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Original Research Article

Relationship between Primary Dysmenorrhea and Body Composition Parameters in Young Females

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ABSTRACT

The present study was aimed to assess body composition in young women with primary dysmenorrhea (PD). Healthy unmarried female volunteers (30 with primary dysmenorrhea and 30 eumenorrheic (control)), in the age group of 18-25 years, having regular 28-32 days menstrual cycle were enrolled. Anthropometric measurements such as height, weight, waist and hip circumferences were measured. Body mass index (BMI), waist-hip ratio (WHR), percent body fat (BF%), lean mass, total body water (TBW) and fat-free-mass index (FFMI) were estimated by multi-frequency bioelectrical impedance technique using Body Stat Quad-Scan 4000 in menstrual , follicular and luteal phases. Total body weight, BMI, WHR and BF% were higher while lean mass, TBW and FFMI were found to be lower in dysmenorrheic subjects when compared with eumenorrheic females, but the differences were not statistically significant (P >0.05). No significant (P >0.05) differences were found in change in body composition among all the phases of the menstrual cycle in both groups. Also, dysmenorrhea was not significantly correlated with BMI and body fat percent.

Key Words: body composition, bioelectrical impedance analysis, primary dysmenorrhea

INTRODUCTION

Primary dysmenorrhea (PD) is usually defined as cramping pain in the lower abdomen occurring at the onset of menstruation or a few hours following onset in the absence of any identifiable pelvic disease. [1] It is one of the most common gynaecological complaints affecting more than 70% young women. Primary dysmenorrhea can be indicative of ovarian hormonal imbalances, which can lead to impaired fertility and menopausal problems in the future. [2] The etiology and pathophysiology of dysmenorrhea have not been fully elucidated. The risk factors for PD are early menarche, long and heavy menstrual flow as well as positive family history. Although, in literature obesity has also been considered as one of the factors for primary dysmenorrhea, [3] In India, few studies have reported 25.26% [4] to 91.67% [5] overweight and obese girls suffering from dysmenorrhea. However, the evidence of an association between obesity and dysmenorrheal is inconsistent. [6]

Bioelectrical impedance analysis (BIA) has become an extremely popular technique to estimate body composition because of its simplicity, portability, and low cost. BIA estimates total body water (TBW), which is used to predict fat-free mass (FFM). Body fat mass is calculated from the subject's total body mass minus the estimated FFM. [7]

Most of the studies were carried out to estimate body composition using BIA during the normal menstrual cycle. [8,9] However, there is a paucity of data in primary dysmenorrhea. Therefore, the objective of the present study was -

(1) To determine if there were fluctuations in body composition parameters during different phases of menstrual cycle in primary dysmenorrheic women and to compare these findings with eumenorrheic women.

(2) To find out, if there was any possible association between the body composition variables and dysmenorrhea.

MATERIALS AND METHODS

The present study was conducted in the Department of Physiology, Subharti Medical College and associated Chattrapati Shivaji Subharti Hospital, Meerut. The study was approved by the research and ethical committees of the institute. Healthy unmarried young female volunteers in the age group of 18-25 years, having regular 28-32 days menstrual cycle for at least last 6 months prior to the study were recruited from the Subharti University campus. On the basis of a menstrual distress questionnaire, [10] two groups of subjects were enrolled in this study. Group 1 consisted of 30dysmenorrheic women and group 2 consisted of 30 eumenorrheic women as control. Intensity of pain was assessed using visual analogue scale (VAS) of 0-10. [11] Dysmenorrhea was scored consisting of 3 grades- mild (score 2-4, did not require analgesics), moderate (score 5-7, required analgesics) and severe score (≥8, not relieved by analgesics). Written informed consent was taken from all the participants prior to the beginning of the study.

Exclusion criteria

After a detailed medical history and thorough clinical examination of the subjects, those with history of gynecological, endocrinological, neurological, cardiovascular or any other chronic disorders, smoking, alcoholism, taking hormonal contraceptive pills, diuretics, laxatives, participating in a weight reduction or endurance exercise program or having fever, vomiting and diarrhea during the study were excluded.

Experimental protocol

All the participants were asked to report to the research laboratory of the department preferably between 11 AM-1PM for three subsequent visits of one menstrual cycle i.ein menstrual, follicular and luteal phases with following instructions:

a) No eating or drinking 3 to 4 hours prior to the test
b) Noexercise12hourspriortothetest.
c) No caffeine consumption 24 hours prior to the test.
d) To remove all metal jewellery.

