International Journal of Nutrology
(Official Journal of the ABRAN - Brazilian Association of Nutrology)

ORIGINAL ARTICLE

DOI: 10.54448/ijn2236

Evaluation of premenstrual syndrome and its relationship with changes in food consumption during the luteal phase in a university center in northwest paulista: a prospective observational cross-sectional study

Beatriz Rosa Meneghesso[1], Giulia Rago Constâncio[1], Marina Morandin Rinaldi[1], Nayara Ferreira e Silva[1], Pedro Tadeu Dalmaso[1], Vitória Zanqueta Marcello[1], Aline Damasceno de Avance[2], Durval Ribas Filho[1], Tainara Costa[1]*

[1] UNIFIPA - Centro Universitário Padre Albino / Padre Albino University Center, Medicine Course, Catanduva, Sao Paulo, Brazil.
[2] Irmandade da Santa Casa de Misericórdia e Maternidade de Dracena (Hospital), Sao Paulo, Brazil / Damasceno Medical Clinic, Dracena, Sao Paulo, Brazil.

Corresponding Author: Dr. Tainara Costa. UNIFIPA - Centro Universitário Padre Albino / Padre Albino University Center, Medicine Course, Catanduva, Sao Paulo, Brazil.
E-mail: tay_costa@yahoo.com.br
DOI: https://doi.org/10.54448/ijn2236
Received: 04-22-2022; Revised: 06-28-2022; Accepted: 07-21-2022; Published: 10-07-2022; IJN-id: e2236

Abstract

Introduction: The menstrual cycle is a natural phenomenon that occurs in two phases: follicular and luteal. Several hormonal, physical and psychological changes occur during this period, which influence the female diet. These changes and consequences are felt mainly in the luteal phase, that is between 1 to 5 days before the menstrual flow, characterizing the premenstrual syndrome (PMS) or premenstrual tension (PMS). **Objective:** This article aims to evaluate food intake and dietary changes in adult women of reproductive age during the luteal phase of the menstrual cycle. **Methods:** Quali-quantitative descriptive exploratory study, carried out with 207 female students, between 18 and 41 years of age, from all courses at a University Center in northwestern São Paulo. An online questionnaire was applied via Google Forms with closed and open questions that characterized the sample regarding the participants' personal and dietary aspects in the luteal phase. The work complied with Resolution 466/12 of the National Health Council and was approved by the Ethics Committee and all participants signed the Informed Consent Term. **Results:** It was observed that there was a predominance of women aged between 19 and 22 years (64.25%). With regard to physical symptoms in the luteal phase, 95.65% of women reported having at least one symptom, such as swollen and/or painful breasts (67.7%) and colic (55.1%). Regarding the intensity of food craving, 5.3% of the women reported no changes, 10.6% had low intensity (mild), 50.7% had moderate intensity, 27.5% had high intensity (high) and 5, 8% very high intensity (severe). According to the change in dietary pattern, among the foods presented, 85% of the participants claimed to have a higher consumption of sugars and sweets during this period and 38.6% higher consumption of carbohydrates, representing most of the responses collected. It was found that food cravings among the participants occurred with high frequency in 91.78% of the cases, with emphasis on the high craving for sweets (87%) and fast food (33.8%). The increase in food consumption in the luteal phase was significant, as it was present in 70.5% of women. **Conclusion:** The luteal phase interferes with the pattern and intensity of food craving, as well as with the increased intake of macronutrients, especially carbohydrates, sugars and sweets.

Keywords: Luteal phase. Food craving. Macronutrients.

Introduction

The menstrual cycle (MC) is a natural biological phenomenon that most women of reproductive age go through monthly and has an average duration of 28 days, with variations between 20 and 45 days **[1]**. In this sense, the cyclical changes undergone by the uterus are responsible for preparing it to receive an embryo and, when implantation does not occur, the result is the shedding of the endometrium, a process that characterizes the beginning of menstruation.

