

The Comparison of Menstrual Characteristics and BMI in Women with Endometriosis and Without Endometriosis

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Abstract

Background: Recent studies have found an inconsistent association between BMI and endometriosis. The target of this study is to compare the menstrual characteristics and BMI in women with and without endometriosis.

Methods and Materials: This study was performed on a 417 women aged between 15-45 years old who had been hospitalized in women's ward of Babol Clinic and Ruhani hospital between August 2008 to August 2014. All participants had undergone laparotomy or laparoscopy. The patients were divided into 2 groups: Target group which has been diagnosed with endometriosis and Control group without endometriosis. The information which was collected from patients included: Characteristics of their menstrual cycle BMI and Demographic profile.

Results: A total of 119 women with endometriosis the mean age of 32.8 ± 6.4 years were placed in case group and 298 women with mean age of 32.4 ± 8.7 years were considered as control group. The findings like menarche before the age of 12 ($P < 0.038$), menstrual cycle of 24 days or less ($P = 0.006$), menstruation lasting 7 days or more ($p = 0.006$) (OR, 1.09 CI, 0.50-2.38) and the age of first sexual contact 17 years or older ($p = 0.007$) (OR, 2.84 CI, 1.44-5.59) had been mostly found in women diagnosed with endometriosis. Endometriosis was more common in women with heavy menstrual flow ($p < 0.001$) (OR, 3.63 CI, 2.29-5.76) or history of dysmenorrhea ($p < 0.001$) (OR, 7.65 CI, 4.76-12.28). There was a correlation between BMI and Occurrence endometriosis up to the age of 29 in such a way that endometriosis was mostly associated with higher BMI.

Conclusion: Early menstrual characteristics and high BMI is more common in women with endometriosis.

Keywords: Endometriosis, Body mass index, Body shape, Menstrual characteristics, Dysmenorrhea

Introduction

Endometriosis is a benign gynecological disorder [1] with multifactorial etiology [2]. And endometriosis is the presence of endometrial tissue anywhere in the body apart from uterine cavity as an ectopic tissue [1,3]. The prevalence of endometriosis is not known exactly because there might be a lot of women with endometriosis who are not having any sign or symptom [4] but it is estimated that in 2%-22% of asymptomatic women, in 35%-50% infertile women and in 80% of women with chronic pelvic pain endometriosis is present [4,5].

One of the most widely accepted theories for explaining endometriosis is Sampson's theory. He believed that retrograde flow of the endometrial tissue through the fallopian tubes into the pelvic cavity leads to implantation of the tissue and scarring and adhesions into surrounding tissues [6-8]. According to this theory most of the epidemiological researches have focused on menstrual cycle characteristics of patients [9,10]. Thus the short menstrual cycles (less than 28 days), menstruation phase lasting 5 days or more, menarche before the age of 11, heavy menstrual flow and low parity are considered risk factors for endometriosis [11-14]. One thing which is present in all the mentioned risk factors is prolonged exposure to estrogen that leads to proliferation of endometrial tissue and endometriosis development [15,16]. Although Cramer, et al. proved that these risk factors were present in patients with endometriosis but Hitchkok and Lui were against their claim [17]. Different studies over the role of environmental factors

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in formation of endometriosis like smoking [18,19], alcohol or caffeine consumption [20-22] or BMI [6,9,23-26] have led to different conclusions.

Heavy menstrual bleeding is one of the common health problems in women [27]. Some studies have considered signs like heavy menstrual bleeding, dyspareunia, dysmenorrhea and irregular menses as causative factors of endometriosis but whether they cause endometriosis or they are risk factors still remains controversial [28,29].

Since studies about the role of BMI and menstrual characteristics in women with and without endometriosis have been inconclusive and inconsistent and since such a study have not been performed in Iran. Thus, the objective of this study was to compare the menstrual factors and BMI with in women with and without endometriosis.