Anthropometric and body composition measurements

Height was measured by stadiometer to nearest 1 cm and weight (wt), by weighing machine (Krups) to the nearest 1 kg with subjects standing without shoes and wearing light clothes. Circumferences at waist (at the level of umbilicus) and hip (at the level of maximum extension of hips) were measured with a tape measure nearest to 0.1 cm.

Participants were asked to lie in the supine position for 5 minutes breathing normally in a relaxed position. Body mass index (BMI), waist-hip ratio (WHR), BF%, lean mass %, TBW% and fat-free-mass index (FFMI) were measured by multi-frequency bioelectrical impedance technique using BodyStatQuadScan4000version 4/10(Isle of Man, UK) which employs multi-frequency (5, 50, 100 & 200 kHz) currents through a tetra polar hand-to-foot impedance model. Care was taken to place the arm well apart from the torso and the legs not touching one another.

Statistical analysis

Microsoft Excel and Graph Pad Instat version 3.10,32 bit for Windows were used for statistical analysis. All values were expressed as mean±SD. One-way analysis of variance (ANOVA) was used in analyzing the data among the phases of menstrual cycle in both groups. Unpaired Student's t-test and chi square test were used to find out the level of significance between the two groups. Pearson correlation coefficient (r) was used to assess any possible association between the variables. P<0.05 was considered statistically significant.

RESULTS

TABLE I : Age and menstrual status of dysmenorrheic (Group I)and control (Group II)subjects.

	Group I (n=30)	Group II (n=30)	P value
Age (years)	18.93±1.22	19.30±1.91	0.669
Age at menarche (Years)	12.16± 2.36	12.76± 0.97	0.746
Length of cycle (days)	29.80± 1.29	29.53 ± 1.52	0.641
Duration of menses (days)	5.07± 1.01	4.60 ± 0.96	0.901
F/H of dysmenorrhea	18 (60%)	8 (26.6%)	0.009

Values are expressed as Mean±SD; Data was analysed using Student's unpaired t test.
F/H -family history, P= 0.009calculated using χ^2 =6.79, df=1.

Table II: Body composition parameters in different phases of menstrual cycle of dysmenorrheic (d) and control (c) subjects (n=30 in each group).

Parameters		Phases of menstrual cycle			P value
		Menstrual	Follicular	Luteal	
Wt (kg)	(d)	60.47± 13. 03	60.70± 12. 93	61.50± 12.86	0.948
	(c)	59.96± 9.98	60.23 ± 9.90	61.43± 10.01	0.999
BMI (kg/m^2)	(d)	23.88± 4.55	23.97± 4.50	23.95± 4.49	0.996
	(c)	23.47± 3.96	23.66± 3.90	23.49± 3.93	0.979
WHR	(d)	0.80± 0.06	0.81± 0.06	0.81± 0.06	0.956
	(c)	0.78± 0.04	0.78 ± 0.05	0.79± 0.04	0.999
BF (%)	(d)	29.72 ± 5.64	30.89± 5.95	30.34 ± 5.89	0.739
	(c)	28.66± 5.45	29.40± 5.45	29.12± 5.25	0.864
Lean mass(%)	(d)	70.27± 5.64	69.08± 5.91	69.64 ± 5.92	0.731
	(c)	71.30± 5.43	70.60± 5.45	70.87± 5.25	0.877
TBW (%)	(d)	49.18± 5.24	48.41± 5.32	48.95± 5.13	0.840
	(c)	49.40± 4.53	49.85± 4.58	50.05± 4.42	0.846
FFMI (kg/m^2)	(d)	16.38± 1.62	16.27± 1.68	16.42 ± 1.66	0.937
	(c)	16.54± 1.73	16.53± 1.69	16.55 ± 1.76	0.998

Values are expressed as Mean±SD; statistical analysis was done by one-way ANOVA test among 3 phases. Wt (weight), BMI (body mass index), WHR (waist-hip ratio), BF%(body fat percentage), TBW% (total body water) and FFMI (fat-free-mass index). No significant differences (P>0.05) were observed between dysmenorrheic and control subjects using Student's unpaired t test.

Table III: Pearson correlation coefficient (r) of VAS (5.70±1.32) with BMI and BF % in dysmenorrheic subjects (n=30).

Parameters	R	P value
BMI	0.253	0.177
BF (%)	0.114	0.545

VAS (visual analogue scale), BMI (body mass index) , BF% (body fat percentage)

General parameters

Table I showed age and menstrual status of dysmenorrheic and control subjects. There was no significant difference (P>0.05) with respect to age, age at menarche, length of menstrual cycle and duration of menses between the two groups. Family history of dysmenorrhea was present in 56% and 26.6% in dysmenorrheic and control subjects respectively. In our study, mean VAS score was 5.70 ±1.32 and it was revealed that 20%, 66.6% and 13.4% of subjects had mild, moderate and severe pain respectively.

