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The relationship between anthropometric index and primary dysmenorehea in female high school students

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Abstract:

INTRODUCTION: Primary dysmenorrhea, painful menstruation without pelvic pathologic complications, is one of the most common problems in women's gynecology and is one of the main causes for women referring to the clinic. Overweight and obesity may play a role in the etiology of primary dysmenorrhea. As a result, this study was conducted to determine the association between primary dysmenorrhea and anthropometric indices in female high school Students.

METHODS: This descriptive, cross-sectional study was conducted on 200 high school female students with primary dysmenorrhea in 2017 in Sabzevar. Anthropometric indicators were considered by the students if they had entry criteria. Data analysis was done using SPSS software.

RESULTS: The results of data analysis showed that there was a significant difference between the presence of dysmenorrhea and anthropometric indices at height $P = 0.05$, waist circumference $P = 0.03$, waist circumference with height $P = 0.01$, height to waist circumference $P = 0.01$, thigh circumference to height $P = 0.04$, height to thigh circumference $P = 0.04$, waist circumference to hip circumference $P = 0.04$, hip circumference to hip circumference $P = 0.05$, and No significant relationship was found between the other indicators.

CONCLUSION: Adherence to a balanced diet and proper lifestyle can prevent dysmenorrhea in adolescent girls.

Keywords:

Anthropometric index, female, primary dysmenorrhea

Introduction

Dysmenorrhea is a Greek word used to describe uterine contractions during menstruation.[1] Painful menstruation is one of the most common complaints of women. Its prevalence in various studies in Iran has been reported between 74% and 90%.[2] From a clinical point of view, dysmenorrhea is often divided into two primary and secondary groups.[3,4] Primary dysmenorrhea, painful menstruation without pelvic pathology, is one of the most common problems in women's diseases and is one of the main causes for referral to the gynecology clinic.[5] The prevalence of primary dysmenorrhea has been reported in different societies between 50% and 90%.[6] Primary dysmenorrhea can affect the quality of life of affected people And disrupt their personal and social health.[7,8] Moreover, in severe cases can cause disability and inefficiency, which is absent from school or work; So that about 1% of women of reproductive age leave work for 1–3 days/month due to severe dysmenorrhea, and about 14% of girls each month get absent from school due to painful

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contractions.[9,10] Primary dysmenorrhea usually begins before the age of 20 and about 6–12 months after the first menstruation. This condition cannot be prevented and sometimes relieved somewhat after delivery.[11] In primary dysmenorrhea, pain develops several hours before or at the onset of menstruation, and lasts for 12–72 h and is similar to labor pain. Dysmenorrhea with cramps is accompanied by nausea, vomiting, diarrhea, and rarely syncope. If the pain begins 3 years after the first menstrual period (menarche), or if dysmenorrhea occurs with periods without ovulation, it should be considered secondary causes.[12,13] The pain is mostly under the umbilical cord, and sometimes, it spreads to the back and thighs.[14] Dysmenorrhea is more common in women and girls with the following characteristics: low age, early menarche, positive familial history, smoking, stress, heavy exercise, shift work, in older women, more natural births, marriage in low age and light sports.[15-17] Several mechanisms for early dysmenorrhea have been proposed that the theory of uterine contractions is more convincing than other theories due to increased production or unbalanced levels of secreted prostheosis from the endometrium during menstruation.[18] Reducing the amount of progesterone at the end of the luteal phase increases prostaglandins. Prostaglandins increase uterine contractions with a dysrhythmic pattern, an increase in the basal tone of the uterus, and an increase in the active pressure in the uterus. This increase in contractions of the uterus reduces its blood flow and increases the sensitivity of the peripheral nerves and ultimately pain.[7] Another mechanism proposed in dysmenorrhea is the increase in vasopressin levels. Increasing the level of vasopressin leads to dysrhythmic contractions of the uterus, decreases in blood flow, and consequently hypoxia of the uterus.[18] On the other hand, a small percentage of patients with normal prostaglandin levels suffer from menstrual pain, the cause of which is unknown.[7] It is likely that overweight and obesity also play a role in the etiology of some menstrual problems, such as primary dysmenorrhea. Increasing body weight and especially increased fatty tissue in the central areas of the body interfere with the balance of steroid hormones, including androgens, estrogen, and sex-bound hormones (SHBG). Changes in SHBG cause changes in the release of both androgens and estrogen in target tissues. On the other hand, obesity can increase estrogen production, which is associated with body weight and body fat.[19,20] The role of adipose tissue in controlling the balance of sex hormones is very important. The adipose tissue stores a variety of lipids that can metabolize steroids, including androgens. The prostaglandin production rate is increased after the endometrial stimulation by estrogen and progesterone.[19] Therefore, it is hypothesized that overweight and obesity by increasing the production of prostaglandins may possibly contribute to the etiology of dysmenorrhea. Investigating studies have shown some insignificant and contradictory evidence about the effect of anthropometric indicators, including body mass index (BMI), on primary dysmenorrhea.[21] As mentioned, one of the factors associated with dysmenorrhea is obesity in adolescent girls. The prevalence of obesity in Iran is estimated to be around 22%–40%.[22] Based on the studies, various physiological, cultural, and psychological factors affect dysmenorrhea. In addition, inappropriate diet, obesity, family history, and reduced breakfast intake per week are factors that affect the frequency of dysmenorrhea.[23] Although some studies have shown a link between obesity or BMI and the prevalence and severity of dysmenorrhea,[24] Heidari *et al*. showed a positive and significant relationship between body fat percentage and dysmenorrhea. However, this relationship is still controversial.[25] In the study of Chuan *et al*., there was a significant correlation between dysmenorrhea and BMI <16.5%, and malnutrition was reported as a factor in dysmenorrhea.[26,27] On the other hand, most studies have only examined the relationship between BMI and dysmenorrhea, and other anthropometric indices have not been considered. Since dysmenorrhea is not just about patient treatment, it is also related to the treatment of the family, the community and the national economy. Adolescence is one of the most critical periods in any girl's life. It is necessary to consider factors associated with menstrual pain in adolescents to improve their quality of life. With emphasis on these points, this study was designed and evaluated to determine the prevalence and severity of primary dysmenorrhea and its relationship with anthropometric variables in high school students. Obviously, if the association between these indices and dysmenorrhea is confirmed, the anthropometric parameters affecting dysmenorrhea can be prevented from the incidence and consequences of the disease in adolescent girls.

