



**ASSESSMENT OF DIETARY PREFERENCES ACROSS THE
DIFFERENT STAGES OF THE MENSTRUAL CYCLE AMONG
ADOLESCENTS: A CROSS-SECTIONAL STUDY IN A SUBURBAN
AREA OF BANGLADESH**

**A PROJECT REAPORT
BY
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Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment
of B.Sc. in Nutrition and Food Engineering

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APPROVAL

The project titled “Assessment of dietary Preferences Across the different stages of the menstrual cycle among adolescents”, submitted by **ISRAT JAHAN BRISTY** to the Department of Nutrition and Food Engineering at Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents.

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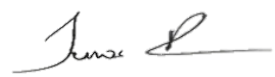
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DECLARATION

The undersigned certifies that this study was completed according to the supervision of **Juwel Rana**, Assistant Professor in the Department of NFE at Daffodil International University. Furthermore, according to the author, no degree or diploma has ever been awarded for this task, in whole or in part.

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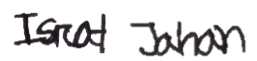
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ABSTRACT

Menstrual cycle is a physiological phenomenon occurring in females on monthly basis which helps in conception and implantation. The fact that the menstrual cycle begins during the adolescent is one of the changes that affect the nutrition and health of adolescent girls to a very large extent. To enhance knowledge about the amount of nutrition knowledge menstrual health education and overall well-being through the evaluating food choice during several cycles in adolescent's this research was conducted. The purpose of this research shall be to establish the differences in dietary preferences amongst adolescents before, during and after the menstrual cycle, and distinguish the different food types preferred during each phase. Further, it aims at identifying the role of mood and psychological aspect on these cravings and the cycle as a whole. In the study, 222 adult female participants rated their food choices based on the three phases of their menstrual cycle. In accordance with their menstrual cycle stages, normality of menstrual cycle, female also questioned about their concerns regarding their physical and emotional health. The gathered data was then analyzed using descriptive statistical methods, correlation, and the hypothesis was supported by the chi square test. In the course of the research, it was evident that a proper functioning of the female reproductive system is influence by medical issues in regard to the regularity of the menstrual cycle. Moreover, there are marked differences in food preferences at different stages of the menstrual cycle. Taste preferences during menstruation were more inclined towards 'sweet' and 'fatty' foods; the most preferred meal as identified by (22%) of the respondents was 'sweets' Consumption of salty snacks was higher in the luteal phase (24%) and carbohydrate rich food in the follicular phase (21%). The lowest proportion of scores for the sour food cravings were recorded in the follicular phase (11%). Altogether, major craving was most often expressed, mainly during the luteal and menstrual phases and also demonstrated the correlation is (.197**), statistically significant at the 0.01 level) of food preference between luteal and menstrual phase of the menstrual cycle. In addition, this study makes a further attempt by explaining the kind of diet preferences during the different stages of menstrual cycle that exist, this study reveals how nutritional interventions connect to teens' body needs. Adolescence remains a special epoch in the progress of man-centered on the advancement, changes, and development. Thus, awareness of these dietary fluctuations and menstrual cycle patterns during this period will help in creating healthy eating habits and, in general wellbeing.

Key words: Menstrual cycle, Adolescents, Dietary preferences, Nutritional assessment, Hormonal changes, Food cravings, Adolescent nutrition.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The menstrual cycle is a normal monthly occurrence in the female reproductive system that enables fertilization and conception, and begins with menarche (the first menstrual bleed during puberty) as well as ending at menopause (Schmalenberger et al., 2021). The first day of bleeding, or day 1, marks the start of the menstrual cycle. The cycle finishes right before the subsequent menstrual cycle. Typically, a menstrual cycle lasts between 24 and 34 days; the percentage of female with exactly 28-day periods is only 10 to 15%; and irregular cycles affect at least 20% of women because they deviate from the typical range in length or width (Parvathy & Varsha, 2022). According to the research of (Thiyagarajan et al., 2022), generally three stages comprise the menstrual cycle: 1. Menstrual phase (this phase lasts one to five days and starts on the first day of menstruation) 2. The follicular phase overlaps with the menstrual phase initially, and the pituitary gland secretes follicle-stimulating hormone (FSH), which directs the ovaries to begin producing follicles. One follicle will mature into an egg, and an adult egg is released from the ovary and enters the fallopian tube. 3. The second half menstrual cycle, known as the luteal phase (which normally lasts from day 15 to 28 in a 28-day cycle), occurs after ovulation and continues until the start of menstruation. Every stage has an independent function in the reproductive process and is impacted by changes in hormone levels which is responsible for various physiological and psychological prospects of a woman's health. Hormonal fluctuations impact not just one's physical and mental health but also one's food preferences and nutritional requirements (Nijboer et al., 2024). Adolescence as is one of the developmental phases that depicts a time of one's physical, psychological, and intellectual development.

Female realizes her sexual maturity and readiness for childbearing and the monthly periods at this stage of life as menarche manifests the onset of menstruation. Due to the fact that growth and development is rapid throughout this stage there is always the need food nutrition (Derman et al., 2004). Hence, it becomes crucial and relevant to establish insight into food choice and diet during different phases of menstruation to maintain health in adolescent girls. Girls going through the menstrual cycle should have different meals at different times of the cycle. Study of (Barbosa et al., 2015) state that there might be augmented food intake, nutrient poor foods during the luteal phase that can affect the nutritionally adequacy of diet. On the other hand, the ability of promoting healthier food choices during the follicular phase presents the subject an opportunity to practice more proper diets.

The study combines quantitative and qualitative methodologies to evaluate dietary preferences during the menstrual cycle in a systematic manner. Specifically, the project aim to develop a comprehensive understanding of how and why food-related behavior vary, engaging daily recording of food preferences and adding qualitative data from interviews conducted face-to-face.

In addition, the study will investigate the psychological and physiological elements that are linked to these dietary modifications, such as fluctuations in mood, stress levels, and physical complaints like weariness and bloating. This all-encompassing method will make it possible to pinpoint certain dietary preferences for each stage of the menstrual cycle, which will ultimately guide the creation of more potent dietary plans that will improve woman's health all through the menstrual cycle.

1.2. Background of the study

A normal menstrual cycle takes place between 26 and 32 days as well as it consists of three phases namely the follicular phase, luteal phase and menstrual phase (Pallavi et al, 2017). Adolescent girl's health and nutrition requirements are significantly shaped by various changes, one which is the commencement of the menstrual cycle. The follicular stage, luteal stage and menstrual stage are three main stage of the menstrual cycle, which usually lasts for 28 days. Estrogen and progesterone are the main hormones that fluctuate during each phase (souza et al., 2018), significant impact on a number of body processes, such as hunger, metabolism, and mood. It is vital to comprehend the dietary preferences of adolescents at various periods of the menstrual cycle in order to promote maximum health during this pivotal era of growth and development. The study area holds significant potential for public health policies, educational initiatives, and tailored nutritional cares that cater to the specific requirements of teenage females. Healthy generations can be promoted by reducing the risk of nutritional deficiencies and long term health problems by addressing the hormonal influences on eating habit during the menstrual cycle.

1.3 Rationale of The Study

Assessing dietary preferences across different stages of the menstrual cycle among adolescents, this study seeks to give a positive understanding of how hormonal fluctuations affect eating behavior, improving menstrual health education, and supporting the overall well-being. The majority of previous research has been on adult females, leaving a knowledge vacuum on how these dynamics manifest in younger girls. Adolescents may experience more pronounced symptoms and changeable food patterns than adults. This study is attempting to fill this gaping hole by investigating the way in which hormonal fluctuation across various stages of menstrual cycle are affecting teenage eating preferences. Additionally, this here study aim to provide a base for development of focused dietary interventions and educational intervention that can assists teenagers in better managing their menstrual health by detecting these trendy. Furthermore, enhance dietary practices and overall health outcomes of the vulnerably group may help support wider public health initiatives.

1.4 Hypothesis

- H1. Numerous medical conditions can interfere with the menstrual cycle's normality.
- H2. Food preferences of the some phase link with other phases of the menstrual cycle.
- H3. Food preferences differ with age during the different stages of menstrual cycle.

1.5 Objectives of the Study

1. To examine how dietary preference differs among adolescents at different phases of their menstrual cycle.
2. To identify specific food craving during the different stages of menstrual cycle.
3. To provide insight into how mood and psychological factors affect the menstrual cycle.
4. To assess possible outcomes of these dietary changes on general health and quality of life.

