Asian Journal of Scientific Research

ISSN 1992-1454

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OPEN ACCESS Asian Journal of Scientific Research

ISSN 1992-1454
DOI: 10.3923/ajsr.2020.164.169

Research Article
Interrelation Between Menstrual Problems and Body Mass Index among Undergraduate Female Students: Cross Sectional Study

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Abstract

Background and Objective: Disorders in the menstrual cycle are a significant gynecological problem among female adults and a source of anxiety to them and their families. In Saudi Arabia, the most prevalent cause for college absenteeism is severe menstrual pain and menstrual irregularity. This study was conducted to assess the relationship between menstrual problems and body mass index among undergraduate female university students, Saudi Arabia. A cross-sectional design adopted in this study. **Materials and Methods:** The research conducted in three female colleges at Wadi Alddawasir Province, which affiliated to Prince Sattam Bin Abdulaziz University, Saudi Arabia. A purposive sample utilized. **Results:** The total sample was 3213 undergraduate single female students in the academic year 2016-2017, the data collected through the interviewing assessment sheet. The present study results revealed that out of 3213 students' girls, 53.9% of the students belonged to normal weight distribution, 21.8% were overweight, 12.8% were obese and 11.5% were underweight. A statistically significant relationship observed between BMI and duration of menses, average numbers of pads used daily during menses dysmenorrhea, menorrhagia and polymenorrhea. **Conclusion:** A positive correlation between body mass index and menstrual characteristics related to the duration of menstruation and the amount of blood flow also dysmenorrhea, menorrhagia and polymenorrhea. So, the finding in the present study indicated the health education program related to the menstrual cycle is needed for undergraduate female students.

Key words: Undergraduate female students, menstrual problems, body mass index, weight distribution, dysmenorrhea

Citation: Mirfat Mohamed Labib Al-Kashif, 2020. Interrelation between menstrual problems and body mass index among undergraduate female students: Cross sectional study. Asian J. Sci. Res., 13: 164-169.

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Competing Interest: The author has declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The Menstrual cycle is regulated and governed by cyclical changes in female sex hormones. The length and regularity of menstrual cycles reflect changes in the level of these hormones[1,2]. Disorders in the cycle or its irregularities are a major gynecological problem among female adults and sources of anxiety for the patients and their families. These disorders have multiple etiologies and studies of associated variables have found relationships with body mass index (BMI). Regulation of reproduction affected by body fat, an extreme body mass undesirably affects reproduction, starting from pubertal development, menstrual function and fertility[3-5].

Body mass index influenced the age at menarche, duration and regularity of menstrual cycle and significantly associated with the menstrual problem as dysmenorrhea, hypomenorrhea, oligomenorrhea, amenorrhea and premenstrual syndrome[6]. Female undergraduates who experienced menstrual disorders reported significant high scores on academic stress (27.31 ± 1.96), ($p<0.05$)[7]. Also, dysmenorrhea has been the leading cause of short-term school absenteeism in 34-50% of the suffering teenagers[8]. Moreover, women with a history of irregular cycles had a 28% increased coronary heart disease risk and may have a higher type 2 diabetes risk[9].

Also, Menorrhagia increased the risk of anemia, which results in reduced menstrual hygiene and increased risk of infection because many young girls might not be able to afford costly sanitary pads to take care of the extra days, especially when they are on school or university campus. They might resort to the use of old clothes or rugs, toilet paper, non-sterile gauze, or cotton[10-12]. In Saudi Arabia, the most prevalent cause for college absenteeism is severe menstrual pain (79.9%) and about two-thirds of them related to the menstrual cycle. Moreover, 27.4% of the female college students were overweight, 11.8% of them were obese, while 10.8% of them were underweight[13].

By searching the research literatures, we did not find any data about the menstrual problem and their relationship to body mass index in the city of Wadi Alddawasir. So, the importance of this research is evident in the value and quality of information it provides to those interested in scientific research, health sectors and the community. Moreover, these results can be considered a guide in this field to establish bases and rules based on evidence-based plan to overcome the problem of obesity and its impact on the menstrual cycle.

This study was conducted to assess the relationship between menstrual problems and body mass index among undergraduate female university students, Saudi Arabia.

