

The Influence of Dietary Patterns on Pre-Menstrual Syndrome (PMS) among the Community in Tanjung Bintang Subdistrict South Lampung

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Abstract. Pre-Menstrual Syndrome (PMS) is a cluster of symptoms that appear several days before menstruation begins and typically improve a few days after menstruation starts. Common PMS symptoms include dizziness, abdominal pain, and heightened emotions. While many people view these symptoms as normal signs that menstruation is approaching, the causes of PMS are inherently complex, with unhealthy eating preference being one contributing factor. The research aims to explore the correlation between dietary preference and the level of PMS. Dietary preference was categorized based on NOVA classification. To assess PMS symptoms, the Premenstrual Symptoms Screening Tool (PSST) questionnaire was used. This research employed an interview method, using a questionnaire that includes informed consent, personal data, PSST, and a dietary pattern questionnaire covering the past four weeks. Additionally, respondents' weight and height were measured to determine their Body Mass Index (BMI). The results indicated that higher consumption of ultra-processed foods (NOVA category 4) was associated with increased severity of PMS, particularly in physical symptoms and daily disturbances. However, dietary preference did not influence PMS symptoms of dysphoric disorder. This result enhances our understanding and help identify suitable dietary patterns to reduce PMS.

1 Introduction

Maturity in a woman is marked by the occurrence of menstruation. Menstruation is the process of shedding tissue on the uterine wall due to the matured egg not being fertilized by sperm. In the journey towards the occurrence of the menstrual cycle, many women experience physical discomfort before the onset of menstruation, a condition known as premenstrual syndrome (PMS). According to data from the World Health Organization (WHO), half of the world's population, mostly residing in developing countries, experiences premenstrual syndrome (PMS). In Indonesia, in the year 2019, the prevalence of premenstrual syndrome (PMS) reached 80% of the entire female population in the

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reproductive age group [1]. Premenstrual syndrome (PMS) is a set of symptoms that occur in the approach to menstruation. This syndrome cyclically manifests itself within a time frame of 6-10 days before the onset of menstruation and dissipates a few days after menstruation begin [2].

Premenstrual syndrome (PMS) is characterized by several behavioral changes, physical symptoms, and emotional fluctuations. In some cases, these symptoms can disrupt daily activities. The symptoms gradually improve after the menstruation period concludes. Common physical symptoms include headaches, breast tenderness, abdominal cramps, fatigue, and weight gain. Meanwhile, psychological symptoms often include irritability, anxiety, and depression. Individuals experiencing this syndrome may encounter one or more of these issues. Besides being caused by an increase in estrogen and progesterone hormone levels during menstruation leading to premenstrual syndrome (PMS), an unhealthy lifestyle, such as an unhealthy diet, can trigger PMS. Currently, many people overlook their dietary intake, exacerbated by the prevalence of unhealthy food choices in our surroundings. Unhealthy eating habits are often observed in adolescents to adults. Essentially, an unhealthy diet significantly affects the body's metabolism, particularly for women experiencing menstruation. An unhealthy diet can influence the nutritional status of the body [3], which is one of the risk factors for menstrual problems such as dysmenorrhea or abdominal pain [4]. Girls approaching menstruation may experience an increase in appetite before PMS, while some may also encounter a decrease in appetite, leading to unhealthy eating patterns. This is due to hormonal instability in the body before menstruation.

Dietary habits such as high sugar, salt, caffeine intake, consumption of sodas, dairy products, and processed foods can exacerbate PMS symptoms [5]. The impact of PMS symptoms can lead to disruptions in daily activities for women experiencing menstrual syndrome, affecting both social and physical health and causing a sense of inability to concentrate. Previous studies have investigated the influence of dietary patterns on PMS within various contexts, including adolescents in schools, boarding schools, and universities. The research conducted by [6] revealed that out of 54 high school teenage respondents in the Batangkuis sub-district in 2019, 38 individuals (70%) exhibited unhealthy eating patterns, while 16 individuals (30%) maintained healthy eating patterns. The study indicated that the majority of respondents experienced PMS. Meanwhile, according to the research by [7] conducted at Brawijaya University, out of 74 respondents, 61 individuals (84.4%) had unhealthy eating patterns, with 46 of them experiencing moderate PMS symptoms and 15 in the mild category. On the other hand, 13 respondents (17.6%) had healthy eating patterns, with 6 individuals experiencing moderate PMS symptoms and 7 others in the mild category. Based on these studies, there hasn't been research conducted in rural areas with respondents in the reproductive age group. Rural areas with a certain level of income could influence individual's food preferences [8]. Therefore, the purpose of this study is to obtain more diverse data to determine whether dietary patterns can influence premenstrual syndrome (PMS) in the community of Tanjung Bintang Subdistrict, South Lampung. By understanding how diet influences PMS, this study can inform interventions to mitigate symptoms and raise community awareness that could enhance their quality of life and overall health.