CHAPTER 2

LITERATURE REVIEW

2.1 Menstrual cycle

One important part of being a woman is having the menstrual cycle (Crawford, 1981). Menstrual health is vital for overall well-being as the cycle spans most women from menarche to menopause, menstruation frequently has a detrimental effect on a woman's psychological, social, and physical wellness (Critchley et al., 2020). Hormonal interactions between the hypothalamus, pituitary gland, and ovaries cause the monthly menstrual cycle, which is characterized by the systematic shedding of the uterine lining (Barbieri, 2014; Reed & Carr, 2015) as well as every principal organ contributing to the cycle (Ferin et al., 1993). As a "natural" biological process, menstruation seems self-evident, which allows it to serve as a continuous and essential marker of difference in fundamentalist conceptions of gender and sex (Hasson, 2020). Although the menstrual cycle's duration is renowned for being unpredictable, it generally lasts 28 days from the start of one period to the start of the next (Thiyagarajan, 2022). However, the greater majority of cycle last between 25 and 30 days (Reed & Carr, 1993). In addition, menarche often between the age range of 12 and 13 (Hillard, 2002) and the cycle ends with menopause, which happens at the average age of 51 (Thiyagarajan et al., 2022; Mihm et al., 2010). According to the study of Agarwal & Venket (2009); Srivastava et al., (2016), the period of transition from childhood to adulthood is referred to as adolescence and menstruation in 80-90% of teenage females lasts for 2 to 7 days as well as resulting in an average blood loss of 30 milliliters every cycle (Hillard, 2002). About 20% of women have irregular cycles, with a cycle that are either longer or less frequent than average (Parvathy & Varsha, 2022). Irregular menstruation cycle can result from variations in the body's estrogen and progesterone levels (Attia et al., 2023). Women's menstrual cycle anomaly have been proven to be associated with obesity (Tang et al., 2020).

2.2 Stages of the menstrual cycle

The phrase "menstrual cycle phase" refers to a completely natural occurrence during which your body gets ready for a possible pregnancy (Parvathy & Varsha, 2022). Basically menstrual cycle has three stages (Bryant et al., 2006; Itriyea, 2022) and those stages are follicular, luteal and menstrual stages (Thiyagarajan et al., 2022). In addition, the luteal phase stay days 17 to 22, the follicular phase (11 to 13 days) and the menstrual phase stay first few days of the cycle from 1 to 3 days (Iacovides et al., 2013). Ovulation indicate the halt of the follicular stage that begins on the first day of the cycle, or the first day of period as well as early in the luteinizing hormone, FSH, and estrogen secretion cycle, this period is characterized by an increase in these hormone (souza et al., 2018). A normal menstrual cycle's luteal phase lasts from the time of ovulation to the first day of bleeding (Li & cooke, 1991; souza et al, 2018). In addition, the luteal phase, during which progesterone and estrogen levels rise and there is no estrogen to balance progesterone during this stage of the cycle (souza et al, 2018).

Throughout the first five or more days, menstrual flow occurs which is called menstrual stage (Small et al., 2006) as well as (Mihm et al., 2010) states, menstrual bleeding (menstrual stage) usually lasts between three and six days for 80% of woman who ovulate, with the second day usually seeing the most flow. Every woman has an increase in FSH during the luteal-follicular transition (Mihm et al., 2010).

2.3 Changes in hormones during the menstrual cycle

The female body is greatly impacted by the hormonal changes that regulate the reproductive system, which has an effect on both physical and emotional health (Farage et al., 2009). The pituitary gland, ovaries, and hypothalamus are main organ where hormonal fluctuation occur and regulate to support normal menstrual cycle and reproductive health (Popat et al., 2008). The continuing interactions between pituitary gonadotropic hormones and ovarian sex steroid hormones, which give both positive and negative feedback, result in the human female reproductive cycle (Bates et al., 1990). Hormonal patterns in teenager menstruation are not constant, and puberty is marked by significant hormonal changes, fast growth, and the beginning of the potential to reproduce (Maïmoun et al., 2014). According to the research of the (Klusmann et al., 2023) hormone levels in women rapidly change throughout the pubertal transition which is greatly impacted by the start of the first cycle (Hoof et al., 2000).

2.4 Menstrual cycle-influencing factor

According to the study of (Naz et al., 2022), a number of variables including genetics, geography, lifestyle, psychological, physiological and chronic illnesses, are through to affect the path of duration from the menarche to the onset of a regular menstrual cycle in adolescent girls, which can differ from various month to several years. The menstrual cycle can be disrupted be environmental, factors such mood, stress and diet (souza et al., 2018).

It is unclear how the menstrual cycle fits into the intricate web of social, cultural, environmental, psychological, and physiological factors that determine dietary intake, endocrinology changes in food may be mitigated by cultural or socioeconomic factors, which may have a grayer impact on calorie consumption than the menstrual cycle as well as depending on the age, lifestyle, environment, nation, and culture of the population, these elements may have differing degrees of impact (Rogan & Black, 2023). Another study (Seif et al., 2015); (Itriyeva, 2022) state that obese women are more likely to suffer from reproductive problems like infertility, polycystic ovarian syndrome (PCOS), Other menstrual illnesses, as well as irregular periods like oligomenorrhea and amenorrhea which include differences in the amount of blood lost during menstruation, the length and regularity of menstrual cycles, and the duration of bleeding. In addition, they may involve heavy menstrual bleeding, which is defined as significant blood loss that detracts from woman's material, social, emotional or physical well-being (Seif et al., 2015).

The consistency, regularity, and flow of the menstrual cycle are probably mostly determined by environmental variables (Rowland et al., 2002; Jahanfar, 2012). Menstrual irregularities are linked to endocrine diseases, migraines, and asthma in general (Jahanfar, 2012). Shorter menstrual cycles have been linked with smoking, but lengthy, unsteady and intermittent bleeding cycles were linked to a history of conceiving (Rowland et al, 2002).

Since many clinical pain syndromes exhibit fluctuations in symptom severity over the menstrual cycle, reproductive hormones are thought to play a role in regulating pain that effect the normal cycle (Lacovides et al., 2015; Tommaso, 2011). Hormonal levels vary dramatically in woman throughout their lives, from puberty to the postmenopausal period and these variation are associated with discernible shifts in how they experience pain as well as interstitial cystitis(IC), rheumatoid arthritis, migraines are just a few of the clinical pain syndromes that show fluctuating symptom severity all over the menstrual cycle (Lacovides et al., 2011). A woman's job Community activity, health, and quality of life are all greatly impacted by her menstrual cycle (Jahanfar, 2012). Study of (Tommaso, 2011), using neurophysiological methods to examine pain-related changes during the menstrual cycle have indicated that central pain modulation fluctuates across phases.

2.5 Symptoms over the menstrual cycle

According to (Manikandan et al., 2016; Laessle et al., 1990), Many physical and mental health problems are thought to be impacted by hormonal change that occur throught the menstrual cycle, while not all women experience this effect(Manikandan et al., 2016). According to the study of (souza et al., 2018); (Ragan & Black, 2023), premenstrual syndrome (PMS), which includes physical, emotional and intellectual symptoms associated with the menstrual cycle, affects thousands of women who are fertile as well as these symptoms recur during the luteal phase and usually go away a few days following the onset of menstruation, these symptoms include irritability, depression, alterations to desire to eat, distress, panic. These symptoms arise from an abnormal central nervous system responsible to hormonal change (Reid, 2015), physical symptoms are bloating and breast discomfort and emotional symptoms are depression, mood swing and difficulty concentrating (Sarla, 2020), these is occur due to insufficient and excessive hormone levels frequency (Parvathy & Varsha, 2022). During the menstrual cycle, healthy female displayed physical and psychological symptoms that were unrelated to change in gonadal plasma levels or body weight, and that altered in tandem with changes in low-grade inflammation (Puder et al., 2006). From 80 to 90% Of women who are menstruating during their reproductive years have premenstrual change, including gas, loose stool, acne, and breast soreness (Reid, 2015). The symptoms appear to be caused by changes in serotonergic activity brought on by the regular fluctuation in estrogen and progesterone levels that occur during the menstrual cycle (souza et al., 2018), premenstrual syndrome is also impact on food consumption(Ragan & Black, 2023). Premenstrual and ovulatory stage saw an increase in desire for eat (Laessle et al., 1990) and variation in nutrition intake between the premenstrual and postmenstrual stages of the cycle (Bryant et al., 2006). On the other study states, one particularly detrimental effect of the menstrual cycle is having specific food choice (Parvathy & Varsha, 2022).

