Factors Associated with Menstrual Irregularities among Female Nursing Students

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Abstract

Background: Menstrual irregularities are a prevalent concern among females of reproductive age. These irregularities create great anxiety among female students and their families. Since, the students' physical, psychological and social well-being as well as quality of life may be negatively affected by menstrual problems. Irregular menstruation may be related to a wide variety of factors that could be prevented or managed to improve menstrual health. **Aim:** To identify the factors associated with menstrual irregularities among female nursing students at Damanhour University. **Design:** A descriptive cross sectional research design was utilized to conduct this study. **Setting:** This study was conducted at all scientific departments at Faculty of Nursing, Damanhour University, Egypt. **Subjects:** Proportional allocation method by academic year was used and female students (n=365) who met the inclusion criteria, conveniently selected from the first, second, third and fourth academic years at the Faculty of Nursing, Damanhour University 2022-2023. **Tools:** Three tools were used. "A structured interview schedule", "Factors associated with menstrual irregularities questionnaire" and "The Perceived Stress Scale". **Results:** The results of this study revealed a high prevalence of menstrual irregularities among female nursing students specially dysmenorrhea and premenstrual syndrome. A significant relation was found between menstrual irregularities and their dietary habits, exercise, daily sleeping hours, a time for relaxation, exposure to passive smoking and stress level. Regarding the multivariate analysis, the most risk factors among the previous statistically significant factors were stress (p=0.025) followed by body mass index (p=0.026) and sometimes having breakfast (p=0.040). **Conclusion:** The finding of this study concluded that menstrual irregularities were associated with a variety of factors. Furthermore, there was a high statistically significant correlation between multiple menstrual irregularities and stress, body mass index and skipping breakfast. **Recommendations:** Conduct frequent educational programs and a series of workshops on menstrual irregularities for health care providers, female nursing students and young females in the community to increase their awareness about menstrual health.

Keywords: Menstrual irregularities, Associated factors, Female nursing students.

Introduction

Menstruation is an important event in the life of every female, as it represents the transition from girlhood to womanhood.**(Hiremath & Shettar, 2021)** It is a natural and essential part of the reproductive cycle and signifies the potential for fertility and the ability to conceive and bear children. Also, it is considered a key indicator of a woman's overall health and well-being. Moreover, maintaining menstrual wellbeing and health is complex and influenced by various psychological, physiological, social, economic and other factors.**(Saji, Sunil, John, Kumar, & Thomas, 2021)**

The term menstruation comes from the Latin word which means "month". It is defined as cyclical shedding of the functional layer of the endometrium, resulting in the discharge of blood and mucosal tissue through the vagina. It normally starts between the ages of 11 to 15 years with average age 13 years. **(Iqbal, 2024; Singh & Sharma, 2024)**

Menstrual cycle is regulated by a complex hormonal interplay involving the hypothalamus, pituitary gland, and ovaries. It is counted from the first day of one menstruation to the first day of the following one.**(Cunningham et al., 2024)** Normal cycle occurs at regular intervals every 21 to 35 days and may extend to 45 days in teenagers. A typical duration of menstruation is 2 to 7 days and the menstrual flow is 30 to 80ml per cycle, with the heaviest bleeding in the first 3 days. Any deviation from normal menstrual cycle characteristics may indicate irregularities in hormone levels or other factors affecting the menstrual cycle .**(De Silva & Tyson, 2024)**

Menstrual irregularities are a common issue affecting women worldwide. Those affect 75% of adolescent females and have become increasingly significant reasons for gynecological visits.**(Odongo, Byamugisha, Ajeani, & Mukisa, 2023)** The prevalence of menstrual irregularities in Egypt is about 87% among female students.**(Alshaikh, El-esrigy, & Al-Kelany, 2020)** University students commonly experience menstrual irregularities, impacting their daily activities. However, this issue often receives insufficient attention, particularly in developing countries.**(Gebeyaw, Zeru, & Ayele, 2021)**

These irregularities encompass various forms as significant changes in the interval, duration, or volume of menstrual flow compared to the regular menstrual cycle,

including premenstrual syndrome (PMS), dysmenorrhea, menorrhagia, hypomenorrhea, polymenorrhea, oligomenorrhea and amenorrhea. PMS is a set of cyclical somatic and psychological manifestations experienced one to two weeks before menstruation and resolved by its onset. **(Attia, Alharbi, & Aljohani, 2023; Trivedi & Pandey, 2024)**

Additionally, dysmenorrhea is defined as a cyclical exacerbation of lower abdominal pain that may radiate to the lower back and upper thigh. Dysmenorrhea may be primary which is experienced as a colicky pain with menstruation without any physical cause or secondary , which results from pelvic pathology.**(De Silva & Tyson, 2024)** Other irregularities in the amount of menstrual blood are menorrhagia that is known as excessive blood loss at menstruation time and hypomenorrhea that is light menstrual blood loss.**(Trivedi & Pandey, 2024)**

Irregularities at menstrual interval, including polymenorrhea at which the cycle repeats at interval less than 21days and oligomenorrhea means that the cycle occurs at more than 35days interval. Moreover, amenorrhea is defined as absence or stopping of menstruation that may be primary or secondary. Primary amenorrhea is lack of initiation of menstruation by the normal age for its onset while secondary amenorrhea is cessation of menstruation for 6 months or three cycles interval.**(Abbaszadegan, Motamedirad, Hosseini, Ebrahimzadeh-Vesal, & Tootian, 2022; Dangga, Putri, & Rahmatullah, 2024; De Pheils, Nathan, & Mihaly, 2024)**

The regularity of the menstrual cycle depends on many factors like body mass index (BMI), nutritional status and physical activity as well as daily sleeping hours, smoking exposure and psychological problems. The life of college students is very stressful, their dietary habits and sedentary lifestyle make them more susceptible to many menstrual irregularities.**(Kumalasari, October 2018; V. Verma, Kanti, & Singh, 2020)**

Socioeconomic status is one of the important factors affecting an individual's health. A low socioeconomic status has a negative impact on nutritional status and lifestyle habits. Subsequently, it influences on reproductive health, leading to menstrual irregularities.**(ieczuja-Dwojacka, Borowska, Janiszewska, & Kozieł, 2019; Kwak, Kim, & Baek, 2019)** Additionally, maintaining a normal BMI appears to be essential for normal ovulation. Deviations from this norm, whether excessive or insufficient level of body fat influence ovarian function leading to menstrual irregularities.**(Mostafa, Marzieh, & Zahra, 2018)**

Moreover, dietary habits are one of the potential influences on women's overall health, impacting several symptoms of menstrual abnormalities. Positive dietary habits, such as regular breakfast consumption and avoiding junk foods are linked with improved menstrual health.**(Taheri, Ardekani, Shahraki, Esfahani, & Hajiahmadi, 2020)** Consequently, unhealthy dietary choices like fast foods, may contribute to an increased risk of menstrual disorders.**(Dhar, Kr.Mondal, & Bhattacharjee, 2023)**

Engaging in regular exercise and maintaining a healthy level of physical activity is associated with a reduced risk of menstrual irregularities. Either low or vigorous physical activity is strongly correlated with irregular menstrual cycles. Women who are both obese and have a sedentary lifestyle experience a higher prevalence of irregular periods compared to normal-weight women who engage in moderate exercise.**(Akhila, Shaik, & Kumar, 2020; Taheri et al., 2020)** It is theorized that heavy exercise may suppress gonadotropin-releasing hormone and elevate testosterone &adrenocorticotropic hormone, potentially disrupting menstrual patterns by inhibiting the secretion of FSH and LH.**(Barriga et al., 2019; Genazzani, 2020)**

Furthermore, sleep disturbance has many health, behavioral, occupational, and academic consequences. So, sleep pattern and duration can affect female reproductive function. Moreover, hormonal imbalances caused by sleep deprivation can disrupt the menstrual cycle.**(Ahmed, Omaima, Entisar, & Abeer, 2020; Hong et al., 2021)**

Smoking is also highlighted as one of the factors contributing to menstrual irregularity. Cigarette smoke contains numerous reproductive toxins, and its adverse effect on women's reproductive health is widely recognized. Also, cigarette smoke may exert an anti-estrogenic effect, contributing to menstrual irregularities.**(Hiroko & Kazutomo, 2021; Nurgül, Didem, & Zehra, 2023)**