MATERIALS AND METHODS

Study design: A Cross-sectional research design was utilized.

Study setting, subjects and sampling: The study conducted in three colleges of female students in Wadi Alddawasir province, which affiliated to Prince Sattam Bin Abdulaziz University, Saudi Arabia. These colleges were educational, Art and science and applied medical science colleges. The total students in three colleges were 4232 students. A purposive sample was utilized, after considering the inclusion and exclusion criteria, the final study sample was 3213 undergraduate single female students in the academic year 2016-2017.

The response rate was 76% of the total students. The remaining sample was 1019 students who were not fulfilling the inclusion criteria or not complete the data and refused to participate. Inclusion criteria are the undergraduate single female students in the academic year 2016-2017. Exclusion criteria were as histories of current medical problems including autoimmune disease, thyroid disorders, adrenal disorder, asthma, psychiatric problems, gynecologic problems including endometriosis or pelvic inflammatory disease, married or using substances abuse.

Sample collection tools: The menstrual self-assessment questionnaire was given to each student. It concerned with:

- The menstrual characteristics of the studied students, such as; current age, the age of menarche, regularity/irregularity of menstruation in interval and duration, the amount of blood loss (number of pads used)
- Menstrual disorder, dysmenorrhea, oligomenorrhea, menorrhagia, hypomenorrhea and polymenorrhea
- To calculate body mass index (BMI), women's height and weight were measured and the value for BMI were stated as follows: A BMI <18.50 kg m^{-2} as under-weight, a BMI of 18.50-24.99 kg m^{-2} as normal, a BMI of ≥ 25.00 kg m^{-2} as over-weight and a BMI ≥ 30.00 kg m^{-2} was stated as obese[14]

Tools development: The researcher constructed it after the extensive review of relevant literature. The tools were tested for the validity of the content by the jury of 5 experts in the field of maternity, obstetrics and gynecology nursing to ascertain relevance and completeness. The reliability of an instrument concerns its consistency and stability. The use

of correlation procedures usually determines the degree of reliability. A correlation coefficient is established between two sets of scores or between the ratings of two judges. A correlation coefficient above 0.70 is considered satisfactory.

Ethical consideration: The study established ethical approval from the Research Ethics Approval Committee, Faculty of Applied Medical Sciences in Wadi Alddawasir, Prince Sattam Bin Abdulaziz University, Saudi Arabia. Oral consent obtained from the participant after full explanation of the aim of the study and ensure confidentially and they have the right to refuse participation.

Sampling collection procedure: All the questionnaires were self-reported and completed by the participants with the aide and observation of researchers about all aspects of the questionnaires. The survey was carried out within 8 months to achieve, from 1st October, 2016 to the end of May, 2017, to rule out the problems related to menstruation.

Statistical analysis: Data were analyzed using SPSS, version 20. Frequencies, percentage, mean and standard deviation (SD) presented as appropriate. Bivariate analysis of data done and the chi-squared test of significance done were appropriate. The $p<0.05$ was considered statistically significant.

RESULTS

As shown in Fig. 1 out of 3213 students' girls, 53.9% of the students belonged to normal weight distribution, 21.8% were overweight, 12.8% were obese and 11.5% were underweight. As demonstrated in Table 1, the underweight student have a significantly higher duration of menses more than 6 days (22.8%), compared to students who belonged to other body mass index categories ($\chi^2 = 33.710$ and $p<0.0001$*). Irregular menstrual cycle was more frequent among underweight and obese students (30.1 and 30.7%, respectively) compared to standard and overweight students. Also, the mean numbers of pads used daily for menses for menses was significantly higher among obese students (4.1±1.3) ($F = 3.340$, $p = 0.019$*).

Table 2 depicts that body mass index (BMI) is significantly associated with dysmenorrhea, as nearly more then have of underweight students (58.5%) complain from dysmenorrhea, however, obese students suffering from dysmenorrhea accounts for (43.0%). While, menorrhagia and polymenorrhea were more frequent among obese students (19.5 and 20%, respectively) compared to other weight categories. The difference was statistically significant.