All the changes that women undergo during MC are a direct result of variations in hormone concentrations secreted by the hypothalamic-pituitary-gonadal axis, among which follicle-stimulating (FSH), luteinizing (LH), estrogen, and progesterone hormones stand out. [two]. However, it is relevant to point out that the MC should not be interpreted only as a physiological phenomenon, since there is a direct action of the nervous system **[3]**.

The MC presents a division delimited by two phases: follicular – comprised between the period of bleeding until ovulation; luteal – in which PMS occurs and extends to the onset of bleeding **[1]**. Concerning hormone levels, in the follicular phase there is the presence of the follicle-stimulating hormone (FSH), luteinizing hormone (LH), and estrogen, which imply the growth of the ovarian follicle and, therefore, ovulation **[2]**. As for the luteal phase, there is an increase in estrogen and progesterone concentrations, which suffer drops in serum levels when fertilization does not occur and, because of this, the result is the desquamation of the endometrium **[2]**.

Also, the menstrual period is composed of a stage of emotional, stress, or physical changes, which is characterized as premenstrual syndrome (PMS) or premenstrual tension (PMS) **[2]**. Usually, most women of childbearing age have physical or emotional symptoms 1 to 5 days before the menstrual flow, that is, in the luteal phase, however, they do not cause serious health problems and have a quick resolution.

Regarding PMS symptoms, the most common are emotional, cognitive, and physical, all of which directly or indirectly interfere with women's social, occupational, and sexual interaction **[1]**. Such interferences are alleviated at the beginning of the menstrual flow **[3]**. In more detail, PMS is portrayed by the following aspects: breast tenderness, swelling, constipation or diarrhea, cramps, water retention with weight gain, fatigue, mood changes (irritability, depression, crying, emotional hypersensitivity), insomnia, sweating in the extremities, dizziness, fainting, headache, changes in appetite and eating behavior (compulsive eating), difficulty concentrating, lower performance, among others **[2]**. Statistically, approximately 47.8% of women suffer from PMS and its interpretation is still a non-consensual issue regarding women's health, precisely due to the absence of scientific studies that address the correlation of food consumption with the period in question, making it difficult to understand of eating behavior and how it influences hormone levels and women's quality of life4. Furthermore, certain foods, such as vegetables, and some dietary patterns, namely low-fat, high-fiber diets, are related to decreased plasma estrogen levels and duration of premenstrual symptoms **[4]**.

Nevertheless, according to some studies that evaluated food intake, it was revealed that excessive consumption of foods such as sweets, fast food, fried foods, coffee, and alcohol are significantly related to the development of PMS **[5]**. Therefore, it is possible to infer that the menstrual period influences a woman's appetite, as well as a higher prevalence and increase in the consumption of macronutrients, especially carbohydrates and fats, due to the drop in serotonin levels in the luteal phase.

Thus, because of the theme presented, the article in question aims to map the dietary pattern during the luteal phase of the menstrual period of female students of childbearing age, enrolled in the courses at Padre Albino University Center/Centro Universitário Padre Albino (UNIFIPA). Because of what has been presented, the parameters will be analyzed, aiming to understand how they influence or not the physiological and psychological changes of the students, in addition to their daily lives.

Methods

Study Design

This study followed a prospective observational cross-sectional model, following the rules of clinical research of the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology), available at: https://www.strobe-statement.org/. The research consisted of a prospective observational study, with qualitative and quantitative axes.

Ethical Approval

This study was analyzed and approved by the Research Ethics Committee of Faculty of Medicine of Catanduva, according to a substantiated opinion number of 4.871.547, and obtaining the patient's consent through the Informed Consent Form, according to CNS/CONEP Resolution 466/ 12.

Settings

The present study was carried out at Padre Albino University Center/Centro Universitário Padre Albino (UNIFIPA), located in the city of Catanduva-SP.

Sample Size and Participants

The present study had 207 female students of childbearing age (18 to 41 years old) who were enrolled in the Institution's courses (Administration, Biomedicine, Law, Physical Education, Nursing, Agronomic Engineering, Pharmacy, Medicine, and Pedagogy) as the study population, being carried out

between June and September 2021, after agreeing to participate in the research and signing the Free and Informed Consent Form.