Students experience higher levels of stress compared to the general population. Additionally, female students tend to exhibit significantly higher levels of anxiety and distress compared to male students.**(Lesnaya, Mansur, Lesnaya, Ketova, & Sturov, 2021)** Stress exerts a significant impact on various aspects of an individual's life, including the endocrine system, immune system, and menstrual cycle.**(Luana, Batara, & Gerald, 2021)** It stimulates a hormonal pathway known as the hypothalamic-pituitary-adrenal (HPA) axis. Stimulation of this axis is associated with an increase in the levels of cortisol and corticotrophin-releasing hormone (CRH) that induce estrogen resistance, leading to conditions like anovulation, amenorrhea, or irregular menstrual cycles.**(Jain et al., 2023; Lesnaya et al., 2021)**

Significance of the study

A comprehensive understanding of the menstrual cycle and possible factors leading to menstrual irregularities is crucial. Identification of the students for these factors enables them to improve their menstrual health as most of these factors are preventable. So, the nursing role in spreading awareness about factors associated with menstrual irregularities is vital for decreasing these irregularities along with promoting students, families and community wellbeing.**(Czura,**

Menzel, & Miotto, 2024; Datta, Yasmin, & Guchhait, 2024; Suleman et al., 2024)

Aims of the Study

This study aimed to identify the factors associated with menstrual irregularities among female nursing students at Damanhour University.

Research question

What are the factors associated with menstrual irregularities among female nursing students at Damanhour University?

Materials and Methods

Design: A descriptive cross sectional research design was utilized to conduct this study. This study design involved the collection of data on the presence of one or more variables of interest, whether exposure or outcome as they exist in a defined population at one particular time.

Setting: This study was carried out at Faculty of Nursing, Damanhour University. It includes 9 departments (Medical Surgical Nursing Department, Critical and Emergency Care Nursing Department, Obstetric and Gynecologic Nursing Department, Pediatric Nursing Department, Community Health Nursing Department, Gerontological Nursing Department, Psychiatric and Mental Health Nursing Department, Nursing Administration Department and Nursing Education Department).

Subjects: The study sample (n=365) was conveniently selected from female students who were enrolled in the previously mentioned setting including the first, second, third and fourth academic years 2022-2023 and met the following inclusion criteria:

- Students who weren't married.
- Didn't take any hormonal therapy.
- Had no medical or gynecological diseases.

They were divided as follows: first-year students (n=41), second-year students (n=124), third-year students (n=115), and Fourth-year students (n=85) based on this equation, n= number of female students at each academic year × sample size (365) ÷ total population (2454). According to proportion allocation method (14.87%) of the total students from each academic year were included in this study.

Tools: The study used three tools for data collection:

Tool I: A structured interview schedule. It was designed by the researcher after reviewing related literature.**(Fernández-Martínez et al., 2021; Nooh, 2015; I. Verma, Joshi, Sood, & Soni, 2020)** It encompassed two major parts:

Part I: Demographic data which included age, academic year, residence, religion, number of family members, crowding index, and family income.

Part II: Menstrual history which consisted of age at menarche, interval, duration, pattern, amount of blood loss, receiving information about menstruation, presence and severity of different menstrual irregularities such as Premenstrual syndrome, Dysmenorrhea, Menorrhagia, Hypomenorrhea, Amenorrhea, Polymenorrhea and Oligomenorrhea.

Tool II: Factors associated with menstrual irregularities questionnaire. This tool was designed by the researcher after reviewing related literature.**(Ansong, Arhin, Cai, Xu, & Wu, 2019; Mittiku, Mekonen, Wogie, Tizazu, & Wake, 2022; Said & Mettwaly, 2017)** It encompassed five major parts:

Part I: Anthropometric measurements included weight, height to calculate body mass index (BMI) by using this formula "a person's weight in Kilograms divided by the square of the person's height in meters (kg /m2)". Based on the calculated BMI, the study participants were classified as underweight (BMI < 18.5), normal weight (BMI18.5–24.9), overweight (BMI 25–29.9), and obese (BMI≥ 30). **(Mittiku et al., 2022)**

Part II: Dietary habits which included the number of meals /day, main meals during the day and frequency of intake of protein, carbohydrates, fat, minerals, salt rich foods, candy foods, spicy foods.

Part III: Exercise which is composed of questions about performing exercise, type of exercises and duration of practicing exercises.

Part IV: Rest and sleep which involved times of comfort and duration of sleep.

Part V: Smoking that consisted of data about smoking practice, exposure to negative smoking and duration of exposure to smoking.

Tool III: The Perceived Stress Scale (PSS). This scale was a classic stress assessment instrument. It was used to assess the stress that may influence the menstrual cycle. It was originally developed by **Tavel et al, 1983,** and modified by them at **1994.** It was used by **Tavel et al, 2022**. It had a 10 items scale that asked about the feelings and thoughts during the last month. The answer of each question was done by choosing one of the four points scale; never (0), almost never(1), sometimes(2), fairly often(3) and very often(4) .The determination of PSS score by following these directions:

- Reverse scores for questions 4, 5, 7, and 8.
- Add scores for each item to get a total.
- Individual scores on the PSS range from 0 to 40 with higher scores indicating higher perceived stress.

▪ Total scoring system is low from 0 to13, moderate from 14 to 26 and high from 27 to 40.

Methods

1.An official letter from The Dean of Faculty of Nursing was directed to the heads of departments, Faculty of Nursing to inform them about the study aim and to get their permission to conduct the study in different departments.

2.Tool **I** &Tool **II** were developed by the researcher after revising relevant literature. Tool **III** was adopted and translated into the Arabic language.

3.Validity of the study tools was tested by a jury consisting of a group of (5) experts in the field of Obstetric and Gynecologic Nursing & Psychiatric and Mental Health Nursing.

4.Reliability of **(Tool III)** was tested by using Cronbach's Alpha coefficient test; it showed an acceptable level of reliability (0.809).

5.The pilot study included 10% of the total sample (36 female students) conveniently selected from all academic years at the Faculty of Nursing, Damanhour University, these students were excluded from the study sample.

Data collection:

▪ The data were collected individually after explaining the aim of the study to gain their cooperation by interviewing every studied female student who enrolled in the Faculty of Nursing, Damanhour University including the four academic years and met inclusion criteria (from 8:30 am to 2pm) using (**Tool I, II and III**).

▪ At the beginning of the interview and the establishment of a relationship with each student the first step was done before data collection, the researcher introduced herself, clarified the purpose of the interview, and ensured the anonymity and confidentiality of the collected data.

▪ **(Tool I, II & III)** took approximately 30-40 minutes for each student.

▪ Data were collected by the researcher over a period of 3 months (from the beginning of March 2023 to the end of May 2023).

Ethical considerations:

▪ The research approval was obtained from The Ethical Committee at the Faculty of Nursing, Damanhour University, prior to the start of the study.

▪ A written informed consent was obtained from the study subjects to be included in the study after an explanation of the aim of the study and participants would be assured that the collected data would be used only for the study purpose.

▪ Study subjects had the right to refuse to participate or withdraw from the study at any time.

▪ Confidentiality and privacy were maintained during the study.

▪ Anonymity regarding the collected data was considered.

Statistical Analysis:

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp). Qualitative data were described using numbers and percents. The Kolmogorov-Smirnov test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum), mean and standard deviation. Significance of the obtained results was judged at the 5% level.

Results

Table (I): Illustrates the distribution of the students according to their demographic data. The age of the studied students ranged from 18 to 23 years with a mean of 21.01 ± 1.33 years. They were divided among the first, the second, the third, and the fourth academic years (11.2%, 34%, 31.5% and 23.3%, respectively) of the total sample size. About three quarters (72.1%) of the students were living in rural areas. The number of family members ranged from 2 to 8 members, most (80%) of these families consisted of more than four members. The crowding index revealed that, the majority (87.7 %) of the students lived in crowded houses (Crowding index >2). Less than three quarters (70.1%) of the students reported that their families' income was enough.

Figure (I) and figure (II) Reveals the distribution of the students according to the presence and types of menstrual irregularities. It was evident from figure (I) that most (99.5%) of the students had menstrual irregularities. Most (95.9%) of them had dysmenorrhea, followed by (90.1%) of them had report having premenstrual syndrome, while more than one quarter (26.2%) of them experienced menorrhagia and more than one fifth (22.9%) of them had oligomenorrhea, while only (12.7%, 12.1% and 7.2%) of them had hypomenorrhea, amenorrhea and poly-menorrhea, respectively as shown by figure (II).