The only noteworthy association found in PMS-affected female concerned a shift in no-starch polysaccharide consumption (Bryant et al, 2006). According to (Manikandan et al., 2016); (Laessle et al., 1990) the last luteal phase which occurs one week before to menstruation is responsible for somatic symptoms such as sleep disturbance, breast pain, abdominal pain and soreness. On the other hand, the late follicular phase is marked by steady progesterone levels, less mood swing, and milder physical symptoms (Manikandan et al., 2016). Due to their emotional impacts (impulsivity and irritability), symptoms that frequently peak during the luteal phase which are link to increase the desire for sweet food and raise the risk of obesity as well as desire for sweet food decrease during the follicular stage of the menstruation (Souza et al., 2018). In addition, during the menstrual phase 75% female observe menstrual symptoms (Manikandan et al., 2016) , Souza et al, (2018) states, from 75 to 80% female experience Premenstrual symptoms. Depression may be influenced by reproductive hormones and link with long and irregular menstrual cycle (Rowland et al, 2002). On the other side, (Young et al., 2000) states, it is well known that stress can upset the reproductive axis, often to the point where irregular cycle occurs in extreme circumstance. Sexual attraction tended to peak in the post-menstrual period and specific physical symptoms mainly affect during the luteal, premenstrual and menstrual stage (Laessle et al., 1990). Even in good health, a strong correlation has been shown between low-grade inflammation, weight and mood (Puder et al., 2006). A variety of mental, physiological, and affective symptoms, ranging in intensity, that arise seven to ten days before the onset of the bleeding and subside at or shortly after the initiation of the menstrual flow are collectively referred to as PMS (Bryant et al., 2006). Menstrual disturbance symptoms can also be found in individuals with turner's disease or other types of gonadal malformation, as well as chronic condition like diabetes ,chronic fatigue syndrome (Hillard, 2022). Primary dysmenorrhea is responsible for painful menstrual cramps and experimental muscular pain (Iacovides et al., 2013)

2.6 Food preferences among adolescents

“Preference” describes the act of choosing one thing over another and Genetic characteristics and environmental influences combine to create dietary choices, Genetic diversity has a role in the development of phenotypic variations in food preferences among individuals (Birch, 1999). This preference may seem inexplicable, and the person may believe that they won't be able to eat until they have that specific meal as well as cravings for food might cause someone to consume unhealthy meals and interfere with their attempts to maintain a balanced diet (Parvathy & Varsha, 2022). Variations adolescents dietary preferences are influenced by modest genetics, people naturally assume that cultural factors, and many of these cultural influences, have a significant impact on how people choose to eat (Smith et al, 2016). According to Birch, (1999), Food consumption starts to be influenced by food preferences, Preferences have an impact on food choices that defy nutritional recommendations and may encourage weight gain and overweigh.

According to the study (Smith et al, 2016), the food preferences of adults and adolescent vary significantly, When it comes to deciding what to eat and how much of each macro- and micronutrient, dietary preferences have a significant role.

2.7 Type of food preferences

Two forms of food cravings exist: selective and nonselective. Cravings that are selective in nature are intense desires for particular meals, such a particular restaurant's burger, a candy bar that is highly desired, or a particular kind of chips made with potatoes. The desire to eat anything can be a sign of thirst as well as true hunger or feeling. Nonselective hunger is the want to consume anything. Excessive nonselective desires can be lessened by drinking water (Parvathy & Varsha, 2022). According to (Ventura & Worobey, 2013), typical taste preferences, tastes that are sweet or umami elicit happy feelings whereas tastes that are bitter or sour elicit negative feelings and these inclinations are probably the result of a biological urge towards foods high in calories and protein and a dislike of foods that could be harmful or dangerous. The study (Lounge & Smith, 1986) revealed that females exhibited a stronger inclination towards low-calorie items, wine, and confectionery, and a lesser preference for animal products, alcohol, spicy foods, and dairy, and, adult indicated that they preferred sweet meals more than items like spicy peppers, which are generally thought of as learned tastes. Early dietary preferences are shaped by these innate tastes, although they are also malleable as well as in a situation that is encouraging and helpful, introducing new or disliked foods on a regular basis can help people accept them and eventually come to prefer them (Venture & Worobey, 2013). Another possibility is pica, which is a yearning for things other than food (non-food items), including frozen tortillas, chalky material, mud, or money coins (Parvathy & Varsha, 2022).

2.8 Cause of food preferences

According to the study of (Parvathy & Varsha, 2022), preference for food are influenced by brain areas related to memory, delight, and satisfaction as well as cravings can also result from hormonal abnormalities, such as those involving serotonin and leptin. The sex hormones have an impact on this central regulation of hunger because the central nervous system contains estrogen receptors that interact with digestive peptides (Rogan & Black, 2023). In addition, Cravings are not the same as starvation, despite being associated with the appetite center of the brain. Hormonal fluctuations during the menstrual cycle and the major alterations in hormones that occur during pregnancy are two factors that can influence food craving (Parvathy & Varsha, 2022).

Premenstrual indicator, which consisting of food craving during the early stage of the menstrual cycle, are widespread in women of reproductive age and have a substantial impact on productivity and stander of life and mainly food preference occur due to hormonal fluctuation (Agarwal et al., 2023).According to (Parvathy & Varsha, 2022) Cravings might occasionally be an indication that your body needs energy and is calling for assistance as well as your body goes through a lot of physical strain throughout the menstrual cycle because your hormones are out of control and you are using up strength

to get ready for the next cycle. Another research (Krishnan et al, 2016) states that Progesterone is linked to a demand for sweetened beverages, and leptin appears to be unrelated to estradiol, while being linked to decreased intake of sweet foods and a decreased desire for fattening foods. In addition, this study also states that the female sex hormonal compounds may have separate effects on eating habits.

2.9 Food preferences throughout the menstrual cycle

A number of research studies, (Barbosa et al, 2015; Parvathy & Varsha, 2022; Souza et al., 2018), have described that women experience food preferences during their menstrual cycle and that this varies during different phases of the menstrual cycle. This study also state, in healthy women, the luteal phase may heighten carbohydrate cravings. Another study of (Bowen & Grunberg 1990) states the relationship between menstrual cycle and food preference as well as through this study, food consumption and taste preferences were investigated, Premenstrual syndrome was linked to increased consumption and desire for sweet foods. On the other hand, (Shukri et al., 2023) state that sugar cravings and stress levels were higher prior to menstruation than after menstruation. However, the link between sugar cravings and stress during the menstrual cycle remains unclear. On the other hand (Bowen & Grunberg, 1990) over the cycle, there were no appreciable changes in mood or other food consumption. The study (Gómez & Lobera, 2021) states the menstrual cycle influences food consumption and mood, particularly during the luteal phase and food cravings grow during this period, particularly for processed foods such as chocolate, but variations in hormonal levels and mental states confuse interpretation. According to the study (Hill & Brown, 1994), on healthy women's experiences with food cravings over the course of five weeks, the study examined (n=25) healthy women's food desiring experiences; 49% of the women reported having a strong need for chocolate and it noticed minute variations in appetite and arousal between chocolate and other sweet desires, as well as a faster rate of elimination than with savory cravings. A relationship between hormonal changes and appetites may exist during the menstrual cycle, as evidenced by the ensuing study, which polled (n=323) college women and discovered that the menstrual phase was linked to increased food desires, especially for chocolate (Ruzicka, 2013).The study (Souza et al, 2018) state the participants in the study leaned somewhat towards late luteal phase food preference to high fat and high complex carbohydrate food and low fat and high protein food, however the study was unable to detect differences in chocolate cravings or intake among college women prior to menstruation.

