

The Relationship between Menstrual Cycle Irregularity and Body Mass Index among Secondary Schools Pupils

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Abstract: The present study aimed to evaluate the relationship between menstrual cycle irregularity and Body Mass Index among secondary schools pupils.

Subjects and methods: A descriptive study was used to conduct this study on 380 single girls from five secondary schools in Damietta city, Egypt with an average age of 15- 18 years old, and started menstruating since at least two years ago.

Tools of Data Collection: Three tools were used for data collection; the first was a structured questionnaire which entailed the student's socio demographics, second tool was the physical assessment sheet which included the participants' anthropometrics, while the third tool was the menstrual cycle questionnaire, it was a 19-item self-report questionnaire.

Results: There was a statistically significant relation between the BMI and the menstrual cycle rhythm; the highest prevalence of irregular menstruation was in obese (65.9%) and overweight students (51.4%), while the least was in normal weight students affecting 41.7% of them.

Conclusion: the current study finding revealed that obese and overweight girls were more frequently have irregular menstrual cycles than normal or underweight girls ($p=0.007$).

Recommendations: Health education programs should be provided to the students; by the school's health nurse, to orient them about the leading factors for obesity and its complications on menstrual disturbances.

Key Words: Menstrual cycle, BMI and Menstrual disorders.

I. Introduction

Menstruation is described as the exclusive sign of femininity. It is well known that the terms menstruation and menses are derived from the Latin menses (month), which in turn relates to the Greek mene (moon) and to the roots of the English word month reflecting the fact that the moon also takes close to 28 days to revolve around the Earth (actually 27.32 days) (Shannon et al., and Ladewig et al., 2008).

Menstrual cycle is a normal physiological process that is characterized by periodic and cyclic shedding of pregestational endometrium accompanied by loss of blood. (Ladewig et al., 2008). It is considered as a vital sign that indicates normal development. Its regularity helps for the exclusion of pathological conditions in adolescent and young girls (Begum et al., 2009).

Girls in the secondary schools are at the period of adolescence; which is a point of physical, emotional, social and psychological changes (Eknayan et al., 2007). Menstrual dysfunction frequently occur at that age, however it is rare to find a significant pathology to explain the dysfunction (Mei, 2002). The increasing rates of obesity, among Egyptian population, that is largely attributed to their lifestyles; including unhealthy dietary habits, like consuming the widely distributed junk, fast food coupled with increasing sedentary lifestyles had been found to result in menstrual disturbances (Galal, 2002).

Because the pattern of menstrual cycle has a significant impact on a girl's reproductive life, which raises a concern for the patient and their families, the current study aimed to evaluate the relationship between menstrual cycle irregularity and body mass index among secondary schools pupils (Romero-Corral, 2008).

II. Significance Of The Study

Obesity is a major problem affects adolescent girls. In Egypt more than 48.5% of girls are obese (Hollmam, Runnebaum, 2004). Some variety of menstrual dysfunction occurs in girls and may affect normal life of young adult women. Physical, Mental, Social, Psychological, Reproductive problems are often associated with menstrual irregularities and menstrual problems. Population-specific reference data are useful to establish what is normal and acceptable, and what is not. Few population studies have been conducted in Egypt on normal and dysfunctional characteristics of menstrual cycles. Since knowledge of their variability is needed for patient education purposes, a descriptive study conducted at Damietta city, aiming to evaluate the relationship between menstrual cycle irregularity and body mass index among secondary schools pupils.

III. Aim Of The Study

This study aimed to evaluate the relationship between menstrual cycle irregularity and Body Mass Index among secondary schools pupils.

Study Question

Does menstrual cycle regularity is affected by the body mass index category?

IV. Subjects And Methods

Study Design: A Descriptive research design was utilized.

Study Setting: The current study was conducted in five secondary schools in Damietta city, Egypt, namely, Alshaheed Odaa secondary school, Om El moamneen secondary school, Omar EbnAbd El Aziz secondary school, AlsayidaKhadiga secondary school, Shehata secondary school), during the period from December 2014 to May 2015.

Sampling

This study was conducted on 380 female secondary schools pupils; who were registered for the school year 2014-2015. They were selected through purposive sampling technique based on the following criteria.

- Age 15- 18 years.
- Single.
- Started menstruating.

Exclusion criteria

- All those who had primary or secondary amenorrhea.
- Had a history/ currently on chemo or radiotherapy.
- On oral contraceptive pills (OCP).

Tools of Data Collections

Data were collected using three tools. The first tool was a structured interviewing questionnaire, the second tool was the physical assessment sheet, and both were developed by the researcher and revised by a jury of three qualified experts in woman's health and midwifery specialty to test its validity. The third tool was a standardized tool; the menstrual cycle questionnaire.

