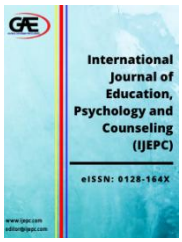
International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 61 (December 2025) PP. 1381-1390
DOI 10.35631/IJEPC.1061095




INTERNATIONAL JOURNAL OF EDUCATION, PSYCHOLOGY AND COUNSELLING (IJEPC)
www.ijepc.com

# THE IMPACT OF HORMONAL CHANGES AND MOTIVATION DURING THE MENSTRUAL CYCLE ON WOMEN'S APPETITE AND CRAVING

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International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 10 Issue 61 (December 2025) PP. 1381-1390
DOI 10.35631/IJEPC.1061095

**Article Info:**

**Article history:**
Received date: 28.10.2025
Revised date: 18.11.2025
Accepted date: 24.12.2025
Published date: 31.12.2025

**To cite this document:**

Nasir, A. M., Firdaus, M. I. A. M., Abd Razak, I. B., Fadzil Akbar, A. N., Azrell, N. E., Che Mohd Nasir, C. M. N., Ahmed, M. A., Allam, A. H. A. E., Md Tajudin, H. H., & Jaffer, U. (2025). The Impact of Hormonal Changes and Motivation During the Menstrual Cycle on Women's Appetite and Craving. *International Journal of Education, Psychology and Counseling, 10* (61), 1381-1390.

**DOI:** 10.35631/ IJEPC.1061095



**Abstract:**

This paper explores the interplay between hormonal fluctuations during the menstrual cycle and their impact on women's appetite, cravings, and emotional well-being. A comprehensive review of the literature reveals consistent findings that hormonal changes, particularly in serotonin and insulin levels, are positively correlated with variations in motivation, cravings, and mood across the menstrual phases. The luteal phase (LP), characterized by a drop in serotonin, is associated with heightened carbohydrate cravings and mood swings. This review synthesizes evidence highlighting the role of nutrient-dense, personalized dietary interventions in mitigating these effects, including the consumption of protein-rich meals to reduce emotional eating and depressive symptoms. Additionally, mindfulness practices and regular physical activity emerge as effective strategies for managing hormonal imbalances by reducing stress, enhancing mood, and promoting self-control. To address the identified challenges, this paper proposes practical applications such as education on hormonal fluctuations, tailored nutrition plans, and the integration of mindfulness and exercise into daily routines. Furthermore, it emphasizes the importance of cultural and lifestyle considerations in shaping dietary behaviors during the menstrual cycle. From an Islamic perspective, the teachings of moderation and mindfulness, as well as spiritual practices such as dhikr and reciting Surah Al-Fatiha, offer additional support in managing hormonal changes and promoting balance. Future research is recommended to explore sociocultural influences, lifestyle variations, and long-term interventions, offering a holistic approach to managing menstrual-related changes.

**Keywords:**

Hormonal Fluctuations, Menstrual Cycle, Cravings, Appetite, Mindfulness Practices, Nutritional Interventions

## Background/Introduction

Most women experience menstruation or also known as menarche typically beginning around the age of nine to fifteen. This menstruation varies for each individual based on the influences of genetics, food intake, lifestyles and other environmental factors. Menstruation is something that is normal, a natural biological process that determines the overall healthiness of a woman. Around 26% of the world's population is female and around half of those women are of reproductive age where the majority of women experience two to seven days of menstruation every month (UNICEF, 2018). This monthly cycle reflects a number of physiological and hormonal processes vital to reproduction and is a significant component of women's health and well-being.

Islam elevates the status of women where women are viewed with great respect. They are seen as special beings endowed with unique qualities such as a cervix, and a female reproductive system that differentiates them from men. This uniqueness gives them the remarkable ability to provide lineage, bear children and play a vital role in educating the descendants of Adam to spread Islam. Menstruation in this context is not merely a physiological process but rather a milestone in a woman's life, symbolizing the beginning of self-care and chastity. It marks the transition into adulthood known as "akil baliqh" which signifies that a girl has reached maturity and is now considered responsible for her own actions. This phase is important as it also indicates that a woman has become "mukallaf" meaning she is accountable for her religious duties. At this stage, women are expected to take care of themselves both physically,

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EISSN : 0128-164X
Volume 10 Issue 61 (December 2025) PP. 1381-1390
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emotionally and spiritually, as they are now subject to religious obligations. For instance, covering the aurah becomes wajib or obligatory upon them, as it is a fundamental practice in maintaining modesty and upholding their dignity in accordance with Islamic teachings.