Another study (Parvathy & Varsha, 2022) evaluate food desires in (n=108) female college students, ages 17 to 23, during their menstrual cycle and the study, which employed a prearranged questionnaire, discovered that 84.3% of individuals had food cravings during their cycle, with a predilection for items that were hot (75%) and sweet (24%) as well as the emerging populace has a low level of awareness of these appetites and their underlying causes. Study of (Nijboer et al., 2024), they investigated whether food preferences differs at various stages of menstrual cycle, this study examined (n=112) adult women (aged between 18 and 45) and find out how their menstrual cycle affected

their choices of food which is differs based on their phase of menstrual cycle. The study (Barbosa et al, 2015) find that variations have been observed in the consumption of macronutrients throughout the menstrual cycle, more specifically, there is a decrease in the consumption of protein and an increase in the desire of fats and carbohydrates and there have also been noted alterations in the kind of carbohydrates consumed, with a greater consumption of simple carbs during the luteal phase, such as sugars and sweets as well as bitter food preferences still same during the different stages of the menstrual cycle. Another study (Agarwal et al., 2023) examined (n=259) women found a link between inflammatory indicators and higher desires for chocolate, sweets, and salty meals during the menstrual cycle, suggesting that inflammation may have an impact on menstrual food cravings. Seventy-six women who volunteered to have an average of two cycles of sweet desire episodes provided pre- and postmenstrual self-reports. This study (Verma et al., 2005) examined the impact of popcorn salt preference on fifty-five seemingly healthy women between the ages of 18 and 22 who were going through various menstrual stages and women exhibited a greater preference for unsalted popcorn during the menstrual phase, whereas a larger preference for salted popcorn was observed during the luteal phase, with the preference increasing with salt intensity. Overall, they observed variation in preference ratings between the luteal and follicular stage, but no discernible diversity between the menstrual phase and other phases (Verma et al., 2005). Bryant et al, (2006) conduct a study where they examined (n=27) controls and (n=31) PMS-affected women revealed that the energy and macronutrient intake of PMS-affected women was consistent. Women with PMS drank more alcohol and non-milk extrinsic sugars, changes were shown to be significantly correlated with the intensity of symptoms as well as the results imply that a food choice are affected by the various factor and hormonal changes during the different stages of the menstrual cycle.

CHAPTER 3

FRAMEWORK AND METHODOLOGY

3.1 Outline of the study

The project combined quantitative data analysis with survey-based descriptive analysis to give a comprehensive picture of participants' dietary preferences during the three stages of the menstrual cycle. The purpose of include adolescents in this study was to determine how different food craving probabilities were at different phases of life. In order to achieve this, the study made an effort to search for trends and variances that can be linked to desires arising in different time's lots of the menstrual cycle as a result of hormonal changes. Such a broad and multi-faceted approach proved to be useful for identifying the specifics of menstrual cycle's phases and the corresponding eating patterns among adolescent girls.

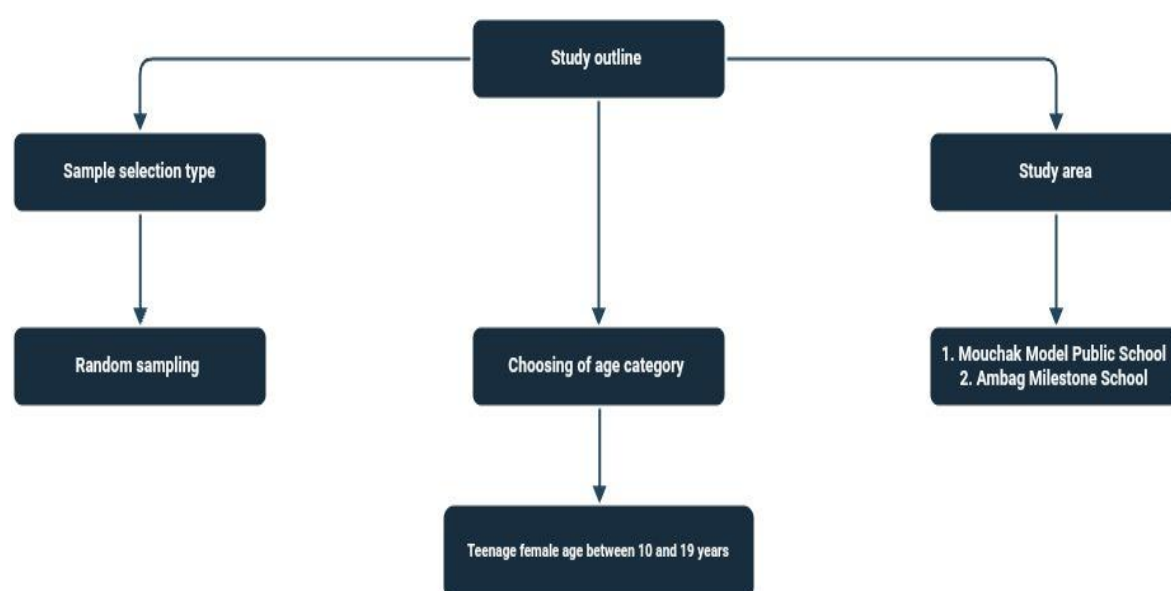


Figure 1: Overview of the study outline

3.2 Study location

Two different educational establishments were used for this study: Mouchak Model Public School in Mouchak and Ambag Milestone School in Konabari. These two educational institutions are situated in the suburban Kaliakair upazila of the Gazipur district. The selection of these geographically close but distinct schools offers a thorough understanding of this region's suburban educational environment.

3.3 Participate selection

Participants were chosen from Ambag Mile School and Mouchak Model Public School, with an emphasis on teenagers between the ages of 10 and 19 who had menstrual-related food cravings.

Girls in classes six through ten, in particular, who are in their adolescent years and have started menstruating, usually fall into this age range. Data gathering focused on these particular categories to learn more about teenage girls' food preferences during their menstrual cycles.

3.4 Study instrument

The study instrument for this study is a set of questionnaire (which is divided into four-part) that is used throughout the data collection survey. The general information, menstrual health, general health history, food craving during different stages of the menstrual cycle, and the daily rating questionnaire for mental and physical symptoms were among the administered questionnaires used in this study. These were Likert scale and multiple choice questions with yes/no options. Those who take part in this study individually receive these questionnaires.

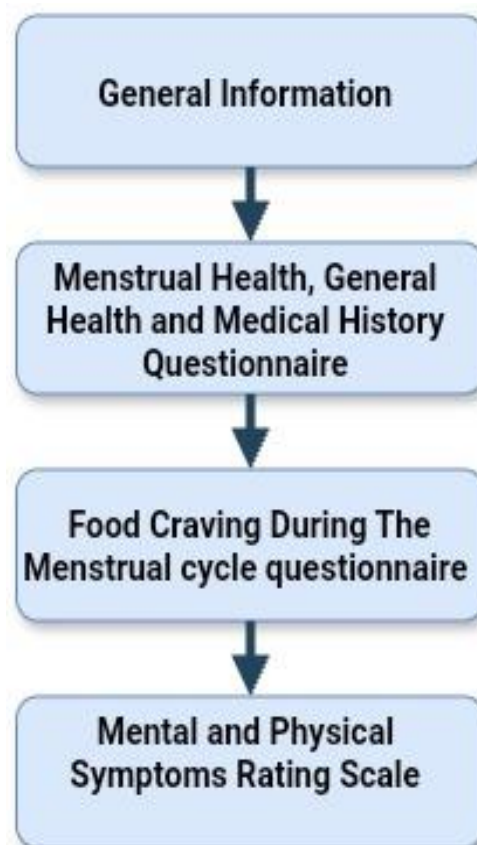


Figure 2: Constituent of questionnaire

3.5 Measures

The measurement process is conducted in two distinct stages: the initial assessment stage and the following assessment phase. In the initial assessment stage, foundational data is meticulously collected, laying the groundwork for a comprehensive evaluation. Following this, the assessment phase builds on the initial findings, delving deeper into the specifics

to provide a thorough and detailed analysis. This bifurcated approach ensures a robust and systematic collection of data, enabling a nuanced understanding of the subject matter.

Initial assessment phase:

1. A comprehensive general information questionnaire was distributed in order to gather essential patient data, including name, address, and cellphone number. The patient's age, weight, and height were all measured using this extensive questionnaire in addition to other critical physical information. The extensive data collection procedure ensured a solid and thorough understanding of each patient's basic information and physical attributes.
2. Menstrual health, general health, and medical history were the main topics of the wide use of thorough questionnaires in the second portion of the first assessment phase. The purpose of these carefully crafted surveys was to gauge the frequency and range of menstrual cycles. They also gave a detailed evaluation of whether the menstrual cycle history was within typical bounds. In order to determine whether the participants' medical history, including any allergies, and overall health, had any bearing on their menstrual cycles, extensive data on these topics was also gathered. A comprehensive assessment of each participant's menstrual health in connection to their overall medical background was ensured by this in-depth approach.