Tool I: A Structured Questionnaire

This tool included the student's demographics; specifically, name, age, school name, class number, residence, and the educational year. It was filled in by the pupils.

Tool II: Physical assessment sheet

It entailed the physical assessment data; in terms of measurement of height, weight, and the calculated Body Mass Index (BMI). It was filled in by the researcher.

Body Mass Index (BMI) was identified as the ratio of weight (kg) to height (m)²to be (kg/m²)**(Freedman, 2009)**. Based on the calculated BMI, the students were classified into 4 groups:

- Underweight =BMI<18.5
- Normal weight = BMI 18.5-24.9
- Overweight = BMI 25-29.9
- Obese = BMI ≥ 30

Tool III: Menstrual cycle questionnaire

It was developed by **Stephen 2011**. It is a 19-item self-report questionnaire which used to assess the menstrual cycle characteristics (e.g., age at menarche, assessment of menstrual blood flow for its duration, consistency, color, and amount, assessment of menstrual cycle for its length and rhythm, evaluation of the characteristics of the menstrual pain, and the associated menstrual symptoms and mood changes).

Validity of the Data Collection Tools

The validity of the tools was ascertained by a panel of three experts in woman's health and midwifery nursing specialty who reviewed the tools for content validity. They were checked the tools for completeness and clarity, and their comments were considered.

Reliability of the Data Collection Tools

To test reliability of the developed tools, the researcher administered the same tools to a group of participants on two occasions, and scores from repeated testing were compared.

Operational Design

This design included the preparatory phase description, pilot study, and the fieldwork.

Preparatory phase

It included reviewing the related literature; using books, articles, internet periodicals, as well as pioneer from nursing experts in order to develop the exact tools for data collection.

Pilot study

Piloting was conducted to test the applicability of the tools, the feasibility of the study and to estimate the time needed for the data collection. It was conducted on 10% of the total sample (38 pupils). Modification, omission and addition were followed as needed according to the results of pilot study.

Field work

- The researcher went to the previously assigned secondary schools at Damietta city; after taking permission from the authorized persons, for three days per week from 9 am to 2 pm.
- A clear explanation of the nature and the aim of the study were provided to the students to obtain their informed verbal consent. The questionnaires were distributed among them, and explanation on how to fill in the forms was given, and the researcher presented all the time for any clarification needed.
- The Arabic translated sociodemographic questionnaire, filled in by each participant.
- Each student took about 10 to 15 minutes to fill in the questionnaire.
- A special room in each of the assigned schools was prepared by the researcher; for the physical assessment of the enrolled students to ensure their privacy.
- The student's weight and height were assessed by the researcher. Body weight was obtained using the same weighting scale, while all participants were in the same uniform and recorded to the nearest 0.1kg, height was measured with a fixed stadiometer and recorded to the nearest 0.5cm; while participants in bare feet.
- The obtained data were recorded in the assigned sheet, and the BMI was calculated using the ratio of weight (kg) to height (m)² to be (kg/m²).
- The obtained data were recorded in the assigned sheet, and the BMI was calculated using the ratio of weight (kg) to height (m)² to be (kg/m²). Each menstrual pattern and rhythm was determined according to their specific definitions and then associations were done.

Limitations of the Study

Two limitations were noted in this study. Firstly, it was difficult for the researcher to set a fixed timetable to interview with the study subjects for their physical assessment and taking their menstrual history because of students' class time. Secondly, menstrual characteristics were students 'self-report, accordingly, susceptible to recall bias.

V. Statistical Analysis

The statistical analysis of data was done by using SPSS program (statistical package for social science) version 20.0. Continuous data were presented in the form of mean and standard deviation while categorical was presented as number and percent. Continuous data were tested for normality of distribution prior to any statistical analysis. The one way ANOVA Test was used to compare the means of variables with continuous data among the groups with different BMI categories. For comparison between categorical data, chi-square test was used. Correlation between variables with continuous data was performed using correlation co-efficient test. Statistical significant difference was considered at P<0.05.

VI. Results

Part I: The basic characteristics of the studied sample

Table 1. Frequency distribution of the age, educational year, and body mass index among the studied sample (n=380)

	n	%
Age (years) (mean ±SD)	16.8 ±0.9	
Educational year		
1 st secondary	144	37.9
2 nd secondary	151	39.7
3 rd secondary	85	22.4
BMI (kg/m²) (mean ±SD)	24.6 ±4	
BMI category		
Underweight (<18.5)	12	3.2%

Normal (18.5 – 25)	198	52.1%
Overweight (25 – 30)	129	33.9%
Obese (30 – 35)	41	10.8%

Table 1 shows the frequency distribution of the age, educational year, and body mass index among the studied sample. It is clear from this table that this study included 380 female secondary school pupils with an average age of 16.8 ± 0.9 years (ranged from 15 to 18 years). Of these girls, 37.9% (n=144) were in the first secondary year, 39.7% (n=151) were in the second year, while 22.4% (n=85) were in the third year. The average BMI of the girls was $25.1 \pm 4.2 \text{ kg/m}^2$ (ranged from 15.2 to 35.9 kg/m^2). According to the BMI categorization, 3.2% (n=12) were underweight, 52.1% (n=198) were normal, 33.9% (n=129) were overweight, 10.8% (n=41) were obese.