2 Methods

2.1 Research time and location

This research was conducted in Tanjung Bintang Subdistrict, South Lampung (5°22'55.1"S 105°24'09.8"E) from February to March 2024, targeting female community

members who have experienced menstruation and have not reached menopause, within the age range of 15-55 years. This age determination is based on the respondent’s ability to answer the questions that will be asked in the questionnaire. Sampling was conducted in five villages within Tanjung Bintang Subdistrict. Five villages are Jati Baru, Jati Indah, Serdang, Totoharjo, and Trimulyo (Fig. 1).

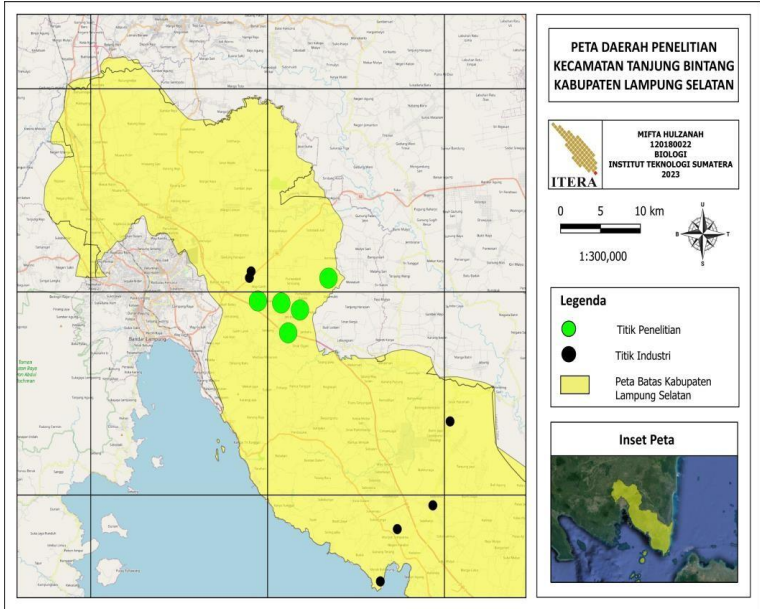


Fig. 1. Map of research area.

2.2 Instruments and Materials

In this study, various instruments and materials were utilized, including questionnaires such as informed consent, a personal data questionnaire, Premenstrual Symptoms Screening Tool (PSST), and a dietary pattern questionnaire covering the last 4 weeks. Additionally, measurements of body weight and height were conducted.

2.3 Personal Data Collection

The personal data consist of full name, age, date of birth, residence, current address, monthly living allowance, height, weight, smoking habits, alcohol consumption, frequency of experiencing stress, contraceptive use, duration of menstruation, menstrual data (date of menarche/first menstruation, menstruation in the last 2 months, and date of the last menstruation).

2.4 Premenstrual Symtoms Screening Tool (PSST) Scale Assessment

PSST is a screening tool for premenstrual syndrome (PMS) symptoms aimed at assessing the severity of PMDD and PMS in women. PSST consists of 19 items divided into 14 premenstrual symptoms and 5 functional items. Each item in the PSST is assessed on a 4-point Likert scale ranging from not at all (0 points) to severe (3 points) (Table 1 and Table 2) [9].