Assessment phase:

The assessment phase starts after collecting general information and health history records during the initial assessment phase.

1. The Food Craving Questionnaire was used in the first phase of the assessment stage to describe the different kinds of cravings that women experience at different times during their menstrual cycle. On a Likert scale, where seldom was evaluated as 1, infrequently as 2, occasionally as 3, frequently as 4, and always as 5, participants recorded their urges. Furthermore, yes/no format questionnaires were used to look into the existence of food cravings as well as potential contextual influences on these cravings. The summative scale was also used to gauge the intensity of these cravings, giving researchers a thorough picture of how cravings change throughout the course of the menstrual cycle.
2. A thorough assessment of the participants' physical and mental symptoms is carried out at the end of the assessment phase. The following physical symptoms are evaluated: breast discomfort, bloating, headaches, and cramps. Mental symptoms like depression, impatience, and mood swings are assessed concurrently. Participants score the severity of each symptom on a comprehensive summative scale, assigning a number to each symptom's degree: not at all (1), slight (2), moderate (3), or extreme (4). Three separate times are used for this painstaking data collection: just before the menstrual cycle, during the menstrual cycle, and after the menstrual cycle. This comprehensive method guarantees an accurate understanding of the ways in which mental and physical symptoms differ in connection to the menstrual cycle.

3.6 Procedure of the measure

Stage1: Actual for the initial part of the procedure, the participants were given the questionnaires and were made to go through the various sections of the study questionnaires in detail. It involved briefing and consultation as to how they should go about the data entries, ideas given as to how to handle multiple choice queries, rating scale questions and yes/no questions. The process also included teaching them on the right ways to answer different kinds of questions, preference questions for instance. Finally, when all the participants were through with their entries, each query was again going to be read to her so that there could be an understanding of what has been required of her and to check if all queries were answered correctly. Some details were explained to remove any confusion, apart from explaining the questions that were thought to be ambiguous to ensure adequate understanding of what is required of them. During the process of filling in the data, participants were provided with quite active support to avoid mistakes and inaccuracies in the forms. To ensure that data collected from the respondent are reliable and accurate, attempts were made to reduce the likelihood of errors.

Stage2: After the respective participants had answered the questions in an accurate and consistent manner, the filled questionnaires were gathered and Respondent's answers were entered carefully and systematically to allow for statistical analysis. These included relating the preferred parameters to deduce qualitative relations from the results of the process. The collected data went through vigorous scrutiny with the aim of identifying schema and relationships that would be useful for the results.

3.7 Data analysis

The entire analysis has been performed by IBM SPSS Statistics (version 24) and statistically significant level of ($p < 0.05$).

A portion of the data were displayed using descriptive analysis, a type of descriptive analysis cross-tabulation was used to determine the frequency and normalcy of the menstrual cycle. Here, cross-tabulation analysis has been used to examine two additional variables: the frequency of food cravings and the experience of food preference. This study used frequency analysis, another type of descriptive statistics, to illustrate dietary preferences at various menstrual cycle stages.

To demonstrate the relationship between food choices during various cycles and to analysis the relationships between various phases of mental and physical symptoms, correlations from descriptive analysis were employed which were accepted statically significant (p values below 0.05). The chi-square statistical test is utilized to assess the variation in food cravings across the various phases of the menstrual cycle based on an individual's age, this test is also applied to two other variables: the normalcy of the cycle and the influence of medical disorders on the menstrual cycle, and , chi-square test significant level of $p < 0.05$.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Results

This study was conducted with a sample size (N= 222) that is easily obtainable

4.1.1 Menstrual cycle

This stage of study identified the normalcy and frequency of the menstrual cycle using cross- tabulation tables, chi-square to show expected count and count which is statistically significant, whether a normal menstrual cycle affects by medical problem.

Table 1: Cross tabulation showing the normalcy of the menstrual cycle and the length of the menses (N=222)

criteria		Normal menstrual cycle		Total
		yes	no	
Menses lasts in days	1-4	54	10	64
	4-7	126	17	143
	7-10	8	2	10
	7-10	0	3	3
	varies	0	2	2

According to the table 1, out of the 222 individuals who responded, 188 have regular cycles and 34 have abnormal cycles. Regardless of cycle categorization, the majority of people have menses that last four to seven days.

Table 2: Chi-Square Analysis of the Association between Medical Problems and Regular Menstruation

			Medical problems		Total	Chi Square	P-value
			No	Yes			
Normal menstrual cycle	No	Count	19	13	32	4.379	0.036
		Expected					
	Yes	Count	23.8	8.2	32		
		Count	146	44	190		
		Expected					
	Yes	Count	141.2	48.8	190		
		Expected					

Note: *: Significant at $p < 0.05$

In this particular table, the Chi-Square Value (4.379) represents the discrepancy between the observed and anticipated frequencies. Regular menstrual cycles are associated with medical problems in a statistically significant way (P-value < 0.05, 0.036).

4.1.2 Food preference

The frequency distribution table in this stage of the study, results illustrated the various phases of food preference table with a cross-tabulation displaying the frequency of food cravings and food preferences. A significant correlation was found between the various stages of food preference as well as Chi-square analysis revealed a significant value in the food preferences of females at various stages of adolescence.

Table 3: The frequency distribution of various food preferences at different phases of the menstruation cycle (N=222).

Food Items	Luteal phase	Menstrual Phase	Follicular Phase
Sweet foods	48	51	37
Salty foods	54	42	39
Savory Food	31	35	37
Fatty foods	27	33	36
Carbohydrate-rich foods	35	29	48
sour foods	27	32	25

Note: Luteal phase: before menstruation; Menstrual phase: during menstruation; Follicular phase: after menstruation (Iacovides et al., 2013).

A frequency analysis of food cravings throughout the menstrual cycle phases is shown in the table: Sweet foods: During menstruation, desires are highest (51), followed by luteal (48), and follicular (37). Foods high in salt: follicular closure (39), luteal phase maximum (54), menstrual phase slightly reduced (42). Savory foods: Menstrual slightly higher (35), luteal (31) and follicular (37), quite consistent. Foods high in fat: luteal (27), follicular (36), and menstrual maximum (33). Foods high in carbohydrates: luteal mild (35), menstrual the least (29), follicular highest (48). Foods that are sour: follicular least (25), menstrual (32), and luteal moderate (27). The data presents an illustration of the fluctuations in food cravings during the menstrual cycle, indicating the impact of hormones on dietary choices.

Table4: Cross tabulation showing the frequency of food craving and experience of food preference (N=222).

		frequency of food craving				Total
		Mild	Moderate	Strong	Very strong	
Experience of food preferences	Rarely/never	0	8	9	2	19
	Occasionally	2	25	41	13	81
	Sometimes	1	14	31	26	72
	Frequently	1	11	18	12	42
	Always	0	1	5	2	8

The degree of food cravings is categorized in the cross tabulation table as Mild, Moderate, Strong, and Very Strong, in relation to how frequently they occur. Fewer people have Very Strong (2) cravings than moderate (8) or Strong (9), who crave infrequently or never. Cravings are sometimes mostly Strong (41), then moderate (25) and Very Strong (13). Cravings are rare but frequently strong (31), with a significant proportion of Very Strong cravings (26). The bulk are Strong (18) and Very Strong (12) for individuals who crave frequently. Most people with constant desires are Strong (5), followed by Very Strong (2) and Moderate (1).

Table 5: Correlation of food preferences during the different stages of menstrual cycle

	Menstrual Phase	Follicular Phase
Luteal phase	.197**	-0.094
Menstrual Phase		-0.019

Note: ** Correlation is significant at the 0.01 level (2-tailed).

The correlation between the different menstrual phases and food preferences is displayed in Table 1. A positive correlation is observed between the luteal phase's food preferences and the menstrual phase's food preferences which is .197** (statistically significant at the 0.01 level), while a negative correlation is demonstrated between the follicular phase and the luteal phase. There was also a negative link found between menstrual phase food desires and follicular phase food desires.