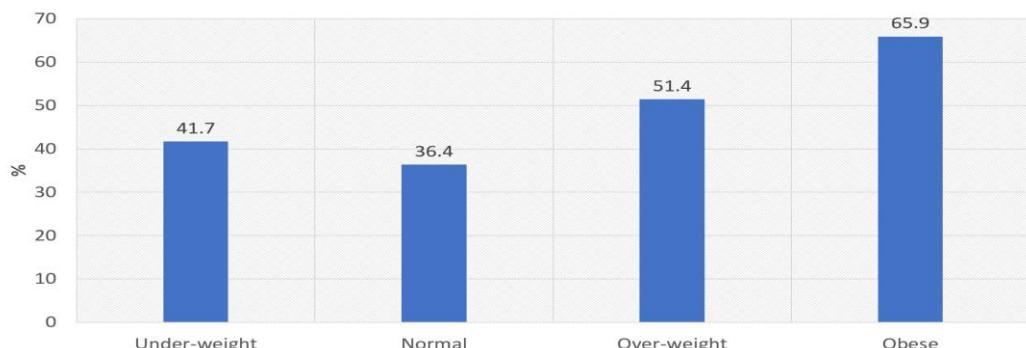


Figure (1): The association between the menstrual cycle's irregularity and the BMI categories

As demonstrated in Figure 1 the girls who were obese (65.9% and 51.4% respectively) or overweight were more frequently have irregular menstrual cycles than normal weight (36.4%) or underweight (41.7%) girls ($p=0.007$ & $X^2 = 12.167$).

VII. Discussion

The current study aimed to evaluate the relationship between menstrual cycle irregularity and body mass index among secondary schools pupils. This study finding revealed that obese and overweight girls were more frequently have irregular menstrual cycles than normal or underweight girls. Accordingly, the study question was answered "Does menstrual cycle regularity is affected by the body mass index category?"

This study finding is supported by the finding of **Hemant Deshpande et al. (2013)**. Such study was conducted in India, over a period of one year on a random sample of 200 medical students at a private medical teaching hospital & research centre. The investigators reported that higher fat percentage (31-34%) was associated with large number of girls with irregular menstrual cycles (89.13%). The same investigators also noticed a statistically significant correlation between irregular cycles and high BMI, and between very high and very low body fat percentages and menstrual irregularities.

In the same line, **Abd El-Gawad et al., 2014** found a strong statistically significant relation between BMI of the studied subjects and their menstrual cycle rhythm and pattern; where obese, underweight and overweight students had significantly higher prevalence of menstrual disorders; 47.8% in underweight, 49.3% in obese, 35.8% in overweight and least percentage (20.6 %) was in normal weight students.

An old study by **Mitchell and Rogers (2004)** revealed that obese women were more susceptible for menstrual disorders; about four times, than those with normal weight, and **Mandakini Parihar (2004)** in a study conducted in Medical College, Mumbai, India, revealed that obesity in teenage women was positively correlated with menstrual irregularity and with light menstrual flow.

Similarly, in a large study involved 3000 women, menstrual disturbances accounted for 75% of them and the investigators designated that the menstrual cycle patterns are reliant on the BMI, and they suggested weight reduction for the improvement of menstrual cycle pattern disorders (**Nowakowska et al., (2005)**). Furthermore, **Chen et al., 2006** found that obese women are at higher risk for the menstrual disorders, and a Swedenstudy by **Kristen et al., (2013)** revealed that prevalence of heavy bleeding decreased with a higher BMI. This finding can be explained by the 'critical weight hypothesis', which proposes that menstruation is established once a 17% body fat compositions or a threshold weight of 48 kg is achieved (**Johnston, 2010**).

VIII. Conclusion And Recommendation

There was a statistically significant relation between the BMI and the menstrual cycle rhythm; the highest prevalence of irregular menstruation was in obese (65.9%) and overweight students (51.4%), while the least was in normal weight students affecting 41.7% of them. Hence, it is recommended to provide health

education programs to the students; by the school's health nurse, to orient them about the leading factors for obesity and its complications on menstrual disturbances.