Table 1. Assessment on a 4-point Likert Scale

Likert-scale	0	1	2	3
Frequency	Not PMS	Mild	Moderate	Severe

Table 2. Assessment of Premenstrual Syndrome based on Established Criteria

Criteria	Frequency
At least one of PMDD is 2 or 3 likert-scale point	Moderate to Severe
At least four of psychological symptoms and somatic symptoms are 2 or 3 linkert-scale point	Moderate to Severe
At least one of daily dysfunctions is 2 or 3 linkert-scale point	Moderate to Severe

2.5 Dietary Behavior Assessment

Dietary pattern questionnaire is questions related to the average daily consumption of food and beverages over the past month or four consecutive weeks, such as the consumption of vegetables, rice, meat, tempeh, eggs, tea, coffee, soda, and others. Portion sizes are estimated in cups for food and milliliters (ml) for beverages. The recorded food and beverages will be classified based on NOVA [10], as seen in Table 3.

Table 3. Food classification based on NOVA

NOVA	Example
Unprocessed or minimally processed foods (1)	This includes pure food items from nature that can be eaten directly. Examples include fruits, grains, vegetables, eggs, milk, mushrooms, and water.
Processed culinary ingredients (2)	Discarding unwanted parts through processes such as drying, grinding, steaming, boiling, baking, and other methods but without adding salt, sugar, oil, or other food ingredients. Examples include fruit and vegetable juices, spices, and herbs.
Processed foods (3)	Food products made by adding sugar, salt, oil, and other ingredients. Using preservation methods like canning, cooking, and non-alcoholic fermentation. Examples include smoked meat and fish, and bread.
Ultra- processed food and drink products (4)	Food products originating from industry, processed through a series of industrial processes using sophisticated equipment. They contain many additives for industrial purposes, such as preservatives, artificial sweeteners, and others, making them considered unhealthy. Examples include packaged foods and beverages.

2.6 Data Analysis

This research found relationship between one variable and another that has a cause-and-effect relationship. The obtained data was analyzed using the Generalized Linear Models (GLM) method in the R program version 4.2.2 to determine the relationship between predictor variables of eating patterns and demographic factors that influence the response to premenstrual syndrome (PMS).

3 Result

In the study conducted with the objectives explained in the background, the results obtained will be detailed in this subsection (Table 4). Data collection was carried out for one month in Tanjung Bintang District, specifically in 5 predetermined villages, which served as the research sample. The results include general demographic data and demographic data related to reproduction. These demographic data are useful for determining whether there is an influence on the variable being studied, which is PMS, aside from the influence of dietary patterns.

Table 4. General demographic data

Demographic		Frequency
Village	Serdang	20
	Jati Baru	30
	Totoharjo	30
	Jati Indah	22
	Trimulyo	22
Income	Rp.0	2
	<Rp.500.000	37
	Rp.500.001-Rp.1.000.000	5
	Rp.1.000.001-Rp.2.000.000	79
	Rp.2.000.001-Rp.3.000.000	1
	Rp.3.000.001-Rp.4.000.000	0
Age	>Rp.5.000.001	0
	Minimal: 15 years old	
	Maximum: 52 years old	
	Mean: 29 years old	
Occupation	Housewife	27
	Student	37
	Trader	22
	Farmer	21
	University Student	10
	Unemployed	2
	Others	5
Education	SD	14
	SMP	53
	SMA	40
	SMK	11
	D3	3
	S1	3

Data collection for this research began in the villages of Serdang, Jati Baru, Totoharjo, Jati Indah, and finally Trimulyo. The differences in respondents surveyed in each village were based on the population size of each village. The respondents varied, including students, housewives, traders, farmers, and others as listed in Table 4, with the age range being 15 to 52 years and an average age of 29 years. This diversity of respondents will yield more varied data, as previous studies were conducted within a specific scope, such as in schools or universities.

Since this research is related to women's reproductive organs, demographic data related to reproduction are needed to support the research findings. This data includes factors that may influence PMS in women, as outlined in Table 5. Because the respondents surveyed range from students to elderly individuals, the results are not monotonous, leading to more varied data. By utilizing this data, we can analyze its influence on PMS.