Data Collect

The data collection technique was performed by applying an online questionnaire via Google Forms (respective link: https://forms.gle/jafpepRPxY9gZArG7), which had closed and open questions that allowed characterizing the sample in terms of personal aspects (age, weight, height, and course) and food in the luteal phase. The questionnaire in question was adopted, based on the "diary" Daily Symptom Report, cited in the article "Nutritional status and food consumption of young women in the luteal and follicular phase of the menstrual cycle" **[6]**. Regarding the procedures, in the evaluation, physical symptoms, dietary approach, age, weight, and height were measured. It is worth mentioning that the food subdivision was based on the Guide to the Pyramid adapted for the Brazilian population6. The invitation to participate in the research was sent online through social networks (WhatsApp, Instagram, Facebook), during the period from July 12, 2021, to September 13, 2021, and in person on August 26, 2021, between 6:30 pm and 7:30 pm, with the delivery of QR codes, which had the link to the online questionnaire, at the UNIFIPA Headquarters Campus.

Statistical Analysis

Concerning the data analysis methodology, the Excel program (Microsoft Office) was used to prepare Tables and Graphs.

Results

The sociodemographic characteristics of the study sample are presented in the Table 1. In total, 207 female students from Centro Universitário Padre Albino participated in the survey, in which 100% of the participants met the inclusion criteria and agreed to the Free and Informed Consent Form. The prevalent age group observed was 19 to 22 years (n = 132, 63.76%), since two participants did not inform their ages, considering a total of 205 responses for this variable. Most students studied medicine (n = 96, 46.38%), followed by law (n = 30, 14.49%), biomedicine (n = 28, 13.53%), nursing (n = 22, 10 .63%), pedagogy (n = 15, 7.25%), physical education (n = 8, 3.86%), pharmacy (n = 4, 1.93%), administration (n = 3, 1, 45%) and agronomic engineering (n = 1, 0.48%).

Table 1. Demographic profile of students enrolled at UNIFIPA.

Variables	N = 207
Age [n (%)][a]	
< 19 years[a]	11 (5.37)
De 19 a 24 years[a]	167 (81.46)
De 25 a 30 years[a]	19 (9.27)
> 30 years[a]	8 (3.92)
Weight [n (%)][b]	
< 49 kg[b]	12 (5.82)
from 49 to 65 kg[b]	132 (64.07)
from 66 to 90 kg[b]	55 (26.69)
> 90 kg[b]	7 (3.39)
Height [n (%)][c]	
< 1.50m[c]	1 (0.48)
De 1.50m a 1.59m[c]	52 (25.24)
De 1.60m a 1.69m[c]	114 (55.33)
> 1.69m[c]	39 (18.93)
Course [n (%)]	
Administration	3 (1.45)
biomedicine	28 (13.53)
Law	30 (14.49)
Physical education	8 (3.86)
Nursing	22 (10.63)
Agronomic Engineering	1 (0.48)
Drugstore	4 (1.93)
Medicine	96 (46.38)
Pedagogy	15 (7.25)

Note. a The total number of women who answered their age was 205. Therefore, the percentages were calculated based on this total. b The total number of women who answered their weight was 206. Therefore, the percentages were calculated based on this total. c The total number of women who answered their height was 206. Therefore, the percentages were calculated based on this total. Source: Prepared by the Author (2021).