Table (II): Illustrates the relation between student's menstrual irregularities and their personal and demographic data. The table shows no statistically significant relationship was observed between the students' age, academic year and crowding index with menstrual irregularities. Speaking about place of residence, most (96.6%) of the students who lived in rural areas had dysmenorrhea, while less than one third (29.9%) of them had menorrhagia. There was a highly significant relation between place of residence and menorrhagia ($X^2 = 6.632$, $P = 0.010$). On the other hand, the majority (92.2%) of the students in urban areas had premenstrual syndrome. Concerning family income, all (100%) of the students whose family income was not enough had dysmenorrhea, followed by (94.6%) of them

having premenstrual syndrome, while only (16.2%) of them having hypomenorrhea and polymenorrhea compared to (5.1%) of the students whose family income was enough had polymenorrhea. A statistically significant relation was observed between family income and polymenorrhea ($X^2 = 7.368$, P = 0.041).

Table (III): Demonstrates the relation between student's menstrual irregularities and their body mass index. Regarding PMS, it was observed among all (100%) of the obese students, compared to (97.1%, 97%) of the normal weight and overweight students, respectively. With a highly significant relation between BMI and PMS (X2 = 88.073, P = <0.001). In relation to dysmenorrhea, it was reported by all of the obese and overweight students, compared to 94.2% of those who had a normal weight. With a highly significant relation between BMI and dysmenorrhea ($X^2 = 40.154$, P = <0.001). According to polymenorrhea, it was experienced among less than three quarters (72.2%) of the obese students, compared to only (6.5%, 3.9% and 1.4%) of the underweight, overweight and normal weight students, respectively. There is a highly significant relation between BMI and polymenorrhea ($X^2 = 56.473$, P = <0.001). Pertaining menorrhagia, it was reported by more than one half (55.6%) of the obese students, compared to (35.7%, 2.9%) of the overweight and normal weight students, respectively. With a highly significant relation between BMI and menorrhagia ($X^2 = 61.777$, P = <0.001).

Table (IV): Illustrates the relation between student's menstrual irregularities and their dietary habits. The table shows that there was no statistically significant relation observed between the number of meals per day, the main meal and having breakfast daily with menstrual irregularities. The table also shows a statistically significant relation between eating starches with dysmenorrhea, premenstrual syndrome and menorrhagia ($X^2 = 10.780$, P = 0.006, $X^2 = 7.606$, P = 0.023, $X^2 = 6.228$, P = 0.031 respectively) as most (97.1%) of students who always had starches had dysmenorrhea and premenstrual syndrome. Also a statistically significant relation was observed between eating sugary foods and premenstrual syndrome ($X^2 = 15.507$, P = 0.001).Additionally, a statistically significant relation was observed between drinking caffeine (tea/coffee), with premenstrual syndrome, menorrhagia and dysmenorrhea ($X^2 = 24.374$, P = <0.001, X 2 = 9.016, P =0.025, $X^2 = 7.803$, P = 0.038 respectively). Finally, A statistically significant relation was observed between eating pickles, salty foods and adding salt to food with dysmenorrhea ($X^2 = 7.450$, P = 0.037, $X^2 = 12.759$, P = 0.003 respectively).

Table (V): Illustrates the relation between student's menstrual irregularities and their life style. It exhibits a statistically significant relation between the performance of regular exercises with premenstrual syndrome and oligomenorrhea (X2= 8.578, P = 0.003, X2 = 4.415, P = 0.036 respectively). Concerning the type of exercise, all (100%) of the students who performed running exercises had dysmenorrhea and premenstrual syndrome, followed by one half (50.0%) of them having hypomenorrhea. Also more than three quarters (80%) of the students who performed heavy exercise had dysmenorrhea and premenstrual syndrome and (50%, 20%) of them had oligomenorrhea and hypomenorrhea, respectively. In contrast, only (2.5%) of the students who performed walking exercise had oligomenorrhea and none of them having hypomenorrhea. A statistically significant relation was observed between the types of exercises with oligomenorrhea and hypomenorrhea (X2= 13.376, P = 0.001, X2= 10.422, P = 0.006 respectively). In relation to daily sleeping hours there was a highly significant relation between daily sleeping hours with PMS, dysmenorrhea and menorrhagia (X2 =35.775, P = <0.001, X2 =15.039, P = <0.001 and X2 = 10.388, P = <0.006 respectively). Regarding having a time for relaxation, most (96.3%) of the students who never had a time for relaxation had dysmenorrhea, followed by the majority (90.9%) of them had premenstrual syndrome, while more than one third (34.1%) of them having menorrhagia. In addition, all (100%) of the students who always had time for relaxation had premenstrual syndrome, most (96.8%) of them had dysmenorrhea and more than one quarter (25.8%) of them had menorrhagia. A statistically significant relation was observed between having a time for relaxation and menorrhagia (X2= 10.581, P = 0.005). Finally for smoking, (15.7%) of the students exposed to passive smoking had hypomenorrhea, compared to 1.3% who weren't exposed. With a statistically significant relation between exposure to passive smoking and hypomenorrhea (X2 = 11.202, P = 0.001).

Figure (III): Demonstrates the relation between student's menstrual irregularities and their level of Stress. As there was a highly significant relation between level of stress with PMS, menorrhagia, amenorrhea and oligomenorrhea ($X^2= 15.531$, P = <0.001, $X^2= 15.172$, P = 0.001, $X^2 = 10.094$, P = 0.004 and $X^2= 33.463$, P = <0.001 respectively).

Table (VI): Illustrates the univariate and multivariate Logistic regression analysis for the factors associated with menstrual irregularities (Multiple Vs. Single). According to the univariate analysis, the most risk factors for multiple menstrual irregularities among female nursing students were stress (p=<0.001) followed by the age of 20 to less than 22 years (p=0.003), BMI (p=0.004), the third academic year (p=0.005), the age of 22 to 23 years (p=0.009), sometimes adding salt to food (p=0.018), always eat sugary foods (p=0.018), always add salt to food (p=0.022), the fourth academic year (p=0.030), the second academic year (p=0.031) then sometimes having breakfast (p=0.032). Regarding the multivariate analysis, the most risk factors among the previous statistically significant factors were stress (p = 0.025) followed by BMI (p = 0.026) and sometimes having breakfast (p = 0.040).

Table (I): Distribution of the students according to their demographic data (n=365):

Personal and demographic data	Total N=365	
	No.	%
Age (years)		
18 - <20	47	12.9
20 - <22	181	49.6
22 – 23	137	37.5
Min. – Max. 18.0 – 23.0 Mean ± SD. 21.01 ± 1.33		
Academic year		
First	41	11.2
Second	124	34.0
Third	115	31.5
Fourth	85	23.3
Residence place		
Rural	263	72.1
Urban	102	27.9
Number of family members		
≤4	73	20.0
>4	292	80.0
Min. – Max. 2.0 – 8.0 Mean ± SD. 5.41 ± 5.0		
Crowding index		
Non Crowded (≤2)	320	87.7
Crowded (>2)	45	12.3
Min. – Max. 0.43 – 6.0 Mean ± SD. 1.72 ± 1.67		
Family income		
Enough & save	56	15.3
Enough	256	70.1
Not enough	37	10.2
Not enough & borrow	16	4.4

SD: **Standard deviation**

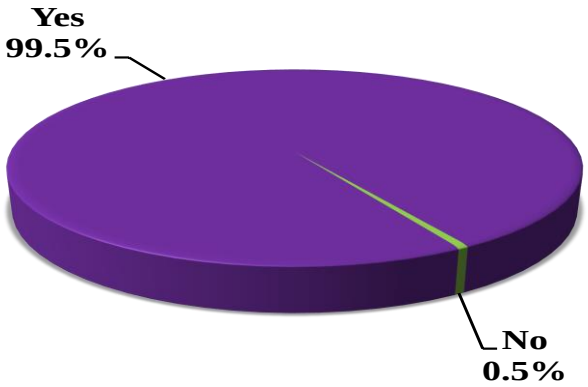

Figure (I): Distribution of the students according to presence of menstrual irregularities (n=365).