Table 6: Chi-Square Analysis of the food craving during the different stages of menstrual cycle according to adolescent age group

	Age	Sweet foods	Salty foods	Savory Food	Fatty foods	Carbohydrate-rich foods	Sour foods	Chi Square	P-value
Luteal phase	12	10	6	11	8	6	7	34.68	0.022
	13	5	10	4	8	9	8		
	14	11	14	5	5	14	6		
	15	9	12	9	2	1	4		
	16	13	12	2	4	5	2		
Menstrual phase	12	16	4	8	9	7	4	31.692	0.047
	13	6	8	3	10	8	9		
	14	9	12	14	5	7	8		
	15	11	11	3	5	5	2		
	16	9	7	7	4	2	9		
Follicular phase	12	12	10	7	9	7	3	25.312	0.19
	13	7	3	5	9	16	4		
	14	12	12	10	7	8	6		
	15	1	6	9	5	9	7		
	16	5	8	6	6	8	5		

Within the three menstrual cycle phases—luteal, menstrual, and follicular—this table displays the distribution of preferences for different food kinds (sweet, salty, savory, fatty, carbohydrate-rich, and sour) among different age groups. P-values, Chi-square values, and measure counts are shown for each phase in the table.

In the luteal phase, the sweet food craving is higher in the age group (16) salty food craving maximum in age (14) and lower (age 12) savory and fatty food craving higher in age group (12 & 13) and carbohydrate food craving higher in age group (14) as well as sour food craving higher in the age group (13), all this food craving observed count according to age group is statistically significant (0.002, $p < 0.005$). In the menstrual phase, sweet craving higher and salty food craving lower in the age group (12), fatty food choices is higher and savory food choice is lower in the age (13), salty food craving and savory food craving is higher and age group of 15, all craving is moderate and sour craving is lower, all types of food craving is moderate in the age (16), all this food craving observed count according to age group is statistically significant (0.047, $p < 0.005$). In the follicular phase, no statistically significant observed between age and food choices.

4.1.3 Symptoms related to menstrual cycle

A connection among the different stages physical and mental symptoms find out in this analysis where matrix of correlation is used and displayed a relation and this is statically significant.

Table7: Matrix of Correlation for Symptoms of Mental and Physical Health during the menstrual cycles three distinct phases

	B Mental symptoms	D Physical symptoms	D Mental symptoms	A Physical symptoms	A Mental symptoms
B Physical symptoms	0.521**	-0.001	0.113	-0.01	-0.112
B Mental symptoms		0.064	0.217**	-0.007	-0.1
D Physical symptoms			0.029	-0.171*	-0.116
D Mental symptoms				0.035	-0.096
A Physical symptoms					0.239**

Note: B: before menstruation (Luteal phase); D: during menstruation (menstrual phase); A: after menstruation (Follicular phase)

** : Significant at $p < 0.01$

* : Significant at $p < 0.05$

The strongest correlation was found between luteal phase's physical symptoms and mental symptoms (0.521, $p < 0.01$), which is the strongest correlation. There is a moderate association between after menstruation's (follicular phase) physical symptoms and mental symptoms (0.239, $p < 0.01$), as indicated by the moderate positive correlation. A moderate negative correlation (-0.171, $p < 0.05$) was found between during menstruation's physical symptoms and after menstruation's Physical symptoms, indicating a negative association between the physical symptoms of these two groups also there is a moderate positive correlation between before menstruation's (luteal phase) mental symptoms and during menstruation's (menstrual phase) mental symptoms (0.217, $p < 0.01$), suggesting that there is a relationship between mental symptoms in these two phases.

4.2 Discussion

This study aimed to determine the various phases of the menstrual cycles (luteal, menstrual, follicular) food preferences. Additionally, note how food preferences change over time, whether a stage's food preferences are reflective of another's, and how they connect to the age group of adolescents.

The first hypothesis was that various medical conditions interfere with the normalcy of the menstrual cycle, and the second hypothesis was that food choices during certain

phases are related to food preferences during others. The study found that the regularity of menstrual cycle is a statistically significant medical concerns. This research also revealed a statistically significant correlation between food preference for some phases and other phases. Therefore, the first two hypotheses were approved. On the opposite this point, the third hypothesis was that food preference differed according to the age of the adolescents stage of each menstrual cycle, but the results showed that the food candidate differed according to the age group in the luteal and menstrual cycle, which was statistically significant, and food preference differed in the follicular phase according to age, which was not statistically significant ($p > 0.05$). That's why this hypothesis is dismissed as not significant.

4.2.1 Menstrual cycle

The majority of previous studies found that the cycle was quite regular, with bleeding lasting three to seven days (Mihm et al., 2011; Itriyeve, 2022). A few earlier studies have addressed how medical issues can alter the menstrual cycle in a way that impacts how frequently the cycle occurs, health issues linked to irregular cycles (Rowland et al., 2002; Yu et al., 2017). Adolescent girl's irregular menstrual cycle are primarily caused by health issues (Yu et al., 2017).

The result of this study, out of the (N=222) participants in this study, 188 had regular menstrual periods, and 126 of these 188 had cycles that lasted four to seven days. Additionally, the length of a female's menstrual cycle varies. This indicates that the length of the menstrual cycle determines how long the period lasts; individuals with regular cycles experience periods lasting four to seven days, while those with irregular cycles experience longer periods. This indicates that if someone has an irregular menstrual cycle, their menstrual cycle duration is likewise irregular.

The principle finding of the investigation is that a chi-square test revealed a relationship between medical problems and regularity, and the chi-square value (4.379) of this analysis was statically significant (0.036, $p < 0.05$). This means that, out of the 222 participants, 19 people with medical problems and 13 people without health problems did not have normal cycles of menstruation, while 146 people without medical problems and 44 people with medical problems had normal cycles. As a result, this indicate that menstrual cycle alterations are common among those with medical issues, and this relationship is significantly examined as well as support the first hypothesis.

4.2.2 Food preferences through menstrual cycle stages among adolescent

An earlier investigation discovered that the food choices that women encounter during their menstrual cycle vary depending on the stage of the cycle (Barbosa et al., 2015; Parvathy & Varsha 2022; Souza et al., 2018). Many study state that during the luteal phase of the menstrual cycle, preferences and food consumption increased and the desire for sweet and carbohydrate foods is increased during the luteal phase (Cohen et al., 1987; Bowen & Grunberg, 1990).

The present study's food preference reveal the participant desires to consume the greatest amount of salty foods compared to other six food categories (N= 54 out of 222) during the luteal phase, sweet food preference is higher (N=51) during the menstrual phase, and carbohydrates during the follicular phase. This study outcome confirmed variety of food preference occur throughout the cycle Moreover, a strong positive linear correlation between the luteal and menstrual phases was found in these data, suggesting a relationship between luteal and menstrual cycle's food preferences. Furthermore, it indicates that these two phases' shared food preferences are changing at a constant rate. The two faces exhibit a desire or aversion to consume the same food type, indicating a link in food preference that was statistically significant at the 0.01 level ($p=.197$, $p<0.01$). However, it was discovered that there is a non-statistically significant negative association between the luteal and menstrual phases with the follicular phase. These findings confirm the second hypothesis that is statistically significant, which holds that food preferences in some phases are related to food preferences in other phases, i.e., there are similarities between food preferences in one period with another and not in all phases. These findings also indicate that there is an occasional higher food craving among individuals who experience food preferences (81 respondents, 36.5%).

The chi-square analysis of food demanding which examined various menstrual cycle stages according to age groups of adolescent is the most significant aspect of the discussion of these results. In the luteal phase of the menstrual cycle, it has been observed that food preferences vary depending on the age group of adolescents. Girls between the ages of 12 and 14 are early adopters in the adolescent age range, and this data reveals that they like foods that are high in salt, savory, sour, and carbohydrates. Additionally, middle age adolescents prefer eating sweet, high-carbohydrate foods, the food preferences that differ during the menstrual period are for sweets, which are most preferred by 12-year-old girls. The only food cravings that differ significantly depending on age group are during the menstrual and luteal phases (chi-square value for luteal phase is 34.68, $p<0.022$; chi-square value for menstrual phase is 31.692, $p<0.047$). However, this study finding state, the dietary variable associated with the adolescent age group in the follicular phase was not statistically significant ($p>0.05$) that's means follicular phase food preference not differ according to age and this chi-square statistical analysis rejected third hypothesis because all menstrual phases food preference were not statistically vary according to adolescents age .