According to Mckellar and Sillence (2020), biologically, the menstrual cycle which lasts from the first day of a woman's period to the day before her next one, is roughly 28 days long and comprises of four stages: Luteal phase, Follicular phase, Ovulation phase and Menstrual phase. Each of these phases has distinct hormonal and physical effects on a woman's body. The Follicular phase begins on the first day of menstruation, where estrogen levels rise and energy improves. Ovulation is marked by the release of an egg and increased libido. The Luteal phase occurs after ovulation, with rising progesterone levels that often cause premenstrual symptoms like mood swings and bloating. Finally, the Menstrual phase involves shedding of the uterine lining, leading to menstruation and often accompanied by cramps and fatigue. These hormonal and physiological changes in all of these stages have an effect on the emotions and behavior of a woman. As hormone levels fluctuate throughout the menstrual cycle, women may experience changes in appetite, cravings and food choices. For instance, during the Luteal phase, many women tend to crave foods high in sugar like chocolate, desserts and sweets and carbohydrates like bread, rice and oats due to an increase in progesterone.

Besides that, motivation plays a significant role in influencing appetite and cravings, particularly in women where emotional and hormonal changes throughout the menstrual cycle can impact food preferences and eating habits. According to Zeidner et al., (2000) as cited in Bandhu et al., (2024) motivation is the internal drive or desire of an individual to participate in a specific behavior or activity. It is the psychological process that starts, directs and sustains goal-oriented behavior. Motivation can be divided into internal or intrinsic factors such as one's own desires and needs as well as external or extrinsic factors such as rewards or social pressures. In the context of appetite and cravings, motivation plays a crucial role in determining what a person chooses to eat, how much they eat and when they feel the need to eat and stop. The psychological effects of hormonal shifts also affect the drive to seek out some particular foods. This is due to the psychological need to reduce tension or discomfort where women may be more likely to reach for meals that offer an instant sensation of comfort or pleasure when their moods fluctuate. This shows how motivation is influenced by emotional and hormonal states in addition to physical hunger which affects eating patterns during the menstrual cycle.

## Methodology

A comprehensive and standardized search strategy was utilized to compile the papers for this review. Particularly, Google Scholar was the main academic search engine used, alongside the Academic Journals database and PubMed. To ensure specific search results, keywords related to the topic of interest were used such as, “menstrual cycle,” “food cravings,” “change in appetite” and “premenstrual syndrome.” Boolean operators (AND, OR) were utilized to expand and limit the search as needed.

### *Inclusion and Exclusion Criteria*

The review consisted of papers published between 2018 to 2021 with one paper dated back to 1997. Additionally, the papers included were original research papers and literature reviews. Research papers that were unpublished and using non-English mediums were excluded from this review.

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***Data Extraction***

A systematic form was developed specifically for this review. This form allowed for a structured synthesis of each article, including the participant demographic information, study design, objective(s) of study, findings and limitations of study as guidelines for future research in the same area.

**Results**

To understand the impact of hormonal changes and motivation during the menstrual cycle on women's appetite and cravings, several key findings from credible academic research papers relevant to the topic were selected and reviewed to demonstrate a comprehensive understanding of the mechanism. de Souza et al. (2018) conducted a study assessing anthropometric measures, food intake, and food cravings during the menstrual cycle of undergraduate students of the Faculty of Nutrition, highlighting the interplay between hormonal changes, cravings, intake, and behavioural outcomes. There are significant hormonal fluctuations during premenstrual syndrome (PMS) which occurs across two phases, the luteal phase (LP) and the follicular phase (FP). The FP begins on the first day of the menstrual cycle and ends with ovulation. It is characterised by increased secretion of oestrogen, follicle-stimulating hormone, and luteinising hormone before ovulation. During the LP, progesterone and oestrogen levels rise after ovulation. Fluctuations in oestrogen and progesterone levels significantly influence serotonin activity, which is implicated in appetite regulation and mood (de Souza et al., 2018).

The study evaluated patterns in food cravings and discussed that there were no statistically significant differences in overall energy intake or distribution of macronutrients between the LP and FP, despite observable variation in reported cravings. Specifically, the authors reported that cravings for calorie-dense foods high in simple carbohydrates, salt, and sugar (e.g., pastries, snacks, sausages, chocolate, sweets, and desserts) were higher during the premenstrual period, even though this did not translate into higher total energy intake (de Souza et al., 2018). One interpretive mechanism is that hormonal changes during the LP may be associated with lower serotonin activity, which can increase the desire for carbohydrate-rich foods because carbohydrate intake can support serotonin synthesis. In this sense, cravings for chocolate and pastries may function as coping responses to concurrent emotional and physiological discomfort.