Table 5. Demographic Data Related to Reproduction

	Demographic	Frequency
BMI	Underweight (<18,5)	24
	Normal (18,5-24,9)	57
	Overweight (25-29,9)	28
	Obese (≥30)	15
Smoking	Yes	1
	No	123
Stress Level	0	56
	1	51
	2	13
	3	4
Alcohol consumption	Yes	0
	No	124
Type of Contraception	Hormonal	30
	Non hormonal	6
	Not using contraception	88
Is your menstrual cycle regular	Yes	90
	No	34
How many days does your menstruation usually last	3 days	6
	4 days	11
	5 days	28
	6 days	17
	7 days	54
	8 days	2
	9 days	1
	10 days	3
	14 days	1
	15 days	1
Sexual Activity	Yes	64
	No	60

In addition to using demographic data, this research also incorporates dietary intake data from the past month, which will then be categorized based on NOVA classification. This dietary intake data is analyzed to determine the most dominant NOVA category for each respondent. In the analysis of dietary patterns in this study, NOVA category 2 is not included because it leads to non-diverse data. This is because NOVA category 2 is dominated by white rice consumption, thereby overshadowing categories 1, 3, and 4. From the results in Table 6, it is evident that the most consumed NOVA category is NOVA 3, accounting for 68.54%.

Table 6. Dominant NOVA Classification

NOVA	Frequency	Percentage
Unprocessed or minimally processed foods (1)	8	6,45%
Processed culinary ingredients (2)	85	68,54%
Processed foods (3)	22	17,74%
Ultra- processed food and drink products (4)	9	7,25%

Based on this research, PMS is categorized into 3 categories: PMDD, Psychological & Somatic Symptoms, and Daily Dysfunctions (Table 7). PMDD is indicated by questions 1-4, Psychological & Somatic Symptoms by questions 5-20, and Daily Dysfunctions by questions A-E found in the PSST questionnaire.

Table 7. General Distribution of PSST in Tanjung Bintang District

PSST Categories	Mild	Moderate to Severe
Categories 1 (PMDD)	57.26%	42.74%
Categories 2 (Psychological and Somatic Symptoms)	52.42%	47.58%
Categories 3 (Daily Dysfunctions)	73.39%	26.61%

The demographic data and dietary intake data were analyzed using a linear model to determine if they have an influence on the three categories of PMS. After conducting the analysis using a linear model for each category, the best results were obtained by including the variables NOVA 1 (Unprocessed or minimally processed foods), NOVA 3 (Processed/adding sugar, salt, oil), NOVA 4 (Ultra- processed/industrial), Age, BMI, Non-hormonal contraception, Not using any contraception, and Stress Level. The results of the linear model for Category 1 (PMDD) indicate that the stress variable has a significant influence on PMS (Table 8). Thus, the higher the level of stress experienced by the respondents, the more the symptoms of PMS in Category 1 increase.

The results of the linear model for Category 2 (Psychological & Somatic Symptoms) indicate that the variables NOVA 4 and stress have a significant influence on PMS symptoms (Table 9). Thus, it can be said that an increase in NOVA 4 consumption will increase the symptoms of PMS in Category 2. In addition to NOVA 4, stress can also exacerbate PMS symptoms in Category 2, as indicated by the results.

Table 8. Results of Linear Model for Category 1 (PMDD)

	Estimate	Std. Error	t value	P value
(Intercept)	1.229	1.617	0.760	0.448
NOVA 1 (Unprocessed or minimally processed foods)	-0.659	1.520	-0.434	0.665
NOVA 3 (Processed/adding sugar,salt,oil)	-0.023	0.847	-0.028	0.978
NOVA 4 (Ultra-processes/industrial)	1.768	1.008	1.754	0.082
Age	-0.056	0.030	-1.872	0.063
BMI	-0.012	0.054	0.226	0.821
Non hormonal contraception	1.553	1.056	1.471	0.144
Not using any contraception	-0.927	0.619	-1.498	0.136
Stress Level	0.924	0.338	2.731	0.007*

Table 9. Results of Linear Model for Category 2 (Psychological & Somatic Symptoms)

	Estimate	Std. Error	t value	P value
(Intercept)	-1.480	1.554	-0.952	0.343
NOVA 1 (Unprocessed or minimally processed foods)	-1.650x101	1.309x103	-0.013	0.989
NOVA 3 (Processed/adding sugar,salt,oil)	3.075x10-1	8.407x10-1	0.366	0.715
NOVA 4 (Ultra-processes/industrial)	3.541	1.334	2.654	0.009*
Age	-1.912x10-2	2.639x10-2	-0.724	0.470
BMI	2.041x10-2	4.915x10-2	0.415	0.678
Non hormonal contraception	6.760x10-1	1.023	0.661	0.510
Not using any contraception	9.864x10-3	5.932x10-1	0.017	0.986
Stress Level	1.224	3.805x10-1	3.218	0.001*