Methods

This descriptive-analytic study was conducted on female high school students in Sabzevar in 2016. This research was carried out after approving the Ethics Committee of the University of medical science and obtaining a letter for introduction from the Faculty of Nursing and Midwifery and presenting it to the officials of the education and high schools of Sabzevar city for collecting the research units. The researcher gave her the necessary explanations after introducing her to the students about the goals and stages of the research. Students were asked to answer questions thoroughly and refrain from responding randomly to questions. In this study, sampling was done by multistage random sampling method; first, according to the list of all schools of education in the city, from different parts of the city, from the inner city of Sabzevar, three high schools and one high school in the city of Touhid city were selected

by random cluster sampling, then in each high school from each section Educational (third, fourth, and fifth) A class was selected randomly. And given that at each level, there were two groups (a) and (b), eight classes were selected, each class having 25 students. The sample size of the study was 200 people (150 from the inner city of Sabzevar and 50 from Toohid Shahr). Sample size was calculated using G * Power software, and according to studies with 95% confidence level and 80% test power, 187 people were calculated. Considering 4% probability of sample loss, 200 people entered the study. In the first stage, the informed consent form was provided to the research units to complete the presence of the researcher. The criteria for entering the study include: High school students, fluency in the Persian language, satisfaction to participate in the study, having regular menstrual periods (21–35 days), dysmenorrhea, bleeding time of 3–7 days, no history of chronic diseases (cardiovascular diseases, respiratory, renal, blood pressure, asthma, diabetes, epilepsy, migraine, thyroid, anemia, nervous system, and psychosis), nonuse of medication continuously while studying (antihypertensive, antidepressant, antihistamine, anticholinergic, and hormonal medications), no incidence of bad and stressful incidents during the past 3 months, otherwise they would not enter the study. Anthropometric indicators including height (height measurements in standing position, without shoes, with the heels of the leg clinging, and the hips and back area of the series and shoulders along a straight line, against a meter attached to the wall with a precision of 0/5 cm), the hip circumference (in the standing position while the meter is located on the ankle of the upper anterior pelvis), the arm circumference (in the standing position, the midline of the arm was measured), the thigh (in the state standing, midline of the thigh measured), waist in standing position, the middle points of the hip joint, the upper anterior pelvic floor and subcutaneous hypothyroidism are determined, and at the end of the natural exhalation weighing (weighing with a SECa scale of Germany, with a minimum dress and no shoe with a precision of 0.1 kg), in kg, with a precision of 0.1 kg, by trained people were measured. Then, the waist-to-hip ratio (WHtR), waist-to-height ratio, height-to-waist ratio, hip-to-waist ratio, hip-to-height ratio, height-to-hip ratio, arm-to-height ratio, height-to-arm ratio, WHtR, BMI (weight in kilograms divided by height in meter squared) were calculated.