Anthropometric &Body composition parameters

Table II showed the measurements of body composition parameters in different phases of the menstrual cycle of dysmenorrheic and control subjects.

Analysis of the data indicated an increase in weight from the menstrual to the luteal phase but the mean BMI was found to be within the normal range in both groups. Majority of the participants had a normal BMI (18.5-24.9 Kg /m^2) which was 56.6% in study group & 66.6 % in control group. The underweight (<18 Kg /m^2), overweight (25-29.9 Kg /m^2) and obese (≥30 Kg /m^2) categories were 3.3%, 26.6%and 13.3% respectively in the study group and 6.6%, 20% and 6.6 % respectively in control group. Total body weight, BMI, WHR and BF% were higher while lean mass, TBW and FFMI were found to be lower in dysmenorrheic subjects, but the differences were not statistically significant (P >0.05).

By applying ANOVA, no significant (P >0.05) differences were found in change in body composition among all the phases of the menstrual cycle in both groups. However, BMI and BF% were highest in follicular phase and lowest in menstrual phase. In the menstrual phase this was accompanied by an increase in lean mass and TBW followed by luteal and follicular phases. It was also seen that FFMI was highest in luteal phase and lowest in follicular phase in both groups.

Pearson correlation coefficient

Table III revealed Pearson correlation coefficient between variables in dysmenorrheic subjects. There was no significant correlation of VAS with BMI (p =0.177) and BF% (P = 0.545).

DISCUSSION

The body composition was assessed to determine BMI, WHR, body fat percent, lean mass, total bodyweight and total body water during different phases of the menstrual cycle in young women suffering from primary dysmenorrhea and to compare these findings with eumenorrheic women.

In our study, weight was found to increase from menstrual to luteal phase in both groups which was in accordance with other studies. [8,12] Most women normally store more water during the premenstrual (luteal) phase than during other phases of the cycle. [13] The cause of this fluid retention in the luteal phase may be due to increase in progesterone concentration which is thought to affect renal output and lead to water retention and an increase in TBW. [14] Since water makes up approximately 73% of lean body tissue, fluctuations in body water may influence measurements of body composition and thus affect BF%, lean weight, and total body weight. [15]

Kirchengast and Gartner studied the effect of the menstrual cycle on WHR of 32 females (24non-oral contraceptive users and 8oral contraceptive users) and reported slight increase in body weight and WHR in both groups during the second half of the menstrual cycle. [16]

We observed a little reduction in BF% which is accompanied by an increased FFM during the luteal phase followed by menstrual and follicular phases in both groups. Gleichauf et al have reported higher BF% estimated by BIA during the follicular phase than during the luteal phase. Increase in TBW during the luteal phase may cause an overestimation of FFM, and subsequent decrease in BF%. [8] Result of no significance in body fat percent was consistent with the findings of other study. [9]

In our study, there was no significant relationship between the dysmenorrhea with BMI which is consistent with previous studies [4,5] Haidariet al reported that the severity of dysmenorrhea was significantly related to body fat mass and WHR. However, there was no significant relationship with weight or BMI. [17] A study on the relation of dysmenorrhea of some patients and body composition analysis reported significant relationship with BMI, body fat mass and WHR [18] Few studies have reported that the risk of dysmenorrhea was higher in women who were underweight compared with overweight and obese women. [19,20] Obesity and excess adipose tissue in relation to lean body mass affects estrogen/ progesterone ratio, [21] It has been suggested that high circulating estrogen levels in the luteal phase may cause the excessive prostaglandin (PG)production specially PGF2-α and PGE2. PG action on the uterus is dependent on progesterone levels, with high levels of progesterone rendering the uterus resistant to PG stimulation, and that excess PGs cause dysmenorrhea as progesterone falls prior to menses, [22] Prostaglandin increases myometrial activity resulting in uterine ischemia causing pain. Dysmenorrheic women produce 8–13 times morePGF2-αthan do non dysmenorrheic women [23]

CONCLUSION

Anthropometric (total body weight, BMI and WH) and body composition data (body fat percent, lean mass and TBW) did not present significant differences in the menstrual cycle phases in both groups. When these variables were compared in each phase of the cycle between the control and the study groups, no significant difference was found. Also, dysmenorrhea was not significantly correlated with BMI and body fat percent. Future research may include large sample size, measurement of prostaglandins, estrogen and progesterone levels.