The results of the linear model for Category 3 indicate whether the symptoms experienced in Categories 1 and 2 influence daily activities. From the linear model results, it is shown that the variables NOVA 4, age, and stress have a significant influence on Category 3 (Table 10). In other words, consuming more NOVA 4 and experiencing increased stress can disrupt daily activities. Besides these two variables, age also influences it. The younger the age, the tendency for symptoms to increase in Category 3.

4 Discussion

Based on this research, variables influencing the occurrence of PMS in women include stress level, NOVA 4 (Ultra-processed/industrial), and age. All three variables have

significant associations with PMS occurrence. For PMS in Category 1 (PMDD), stress level significantly impacts it. Higher stress levels correlate with increased PMDD occurrences. Stress can elevate cortisol hormone secretion and decrease neurotransmitters like serotonin and dopamine. This happens because stress disrupts the biosynthesis pathways necessary for serotonin and dopamine production. Serotonin and dopamine are known as hormones regulating an individual's mood, inducing calmness [11].

Table 10. Results of Linear Model for Category 3 (Daily Dysfunctions)

	Estimate	Std. Error	t value	P value
(Intercept)	1.992	1.898	-1.049	0.296
NOVA 1 (Unprocessed or minimally processed foods)	1.975	1.710	1.155	0.250
NOVA 3 (Processed/adding sugar,salt,oil)	1.774	1.168	1.519	0.131
NOVA 4 (Ultra- processes/industrial)	2.488	1.199	2.074	0.040*
Age	-0.105	0.037	-2.772	0.006*
BMI	0.095	0.051	1.842	0.068
Non hormonal contraception	-1.013	1.352	-0.749	0.455
Not using any contraception	-1.242	0.703	-1.765	0.080
Stress Level	0.752	0.300	2.506	0.013*

Emotion regulation in humans is managed in the brain, particularly in the limbic system comprising the thalamus, hypothalamus, hippocampus, and amygdala. Changes in serotonin and dopamine affect these brain regions in regulating one's emotions [12]. Therefore, if serotonin and dopamine decrease beyond the threshold, it leads to emotional instability, as shown in Category 1 symptoms, which lean towards depression, such as irritability, feeling depressed, and easy crying.

The significant results regarding PMS Category 2 (Psychological & Somatic Symptoms) are the variables NOVA 4 (Ultra-processed/industrial) and stress level. NOVA 4 refers to ultra-processed foods. In this study, commonly consumed ultra-processed foods include "ayam geprek" (crushed fried chicken), instant noodles, snacks, and "seblak" (spicy Indonesian snack). It is known that "ayam geprek" contains high levels of fat. Fat consumption can increase adiposity, leading to inflammation. High levels of inflammation due to fat are associated with the risk of PMS in body parts containing estrogen hormones such as the ovaries and fatty tissues. Fat can elevate cholesterol levels; individuals with high cholesterol levels are at a higher risk of experiencing PMS symptoms in the Somatic Symptoms category. Examples of somatic symptoms include abdominal pain, breast tenderness, and abdominal cramps. This occurs because fat is one of the precursors of estrogen hormones. High fat intake can increase estrogen levels, leading to abdominal, muscle, and joint pain due to the binding response between estrogen and these tissues. Additionally, fat can impede blood circulation in the abdominal area due to thickening of the uterine wall caused by estrogen, which increases the risk of abdominal cramps [13].

Some women experience dizziness due to estrogen fluctuations occurring before menstruation, which cause the blood vessels around the uterus to experience pressure. This indirectly affects the regulation of blood pressure to the brain, leading to dizziness. Moreover, individuals with a history of anemia are more prone to experiencing dizziness during menstruation [14]. Besides "ayam geprek," other NOVA 4 processed foods are found, such as instant noodles, snacks, and "seblak." These three foods contain high sodium levels. High sodium content can cause water retention in the body, leading to bloating and pain [15]. NOVA 4 processed foods result in PMS symptoms in the form of somatic symptoms. These symptoms will affect a person's physical condition, making them feel unwell. This, in turn, triggers psychological symptoms during PMS, such as difficulty concentrating, fatigue/lack of energy, and feeling overwhelmed/out of control.