Materials and Methods

This case control study was made over 417 women aged 15-45 years old who had been hospitalized with different gynecological disorders in Babol Clinic and Rohani Hospital undergoing laparotomy or laparoscopy between August 2008-August 2014. For the purpose of data collection the files of the patients were reviewed and they were called to obstetric and gynecological clinic in Rohani hospital in order to fill the designed questionnaire in their presence with their consent and their answers. According to the pathology reports the patients were divided into 2 groups: case group which has been diagnosed with endometriosis (119 women) and Control group which has been diagnosed without endometriosis (298 women).

Those patients diagnosed with uterine myoma or ectopic pregnancy was excluded from our study. The ages of women were homogenized and the information prior to appearing of endometriosis was collected. These criteria about the patients were collected: age, socioeconomic status, the age at first child delivery ,age at menarche, smoking, history of dysmenorrhea, menstrual cycle duration and menstruation phase duration, age at first sexual intercourse, intercourse near the onset of menstrual cycle or within this period, chronic pain during menstrual cycle, menarche before the age of 11, menstruation lasting more than 5 days, menstrual cycle longer than 28 days, heavy menstrual flow, parity, gravity, height and weight and BMI at the time of diagnosis of endometriosis, size and shape of the body within last five years of life according to women's own ideas which can be evaluated according to figure 1 [30,31]:

This study has been approved by research center and ethics committee of Babol Medical College. All subjects had given a written consent prior participating in the study.

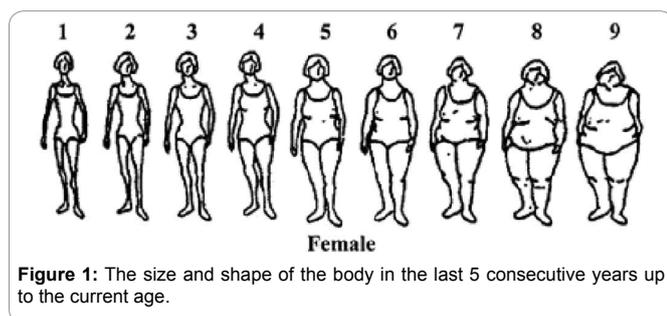


Figure 1: The size and shape of the body in the last 5 consecutive years up to the current age.

The data were entered into SPSS22 software and the analysis was done using chi-square, t-test, logistic regression test. P-value=5% and CI= 95% was considered logical and meaningful.

Findings: The mean age of case group was 32.8 ± 6.4. The mean age of control group was 32.8 ± 8.7. There was a significant association between history of infertility, marital status, educational level, socioeconomic status, number of parity and gravity, number of live births, age at the time of first sexual intercourse and occurrence of endometriosis (Table 1).

Table 2 shows the odds ratio and adjusted odd ratio for the age at menarche, menstrual phase length, menstrual cycle length, age at first sex and age at first child birth that shows significant association between them and occurrence of endometriosis, but in calculation of adjusted OR There was no effect of age at menarche over happening of endometriosis so it was omitted and Finally it was found that in women with cycles of 24 days of less, menstruation phase of 7 days or longer and who had their first intercourse later in their lives endometriosis was more common (Table 2).

Table 2 shows the odds ratio and adjusted odd ratio for the increase the intensity of bleeding, dysmenorrhea and sex during menstruating that shows significant association between them and occurrence of endometriosis. But in calculating of adjusted OR there was no effect of age at menarche over happening of endometriosis so it was omitted. Finally it was found that in women with heavy menstrual flow and in women with dysmenorrhea endometriosis was more common. There was no significant association between having sexual contact during menstrual cycle and endometriosis (Table 3).