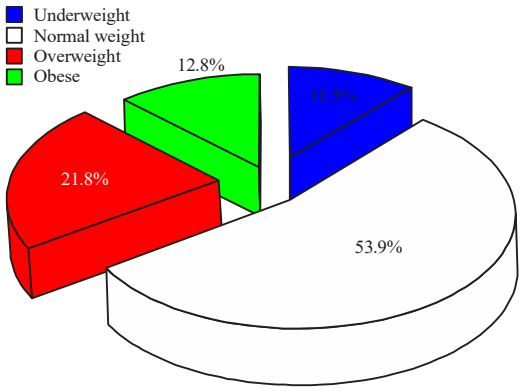

Fig. 1: Distribution of the studied sample according to their body mass index (n = 3213)

Table 1: Relation between body mass index and menstrual characteristics among the studied sample (n = 3213)

	Studied female students (n = 3213)								
	Underweight (n = 369)		Normal (n = 1731)		Overweight (n = 702)		Obese (n = 411)		
Menstrual characteristics	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Significance
Duration of menses (days)									
3 or less	63	17.0	84	4.9	30	4.3	27	6.6	$\chi^2 = 33.710$
4-6	222	60.2	1368	79.0	558	79.5	312	75.9	p<0.0001*
More than 6	84	22.8	279	16.1	114	16.2	72	17.5	
Length of the menstrual cycle									
Less than 21	18	4.9	162	9.4	48	6.8	15	3.6	$\chi^2 = 7.495$
21-35	117	31.7	612	35.4	255	36.3	165	40.1	p = 0.586
More than 35	93	25.3	447	25.8	192	27.4	105	25.6	
Irregular	111	30.1	510	29.4	207	29.5	126	30.7	
Average pads number used daily									F = 3.340
Min-Max	1-8		1-8		1-8		1-8		p = 0.019*
Mean±SD	4.0±1.2		3.8±1.3		3.7±1.3		4.1±1.3		over/obese*

F: ANOVA test, χ^2: Chi-Square test, *Significant at $p \leq 0.05$, over/obese*, Normal/obese*: Significant difference by Bonferroni *post hoc* test

Table 2: Body mass index and menstrual problems among the studied sample (n = 3213)

	Studied female (n = 3213)								
	Underweight (n = 369)		Normal (n = 1731)		Overweight (n = 702)		Obese (n = 411)		
Menstrual disorders	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Significance
Dysmenorrhea	216	58.5	963	55.6	372	53.0	177	43.0	χ^2 = 1.409E2[a]
Oligomenorrhea	31	8.4	162	9.4	65	9.2	35	8.5	p = 0.001*
Menorrhagia	48	13.0	239	13.8	100	14.2	80	19.5	
Hypomenorrhea	30	8.1	147	8.5	69	9.9	37	9.0	
Polymenorrhea	44	12.0	220	12.7	96	13.7	82	20.0	

χ^2: Chi-Square test, *Significant at p≤0.05

DISCUSSION

Obesity is an epidemic chronic medical problem world wide includes both developed and developing countries[15]. It is considered the most health problem in Saudi Arabia[16]. In the current study results, 53.9% of the respondents belonged to normal weight distribution, 21.8% were overweight and 12.8% were obese, while 11.5% were underweight. In another study conducted in Abha City, King Khalid University, KSA, overweight reported to 27.4%, obesity was 11.8%, while 10.8% of them were underweight[13]. This result is nearly similar to the study results in Egypt, where 52.1% of girls presented with normal body mass index and 10.8% were obese, 3.2% of girls were underweight and 33.9% had body mass index[17] from 25 -30. On the other hand, these results are not congruent with the results of Thapa and Shrestha[18], Margaret and Dash[19] and Jayaraj *et al*.[20]. The chief aim of the current study was to assess the relationship between menstrual problems and body mass index among undergraduate female university students. It is noticeable from the present study results that increase the number of menstrual flow days more than 6 days among underweight students (22.8%) compared to students who belonged to other body mass index categories. In contrast to these results, Hahn *et al*.[21] and Jang *et al*.[22] showed that obesity associated with slight increases in the prevalence of more extended flow. As for the length of the menstrual cycle, the present study result revealed that there were no statistical differences between students who belonged to different body mass index categories regarding menstrual length. In contrast to these findings, Hahn *et al*.[21] reported that obese women, compared with those of healthy weight, were more likely to have short cycles (PR = 1.52, 95% CI = 0.86-2.69). The prevalence of prolonged cycles increased monotonically across the categories of BMI, with with the massively obese women being more likely to report cycles of $ 33 days (PR = 1.86, 95% CI = 1.05-3.28).