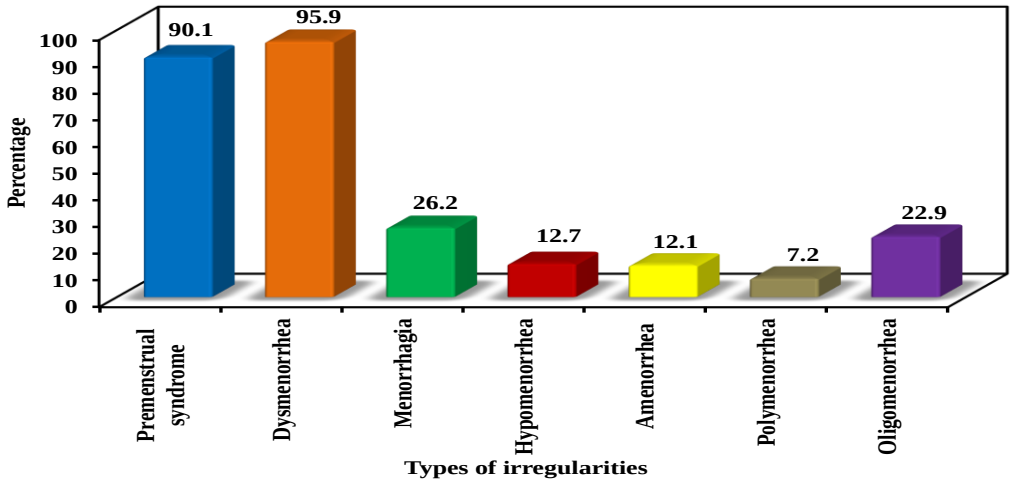

Figure (II): Distribution of the students according to types of irregularities (n=365).

Table (II): Relation between student's menstrual irregularities and their demographic data (n = 363):

Demographic data	N	Menstrual irregularities													
		Premenstrual syndrome (n = 327)		Dysmenorrhea (n = 348)		Menorrhagia (n = 95)		Hypomenorrhea (n = 46)		Amenorrhea (n = 44)		Polymenorrhea (n = 26)		Oligomenorrhea (n = 83)	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age (years)															
18 - <20	**47**	38	80.9	44	93.6	17	36.2	3	6.4	6	12.8	5	10.6	9	19.1
20 - <22	**179**	165	92.2	172	96.1	48	26.8	27	15.1	20	11.2	10	5.6	40	22.3
22 – 23	**137**	124	90.5	132	96.4	30	21.9	16	11.7	18	13.1	11	8.0	34	24.8
χ^2(p)		5.392 (0.067)		0.704 (0.703)		3.765 (0.152)		2.743 (0.254)		0.303 (0.860)		1.677 (0.432)		0.691 (0.708)	
Academic year															
First	**41**	33	80.5	39	95.1	15	36.6	3	7.3	6	14.6	3	7.3	10	24.4
Second	**123**	110	89.4	117	95.1	26	21.1	19	15.4	14	11.4	9	7.3	29	23.6
Third	**114**	105	92.1	110	96.5	36	31.6	12	10.5	14	12.3	4	3.5	25	21.9
Fourth	**85**	79	92.9	82	96.5	18	21.2	12	14.1	10	11.8	10	11.8	19	22.4
χ^2(p)		5.583 (0.134)		0.622(^{MC}p=0.897)		6.737 (0.081)		2.553 (0.466)		0.319 (0.956)		5.024 (0.159)		0.159 (0.984)	
Residence place															
Rural	**261**	233	89.3	252	96.6	78	29.9	32	12.3	31	11.9	17	6.5	64	24.5
Urban	**102**	94	92.2	96	94.1	17	16.7	14	13.7	13	12.7	9	8.8	19	18.6
χ^2(p)		0.683 (0.408)		1.097 (^{FE}p=0.377)		6.632* (0.010*)		0.142 (0.706)		0.052 (0.820)		0.589 (0.443)		1.444 (0.229)	
Crowding index															
Non Crowded (≤2)	**318**	284	89.3	305	95.9	83	26.1	41	12.9	39	12.3	23	7.2	76	23.9
Crowded (>2)	**45**	43	95.6	43	95.6	12	26.7	5	11.1	5	11.1	3	6.7	7	15.6
χ^2(^{MC}p)		1.722 (^{FE}p=0.285)		0.013 (^{FE}p=1.000)		0.007 (0.936)		0.113 (0.737)		0.049 (0.824)		0.019 (^{FE}p=1.000)		1.556 (0.212)	
Family income															
Enough & save	**55**	48	87.3	54	98.2	19	34.5	5	9.1	8	14.5	5	9.1	12	21.8
Enough	**255**	231	90.6	242	94.9	65	25.5	33	12.9	31	12.2	13	5.1	57	22.4
Not enough	**37**	35	94.6	37	100.0	8	21.6	6	16.2	3	8.1	6	16.2	9	24.3
Not enough & borrow	**16**	13	81.3	15	93.8	3	18.8	2	12.5	2	12.5	2	12.5	5	31.3
χ^2(^{MC}p)		2.970 (0.362)		2.675 (0.370)		2.910 (0.406)		1.173 (0.754)		0.903 (0.829)		7.368* (0.041*)		0.755 (0.860)	

SD: **Standard deviation** **t: Student t-test** χ^2: **Chi square test** MC: **Monte Carlo** FE**: Fisher Exact**

p: p value for Relation between the different studied categories *: Statistically significant at $p \leq 0.05$

Table (III): Relation between student's menstrual irregularities and their body mass index (n = 363):

Body mass index	N	Menstrual irregularities													
		Premenstrual syndrome (n = 327)		Dysmenorrhea (n = 348)		Menorrhagia (n = 95)		Hypomenorrhea (n = 46)		Amenorrhea (n = 44)		Polymenorrhea (n = 26)		Oligomenorrhea (n = 83)	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
BMI (kg/m^2)															
Underweight	**46**	19	41.3	35	76.1	1	2.2	5	10.9	9	19.6	3	6.5	14	30.4
Normal weight	**69**	67	97.1	65	94.2	2	2.9	12	17.4	7	10.1	1	1.4	15	21.7
Overweight	**230**	223	97.0	230	100.0	82	35.7	25	10.9	27	11.7	9	3.9	53	23.0
Obese	**18**	18	100.0	18	100.0	10	55.6	4	22.2	1	5.6	13	72.2	1	5.6
χ^2(^{MC}p)		**88.073* (^{MC}p<0.001*)**		**40.154* (^{MC}p<0.001*)**		**61.777* (<0.001*)**		**3.897 (0.252)**		**3.406 (0.333)**		**56.473* (^{MC}p<0.001*)**		**4.606 (0.203)**	

SD: **Standard deviation** **t: Student t-test** χ^2: **Chi square test** MC: **Monte Carlo** FE**: Fisher Exact**

p: p value for Relation between the different studied categories *: Statistically significant at $p \leq 0.05$

Table (IV): Relation between student's menstrual irregularities and their dietary habits (n = 363):