The prevalence and severity of dysmenorrheal pain in the whole population were assessed using a visual analog pain assessment.[28] This tool is standard and its validity and reliability have been proven in various studies.[6,9] In this method, the patient is trained to indicate the severity of his pain on the 10 cm ruler. The beginning of the ruler means painless and the end of it is severe pain. Statistical analysis was performed using SPSS (Version 23) (IBM Company, Armonk, NY) software. Descriptive statistics for quantitative variables were presented as mean and standard deviation, relative frequency and absolute frequency, and range of changes. Independent *t*-test was used for abnormal distribution of variables and $P < 0.05$ was considered statistically significant.

Results

Of 200 participants in the study, 189 people had dysmenorrhea and 11 people had no dysmenorrhea. The demographic characteristics of the research units showed that most students (75%) were in the range of 15–17 years old and had a mean age of 16 ± 2.3 years. The fathers of most students completed diploma education (57.5%), were employees (38.5%), and had income of 15 million rials and lower (62.3%). Most of the student mothers' education was secondary school (70%) and they were homemakers (75%). In this group, 11 people without pain, 53 people had mild pain (1–3), 102 people had moderate pain (4–7), and 34 people had severe pain (10–8).

The results of Mann–Whitney test showed that there was a significant relationship between the presence of primary dysmenorrhea and anthropometric indices such as height $P = 0.05$, waist circumference $P = 0.03$, waist circumference with height ratio $P = 0.01$, height-to-waist circumference ratio $P = 0.01$, thigh circumference to height ratio $P = 0.04$, height-to-thigh circumference ratio $P = 0.04$, waist circumference to hip circumference ratio $P = 0.04$, hip circumference to thigh circumference ratio $P = 0.05$. In addition, no significant relationship was found between the other indices and the primary dysmenorrhea [Table 1].

In addition, based on the general linear regression test, it was shown that there was no significant relationship between the demographic variables of high school female students with premenstrual syndrome including age ($P = 0.12$), father education ($P = 0.239$), mother education ($P = 0.089$), and household income ($P = 0.112$).

Discussion

The aim of this study was to investigate the relationship between anthropometric indices and dysmenorrhea in high school students in Sabzevar city. In this study, we examined the association of some anthropometric indices (height, weight, arm circumference, hip circumference, waist circumference, thigh circumference, waist circumference to height ratio, height-to waist circumference ratio, hip circumference to height ratio, height-to-hip circumference ratio, thigh circumference to height ratio, height-to -high circumference ratio, arm circumference to height ratio, height-to-arm circumference

Table 1: Relationship between dysmenorrhea and anthropometric indices of high school student girls

Anthropometric indices	Mean±SD		*P* (Mann-Whitney test)
	Without dysmenorrhea	With dysmenorrhea	
Height	78.20±8.158	35.61±5.163	0.05
Weight	62.81±7.26	61.94±10.87	0.52
Arm circumference	28.00±2.49	28.95±3.66	0.47
Hip circumference	97.06±6.32	99.01±13.54	0.54
Waist circumference	90.27±12.82	82.01±12.15	0.03
Thigh circumference	53.18±3.65	51.78±6.57	0.23
Waist circumference to height ratio	0.57±0.10	0.5±0.7	0.01
Height-to-waist circumference ratio	1.79±0.32	2.03±0.28	0.01
Hip circumference to height ratio	0.61±0.07	0.60±0.08	0.7
Height to hip circumference ratio	1.63±0.18	1.73±1.01	0.7
Thigh circumference to height ratio	0.33±0.02	0.31±0.04	0.04
Height to thigh circumference ratio	2.99±0.24	3.20±0.40	0.04
Arm circumference to height ratio	0.17±0.02	0.17±0.02	0.99
Height to arm circumference ratio	5.72±0.74	5.74±0.75	0.99
BMI	25.33±5.15	23.13±3.92	0.17
Waist circumference to hip circumference ratio	0.93±0.12	0.86±0.59	0.004
Waist circumference to thigh circumference ratio	1.69±0.21	1.59±0.59	0.12
Hip circumference to thigh circumference ratio	1.84±0.23	1.92±0.22	0.05

BMI=Body mass index, SD=Standard deviation

ratio, BMI, waist circumference-to-hip circumference ratio, waist circumference to thigh circumference ratio, hip circumference to thigh circumference ratio) with dysmenorrhea. The relationship between anthropometric indices measured with dysmenorrhea showed that there was a significant relationship between the presence of primary dysmenorrhea and anthropometric indices such as height, waist circumference, waist circumference with height ratio, height to waist circumference ratio, thigh circumference to height ratio, height to thigh circumference ratio, waist circumference to hip circumference ratio, hip circumference to thight circumference ratio. In addition, no significant relationship was found between the other indices and the primary dysmenorrhea. In studies, more studies include BMI, weight, height, and waist circumference, which we refer to in some cases here.

