndrome.²⁰

Kushartanti R's study also found no relationship between body mass index and premenstrual syndrome ($p > 0.05$).¹¹ However, Tas'au T et al.'s study stated that there was a relationship between body mass index and premenstrual syndrome ($p > 0.05$, $p < 0.05$), people with excess nutritional status are more likely to experience premenstrual syndrome.²¹

Relationship of vitamin B6 intake with premenstrual syndrome

This study found no significant relationship between vitamin B6 intake and premenstrual syndrome ($p = 1,000$). However, respondents who had a sufficient intake of vitamin B6 had more premenstrual syndrome (15.0%) than respondents who consumed less vitamin B6 (13.6%). This could be because most respondents were included in the sufficient category in consuming vitamin B6 (86.4%). Based on the results of the T-test, the average intake of vitamin B6 in the group of respondents who experienced PMS was 5.27 ± 3.97 , almost the same as the average intake of vitamin B6 in the group of respondents who did not experience PMS (5.70 ± 6.86) with p -value = 0.767 ($p > 0.05$) so that there is no significant difference.

In the T-test, it was found that respondents with PMS had lower levels of vitamin B6 intake (5.27 ± 3.97) compared to respondents who did not experience PMS (5.70 ± 6.86). This is because decreased levels of vitamin B6 in the body will interfere with serotonin biosynthesis and change the pattern of estrogen and progesterone. The occurrence of fluctuations in estrogen will reduce serotonin levels that trigger PMS symptoms. An adequate intake of vitamin B6 is needed to control serotonin production. Vitamin B6 has been shown to relieve symptoms of premenstrual syndrome.^{8,9} Vitamin B6 is also a cofactor in the biosynthesis of the neurotransmitter dopamine.²² Vitamin B6 deficiency will reduce dopamine levels in the kidneys and increase sodium retention, causing fluid accumulation in the body and causing symptoms. Such as swelling of the extremities and abdominal and chest discomfort.²³

This study's results align with the research conducted by Anggraeni et al., which stated that there was no relationship between vitamin B6 intake and premenstrual syndrome ($p > 0.05$). The results showed an improvement in PMS complaints after taking vitamin B6 supplements ($p < 0.05$).²⁴ The assessment of the adequacy of vitamin B6 intake was carried out quantitatively to be more accurate.

The limitation of this study is the measurement of vitamin B6 intake using the SQ-FFQ questionnaire, so the nutritional adequacy rate is highly dependent on the respondents' memory and is less accurate.

CONCLUSION

Based on the results of research and analysis that has been carried out, it can be concluded that there is no relationship between vitamin B6 intake, respondent characteristics (age, age of

menarche), exercise, and body mass index (BMI) with premenstrual syndrome in junior high school students. However, the lack of vitamin B6 intake was more common in respondents with PMS.

Some things that can be done for further research are using other research methods such as clinical trials with pre and post-test group designs, measuring vitamin B6 levels in the blood, and researching other nutrients associated with premenstrual syndromes such as zinc, magnesium, calcium, or other factors. Other factors that can affect premenstrual syndrome include family history and psychological factors.

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AUTHORS CONTRIBUTION

CMA: Study concept and design, data collection, analysis and interpretation of results, preparation of manuscripts; PT: Concept and study design, analysis and interpretation of results, preparation of manuscripts, and corresponding author.

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CONFLICT OF INTEREST

There is no conflict of interest between the authors.

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