Dietary habits	N	Menstrual irregularities													
		Premenstrual syndrome (n = 327)		Dysmenorrhea (n = 348)		Menorrhagia (n = 95)		Hypomenorrhea (n = 46)		Amenorrhea (n = 44)		Polymenorrhea (n = 26)		Oligomenorrhea (n = 83)	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Have breakfast daily															
Always	71	62	87.3	69	97.2	19	26.8	8	11.3	8	11.3	5	7.0	16	22.5
Some times	217	195	89.9	211	97.2	52	24.0	31	14.3	28	12.9	14	6.5	51	23.5
Rarely	65	60	92.3	58	89.2	18	27.7	6	9.2	6	9.2	6	9.2	12	18.5
Never	10	10	100.0	10	100.0	6	60.0	1	10.0	2	20.0	1	10.0	4	40.0
χ^2(p)		**2.078 (0.556)**		**6.775(^{MC}p=0.051)**		**6.561 (0.087)**		**1.397 (0.706)**		**1.266 (0.737)**		**1.318(^{MC}p=0.684)**		**2.434 (0.487)**	
Eat starches															
Always	311	285	91.6	302	97.1	84	27.0	42	13.5	36	11.6	24	7.7	69	22.2
Some times	50	41	82.0	45	90.0	9	18.0	4	8.0	8	16.0	2	4.0	13	26.0
Rarely	2	1	50.0	1	50.0	2	100.0	0	0.0	0	0.0	0	0.0	1	50.0
χ^2(p)		**7.606*(^{MC}p=0.023*)**		**10.780*(^{MC}p=0.006*)**		**6.228*(^{MC}p=0.031*)**		**1.207 (^{MC}p=0.512)**		**1.178 (0.506)**		**1.106 (^{MC}p=0.613)**		**1.720 (^{MC}p=0.423)**	
Eat sugary foods															
Always	277	253	91.3	267	96.4	77	27.8	35	12.6	33	11.9	20	7.2	65	23.5
Some times	35	33	94.3	35	100.0	9	25.7	2	5.7	6	17.1	3	8.6	8	22.9
Rarely	48	41	85.4	43	89.6	8	16.7	9	18.8	5	10.4	3	6.3	10	20.8
Never	3	0	0.0	3	100.0	1	33.3	0	0.0	0	0.0	0	0.0	0	0.0
χ^2(p)		**15.507*(^{MC}p=0.001*)**		**5.715 (^{MC}p=0.108)**		**2.990 (^{MC}p=0.379)**		**3.078 (^{MC}p=0.354)**		**1.177 (^{MC}p=0.753)**		**0.541 (^{MC}p=0.906)**		**0.519 (^{MC}p=0.988)**	
Drink caffeine (tea/coffee) or soda															
Always	240	204	85.0	225	93.8	72	30.0	29	12.1	34	14.2	13	5.4	59	24.6
Some times	24	24	100.0	24	100.0	5	20.8	1	4.2	0	0.0	2	8.3	3	12.5
Rarely	93	93	100.0	93	100.0	15	16.1	15	16.1	10	10.8	10	10.8	19	20.4
Never	6	6	100.0	6	100.0	3	50.0	1	16.7	0	0.0	1	16.7	2	33.3
χ^2(p)		**24.374*(^{MC}p<0.001*)**		**7.803*(^{MC}p=0.038*)**		**9.016*(^{MC}p=0.025*)**		**4.702 (^{MC}p=0.172)**		**1.144(^{MC}p=0.763)**		**4.685 (^{MC}p=0.167)**		**2.614 (^{MC}p=0.450)**	
Eat pickles or salty food															
Always	241	218	90.5	234	97.1	69	28.6	30	12.4	29	12.0	18	7.5	53	22.0
Some times	66	59	89.4	64	6	15	22.7	9	13.6	7	10.6	4	6.1	18	27.3
Rarely	43	37	86.0	39	90.7	7	16.3	6	14.0	5	11.6	3	7.0	11	25.6
Never	13	13	100.0	11	84.6	4	30.8	1	7.7	3	23.1	1	7.7	1	7.7
χ^2(p)		**1.882(^{MC}p=0.591)**		**7.450*(^{MC}p=0.037***		**3.480 (0.323)**		**0.421 (0.936)**		**1.619 (0.655)**		**0.356 (^{MC}p=1.000)**		**2.708 (0.439)**	

χ^2: **Chi square test** MC: **Monte Carlo**

p: p value for Relation between the different studied categories *: Statistically significant at $p \leq 0.05$

Table (V): Relation between student's menstrual irregularities and their lifestyle (n=363):

Life style	N	Menstrual irregularities													
		Premenstrual syndrome (n = 327)		Dysmenorrhea (n = 348)		Menorrhagia (n = 95)		Hypomenorrhea (n = 46)		Amenorrhea (n = 44)		Polymenorrhea (n = 26)		Oligomenorrhea (n = 83)	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Performance of regular exercises															
Yes	**52**	41	78.8	50	96.2	15	28.8	3	5.8	7	13.5	5	9.6	6	11.5
No	**311**	286	92.0	298	95.8	80	25.7	43	13.8	37	11.9	21	6.8	77	24.8
χ^2(p)		8.578* (0.003*)		0.013 (^{FE}p=1.000)		0.225 (0.635)		2.613 (0.106)		0.102 (0.749)		0.549 (^{FE}p=0.397)		4.415* (0.036*)	
Type of exercises		(n = 41)		(n = 50)		(n = 15)		(n = 3)		(n = 7)		(n = 5)		(n = 6)	
Walking	**40**	31	77.5	40	100.0	10	25.0	0	0.0	4	10.0	4	10.0	1	2.5
Running	**2**	2	100.0	2	100.0	0	0.0	1	50.0	0	0.0	0	0.0	0	0.0
Heavy exercise	**10**	8	80.0	8	80.0	5	50.0	2	20.0	3	30.0	1	10.0	5	50.0
χ^2(^{MC}p)		0.355 (1.000)		6.952 (0.051)		2.845 (0.207)		10.422* (0.006*)		2.893 (0.261)		0.567 (1.000)		13.376* (0.001*)	
Daily sleeping hours															
< 6 hours	**196**	160	80.8	181	91.4	40	20.2	29	14.6	25	12.6	15	7.6	45	22.7
6-10 hours	**153**	153	100.0	153	100.0	53	34.6	14	9.2	19	12.4	11	7.2	36	23.5
> 10 hours	**14**	14	100.0	14	100.0	2	14.3	3	21.4	0	0.0	0	0.0	2	14.3
χ^2(p)		35.775* (<0.001*)		15.039* (<0.001*)		10.388* (<0.006*)		3.397 (0.183)		1.999 (0.368)		1.136 (0.567)		0.624 (0.732)	
Have a time for relaxation															
Never	**164**	149	90.9	158	96.3	56	34.1	21	12.8	21	12.8	13	7.9	34	20.7
Sometimes	**168**	147	87.5	160	95.2	31	18.5	25	14.9	21	12.5	11	6.5	41	24.4
Always	**31**	31	100.0	30	96.8	8	25.8	0	0.0	2	6.5	2	6.5	8	25.8
χ^2(p)		4.776 (0.092)		0.325 (0.850)		10.581* (0.005*)		5.242 (0.073)		1.030 (0.597)		0.263 (0.877)		0.801 (0.670)	
Exposure to passive smoking															
Yes	**287**	262	91.3	275	95.8	79	27.5	45	15.7	37	12.9	23	8.0	67	23.3
No	**76**	65	85.5	73	96.1	16	21.1	1	1.3	7	9.2	3	3.9	16	21.1
χ^2(p)		2.234 (0.135)		0.008 (^{FE}p=1.000)		1.303 (0.254)		11.202* (0.001*)		0.765 (0.382)		1.494 (0.222)		0.179 (0.672)	

χ^2: **Chi square test** MC: **Monte Carlo** FE**: Fisher Exact**
p: p value for Relation between the different studied categories
*: Statistically significant at p ≤ 0.05

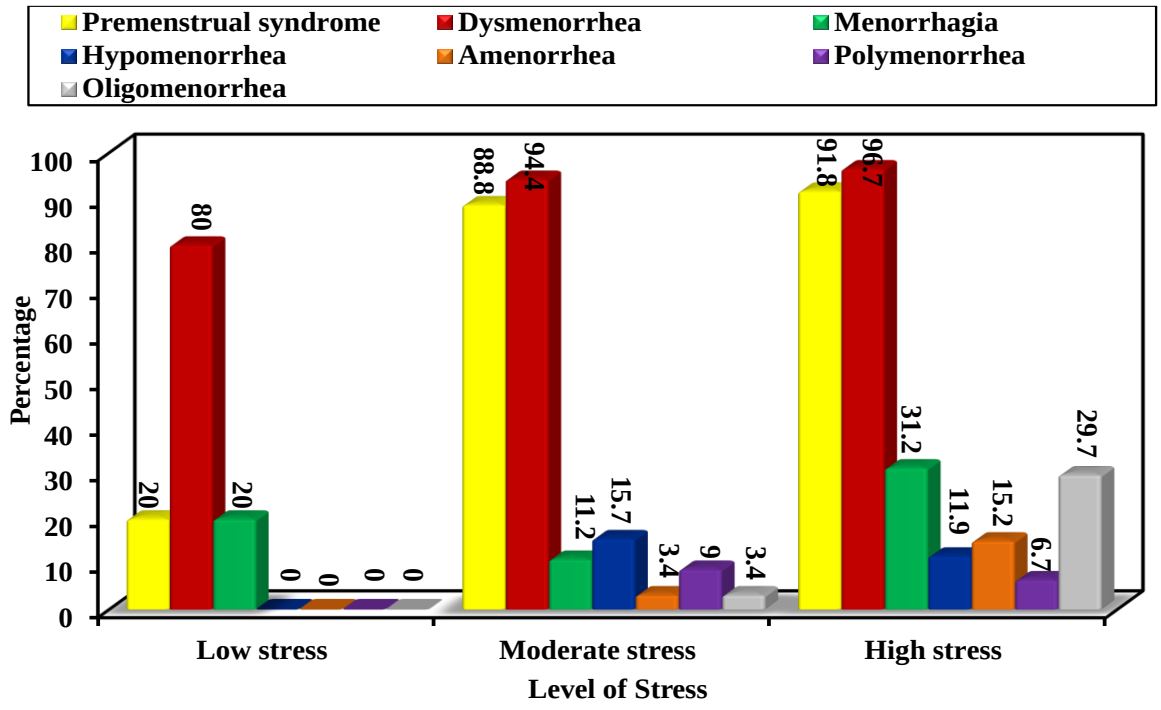

Figure (III): Relation between student's menstrual irregularities and their level of Stress (n=363).