demographic and productive characteristics	With endometriosis N=119 N(%)	Without endometriosis N=298 N(%)	p-value
Education			
Less than high school diploma	41(34.4)	132(44.2)	0.041
Diploma and higher	78(65.6)	166(55.8)	
Socio-economic status			
Weak	17(14.3)	64(21.5)	<0.001
Average	73(61.3)	191(64.1)	
Good	29(24.4)	43(14.4)	
History of smoking			
No	116(97.5)	277(93)	0.053
yes	3(2.5)	21(7)	
Alcohol and drugs			
No	119(100)	294(98.7)	0.259
yes	0(0)	4(1.3)	
History of infertility			
No	29(26.9)	167(80.7)	<0.001
yes	79(73.1)	40(19.3)	
marital status			
Married	108(90.75)	207(69.46)	<0.001
Single	11(9.25)	91(30.54)	
parity(Mean ± SD)	1.3 ± 0.4	1.9 ± 0.9	0.001
Gravity(Mean ± SD)	1.83 ± 1	2.26 ± 1.09	0.015
Age, y(Mean ± SD)	32.8 ± 6.4	32.4 ± 7.8	0.51
Age at menarche, y (Mean ± SD)	12.76 ± 1.3	12.93 ± 1.1	0.23
Age at first sex, y (Mean ± SD)	22.19 ± 4.6	20.93 ± 4	0.012
age at first child, y (Mean ± SD)	22.91 ± 3.8	22.95 ± 3.9	0.24

Table 1: A comparison of distribution of demographic and reproductive characteristics in two groups of patients' with and without endometriosis.

characteristics	Case N=119 N(%)	Control N=298 N(%)	Unadjusted OR(95% CI) ^b	p-value	Adjusted OR(95% CI)	Adjusted p-value
Age at menarche, y					^c	
<12	17(14.3)	19(6.4)	1(-)		1(-)	
12-13	73(61.3)	205(68.8)	0.39(0.19-0.80)		0.38(0.18-0.80)	
≥14	29(24.4)	74(24.8)	0.43(0.20-0.95)	0.038	0.42(0.18-0.95)	0.039
Cycle length, d					^d	
≤24	8(6.7)	5(1.7)	1(-)		1(-)	
25-29	73(61.3)	166(56.3)	0.27(0.08-0.86)		0.60(0.13-2.75)	
30-34	33(27.7)	83(28.1)	0.24(0.07-0.81)		0.41(0.08-1.95)	
≥35	5(4.2)	41(3.9)	0.07(0.01-0.32)	0.006	0.07(0.13-0.45)	0.002
Menstrual phase length, d					^e	
≤4	11(9.2)	27(9.1)	1(-)		1(-)	
5-6	31(26.1)	127(42.6)	0.59(0.26-1.33)		0.56(0.24-1.29)	
≥6	77(64.7)	144(48.3)	1.31(0.61-2.78)	0.006	1.09(0.50-2.38)	0.032
Age at first sex, y					^f	
≤17	13(10.9)	58(19.5)	1(-)		1(-)	
18-20	30(25.2)	47(15.8)	2.84(1.33-6.06)		3.41(1.56-7.45)	
≥21	65(54.6)	102(34.2)	2.84(1.44-5.59)	0.007	2.90(1.45-5.79)	0.004

b: CI confidence interval

c: Adjusted odds ratio with menstrual phase and Menstrual cycle

d: Adjusted odds ratio with Dysmenorrhea, menstrual age, body mass index at menarche

e: Adjusted odds ratio with Age of menstruation and bleeding intensity

f: Adjusted odds ratio with Menstrual age and severity of bleeding and menstrual phase

Table 2: The adjusted odds ratio (OR) and unadjusted OR of characteristics of the menstrual cycle and age at first sex.

characteristics	Case N=119 N(%)	Control N=298 N(%)	OR ^b (95% CI)	p-value	Adjusted OR(95% CI)	Adjusted p-value
Increase the intensity of bleeding					^c	
No	64(53.8)	241(80.9)	3.63(2.29-5.76)	<0.001	2.27(1.34-3.83)	<0.001
Yes	55(46.2)	57(19.1)				
Dysmenorrhea					^d	
No	39(32.8)	235(78.9)	7.65(4.76-12.28)	<0.001	8.22(5.03-13.45)	<0.001
Yes	80(67.2)	63(21.1)				
Sex during menstruation						
NO	118(99.2)	296(99.3)	1.25(0.11-13.96)	0.85	1.25(0.11-13.96)	0.85
YES	1(0.8)	2(0.7)				

b: CI confidence interval

c: Adjusted odds ratio with Phase menarche, age at menopause and dysmenorrhea

d: Adjusted odds ratio with Age of menarche and menstrual cycle

Table 3: The adjusted odds ratio (OR) and unadjusted OR of characteristics of dysmenorrhea, severe menstrual bleeding and sex during menstruation.