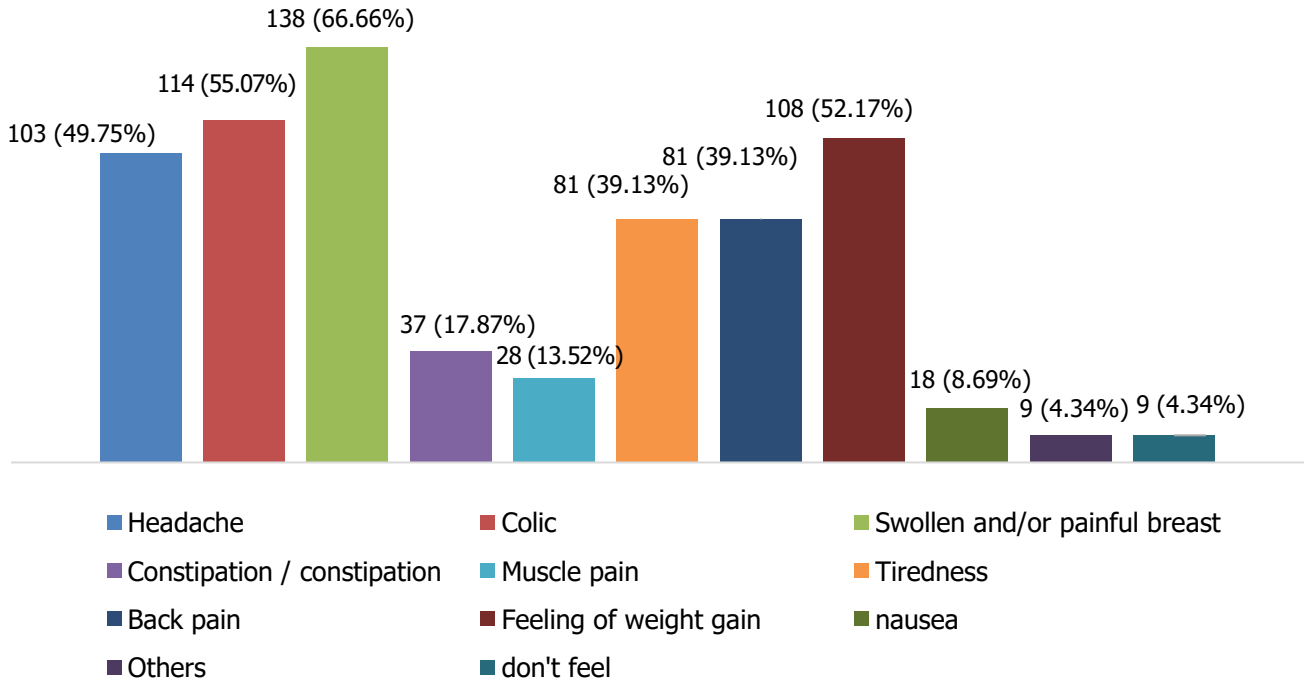
Regarding weight (kg), the predominant range was from 49 to 65 kg (n = 132, 64.07%), since one participant did not inform her weight, considering a total of 206 responses for this variable. In relation to height, the most frequent measurements were 1.57 m to 1.58 m (n = 24, 11.59%), 1.60 m (n = 19, 9.17%), 1.63 m to 1 .65m (n = 51, 24.63%), 1.68m (n =15, 7.24%) and 1.70 m (n = 13, 6.28%), representing 58.91% of the participants, since one participant did not inform her height, considering the total of 206 responses for this variable.

To identify the most recurrent physical symptoms during the luteal phase of the menstrual cycle, participants were asked what they felt most. In this light, 49.75% (n = 103) of the women reported experiencing headaches, 55.07% (n = 114) reported experiencing cramps, 66.66% (n = 138) reported feeling swollen breasts and/ or sore, 17.87% (n=37)

reported having constipation/stuck bowel, 13.52% (n = 28) reported feeling muscle pain, 39.13% (n = 81) reported feeling tired, 39.13% (n = 81) reported having back pain, 52.17% (n = 108) reported experiencing weight gain, 8.69% (n = 18) reported experiencing nausea, 4.34% (n = 9) reported experiencing other types of physical symptoms, while 4.34% (n = 9) said they did not experience physical symptoms, one of the reasons for this being the absence of menstruation. **Figure 1** shows recurring physical symptoms during the luteal phase.