Table (VI): Univariate and multivariate Logistic regression analysis for the factors associated with menstrual irregularities (Multiple = 342 Vs. Single = 21)

	Univariate		#Multivariate	
	p	**OR (LL – UL 95%C.I)**	**p**	**OR (LL – UL 95%C.I)**
Personal and demographic data				
Age (years)				
18 - <20®		1.000		1.000
20 - <22	0.003*	5.040 (1.725 – 14.728)	0.526	0.215 (0.002 – 24.912)
22 – 23	0.009*	4.479 (1.465 – 13.689)	0.174	0.011 (0.000 – 7.389)
Academic year				
First®		1.000		1.000
Second	0.031*	3.412 (1.119 – 10.406)	0.221	24.628 (0.145 –4172.873)
Third	0.005*	7.618 (1.867 – 31.077)	0.159	110.804(0.158–77575.07)
Fourth	0.030*	4.169 (1.145 – 15.178)	0.202	117.09(0.077–177009.21)
Residence place [Urban]	0.653	1.267 (0.452 – 3.554)		
Crowding index [Crowded (>2)]	0.682	1.366 (0.307 – 6.072)		
BMI (kg/m^2)	0.004*	3.695 (1.529 – 8.929)	0.026*	8.816 (1.291 – 60.207)
Dietary habits				
Number of meals per day				
<3	0.482	1.641 (0.412 – 6.530)		
3	0.497	1.594 (0.416 – 6.113)		
>3®		1.000		
Have breakfast daily				
Always®		1.000		1.000
Some times	0.032*	3.281 (1.109 – 9.705)	0.040*	7.532 (1.098 – 51.677)
Rarely+ Never	0.914	1.063 (0.353 – 3.198)	0.490	2.392 (0.201 – 28.423)
Have dinner daily				
Always®		1.000		
Some times	0.775	1.148 (0.445 – 2.962)		
Rarely+ Never	0.317	2.866 (0.365 – 22.525)		
Eat plant protein				
Always®		1.000		
Some times	0.313	1.638 (0.628 – 4.272)		
Rarely+ Never	0.711	1.338 (0.286 – 6.246)		
Eat sugary foods				
Always	0.018*	3.231 (1.221 – 8.546)	0.467	0.447 (0.051 – 3.925)
Some times	0.123	5.409 (0.635 – 46.092)	0.799	0.631 (0.018 – 22.005)
Rarely+ Never®		1.000		1.000
Drink milk /eat milk products				
Always®		1.000		
Some times	0.297	0.600 (0.230 – 1.568)		
Rarely+ Never	0.687	1.390 (0.280 – 6.897)		
Eat pickles or salty food				
Always	0.201	2.050 (0.682 – 6.157)		
Some times	0.786	1.196 (0.328 – 4.363)		
Rarely+ Never®		1.000		
Add salt to food				
Always	0.022*	3.788 (1.213 – 11.829)	0.267	5.230 (0.281 – 97.366)
Some times	0.018*	4.917 (1.320 – 018.313)	0.198	8.585 (0.325 – 226.942)
Rarely+ Never®		1.000		1.000
Exposure to negative smoking	0.379	1.554 (0.582 –4.152)		
Total Stress	<0.001*	1.214 (1.117 – 1.319)	0.025*	1.257 (1.030 – 1.535)

#Hosmer and Lemeshow Test (□□=0.279, p = 1.000)

C.I: Confidence interval LL: Lower limit UL: Upper Limit

#: All variables with p<0.05 was included in the multivariate

*: Statistically significant at p ≤ 0.0

Discussion

Menstruation is a sign of femininity. It is an essential indicator of women's general and reproductive health. It is influenced by a variety of physiological and psychological factors that can affect at any level from hypothalamus pituitary ovarian axis.**(Memon et al., 2022; Wibowo, Linda, & Novianus, 2023)** Menstrual irregularities are prevalent among the international student community as a result of a wide range of factors contributing to these irregularities.**(Ansong et al., 2019)**

This study result will be discussed under three sections. **Firstly**: distribution of the students according to the presence of menstrual irregularities. **Secondly**: the relation between menstrual irregularities and their associated factors. **Thirdly**: univariate and multivariate logistic regression analysis of different risk factors associated with multiple menstrual irregularities.

The **First** section indicates that most (99.5%) of the studied students had menstrual irregularities, compared to only (0.5) of them hadn't menstrual irregularities. This high prevalence may be because all of

study sample were students who usually had an irregular lifestyle. This result is close to the findings of two other studies. A study was carried out by **Acharya et al** (2023) who explored the menstrual disorder and associated factors among female of reproductive age group in Sunkoshi Rural Municipality, Sindhuli, Nepal. Their findings revealed that the occurrence of menstrual disorders was 84.2%.

Another study was performed in Moscow by **Lesnaya et al** (2021) which examined the effect of stress on menstrual dysfunction among female students of higher educational institutions, estimated that 82.4% of them had various menstrual irregularities. This harmony between the results of the current study and the above-mentioned two may be attributed to the approximate age groups of most participants in these studies who were adolescent and adult (16-25 years). Also, the age of the students in the current study ranged from 18-23 years.

On the other hand, these findings are contradicted by a study done by **Alhammadi et al** (2022) who determined menstrual cycle irregularity during examination of female medical students at King Abdulaziz University, Jeddah, Saudi Arabia. Their findings revealed a remarkably lower prevalence than that reported in the present study. About one half (48.2%) of the students had menstrual irregularities. The difference between the findings of the current study and the previous one may be related to the ways that the student used to improve their menstrual health. As they usually used herbal medication and home remedies. That consequently reduces the prevalence of these irregularities.

Regarding types of menstrual irregularities, the present study showed that dysmenorrhea was the most prevalent menstrual problem as most (95.9%) of the studied students had dysmenorrhea, followed by (90.1%) of them had premenstrual syndrome, while more than one quarter (26.2%) of them had menorrhagia and more than one fifth (22.9%) of them had oligomenorrhea, while only (12.7%, 12.1% and 7.2%) of them had hypomenorrhea, amenorrhea and poly-menorrhea, respectively.

However, various studies didn't show typical findings. Some irregularities may be closely related to the current study, while others may be extremely lower or higher than it. For example, a study was conducted in Syria by **Kahal et al** (2024), who identified the prevalence of menstrual disorders and their association with psychological stress in Syrian students enrolled at health-related schools. Their result revealed that the most common menstrual irregularities among female students were dysmenorrhea (88%), and PMS (87%) followed by polymenorrhea, amenorrhea, menorrhagia and oligomenorrhea (16%, 8%, 7% and 5%), respectively.

The possible causes for those variations in the prevalence of various types of menstrual irregularities could be attributed to differences in the study settings, screening tool, variant traditions and cultures between regions as well as exposure to different factors affecting the menstrual cycle and level of awareness to manage menstruation.

The **second** section indicates that, several factors were found to be associated with menstrual irregularities. With respect to the place of residence, the present study showed that the residence had a significant association with menorrhagia. These findings are consistent with a study performed by **Mittiku et al** in Ethiopia (2021) who identified menstrual irregularity and its associated factors among college students. Their findings showed that they were more likely to experience menstrual irregularities than those in urban areas.