References

- [1]. Abd El-Gawad (2014) . Body mass index and its relation to menstrual patterns and blood pressure EL-MINIA MED. BULL.VOL. 20.
- [2]. Begum J., Hossain A.M., Nazneen S.A. (2009). Menstrual pattern and common menstrual disorders among students in Dinajpur Medical College Dinajpur Med. Col. J., 2(2), 37-43.
- [3]. Chen, H. M., and Chen, C. H. (2010): Related factors and consequences of menstrual distress in adolescent girls with dysmenorrhea in Taiwan the Kaohsiung Journal of Medical Sciences, 41, 121-7.
- [4]. Derntl B, Hack RL, Kryspin-Exner I, Habel U (January 2013). "Association of menstrual cycle phase with the core components of empathy". HormBehav 63(1): 97–104. doi:10.1016/j.yhbeh.2012.10.009. PMC 3549494.PMID 23098806.
- [5]. Eknayan and Garabed. (2007): "Adolphe Quetelet (1796–1874)—the average man and indices of obesity". Nephrology Dialysis Transplantation 23 (1): 47–51.
- [6]. Freedman, D., Wang J., Thornton J., Mei Z., Sopher, A and Pierson, R., et al. (2009):Classification of body fatness by Body Mass Index-forageamong children. Archives of Pediatric & Adolescent Medicine,163(9), 805-11.
- [7]. Galal, O. M (2002). The nutrition transition in Egypt: Obesity, undernutrition and the food consumption context. Public Health Nutrition. 2002;5(1A):141-148.
- [8]. Hemant D., Shankar B. and Priyanka D. (2013):Relationship of body mass index and body fat percentage with menstrual cycle pattern in adolescents Int J Pharm Biomed Sci 2013, 4(4), 114-117 ISSN No: 0976-5263.
- [9]. Heyward HV. andStolarczyk ML. (2005):Applied body composition assessment. Champaign, IL: Human Kinetics; 1996:4-19.
- [10]. Hollman M, Runnebaum B, Gerhard 1(2004): Impact of waist-hip-ratio and body-mass index on hormonal and metabolic parameters in young, obese women. Int J ObesRelatMetabDisord 2004;27:476.
- [11]. Johnston FE., Malina RM., Galbraith MA., Frisch RE., Revelle R.& Cook S.(2010):Height, weight and age at menarche and the 'critical weight' hypothesis Science174, 1148–9.
- [12]. Kristen A. and et al., (2013):Correlates of menstrual cycle characteristics among nulliparous Danish women J. Obstet-Gynecol. Reprod. Biol.; 70: 451-60.
- [13]. Ladewig J.O. and Hillard P. (2008):German Journal of Obstetrics and Gynecology: PMS: A clinical perspective Vol.99, Issue 4, P.P 655–62.
- [14]. Mandakini P. (2004): Reviews in Gynecological Practice 3 (2004) 120–126 Obesity and infertility Department of Obstetrics and Gynaecology, K.J Somaiya Medical College, Mumbai, India.
- [15]. McArdle W., Katch FJ. And Katch VL. (2004):Exercise physiology: energy, nutrition and human performance. Philadelphia, PA: Lea and Fibiger; 2004 US National Library of Medicine enlisted journal ISSN0974 - 1143.
- [16]. Mei Z., Grummer-Strawn L.M., Pietrobelli A., Goulding A., Goran MI.,& Dietz WH. (2002). "Validity of body mass index compared with other body-composition screening indexes for the assessment of bodyfatness in children and adolescents". Am J ClinNutr 75 (6): 978–85. PMID 12036802.
- [17]. Mitchell GW. and Rogers J. (2004):The influence of weight reduction on amenorrhea in obese women. NEJM 2004;249:835–7.
- [18]. Nowakowska et al., (2005): Menstrual irregularity- a possible clinical marker of metabolicdysfunction in women with class III obesity. GynecolEndocrinol 2010Oct;26(10):768-72.
- [19]. Romero-Corral, Somers A., Lopez-Jimenez V., Korenfeld F., Palin Y., Boelaert S., Boarin K., Sierra-Johnson S., and Rahim JA. (2008): 3-D Body Scanner, Body Volume Index: A Novel, Reproducible andAutomated Anthropometric Tool Associated with CardiometabolicBiomarkersObesity A Research Journal 16 (1) 266-P.
- [20]. Schwartz DH, Romans SE, MeiyappanS, DeSouza MJ, EinsteinG (September(2012)."Theroleof ovarian steroid hormones in mood". HormBehav62 (4): 44854. doi: 10.1016/j.yhbeh.2012.08.001.PMID22902271.
- [21]. Shannon; Marilyn M. (2008): Fertility cycles & nutrition: how diet affects menstrual cycles & fertility, 3rd edition, Cincinnati, Ohio: P.P. 71–72.
- [22]. STEPHEN D. SAEKS, PhD, (2011): LAc2 Roads Crossing Healthcare, PC 15455 NW Greenbrier Parkway, Suite * 240Beaverton, Oregon 9700681165036170450.