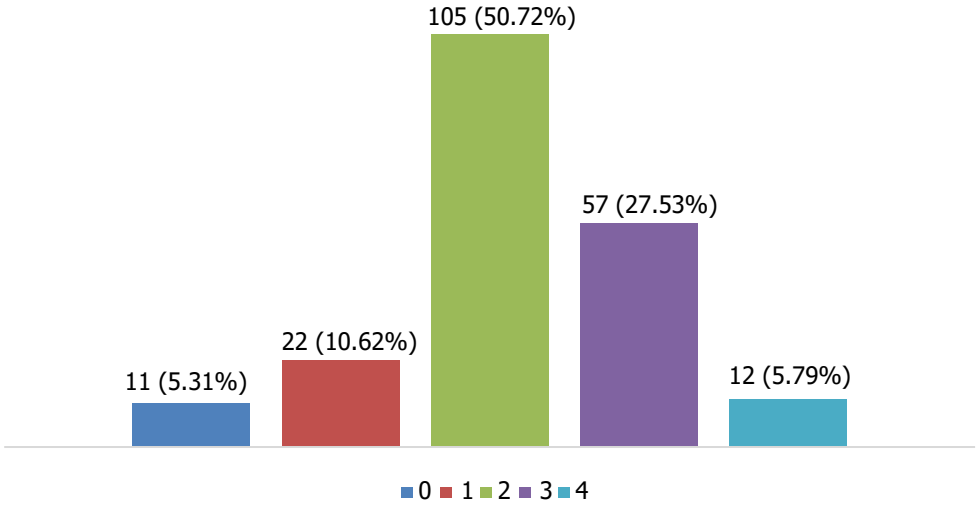
To find out if food cravings were intensified during the luteal phase, women were proposed to rate the intensity of craving from 0 to 4, where 0 corresponds to no food cravings, 1 mild food cravings, and 2 moderate food cravings that do not interfere with daily life, 3 high food cravings that interfere with daily activities, and 4 severe food cravings that are difficult to control and impair daily life. Thus, 5.31% (n = 11) reported having no food cravings during this period, 10.62% (n = 22) claimed to have mild food cravings, 50.72% (n = 105) claimed to have food cravings moderate, 27.53% (n = 57) reported having high food cravings and 5.79% (n = 12) reported having severe food cravings. **Figure 2** presents the intensity of food cravings during the luteal phase.

Figure 1. Graph showing recurring physical symptoms during the luteal phase.



Source: Prepared by the Author (2021).

Figure 2. Graph showing the intensity of food cravings during the luteal phase.



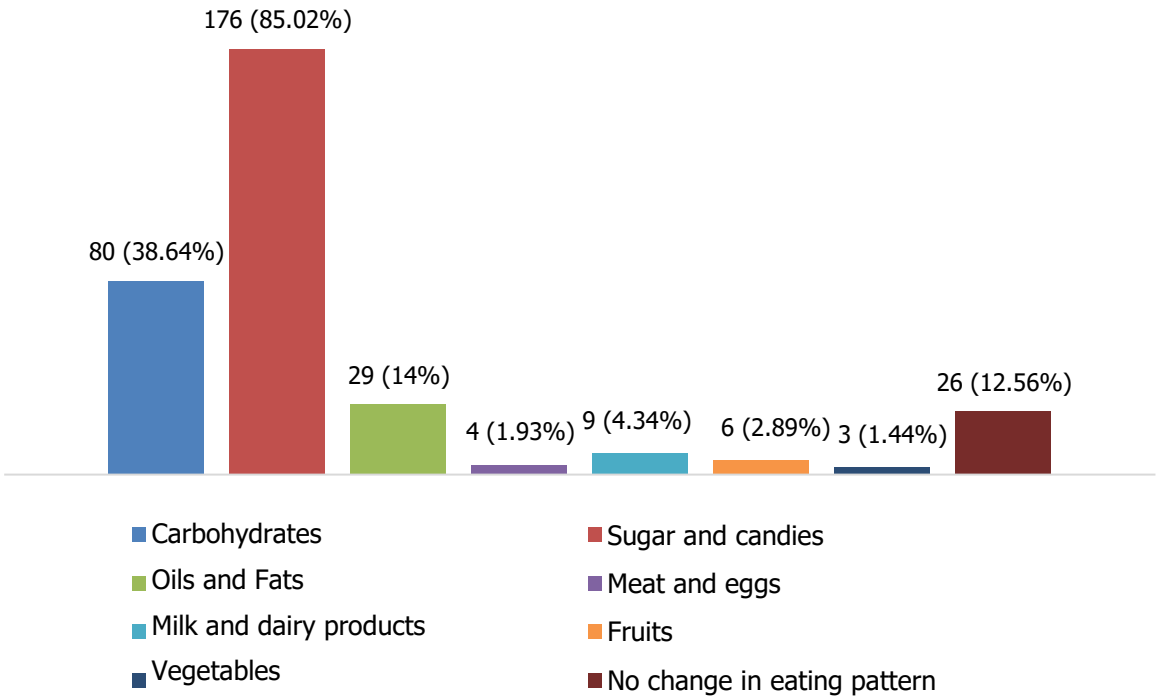
In addition to the change in food desire, the present study also aimed to analyze changes in the dietary pattern during the luteal phase, seeking to assess whether there was an increase in consumption of certain foods, namely carbohydrates, sugars and sweets, oils, and fats, meat, and eggs, milk and dairy products, fruits and vegetables. Thus, 38.64% (n = 80) of the women said they consumed more carbohydrates during this phase of the menstrual cycle, 85.02% (n = 176) said they increased their consumption of sugars and sweets, 14% (n = 29) said to consume more oils and fats, 1.93% (n = 4) said they consumed more meat and eggs, 4.34% (n = 9) said they increased their consumption of milk and dairy products, 2.89% (n = 6) claimed to consume more fruits, 1.44% (n = 3) claimed to consume more vegetables and 12.56% (n = 26) reported no changes in their dietary pattern. **Table 2** illustrates how food consumption was manifested during the luteal phase among university students. **Figure 3** shows changes in eating patterns during the luteal phase.