By contrast, a study was done by **Kwak et al** (2019) who examined the prevalence of irregular menstruation according to socioeconomic status in Korea. Their results mentioned that residence was not significantly associated with menstrual regularity. This disparity between findings may be attributed to different study settings and wide variation in the sample size of the current study and the Korean study. As the current study sample size was 365 unlike the Korean one which had 4709 women. In addition to, different population ages between these studies.

In fact, women with a low socioeconomic status usually have a poor nutritional status and lack of healthy behaviors, indicating that socioeconomic status plays a crucial role in an individual's health. The current study showed a statistically significant relation was observed between family income and polymenorrhea.

These findings agreed with a study postulated in Egypt by **Alshaikh et al** (2020) which reported that there was statistically significant relationship between the menstrual disorders and socioeconomic standard, as most of the participants with low socioeconomic standard (95%) had menstrual disorders.

On the other side, the findings are in disagreement with a previously mentioned study done in Korea by **Kwak et al** (2019) which illustrated that women with the highest income group had the highest prevalence of irregular menstruation. In contrast, women who reported a medium-high or lower level of income had the lowest prevalence of irregular menstruation. This difference may be due to variant participants' characteristics. Since high-income females were likely to engage in specialized positions. For these women job-related stress may cause sleep problems, fatigue, and dietary changes which can disturb menstruation.

Moreover, one of the factors that frequently plays a role in the regularity of the menstrual cycle is body mass index (BMI). The result of the current study revealed that the obese and overweight students were more at risk for menstrual irregularities, compared to normal weight students. Furthermore, a highly significant relation was observed between BMI with PMS, dysmenorrhea, polymenorrhea and menorrhagia.

This result is in agreement with the findings of **Vaishali et al** (2022) who performed a study titled "Role of dietary habits in menstrual disorders among adolescent girls in Western Maharashtra Navi Mumbai" their study indicated that the occurrence of menstrual irregularities was found to be more in the obesity group followed by overweight and underweight respectively with a statistical significance with menstrual irregularities.

Additionally, they are consistent with study was performed in Iran (2020) by **Taheri et al** which titled "Nutritional status and anthropometric indices in relation to menstrual disorders". It stated that dysmenorrhea, menorrhagia, irregular menstruation, and PMS were worsened by increased BMI > 24.9 significantly. These results are plausible because females with a normal BMI would have a normal body fat. This fat leads to a normal level of estrogen in the body as well as a normal menstrual cycle.

On the other hand, increased BMI would be associated with increased estrogen levels. Also, very low BMI results in a decrease in the conversion of androgen to the estrogen hormone and a low estrogen level. This occurrence will affect the work mechanism of the hypothalamus and interrupt the menstrual cycle. **(De Silva & Tyson, 2024; Genazzani, 2020; Strauss, Barbieri, Dokras, & Williams, 2023)**

In conflicting with these results, the study was done by **Verma et al** (2020) who assessed the menstrual problems among undergraduate medical students in a medical college of North India, pointed out that there was no significant association of menstrual irregularities including PMS, dysmenorrhea and menorrhagia with BMI. The variance may be attributed to different study setting and lifestyle habits that affect normal body weight. As about two thirds of the subjects ate a healthy diet and performed walking exercise regularly.

Concerning the dietary habits, the present study revealed that there was no statistically significant relation observed between the number of meals per day, the main meal and skipping dinner or breakfast with menstrual irregularities. This result is relatively conflicting with the previously mentioned study done by **Vaishali et al** (2022) in Western Maharashtra Navi Mumbai and a study in Nepal by **Amgain et al** (2019) which examined the effect of BMI and food habits on menstrual characteristics among adolescent girls. The result of both studies revealed the significant role of dietary pattern such as skipping meals on the occurrence of menstrual irregularities. This discrepancy between our study results and this mentioned study could be explained by variation in the ages of study participants. As that study was conducted with adolescent girls which is a vital stage in development of the female body. So, skipping meals is an important factor affecting adolescent female general and reproductive health.

Furthermore, the current study illustrated that there was no statistically significant relation observed between eating many starches, sugary foods, salty foods, pickles, drinking tea/coffee and adding salt to food with menstrual irregularities. Interestingly, our study mentioned that there was a significant relation between eating starches and drinking caffeine (tea/coffee) with dysmenorrhea, premenstrual syndrome and menorrhagia. Additionally, it revealed the presence of highly statistically significant relation between eating sugary foods and premenstrual syndrome. Finally, a statistically significant relation was observed between eating pickles and salty foods with dysmenorrhea.

These results go in line with findings by **Smruthi et al** (2023) in India who performed a study titled "Impact of lifestyle and dietary habits on menstrual cycle among female medical students". They had found a statistically significant association between frequent consumption of sugary foods, fatty foods like burgers, pizza etc. and menstrual cycle regularities. A similar picture was found in a previously mentioned Iranian study was carried out by **Taheri et al** (2020). It illustrated that the women with all types of menstrual irregularities had excess calorie intake. This study had shown that the women with menstrual abnormalities consume a high fat and carbohydrates intake.

The same was also observed in a study mentioned before, was performed by **Amgain et al** (2019) in Nepal who revealed that the poor eating habit was significantly associated with menstrual problems. Also, the occurrence of the menstrual irregularities and intensity of dysmenorrhea were high in the participants who had fast foods, tea and coffee more frequently. These results could be explained by the fact that balanced diet is essential for enhancing reproductive health and promoting overall well-being among individuals. For instance, a nutrient-rich diet provides the essential vitamins and minerals necessary for the proper functioning of the endocrine system, which regulates menstruation. Moreover, healthy diet also helps in managing body weight which is crucial for normal menstrual cycle.**(De Silva & Tyson, 2024; Loftus & Radomski, 2021; Strauss et al., 2023)**

On the other hand, these findings are contradicting with a study conducted at (2022) by **Wibowo et al** who clarified the factors related to menstrual disorders in students of SMAN 12 City of Depok , Indonesia. Their findings revealed that there was no significant relation between the nutritional status and the menstrual irregularities, as no relationship was found between fat, carbohydrates and protein intake with these irregularities. This difference may be due to variation in the nature of the population and the sample size. Since this Indonesian study had a small sample size (168 students) compared to the present one. Consequently, these variations may cause dissimilarity at some factors related to menstrual irregularities in both studies.

Most importantly, the present study revealed that the majority of the students who had menstrual irregularities didn't perform regular exercise. A significant relationship was found between exercise with premenstrual syndrome and oligomenorrhea. A positive

correlation was observed between decreased risk of menstrual irregularities including; PMS and oligomenorrhea with performance of regular exercises among female students.

This result agrees with the findings reported by **Kulshrestha et al** (2019), their study titled " Prevalence of menstrual disorders and their association with physical activity in adolescent girls ". They revealed a significant association between physical activity and menstrual disorders including dysmenorrhea, oligomenorrhea and PMS which means that low physical activity leads to a higher prevalence of menstrual irregularities. These results could be explained by the fact that engaging in regular physical activity helps regulate the endocrine system, which is important for maintaining a regular menstrual cycle.**(Al-Suhaimi, Khan, & Homeida, 2022; Nakamura & Aizawa, 2023)**

In conflicting to these results, a previously mentioned study was conducted by **Verma et al** (2020) in a medical college of North India, reported that 73.22% of the students performed regular exercises. It also mentioned that there was no significant association of exercise with PMS, menorrhagia and menstrual cycle regularity. While the incidence of dysmenorrhea was significantly more in girls who were exercising occasionally than those were exercising routinely. The variation may be attributed to different study setting, participants' lifestyle habits and the small sample size (183 female students) compared to the current study.

Concerning the type of exercise, the present study was revealed that there was a highly significant relation between the type of exercise with oligomenorrhea and hypomenorrhea. Additionally, this result is accordant with a previously mentioned study was done by **Wibowo et al** (2022) in Indonesia. Their findings stated that more than three quarters of the students performed high physical activity. Moreover, there was a relationship between the physical activity level and menstrual irregularities. These findings could be returned for that an excessive physical activity results in fatigue and causes disturbed GnRH secretion, leading to menstrual irregularities.**(Nakamura & Aizawa, 2023)**

In conflict to these results a study carried out by **Zeru et al** (2021) who examined the magnitude and associated factors of menstrual irregularity among 620 undergraduate students at Debre Berhan University, Ethiopia. This study reported that most of students with menstrual irregularities performed low to moderate physical activity and no significant relation was found between level of exercise and menstrual irregularities. This difference may be due to variant study setting, screening tool and sample size, as well as daily habits compared to the present study.