The pattern of heightened cravings, especially for palatable foods, aligns with prior research indicating that food craving is more pronounced during the premenstrual window than post-menstruation (Gorczyca et al., 2016; Santos et al., 2011, as cited in de Souza et al., 2018). Moreover, irritability, impulsivity, and affective reactivity—symptoms often reported as more intense in the LP—have been linked to stronger cravings for highly sweet foods, which may elevate the longer-term risk of weight gain if recurrent overconsumption becomes habitual (Yen et al., 2018, as cited in de Souza et al., 2018). The study therefore supports a key conclusion: cravings can change meaningfully across phases even when total intake does not change to the same extent, suggesting that motivational and affective components of eating are central to understanding menstrual-related appetite shifts.

Dye and Blundell (1997) examined the relationship between menstrual-cycle hormones and food preference, with implications for weight regulation. They argued that the psychological and physiological features of PMS may influence appetite expression, including hunger intensity, cravings for specific foods, meal-size changes, and alterations in fat and carbohydrate

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selection. They further summarised evidence that LP energy intake is often higher than FP intake in cyclical patterns. A proposed pathway concerns changes in insulin sensitivity across the cycle. Marsden et al. (1996, as cited in Dye & Blundell, 1997) observed reduced insulin receptor binding in adipose tissue during the LP; although downstream compensatory changes may preserve overall insulin action, the endocrine milieu resembles states of elevated progesterone and oestrogen where insulin sensitivity can be impaired. Dye and Blundell (1997) also discussed serotonin as a key mediator, proposing that low serotonin activity may contribute to dysphoric mood and prompt carbohydrate-seeking as an adaptive attempt to raise brain serotonin (Fernstrom & Wurtman, 1971, as cited in Dye & Blundell, 1997). Collectively, these findings provide a plausible biological account of why cravings for carbohydrate-rich, sweet, or comfort foods may be intensified in the LP.

In a Malaysian context, Abdullah et al. (2021) conducted a cross-sectional study among university students to examine the level of food craving during pre-menstruation and PMS symptoms. The study reported that food craving and PMS symptoms were prevalent during pre-menstruation and significantly associated. The authors noted that menstrual symptoms are common, with many women reporting some symptoms during reproductive years, and that craving can rise notably in the days preceding menses (Abdullah et al., 2021). In their sample, clinically relevant traits of food craving were reported among roughly half of respondents, with sweet foods being the most commonly craved category, followed by fatty foods (Abdullah et al., 2021). The study also found a significant association between food craving and PMS symptom severity, supporting the view that affective and somatic symptoms may amplify reward-driven eating during this window. These results reinforce the broader conclusion that menstrual-phase eating patterns cannot be reduced to caloric intake alone: affect regulation, perceived stress, and hedonic responsiveness appear to be part of the mechanism.

**Discussion**

A detailed review of the literature reveals a complex relationship between hormonal fluctuations during the menstrual cycle and factors influencing appetite, food cravings, motivation, and emotional well-being. During the FP, rising oestrogen levels are commonly associated with appetite suppression, which may reflect an adaptive energy-allocation pattern around ovulation (de Souza et al., 2018). In contrast, the LP is characterised by increased progesterone, which has been linked to heightened appetite and a greater pull toward calorie-dense, palatable foods (Dye & Blundell, 1997). However, an exclusively biological reading risks over-simplifying the issue, because the same hormonal shifts are experienced within social and psychological environments that shape eating behaviour.

A key contemporary issue concerns how body-image pressures and social evaluation intersect with menstrual-phase vulnerability. Social norms around “controlled” eating, appearance ideals, and weight-related teasing may intensify distress at precisely the time when appetite and cravings are more pronounced. Evidence suggests that psychosocial stressors can magnify eating-related distress and body dissatisfaction, and that endocrine states may moderate these links in younger populations (Forney et al., 2019). In practice, this means that the LP may become a “perfect storm” for guilt-driven restriction followed by rebound overeating, a pattern that can entrench disordered eating over time.

An integrated account also needs to consider the modern food environment. Contemporary diets are shaped by ubiquitous availability of high-salt, high-sugar, high-fat foods, alongside

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marketing that frames such products as comforting and indulgent. When hormone-related cravings increase sensitivity to reward, environmental cues may push intake in an unhealthy direction. Research suggests that exposure to food advertising can increase immediate intake, especially for energy-dense products, which has clear implications for people experiencing cyclical craving peaks (Arrona-Cardoza et al., 2023). This indicates that menstrual-related cravings are not only a matter of internal physiology; they are also environmentally "fuelled".