Table 2. Eating relationships and physical symptoms among university students during the luteal phase.

Variables	N = 207
Physical Symptoms [n (%)]	
Tiredness	81 (39.13%)
Colic	114 (55.07)
Constipation/Intestinal stuck	37 (17.87)
Headache	103 (49.75)
Muscle pain	28 (13.52)
Back pain	81 (39.13)
Swollen and/or painful breast	138 (66.66)
nausea	18 (8.69)
Feeling of weight gain	108 (52.17)
Others	9 (4.34)
No symptoms/No menstruation	9 (4.34)
Intensity of food craving [n (%)]	
0	11 (5.31)
1	22 (10.62)
2	105 (50.72)
3	57 (27.53)
4	12 (5.79)
Change in food pattern [n (%)]	
Sugars and sweets Carbohydrates	176 (85.02
Meat and eggs	80 (38.64)
fruits	4 (1.93)
Vegetables	6 (2.89)
Milk and dairy products	3 (1.44)
Oil and fat	9 (4.34)
Don't feel change	29 (14)
	26 (12.56)
I want to feed [n (%)]	
Alcohol	12 (5.8)
Coffee	12 (5.8)
Candy	180 (86.96)
fast food	70(33.82)
frying	41 (19.81)
I do not feel	17 (8.21)
Increase in food intake [n (%)]	
Yes	146 (70.53)
No	61 (29.47)

Source: Prepared by the Author (2021).

Figure 3. Graph showing changes in eating pattern during the luteal phase.



Source: Prepared by the Author (2021).

Regarding the desire to eat certain foods during the luteal phase, a massive number of women reported a desire for sweets (n = 180, 86.96%), followed by fast food (n = 70, 33.82%), fried food (n = 41, 19.81%), coffee (n = 12, 5.8%) and alcohol (n = 12, 5.8%), while 8.21% (n = 17) of the participants reported feeling no desire (may or may not be associated with other desires). It was also observed that among the answers, 48.79% of the students reported having only the desire for sweets during some moment of the luteal phase. Regarding the increase in food consumption, more than half of the women (n = 146, 70.53%) reported having an increase in food intake, while about 29.47% (n = 61) indicated that they did not eat more than usual during the luteal phase.

Discussion

Through the analysis of the results, the elaboration of this research was important to investigate the correlation between the luteal phase of the menstrual period and dietary changes, which include changes in the type of food, especially with a focus on macronutrients (carbohydrates, proteins, and fats) and the amount of intake. In this sense, applying this thematic approach, which, in turn, has been worked on in the scientific literature, within the Padre Albino University Center - Catanduva / SP, is pertinent since the references worked in the literature could be verified in the results presented above, which revealed direct changes between diet and menstrual period.