Irregular menstrual cycle was relatively more frequent among underweight and obese students (30.1 and 30.7%), while the least was in normal-weight students (29.4%) but not reach a significant level as shown in the present study results. These results are like the results of Sen *et al*.[23], which showed no difference in menstrual cycle length irregularities between overweight girls and all other girls. Hossam *et al*.[17] proved that the highest proportion of irregular menstruation was found in (65.9%) of obese and (51.4%) in overweight students, while the least was in normal-weight students affecting 41.7% of them with a statistically significant. Also, Hahn *et al*.[21] found that obese women had a higher prevalence of irregular cycles compared with women of normal weight (PR = 1.46, 95% CI = 1.06-2. In this respect, Wei *et al*.[24] have reported that increased BMI, FAI, serum T and insulin, as well as decreased levels of serum SHBG, are associated with an increased likelihood of menstrual irregularity among women in reproductive age.

Also, the mean numbers of pads used daily for menses was significantly higher among obese students (4.1±1.3) (F = 3.340, p = 0.019*), this agrees with Hahn *et al*.[21] who found that the prevalence of heavy bleeding increased monotonically with a higher BMI category. Also, Santos *et al*.[25] stated that obesity associated with a two-fold increase in the prevalence of massive menstrual flow.

It reported that obesity was associated with many health problems, which have negative effects on reproductive health Jungheim *et al*.[26]. However, various studies have been obtained on their relationship with dysmenorrheal Ju *et al*.[27]. In the present study the association between body mass index and dysmenorrhea was statistically significant with increased the percentage in the low body mass index students (58.5%) and decreased with the obese one (43.1%). This result agrees with Chauhan and Kala[28] who found a significant correlation between dysmenorrheal and BMI (p = 0.01), with increased prevalence in the low BMI group and suggested that improvement of the nutritional

status of adolescent girls might reduce dysmenorrhea. Moreover, Ju[29] mentioned that underweight and obese women showed a higher risk of reporting dysmenorrheal (34 and 22%, respectively) and the risk of dysmenorrheal disappeared among obese women when they lost weight and acquired healthier body weight. However, the present study results contrast with other study results conducted in Saudi Arabia as the relation between body mass index and dysmenorrheal was not reach the significant value[13]. The present study shows that menorrhagia and polymenorrhea were more frequent among obese students (19.5 and 20%, respectively) compared to other weight categories. The difference was statistically significant. The present study results related to menorrhagia and polymenorrhea were supported by Dars *et al*.[6]. However, the findings by Aladashvili-Chikvaidze *et al*.[30] reported non-significant correlation.

CONCLUSION

The results of the present study are like those reported in other parts of the world, with limited scientific literature in Saudi Arabia. It can conclude from the current study results that there was a positive correlation between body mass index and menstrual characteristics related to the duration of menstruation and the amount of blood flow-also, dysmenorrhea, menorrhagia and polymenorrhea.

SIGNIFICANCE STATEMENT

This study discovers the magnitude of menstrual problems among female undergraduate students and their correlation with body mass index. So, the importance of this research is evident in the value and quality of information it provides to those interested in scientific research, health sectors and the community. Moreover, these results can be considered a guide in this field to establish bases and rules based on evidence-based plan to overcome the problem of obesity and its impact on the menstrual cycle. Thus, health education programs related to menstruation and nutritional counseling should be accessible and persistently provided to undergraduate female students to improve their health and lowering the risk of the physical, social and emotional impact of menstruation. Moreover, future studies needed about the menstrual problems and their associated factors include evidence-based nursing management guidelines in different female settings in Saudi Arabia.

ACKNOWLEDGMENT

The author thanks all female students in Wadi Alddawasir Province, Prince Sattam Bin Abdulaziz University, Saudi Arabia, for their contribution to the collection of the data used in this study.

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