4.2.3 Menstrual cycle symptoms

Most of the previous study state that, Premenstrual syndrome has been associated with increased sweet food intake and cravings, Conversely, stress levels and sugar cravings were higher before and during menstruation than they were after (Bowen & Grunberg 1990; Shukri et al., 2023). The main finding of this study, the highest was between physical and mental symptoms luteal phase, that may suggest that severity of these symptom can be interconnected (statically significant level of $p<0.01$; 0.521) and can lead to cravings for sweet and salty food. The menstrual phase reveals average comparisons of bodily signs and symptoms, before or during menstruation, participating in varied food

cravings due to the severity of symptoms. According to this study, Compared to all other food categories, the luteal and menstrual phases had the largest desires for sweet foods, at 21.62 percent and 22.97 percent, respectively. In addition, this study examined and discussed the mental and physical symptoms of the menstrual cycle. This study result state, Menstrual-related mental symptoms and mental symptoms experienced before menstruation are correlated. This suggests a connection link the mental health issues present during these stages and the emotional stress that may be influencing desires for particular meals (such as salty and sweet items). As of at this point, the findings indicate that cravings for sweet foods and salty foods are the underlying cause of pre-menstrual mental symptoms which is called pre-menstrual syndrome (Bowen et al, 1990). These cravings are also higher during the menstrual cycle, and similar mental symptoms also arise during that cycle. In this sense, the data show a statistically significant (0.217; $p < 0.01$) positive correlation between the two periods of mental symptoms which is maybe responsible for sweet food choice.

The follicular phase is characterized by a moderate association between complaints and affect, which may affect cravings for carbohydrate foods. These statically significant correlations bring out the core relationship between physical symptom, psychological symptoms, food cravings and the different phases of the menstrual cycles.

4.2.4 Application

The implications of the results of the investigation on food preferences in relation to the phases of the menstrual cycle include the following: Health and Nutrition Promotion-counsel, Education, Research, Products, Mental Health. The health care workers can develop the dietary plans and modify the intake to enhance the menstrual cycles' patterns. Awareness-raising interventions can help to enforce knowledge among adolescents and their care-givers on the impacts of the phases of the menstrual cycle before food cravings which are healthier options. Future research can study the biological factors and subgroups based on age. It is easy for the food industry to come up with products and specific diets suitable for consumption depending on the phase of the menstrual cycle. Adolescent nutrition and stress management programs can be incorporated into the psychiatric treatment plan to enhance the moderating of mood changes and cravings. Collectively, all of these applications are meant to improve the service delivery to the adolescent girls so that they can make mindful decisions for improved health.

CHAPTER 5

CONCLUSION

The findings of this study on the dietary preferences of adolescents during the various phases of the menstrual cycle indicate the strong relativity of diet preference with the phases of the menstrual cycle. The general purpose of this study was to establish the changes in the dietary preference among adolescent girls at the various stages. Specifically, the study sought to discover specific dietary desires. This study examines a noteworthy dietary variation at various phases of the menstrual cycle. It has been shown that cravings for salty meals (N= 54 out of 222) are highest during the luteal phase, whereas those for sweet and fatty foods are strongest during the menstrual period. The follicular phase exhibits a significantly reduced inclination towards sour food, although it is still pretty noticeable in both the luteal and follicular phases. However, it has been discovered that the follicular phase has the strongest appetite for foods high in carbohydrates (N=48 out of 222). The occurrence and intensity of eating preferences change based on the stages at which a person has a larger need for sweets, fatty and salty food. This study imply that food choices throughout distinct menstrual cycle stages are related to one another, explaining hormonal fluctuations which is support the hypothesis. Enlarged search for salty food this typically happens during the luteal phase to get the body ready for a possible pregnancy. However, during the menstrual phase, there is a preference for confectionery and fatty products; this can be as a result of the body feeling uncomfortable. These, therefore, are some of the main reasons for the physical and psychological symptoms associated with menstruation. This research has a wide range of implications. These results can, in part, be utilized to develop an adolescent diet chart, also be utilized to develop overall well-being and maintaining a healthy weight, as well as to address food craving that may be linked to bad eating habits and result in weight gain. There is a number of limitations in this study, the primary one is that the late adolescents. group data was omitted and the study focused on an age group that did not accurately represent all adolescents. Some other extrinsic factors that affect dietary preferences, such as physical activity and economic position, were not taken into account in this study. Additionally, some respondents are unable to remember or accurately record their dietary preferences. Further studies ought to increase the sample size, choose a diverse population and in order to get better results, the study should be conducted over an extended period of time, include lab examination of the entire cycle. Economic and other environmental factors are also taken into consideration. This study concludes by reviewing the effects of dietary variations on various menstrual cycle phases. Additionally, this study shows how nutritional interventions link to teenagers' physical requirements by emphasizing the nature of dietary preferences. And being aware of these dietary variations and menstrual cycle patterns is essential to developing good eating habits and attaining overall wellbeing during adolescence—an essential stage of progress, cognitive development and growth

REFERENCES

- Agarwal, A., & Venkat, A. (2009). Questionnaire study on menstrual disorders in adolescent girls in Singapore. *Journal of pediatric and adolescent gynecology*, 22(6), 365-371.
- Agarwal, K., Franks, A. T., Zhang, X., Schisterman, E., Mumford, S. L., & Joseph, P. V. (2023). Association of inflammation biomarkers with food cravings and appetite changes across the menstrual cycle. *Clinical Nutrition ESPEN*, 56, 193-199.
- Attia, G. M., Alharbi, O. A., & Aljohani, R. M. (2023). The Impact of Irregular Menstruation on Health: A Review of the Literature. *Cureus*, 15(11).
- Barbieri, R. L. (2014). The endocrinology of the menstrual cycle. *Human fertility: methods and protocols*, 145-169.
- Barbosa, D. E. C., de Souza, V. R., dos Santos, L. A. S., de Jesus Chiappini, C. C., de Sa, S. A., & de Azeredo, V. B. (2015). Changes in taste and food intake during the menstrual cycle. *Journal of Nutrition & Food Sciences*, 5(4), 1.
- Bates, G. W., Garza, D. E., & Garza, M. M. (1990). Clinical manifestations of hormonal changes in the menstrual cycle. *Obstetrics and gynecology clinics of North America*, 17(2), 299-310.
- Birch, L. L. (1999). Development of food preferences. *Annual review of nutrition*, 19(1), 41-62.
- Bowen, D. J., & Grunberg, N. E. (1990). Variations in food preference and consumption across the menstrual cycle. *Physiology & behavior*, 47(2), 287-291.
- Bryant, M., Truesdale, K. P., & Dye, L. (2006). Modest changes in dietary intake across the menstrual cycle: implications for food intake research. *British journal of nutrition*, 96(5), 888-894.
- Crawford, P. (1981). Attitudes to menstruation in seventeenth-century England. *Past & Present*, (91), 47-73.
- Critchley, H. O., Babayev, E., Bulun, S. E., Clark, S., Garcia-Grau, I., Gregersen, P. K., ... & Griffith, L. G. (2020). Menstruation: science and society. *American journal of obstetrics and gynecology*, 223(5), 624-664.
- de Tommaso, M. (2011). Pain perception during menstrual cycle. *Current pain and headache reports*, 15, 400-406.