The serotonin-based explanation remains influential: lower serotonin activity has been proposed to contribute to dysphoric mood and to promote carbohydrate-seeking as a short-term mood-regulation strategy (Dye & Blundell, 1997). Yet emotional eating is rarely only biochemical. Learned coping strategies, stress reactivity, and habitual comfort-eating can become entrenched and then be triggered more easily during the LP. Emotional eating is reported across weight groups and is associated with difficulties in emotion regulation, indicating that psychological interventions should be considered alongside nutritional guidance (Frayn et al., 2018). Cultural norms can further reinforce these patterns by shaping what "comfort" foods are, when indulgence is socially acceptable, and how emotions are expressed in food contexts (Ebrahimi et al., 2024).

Longer-term consequences also deserve emphasis. Habitual consumption of calorie-dense foods during recurrent LP craving peaks can contribute to weight gain and metabolic risk, particularly if accompanied by sleep disruption and reduced activity. While nutritional suggestions such as increasing protein and fibre may help mitigate cravings (Abdullah et al., 2021), the real-world effectiveness and sustainability of such strategies remain under-examined in longitudinal designs. Motivation adds an additional layer: health intentions, self-control beliefs, and social goals may interact with hormonal drives but are seldom measured directly. Methodologically, many studies rely on small or homogeneous samples and self-report dietary assessment, limiting generalisability and introducing recall bias. These limitations suggest a need for more rigorous, multi-method designs (e.g., hormone assays combined with ecological momentary assessment) to capture both biological state and real-time eating behaviour.

Synthesising these insights, it is evident that the literature provides a strong foundation for biological mechanisms, but often under-specifies how psychological, sociocultural, and environmental factors interact with hormonal changes. Bridging these gaps requires interdisciplinary research and integrated interventions that combine nutritional strategies with skills-based psychological support (e.g., cognitive restructuring and emotion-regulation training), tailored to menstrual-phase vulnerabilities.

## Application to Selected Contemporary Issues

From the analysis of the literature, the findings are broadly consistent across studies in reporting associations between menstrual-phase hormonal changes and women's appetite and cravings. This section applies the reviewed evidence by proposing practical applications and identifying future research directions.

### *Education on Nutrition Intake*

A first application is structured education on menstrual-cycle physiology and its links to appetite regulation. Understanding phase-related changes (e.g., why cravings may rise in the LP) can reduce guilt and self-blame and support more intentional eating decisions. During the LP, when cravings for carbohydrates and sweet foods tend to rise, a practical recommendation

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EISSN : 0128-164X
Volume 10 Issue 61 (December 2025) PP. 1381-1390
DOI 10.35631/IJEPC.1061095

is to prioritise nutrient-dense carbohydrate sources (e.g., whole grains, fruit, legumes, and vegetables) alongside adequate protein and fibre to improve satiety and stabilise energy levels. Where feasible, personalised nutrition planning may be helpful, particularly for individuals with pronounced PMS symptoms or a history of disordered eating, although the evidence base for fully personalised "hormone-tailored" plans is still emerging (Mazza et al., 2024). In addition, observational evidence suggests that dietary patterns are meaningfully related to mental health outcomes, and diets with higher-quality nutrient profiles (including adequate protein) may support mood stability (Sun et al., 2020). Taken together, education should focus on (i) normalising cyclical appetite shifts, (ii) planning for higher-risk windows, and (iii) choosing foods that meet cravings while still supporting overall nutritional quality.

***Physical Activity and Mindfulness***

Mindfulness skills and physical activity can serve as alternative coping mechanisms for managing stress, low mood, and emotion-driven eating. Mindfulness-based interventions have been associated with improvements in stress-related physiology and psychological well-being, including outcomes linked to cortisol regulation (Vargas-Uricoechea et al., 2024), and mindfulness-based eating interventions have shown promise in reducing maladaptive eating patterns and improving self-regulation (Yu et al., 2020). Practising brief techniques (e.g., paced breathing, grounding, or body scans) can help distinguish physical hunger from emotionally triggered cravings, especially during the LP when irritability and stress may be heightened. Physical activity can also support mood through behavioural activation and improved sleep, and can be presented as a non-punitive strategy for wellbeing rather than a compensatory response to eating. For practicality, interventions should emphasise moderate, enjoyable movement and realistic goal-setting that fits individuals' schedules and cultural context.