In reality, NOVA 4 (Ultra-processed/industrial) foods will not affect PMS if consumed in small amounts. Essentially, the human body requires fat as one of the precursors of estrogen and progesterone hormones. Fat content can be found in NOVA 4 foods [16]. Therefore, consuming NOVA 4 in appropriate amounts will help in secreting estrogen and progesterone hormones without causing hormone fluctuations that can lead to PMS. Similarly, sodium is needed to maintain fluid balance in the body. However, if sodium levels are too high, it can cause the body to retain excess fluid, leading to negative effects during menstruation [17].

In addition to NOVA 4 (Ultra-processed/industrial), stress levels significantly impact PMS Category 2. Stress can lower serotonin levels. Low serotonin levels can lead to changes in the patterns of estrogen and progesterone hormones. This occurs because serotonin can influence the activity of the pituitary gland in the brain to secrete FSH and LH hormones, which in turn affects the secretion of estrogen and progesterone hormones. As a result, there are changes in the patterns of estrogen and progesterone hormones, which can trigger somatic symptoms such as breast tenderness and bloating. When someone experiences chronic stress, it makes PMS symptoms more pronounced because it triggers an imbalance in estrogen and progesterone hormones. In other words, estrogen levels increase while progesterone levels decrease, making PMS difficult to manage [18]. These findings are consistent with [19] study, which found a significant correlation between work-related stress among nurses and premenstrual syndrome in RS.X Bekasi. The higher the level of stress, the more it increases the symptoms of premenstrual syndrome.

In addition to somatic symptoms, stress levels can also result in psychological symptoms. Stress can disrupt sleep patterns by increasing brain activity, making it difficult to fall asleep. Furthermore, stress can lead to a decrease in serotonin levels. The decrease in serotonin can affect the autonomic nervous system, which regulates unconscious bodily functions such as appetite, leading to increased appetite in some individuals. Consequently, this increased appetite results in weight gain.

For significant variables in PMS Category 3 (Daily Dysfunctions), they include stress levels, NOVA 4 (Ultra-processed/industrial), and age. PMS in Category 3 indicates whether symptoms experienced in Categories 1 and 2 can affect daily activities. According to the results, symptoms of PMS in Categories 1 and 2 lead to fatigue and lack of energy in the body, resulting in decreased work and social activities. In Category 3 (Daily Dysfunctions), it is noted that respondents with a younger age, namely students in this study, predominantly experience PMS Category 3 (Daily Dysfunctions). This may be because students have relatively flexible responsibilities. Therefore, when students experience PMS, they can rest. On the other hand, older respondents have responsibilities to work and earn a living, making it more challenging for them to rest when experiencing PMS.

Based on the research conducted in Tanjung Bintang District, specifically in 5 villages, it is known that overall, the PMS experienced by its residents is in mild conditions in all three categories of PMDD, Psychological & Somatic Symptoms, and Daily Dysfunctions.

However, for villages with the highest levels of stress, namely Jati Baru and Trimulyo, it may be due to various factors. Jati Baru is the center of Tanjung Bintang District and is more urban, thus experiencing higher social pressure and different environmental conditions. Urban residents tend to experience higher levels of stress compared to rural residents [20]. This urban environment likely contributes to the higher stress levels observed in Jati Baru. As for Trimulyo village, it is because the respondents are predominantly students who may experience high levels of stress.

5 Conclusion

Based on this research, the factors that most influence the occurrence of PMS in the community of Tanjung Bintang District, South Lampung, are as follows: PMS in Category 1 (PMDD) is influenced by the level of stress, PMS in Category 2 (Psychological & Somatic Symptoms) is influenced by NOVA 4 (Ultra-processed/industrial) and the level of stress, and PMS in Category 3 (Daily Dysfunctions) is influenced by NOVA 4 (Ultra-processed/industrial), the level of stress, and age. This study will involve developing and implementing targeted interventions to address these specific factors, such as stress management programs, nutritional education focused on reducing ultra-processed food consumption, and age-specific strategies to mitigate PMS symptoms.

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