Limitations

The following limitations are noted as they may have affected the outcome of this study. Participants self-reported their dates of menstruation using a calendar starting with the first day of menstruation to the last day of the menstrual cycle, prior to the start of the next menstruation. No other determinations were used in this study. Sample size was small. Also, diet was not controlled. Other methods to assess body composition like Dexa and Tanita were not done due to financial considerations.

REFERENCES

1. Dawood MY. Primary dysmenorrhea: advances in pathogenesis and management. ObstetGynecol 2006;108: 428-441.
2. Joseph L M,A Healthy Menstrual Cycle. Clinical Nutrition Insights1997;5:1-8.
3. Harlow SD, Park MA. Longitudinal study of risk factors for the occurrence, duration and severity of menstrual cramps in a cohort of college women. Br JObstetgynaec1996; 103:1134-1142.
4. Kaur K. Obesity and dysmenorrhea in young girls: Is there any link?. Human Biology Review 2014;3: 214-225.
5. Singh A, Kiran D, Sing H, NelB, Singh P, Tiwari P. Prevalence and severity of dysmenorrhea: a problem related to menstruation, among first and second year female medical students. IndianJPhysiolPharmacol2008;52:389–397.
6. Andersch B, Milsom I. An epidemiologic study of young women with dysmenorrhea. Am J ObstetGynecol 1982; 144:655-660.
7. Kyle UG, Bosaeus I, De Lorenzo AD, et al. Bioelectrical impedance analysis-part I: review of principles and methods. Clinical Nutrition 2004; 23:1226-1243.
8. Gleichauf CN, Roe DA. The menstrual cycles effect on the reliability of bioimpedance measurements for assessing body composition. Am J Clinical Nutr1989;50:903-907.
9. Chumlea WMC, Roche AF, Guo S, Woynarowska B. The influence of physiologic variables and oral

contraceptives on bioelectric impedance. Human Biology 1987;59:257-269.
10. Moos RH. The Menstrual Distress Questionnaire. Psychosom Med 1968; 30:853-867.
11. Mark P, Jensen CC, Andrew M. Interpretation of visual analogue scale ratings and change scores: a reanalysis of two clinical trials of postoperative pain. Journal of Pain 2003; 4:407-410.
12. Lissner L, Stevens J, Levitsky DA, Rasmussen KM, Strupp BJ. Variation in energy intake during the menstrual cycle: Implications for food intake research. Am J Clin Nutr 1988;48:956-962.
13. Bickers W, Woods M. Premenstrual tension: its relation to abnormal water storage. New Engl J of Med 1951; 245:453-56.
14. O'Brien PMS, Selby C, Symonds EM. Progesterone, fluid, and electrolytes in premenstrual syndrome. British Medical J 1980; 10:1161-1163.
15. Neiman D. Body composition. In Exercise testing and prescription: A health- related approach. 6th ed, McGraw-Hill: Columbus, OH.2007; 123-170.
16. KirchengastS, Gartner M. Changes in fat distribution (WHR) and body weight across the menstrual cycle. CollegiumAntropologicum2002;26:47-57.
17. Haidari F, Akrami A,Sarhadi M, Shahi MM. Prevalence and severity of primary dysmenorrhea and its relation to anthropometric parameters. Journal of Hayat2011; 17:70-77.
18. Jeong JH, Lee JM, Lee CH, Cho JH, Jang JB, Lee KS. A study on the relation of dysmenorrhea of some patients and body composition analysis. J Orient Obstet Gynecol 2007:20;155-163.
19. Ozerdogan N, Sayiner D, Ayranci U, Unsal A, Giray S. Prevalence and predictors of dysmenorrheal among students at a university in Turkey. Int J Gynaecol Obstet. 2009; 107: 39-43.
20. Madlen QA. Evaluation of serum magnesium, hemoglobin and body mass index in dismenoreric women in Tikrit City /Iraq. Tikrit Journal of Pure Science 2012;17:59-62.
21. Edman CD, MacDonald PC. Effect of obesity on conversion of plasma and rostenedione to estrone in ovulatory and anovulatory young women. Am J ObstetGynecol1978;130:456-61.
22. Budoff PW. The use of prostaglandin inhibitors for the premenstrual syndrome. J Reprod Med1983;28:469-478.
23. Chan WY, Dawood MY. Prostaglandin level in menstrual fluid of non-dysmenorrheal and of dysmenorrheal subjects with and without oral contraceptive or ibuprofen therapy. Adv Prostaglandin TromboxaneLeukot Res1980;8:1443-144

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