According to Halbreich 2007 (apud López, 2013) **[7]**, PMS is a common condition characterized by the accentuation of physical and behavioral symptoms that occur during the luteal phase, of which the most commonly reported are: headaches and breast tenderness, irritability, fatigue, depression, abdominal pain, and increased appetite. Such a context can imply negative consequences for the woman as well as her social relationships, namely, family and close friends **[8]**. Another important aspect is that, because the symptoms are more accentuated in the luteal phase and, consequently, there is a greater consumption of specific macronutrients, it is pertinent to pay more attention to dietary practices to avoid eating disorders with possible negative consequences for women **[7]**.

Based on the results presented above, concerning dietary change, 38.6% of the participants responded to ingesting carbohydrates, and "one of the hypotheses about the relationship between carbohydrate consumption and menstrual cycle lies in the variation of steroid concentration, being observed that estrogen suppression may influence carbohydrate consumption" **[3]**. Furthermore, still, concerning carbohydrate intake, there is a second hypothesis that explains the relationship between high glycemic index carbohydrates (rich in simple carbohydrates) and increased brain serotonin production and, consequently, relief of premenstrual symptoms" **[9]**.

Still, a study through qualitative results demonstrated the prevalence of a change in the pattern of consumption of sweets, which are rich in carbohydrates and foods with high-fat contents (apud Silva, 2012) **[3]**, so that, a justification for this fact is the attempt to attenuate the physical and emotional symptoms that involve PMS, to try to increase the concentration of fats so that these, more specifically cholesterol, are transformed into follicle-stimulating hormone (FSH) and luteinizing hormone (LH), which decreases considerably in the luteal phase period **[3]**. This whole process of hormonal and metabolic changes leads to greater consumption of carbohydrates, as an attempt to increase tryptophan (precursor of serotonin) in the brain, generating variations in food consumption, in which the increase in carbohydrate intake acts as a compensatory response to changes in serotonin level during the cycle. Added to this, it was observed in the luteal phase in particular an increase in consumption in the following classes: sweets, sugars, oils, and fats **[3]**. Regarding the physical symptoms that were prevalent in this study, namely, physical fatigue - present in 39.1% of the participants.

In correlation with the results obtained in the present research, it was observed that 85.02% of the participants ingest sweets and sugars, in addition to 86.96% of them also feeling the desire for these foods, while the other food categories presented had percentages smaller, such as the intake of carbohydrates (38.6%) and oils and fats (14%) (**Table 2**). This is due to the mechanism already mentioned above, so the greatest increase in sweets and sugars, both rich in carbohydrates, refers to the variable concentration of steroids. As for serotonin, in addition to increasing endorphin through the action of food consumed, it works as a natural analgesic and, therefore, increases pain tolerance, attenuating muscle pain in 13.5% of patients **[3,9]**.

Still, the accentuated desire for certain classes of food in the luteal phase can be explained based on sensory issues. After all, according to Lopéz, 2013, p.21, "...the perception of flavors and aromas varies during the cycle, but is increased during the luteal phase" **[7]**. Concerning the macronutrients ingested in greater amounts during the luteal phase and, therefore, the results obtained, it is necessary to consider the participants' ability to know how to differentiate the types of macronutrients **[7]**. Also, Lopéz says "...methodological issues, such as the population's ability to differentiate carbohydrates from fats when having products rich in both macronutrients, exert potential difficulty in determining a more accurate assessment" **[7]**.

It is worth mentioning that this work can be analyzed under the bias of stimulus and guidance for other scientific studies, which may expand the sample, as well as add other variables that may imply dietary changes during the menstrual period. Finally, according to the results obtained, it is possible to affirm that the present work is in line with the study by Sampaio et al. (2002) **[2]**, which showed that the premenstrual cycle can interfere with the number of meals and in the increase in the intake of macronutrients, namely, carbohydrates **[3]**.