There is no doubt proper sleep is necessary for the good physiological functioning of the body. It is essential for the regulation of hormonal cycles, stress reduction and maintaining a healthy body weight.**(Andersen, 2023; Pellechi & Sedky, 2020)**

Students may suffer from inadequate sleep as a result of delayed online lectures, extensive assignments, projects, and studying for exams. The current study mentioned that more than half of students who had menstrual irregularities slept for less than 6 hours daily. There was a highly significant relation between daily sleeping hours and menstrual irregularities including; PMS, dysmenorrhea and menorrhagia.

This is parallel with **Jeon et al** (2023) in Korea who conducted a study titled "Menstrual disturbances and its association with sleep disturbances". This study revealed that menstrual irregularities including PMS, dysmenorrhea and heavy menstrual bleeding were associated with sleep disturbances in form of poor sleep quality and short sleep duration.

Contrary to the findings of **Hong et al** (2021) who assessed the sleep status and menstrual problems among 2260 Chinese young females aged 17 to 30. They reported that menstrual irregularities weren't significantly associated with, bedtime, bedtime regularity and sleep duration. This variation in findings may be due to differences in study setting and participant characteristics in this study compared to the current study.

It is proven that relaxation promotes the individuals' quality of life through improvement of sleep, reduction of stress and inflammatory response. It can improve general and reproductive health and reducing menstrual pain.**(Andersen, 2023; Genazzani, 2020)** Despite that there is no obvious effect of relaxation on menorrhagia. The current study revealed that more than two fifths of the students who had PMS and dysmenorrhea never had a time for relaxation and another two fifths of them sometimes had relaxation time. Along with that, nearly three fifths of the students who experienced menorrrhagia never had a relaxation time while about one third of them sometimes had relaxation time. However, there was only a statistically significant relation between having a time for relaxation and menorrhagia.

This is contradicted with a study was performed by **IŞIK et al** (2024) in Turkey who investigated the efficacy of the relaxation technique on primary dysmenorrhea and menstrual symptoms among 76 students. The study illustrated that attendance to relaxation training was highly significant with decreased dysmenorrhea pain. This dissimilarity is related to the fact that most studies measured the effect of relaxation on dysmenorrhea. While no study found about measuring the effect of relaxation on menorrhagia.

Exposure to smoking causes significant health problems especially reproductive health. In the current study, more than three quarters of the students who had menstrual irregularities were exposed to passive smoking. A statistically significant relation was observed between

hypomenorrhea with exposure to passive smoking and the frequency of its exposure.

This result is supported by a study was performed by **Hiroko et al** (2021) in Japan which measured the effects of environmental tobacco smoke exposure on the menstrual cycle and menstrual phase-related symptoms. This study pointed out that the smokers had the highest risk of an abnormal menstrual cycle, followed by nonsmokers with secondhand smoking exposure from a family member or colleague being. Moreover, it reported that passive smoking was similar to heavy smoking, had been associated with decreased duration of bleeding and increased duration of dysmenorrhea among females.

This correlation between smoking and menstrual irregularities could be justified by the fact that the chemicals in cigarettes such as nicotine increase the estrogen breakdown, leading to lower levels of that hormone in the body. It also causes vasoconstriction which reduces blood flow to the reproductive organs, subsequently leading to menstrual irregularities.**(Genazzani, 2020; Liang, Ali, Ramaiyer, & Borahay, 2023)**

On the contrary, a study was conducted by **Ieczuja-Dwojacka et al** (2019) who assessed the relation of socioeconomic status and lifestyle with menstrual cycle characteristics among 896 healthy women from Central Poland. This study revealed that there was no significant relation between smoking and menstrual irregularities. This disparity of findings may be attributed to the different study setting, sample size, and along with differences in cultures and lifestyle habits.

Stress is a common experience among students, often resulting from academic pressures, social challenges, and lifestyle changes. The present study indicated that increased stress levels are associated with a higher risk of menstrual irregularities. There was a highly significant relationship between the level of stress and various menstrual irregularities, including; PMS, menorrhagia, amenorrhea, and oligomenorrhea.

After sifting through a large number of studies related to the menstrual cycle and stress as a factor affecting it, it is evident that moderate to high stress is increased among students. These studies found that increased stress level is significantly associated with various menstrual irregularities. For example, a previously mentioned study that was performed at the Syrian University **(**2024) by **Kahal et al**, demonstrated that 82% of the students had moderate stress, 10% had high stress and 8% had low stress. Moderate to high perceived stress was associated with an increased risk of PMS.

Additionally, a study was conducted by **Jain et al** (2023) in India which titled " Correlation of perceived stress with monthly cyclical changes in the female body". This study demonstrated that the percentage of participants with moderate to high perceived stress is more than those with low stress (85.25%). There was a statistically significant correlation observed between the presence of PMS, menorrhagia, dysmenorrhea and the PSS score. These findings could be explained by the fact that stress leads to various physiological and psychological mechanisms. One primary way stress affects the menstrual cycle is by disrupting hormonal balance. It increases the production of stress hormones like cortisol and activates the HPA axis. These changes can suppress the hypothalamic pituitary ovarian (HPO) axis, causing menstrual irregularities.**(Strauss et al., 2023; Ussher, 2024)**

Finally, the **third** section of this study indicated that, there was a statistically significant regression analysis of different risk factors associated with multiple menstrual irregularities among female nursing students. It was found that the main significant predictors of the occurrence of multiple menstrual irregularities were stress, body mass index, sometimes skipping breakfast, the age from 20 to less than 23 years, the second, third and fourth academic years, sometimes or always adding salt to food and eating sugary foods.

This go in line with a previously mentioned study of **Mittiku et al** (2022) in Ethiopia which revealed that the factors significantly associated with menstrual irregularities were perceived stress, BMI, the age of the students and residence. In addition, the previously mentioned study which was conducted by **Zeru et al** (2021) in Ethiopia illustrated a significant association between menstrual irregularities with factors included; sleep hours, perceived stress and BMI.

Furthermore, a study was carried out in China (2019) by **Ansong et al** who found out that high stress was also significantly associated with the risk of menstrual irregularities. However, other factors like age, lack of exercise, and BMI did not show strong significant associations in this Chinese study but they increased the students' risk for developing menstrual irregularities. This relative discrepancy may be due to differences in population characteristics, traditions and cultures between regions.

Conclusion

The findings of this study concluded that, the most common menstrual irregularities among female nursing students were dysmenorrhea and PMS. There was an association between the students' residence, family income and body mass index with menstrual irregularities. In addition, there was a significant relation between menstrual irregularities with dietary habits, irregular exercise, daily sleeping hours, a time for relaxation, exposure to passive smoking, and stress level. From the present study, it seems that the most predominant risk factors for multiple menstrual irregularities were stress, body mass index, age and dietary habits.

Recommendations

Based on the findings of the current study, the following recommendations are suggested:

A. Recommendations for the Health Directorates:

- Continuous professional development and training for healthcare providers on the latest guidelines, research, and best practices in managing menstrual health and irregularities.

- Expand telehealth services to include consultations for menstrual health issues, making it easier for women in remote or underserved areas to access healthcare providers.

B. Recommendations for the Faculty of Nursing

- Engage education about menstruation and menstrual irregularities in the nursing curriculum.

- Provide cultural sensitivity training for faculty members and students to ensure that discussions about menstrual health are respectful and inclusive of all cultural backgrounds and beliefs.

- Conduct regular health workshops and seminars that cover a wide range of topics related to menstrual health, including nutrition, stress management, and exercise.

C. Recommendations for Female Students:

- Encourage students to keep a menstrual diary or use digital apps to track their menstrual cycles, symptoms and any irregularities.

- Enhance regular participation of female students in stress management techniques such as relaxation exercises, meditation, mindfulness and peer support groups to help students cope with academic and personal stress, which can impact menstrual regularity.

- Support female students to seek regular health check-ups to monitor and manage menstrual health effectively.

D. Recommendations for Further Research:

- Investigate the barriers to accessing gynecological care and menstrual health services among female students and propose strategies to improve utilization.

- Explore the impact of menstrual irregularities on women's health and academic performance.

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