The study of Mojarrad Ezbarami *et al.* (2014) aimed at comparing the prevalence and severity of primary dysmenorrhea in athletic and nonathlete girls and their association with body composition on 223 patients showed that there was a significant difference between the severity of primary dysmenorrhea and waist circumference and body fat percentage there is a significant relationship, but there is no significant correlation between BMI and waist circumference with hip circumference.[28] Which is not in line with the results of our study in the second part, perhaps because of the difference in pain testing tool. As overlapping in the description of premenstrual symptoms due to physical and psychological disorders in adolescence.[29] Age difference in Mojarad Abzarmi study and our study may affect the age on the definition and self-examination of pain by individuals.[30] In this study, regular exercise or physical inactivity as a variable was considered. Accordingly, the results were interpreted while the amount of exercise was not studied in this study, which may be due to the incompatibility of the results of these two studies.

Heidari *et al*. (2011) also conducted a study to determine the prevalence and severity of primary dysmenorrhea and its relationship with anthropometric indices on 388 female students. They reported that pain intensity with waist circumference, hip circumference, and waist circumference to height ratio. There was a significant positive correlation between height of waist and height, but there was no significant relationship between pain intensity with BMI and waist circumference to hip circumference ratio.[31] The differences in the age range of individuals and the differences in the indicators studied in two studies are evident. In the study of Chauhan *et al.* (2012) with the aim of investigating the relationship between dysmenorrhea and BMI, there was an inverse and significant relationship between the prevalence of dysmenorrhea and BMI.[26] In this study, malnutrition of low-grade girls is suggested as a factor for dysmenorrhea. The catastrophic pain indicates the role of the central nervous system in increasing the severity of menstrual pain, which is suggested as a potential cause for dysmenorrhea.[32] According to this theory, the psychological stress associated with weight loss or weight gain may be due to the difference in pain perception and pain sensitivity between these individuals and those with normal weight that results in a different mental experience of pain.[33] The study of Khodakarami *et al*. (2015) aimed at determining the relationship between dysmenorrhea and BMI on 579 high

school students showed that there is no significant relationship between dysmenorrhea and BMI.[34] There is a complex relationship between body fat and steroid hormones that are controlled by endocrine.[35] However, the mechanism between dysmenorrhea and BMI is not completely determined and dysmenorrhea may be different in subjects underweight and obese. It seems that there is a certain amount of body fat to maintain the normal ovulation cycle, but much more or much less fat is associated with reproductive health disorders.[36] There are several known mechanisms on the effect of adipose tissue on ovulation and menstrual cycle: (1) Adipose tissue transforms androgens into estrogens. (2) Body weight in lower lean women with less power and obese women are more likely to affect estrogen metabolism. (3) Obese women have less ability to attach estrogen to sexually transmitted globulin, which causes estrogen to be inactivated and thus increase the serum-free estradiol level.[37] Although the inverse association between BMI and total estrogen is evident,[38] it is suggested that the estrogen-progesterone ratio, rather than estrogen alone, may be related to dysmenorrhea.[39] Instead, fat tissue produces adipokines, (signaling molecules that produce different fat masses) that may directly reduce ovarian function by altering the signal of the hypothalamus-pituitary-ovarian axis, resulting in leading to menstrual dysfunction. There is evidence that menstrual irregularities in girls with high and low BMI are more prevalentand irregular menstrual cycles are associated with dysmenorrhea.[40] The limitations of this study are the lack of measurement of fat mass and sample size. In addition, in the self-report of pain, individual differences and the threshold of pain vary from the limits of all studies that are done on pain. Other weaknesses in this study were the lack of study of the frequency of food and the nutritional status of students, which may have contributed to the type of nutrition and the use of stimulant nutrition in the etiology of dysmenorrhea. The strengths of this study are to evaluate most of the anthropometric indices, and it is recommended that studies with larger sample sizes be carried out along with the measurement of fat mass.

Conclusion

The results of this study showed that there is a significant relationship between dysmenorrhea and some of the anthropometric indices. Considering that these indices are influenced by balanced diet and lifestyle, we can consider adolescent education by conducting more extensive studies in this field and confirming the causal relationship between dysmenorrhea and anthropometric indicators.

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Conflicts of interest

There are no conflicts of interest.

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