- Derman, O., Kanbur, N. Ö., Tokur, T. E., & Kutluk, T. (2004). Premenstrual syndrome and associated symptoms in adolescent girls. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 116(2), 201-206.
- Ferin, M., Jewelewicz, R., & Warren, M. P. (1993). *The menstrual cycle: physiology, reproductive disorders, and infertility*. Oxford University Press, USA.
- Farage, M. A., Neill, S., & MacLean, A. B. (2009). Physiological changes associated with the menstrual cycle: a review. *Obstetrical & gynecological survey*, 64(1), 58-72.
- Hasson, K. A. (2016). Not a “real” period? Social and material constructions of menstruation. *Gender & Society*, 30(6), 958-983.
- Hill, A. J., & Heaton-Brown, L. (1994). The experience of food craving: A prospective investigation in healthy women. *Journal of Psychosomatic Research*, 38(8), 801-814.
- Hillard, P. J. A. (2002). Menstruation in young girls: a clinical perspective. *Obstetrics & Gynecology*, 99(4), 655-662.
- Horie, K., Takakura, K., Fujiwara, H., Suginami, H., Liao, S., & Mori, T. (1992). Immunohistochemical localization of androgen receptor in the human ovary throughout the menstrual cycle in relation to oestrogen and progesterone receptor expression. *Human reproduction*, 7(2), 184-190.
- Iacovides, S., Avidon, I., & Baker, F. C. (2015). Does pain vary across the menstrual cycle? A review. *European Journal of Pain*, 19(10), 1389-1405.
- Itriyeva, K. (2022). The normal menstrual cycle. *Current problems in pediatric and adolescent health care*, 52(5), 101183.
- Jahanfar, S. (2012). Genetic and environmental determinants of menstrual characteristics. *Indian Journal of Human Genetics*, 18(2), 187.
- Klusmann, H., Eisenlohr-Moul, T., Baresich, K., Schmalenberger, K. M., Girdler, S., & Andersen, E. (2023). Analyzing the atypical—Methods for studying the menstrual cycle in adolescents. *Psychoneuroendocrinology*, 158, 106389.
- Krishnan, S., Tryon, R., Welch, L. C., Horn, W. F., & Keim, N. L. (2016). Menstrual cycle hormones, food intake, and cravings. *The FASEB Journal*, 30, 418-6.
- Laessle, R. G., Tusch, R. J., Schweiger, U., & Pirke, K. M. (1990). Mood changes and physical complaints during the normal menstrual cycle in healthy young women. *Psychoneuroendocrinology*, 15(2), 131-138.
- Li, T. C., & Cooke, I. D. (1991). Evaluation of the luteal phase. *Human Reproduction*, 6(4), 484-499.

- Logue, A. W., & Smith, M. E. (1986). Predictors of food preferences in adult humans. *Appetite*, 7(2), 109-125.
- Maïmoun, L., Georgopoulos, N. A., & Sultan, C. (2014). Endocrine disorders in adolescent and young female athletes: impact on growth, menstrual cycles, and bone mass acquisition. *The Journal of Clinical Endocrinology & Metabolism*, 99(11), 4037-4050.
- Manikandan, S., Nillni, Y. I., Zvolensky, M. J., Rohan, K. J., Carkeek, K. R., & Leyro, T. M. (2016). The role of emotion regulation in the experience of menstrual symptoms and perceived control over anxiety-related events across the menstrual cycle. *Archives of women's mental health*, 19, 1109-1117.
- Mihm, M., Gangooly, S., & Muttukrishna, S. (2011). The normal menstrual cycle in women. *Animal reproduction science*, 124(3-4), 229-236.
- Moreno-Gómez, E., & Jáuregui-Lobera, I. (2022). Variables emocionales y food craving: Influencia del ciclo menstrual. *Journal of Negative and No Positive Results*, 7(1), 28-63.
- Naz, M. S. G., Farahmand, M., Dashti, S., & Tehrani, F. R. (2022). Factors affecting menstrual cycle developmental trajectory in adolescents: a narrative review. *International Journal of Endocrinology and Metabolism*, 20(1).
- Nijboer, A. C. S., Sellitto, M., Ruitenber, M. F. L., Kerkkänen, K. I. L., & Schomaker, J. (2024). Food-related exploration across the menstrual cycle. *Appetite*, 107261.
- Pallavi, L. C., SoUza, U. J. D., & Shivaprakash, G. (2017). Assessment of musculoskeletal strength and levels of fatigue during different phases of menstrual cycle in young adults. *Journal of clinical and diagnostic research: JCDR*, 11(2), CC11.
- Parvathy, N. S., & Varsha, L. (2022). Assessment of food cravings during menstrual cycle in Young college students. *Nehru E-Journal*.
- Popat, V. B., Prodanov, T., Calis, K. A., & Nelson, L. M. (2008). The menstrual cycle: a biological marker of general health in adolescents. *Annals of the New York Academy of Sciences*, 1135(1), 43-51.
- Puder, J. J., Blum, C. A., Mueller, B., De Geyter, C., Dye, L., & Keller, U. (2006). Menstrual cycle symptoms are associated with changes in low-grade inflammation. *European journal of clinical investigation*, 36(1), 58-64.
- Reed, B. G., & Carr, B. R. (2015). The normal menstrual cycle and the control of ovulation.

- Reid, R. L. (2015). Premenstrual dysphoric disorder (formerly premenstrual syndrome).
- Rogan, M. M., & Black, K. E. (2023). Dietary energy intake across the menstrual cycle: a narrative review. *Nutrition reviews*, 81(7), 869-886.
- Rowland, A. S., Baird, D. D., Long, S., Wegienka, G., Harlow, S. D., Alavanja, M., & Sandler, D. P. (2002). Influence of medical conditions and lifestyle factors on the menstrual cycle. *Epidemiology*, 13(6), 668-674.
- Rowland, A. S., Baird, D. D., Long, S., Wegienka, G., Harlow, S. D., Alavanja, M., & Sandler, D. P. (2002). Influence of medical conditions and lifestyle factors on the menstrual cycle. *Epidemiology*, 13(6), 668-674.
- Ruzicka, T. (2013). Determining the Effect of Hormonal Changes Throughout the Menstrual Cycle on Food Cravings and Eating Habits of Undergraduate University Females.
- Sarla, G. S. (2020). Those few horrible days: Premenstrual syndrome. *Biomedical Research Journal*, 7(1), 1.
- Schmalenberger, K. M., Tauseef, H. A., Barone, J. C., Owens, S. A., Lieberman, L., Jarczok, M. N., ... & Eisenlohr-Moul, T. A. (2021). How to study the menstrual cycle: Practical tools and recommendations. *Psychoneuroendocrinology*, 123, 104895.
- Seif, M. W., Diamond, K., & Nickkho-Amiry, M. (2015). Obesity and menstrual disorders. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 29(4), 516-527.
- Sharma, P., Malhotra, C., Taneja, D. K., & Saha, R. (2008). Problems related to menstruation amongst adolescent girls. *The Indian Journal of Pediatrics*, 75, 125-129.
- Shukri, N. A. M., Syafie, R. H., & Mahmood, W. F. F. W. (2023). Sugar craving and stress levels during different phases of menstrual cycle among university students.
- Small, C. M., Manatunga, A. K., Klein, M., Feigelson, H. S., Dominguez, C. E., McChesney, R., & Marcus, M. (2006). Menstrual cycle characteristics: associations with fertility and spontaneous abortion. *Epidemiology*, 17(1), 52-60.
- Smith, A. D., Fildes, A., Cooke, L., Herle, M., Shakeshaft, N., Plomin, R., & Llewellyn, C. (2016). Genetic and environmental influences on food preferences in adolescence. *The American journal of clinical nutrition*, 104(2), 446-453.

- Souza, L. B. D., Martins, K. A., Cordeiro, M. M., Rodrigues, Y. D. S., Rafacho, B. P. M., & Bomfim, R. A. (2018). Do food intake and food cravings change during the menstrual cycle of young women?. *Revista Brasileira de Ginecologia e Obstetrícia*, 40, 686-692.
- Tang, Y., Chen, Y., Feng, H., Zhu, C., Tong, M., & Chen, Q. (2020). Is body mass index associated with irregular menstruation: a questionnaire study?. *BMC women's health*, 20, 1-6.
- Thiyagarajan, D. K., Basit, H., & Jeanmonod, R. (2022). Physiology, menstrual cycle. In StatPearls [Internet]. StatPearls Publishing.
- Thiyagarajan, D. K., Basit, H., & Jeanmonod, R. (2022). Physiology, menstrual cycle. In *StatPearls [Internet]*. StatPearls Publishing.
- van Hoof, M. H., Voorhorst, F. J., Kaptein, M. B., Hirasing, R. A., Koppelaar, C., & Schoemaker, J. Versus Counterstereotypical. *Communication Research*, 38, 4.
- Ventura, A. K., & Worobey, J. (2013). Early influences on the development of food preferences. *Current biology*, 23(9), R401-R408.
- Verma, P., Mahajan, K. K., Mittal, S., & Ghildiyal, A. (2005). Salt preference across different phases of menstrual cycle. *Indian J Physiol Pharmacol*, 49(1), 99-102.
- Young, E. A., Midgley, A. R., Carlson, N. E., & Brown, M. B. (2000). Alteration in the hypothalamic-pituitary-ovarian axis in depressed women. *Archives of general psychiatry*, 57(12), 1157-1162.
- Yu, M., Han, K., & Nam, G. E. (2017). The association between mental health problems and menstrual cycle irregularity among adolescent Korean girls. *Journal of affective disorders*, 210, 43-48.

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