Conclusion

In the present study, the results demonstrate that, for the participating women, the luteal phase has a great influence on food consumption. It was evidenced that most of them present an increase in food desire of moderate to severe intensity, with an increase in consumption mainly of sugars, sweets, and macronutrients, especially carbohydrates, in addition, more than 70% of women increase their food intake in general. Such changes in food pattern and consumption are justified as a way to alleviate the symptoms of premenstrual syndrome so that the main symptoms evidenced by the study participants are swollen and/or painful breasts, cramps, feeling of weight gain, and headaches.

Acknowledgement

Not applicable.

Ethical approval

This study was analyzed and approved by the Research Ethics Committee of Faculty of Medicine of Catanduva, according to a substantiated opinion number of 4.871.547, and obtaining the patient's consent through the Informed Consent Form, according to CNS/CONEP Resolution 466/ 12.

Informed consent

The patient signed the consent form.

Funding

Not applicable.

Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

References

1. Oliveira DR et al. Síndrome pré-menstrual e aspectos relacionados à antropometria e ao comportamento alimentar. O mundo da saúde, v. 37, n. 3, p. 280- 287, 2013. Disponível em: <http://www.saocamilo-sp.br/pdf/mundo_saude/106/1824.pdf>. Acesso em 13 de setembro de 2021.
2. Sampaio HAC. Aspectos nutricionais relacionados ao ciclo menstrual. Revista de Nutrição, v. 15, n. 3, p. 309-317, 2002. Disponível em: <https://www.scielo.br/pdf/rn/v15n3/a07v15n3>. Acesso em 13 de setembro de 2021.
3. Silva SMCS et al. A influência da tensão pré-menstrual sobre os sintomas emocionais e o consumo alimentar. Nutrire Rev. Soc. Bras. Aliment. Nutr, p. 13-21, 2012. Disponível em: <http://sban.cloudpainel.com.br/files/revistas_publicacoes/350.pdf>. Acesso em 13 de setembro de 2021.
4. Moradifili B et al. Dietary patterns are associated with premenstrual syndrome: evidence from a case-control study. Public Health Nutr. 2020 Apr 23. Disponível em: <https://www.cambridge.org/core/journals/public-health-nutrition/article/dietary-patterns- are-associated-with-premenstrual-syndrome-evidence-from-a-casecontrol-study/B23D6BA51C657F425C1D735537E95DBB>. Acesso em 13 de setembro de 2021.
5. Farasati N et al. Western dietary pattern is related to premenstrual syndrome: a case-control study. Br J Nutr. 2015 Dec 28. Disponível em: <https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/western- dietary-pattern-is-related-to-premenstrual-syndrome-a-casecontrol-study/F2C1436021136BDA3A9CC0968C351E46>. Acesso em 13 de setembro de 2021.
6. Santos LAS et al. Estado nutricional e consumo alimentar de mulheres jovens na fase lútea e folicular do ciclo menstrual. Rev. Nutr., Campinas, v. 24, n. 2, p. 323-331, abril de 2011. Disponível em: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S1415-52732011000200013&lng=en&nrm=iso>. Acesso em 10 de maio de 2021.
7. Lopéz L. Aspectos nutricionais e metabólicos na tensão pré-menstrual. Orientadora: Cileide Moulin. 2013. 48f. TCC(graduação) - Curso de Nutrição, Faculdade de Medicina, Universidade Federal do Rio Grande do Sul, Porto Alegre, 2013. Disponível em: <https://www.lume.ufrgs.br/bitstream/handle/10183/77278/000896340.pdf?sequence=1>. Acesso em: 3 de set. 2021.
8. Abrahan GE. Nutritional factors in the etiology of the premenstrual tension syndromes. Disponível em: <http//europepmc.org/article/med/6684167>. Acesso em: 3 set 2021.
9. Rossi Luciana TJ. Implicações do sistema serotoninérgico no exercício físico. Arquivos Brasileiros de Endocrinologia & Metabologia [Internet]. 2004 Jul 07;48(2):1. Disponível em:< https://www.scielo.br/j/abem/a/TwYqWxv5dTMxrDz3k5CPS6g/?lang=pt>. Acesso em 10 set 2021.