***The Islamic Lense***

Islam emphasises moderation (wasatiyyah) and the ethical discipline of appetite. Menstruation (ḥayḍ) is a natural physiological process, not a moral deficit. A frequently cited Prophetic teaching highlights moderation in eating: "A believer eats in one intestine … and a disbeliever eats in seven intestines" (Ṣaḥīḥ al-Bukhārī). While this narration is not about menstruation specifically, it can be used pedagogically to reinforce mindful restraint and balance in eating habits, including during phases of heightened craving.

In addition, the Qur'an offers a general behavioural ethic relevant to consumption: "Eat and drink, but do not waste. Surely, He does not like the wasteful" (Qur'an, 7:31). Contemporary health applications of spiritual practice should be framed cautiously: while Qur'an recitation and dhikr may reduce stress and support emotion regulation for some individuals, claims about direct "hormone stabilisation" require careful scientific substantiation. A recent review suggests that Qur'an recitation may be associated with improved mental well-being and reduced stress-related outcomes, though the evidence varies in quality and context (Moulaei et al., 2023). Thus, integrating spiritual practices can be presented as a complementary strategy which supports coping, meaning-making, and self-regulation, alongside nutritional planning and psychological skills.

**Limitations**

The reviewed literature has several limitations that constrain interpretation. First, many studies are cross-sectional or short-term, limiting causal inference about whether hormonal changes drive cravings directly or whether unmeasured confounders (e.g., stress, sleep, physical

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activity) account for observed associations. Second, samples are often small and relatively homogeneous (frequently university students), restricting generalisability across age groups, socioeconomic contexts, and cultures. Third, reliance on self-reported dietary intake and cravings introduces recall and social desirability bias, particularly in contexts where weight stigma is present. Fourth, menstrual-cycle phase is sometimes estimated using self-report rather than confirmed with hormone assays, increasing misclassification risk. Finally, older foundational work (e.g., Dye & Blundell, 1997) remains influential but may not fully capture current food environments shaped by digital marketing, delivery platforms, and ultra-processed food availability.

**Future Directions**

Future research would benefit from multi-method, longitudinal designs that combine hormonal measurements (e.g., oestradiol, progesterone, and stress markers) with real-time assessment of cravings and intake (e.g., ecological momentary assessment, wearable activity/sleep tracking, and digital food logging). Studies should expand beyond student samples to include adolescents, working adults, and perimenopausal women, as well as culturally diverse populations where dietary norms differ. Intervention studies are also needed to test integrated approaches that combine (i) nutrient-focused strategies (protein/fibre planning, healthier carbohydrate substitutions), (ii) psychological skills (emotion regulation, cognitive-behavioural strategies), and (iii) context-level supports (reducing exposure to food advertising cues during high-risk windows). Finally, more research should examine how motivations—such as health goals, self-efficacy, and social pressures—interact with hormonal states to predict whether cravings translate into overeating or are managed adaptively.

**Conclusion**

In conclusion, this paper has explored the complex relationship between hormonal fluctuations during the menstrual cycle and their effects on women's appetite, cravings and emotional well-being. The findings indicate that changes in hormones, especially during the LP, are associated with increased appetite and stronger cravings for high-fat, sugary and highly palatable foods (de Souza et al., 2018; Dye & Blundell, 1997). These tendencies may be linked to serotonin-mediated mood shifts, changes in reward sensitivity, and broader motivational dynamics. The Malaysian student evidence further suggests that PMS symptom severity is significantly associated with food craving, reinforcing the importance of affective and behavioural pathways (Abdullah et al., 2021).

From an applied perspective, a balanced approach combining nutrition education, practical dietary planning, psychological skills (including mindfulness-based self-regulation), and supportive lifestyle habits (including moderate physical activity) offers a more realistic response than physiological explanations alone. Integrating Islamic ethical guidance on moderation and non-wastefulness can provide additional motivational framing, while spiritual practices may support coping and stress reduction for some individuals (Qur'an, 7:31; Moulaei et al., 2023). Overall, understanding the interplay between hormones, environment, motivation, and coping can empower women to make informed choices and seek proactive strategies to manage menstrual-cycle challenges in a sustainable, compassionate way.

**Acknowledgement**

I would like to express my gratitude to everyone who supported me in the completion of this research. In addition, no potential conflict of interest was reported by the author(s).

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IJEPC
EISSN : 0128-164X
Volume 10 Issue 61 (December 2025) PP. 1381-1390
DOI 10.35631/IJEPC.1061095

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