BMI of patients was measured according to their height and weight at the time of diagnosis of endometriosis in them. For calculating BMI of patients at different ages and at the time of menarche we used picture 1-9 below. The corresponding BMI from picture 1 to 9 is 18.5, 19.5, 20.7, 22.8, 26.4, 31.6, 35.9, 40, and 45 respectively [30,31]. The credibility of this method was evaluated by comparing the calculated BMI using the recorded height and weight of patients in their files and BMI of above pictures. The credibility of this technique has been approved in other studies as well [32,33]. Although mean of BMI in patients with endometriosis was higher at the time of diagnosis, but this difference was not significant. According to this picture BMI of women with endometriosis at different ages were higher. The association between BMI and endometriosis at the age of 30 and above was not significant (Table 4).

There was no significant association between weight, height, BMI with endometriosis at the time of diagnosis (Table 5).

According to collected information, by increase in height the incidence of endometriosis reduces. There was no significant association between endometriosis and BMI (Table 6).

BMI, kg/m ²	case (Mean±SD)	control(Mean±SD)	P-value
at menarche age	24.32 ± 4.88	22.42 ± 3.42	<0.001
15-19y	24.50 ± 5.16	22.91 ± 3.64	0.003
20-24 y	26.26 ± 5.25	25.04 ± 5.49	0.04
25-29 y	28.5 ± 5.67	26.49 ± 5.64	0.003
30-34 y	29.23 ± 5.66	28.55 ± 6.42	0.41
35-39 y	31.15 ± 5.8	29.39 ± 6.78	0.15
40-44 y	31.02 ± 7.53	30.7 ± 7.14	0.89
BMI, kg/m ² at the time of diagnosis	29.24 ± 6.17	28.27 ± 6.86	0.18

Note: BMI = body mass index

Table 4: A comparison of BMI indifferent age categories, the first menstruation and at the time of diagnosis based on selected shape of case and control groups.

BMI Characteristics	case (Mean ± SD)	control(Mean ± SD)	P-value
Weight, kg	65.39 ± 12.5	68.27 ± 18.4	0.068
Height, cm	160.65 ± 7.17	161.59 ± 7.06	0.223
BMI, kg/m ²	25.3 ± 4.4	26.07 ± 6.3	0.16

Note: BMI = body mass index

Table 5: A comparison of height and weight and BMI at diagnosis based on information contained in the records of patients in the two groups.

BMI Characteristics	Case N(%)	Control N(%)	OR(95%CI)	P-value
Height, m			1(-)	
<1.6	65(54.6)	120(40.3)	0.59(0.38-0.92)	0.02
1.6-1.7	49(41.2)	52(51)	0.35(0.13-0.96)	
>1.7	5(4.2)	26(8.7)		
BMI, kg/m ²			1.45(0.94-2.24)	
>25	50(42)	152(51)		0.08
≤25	69(58)	146(49)		

Note: BMI = body mass index

Table 6: The odds ratio of height and body mass index on the basis of the information contained in the records of patients in the two groups.

Discussion

Our findings show that menstrual characteristic significantly association with endometriosis but between BMI and endometriosis up to the age of 29 in such a way that endometriosis was mostly associated with higher BMI.

Similar findings have been reported in some other studies in other countries.

our study and some other studies performed in other countries conclude: In women who had menarche before age of 12 endometriosis was more common [18,25,34,35] in another cohort study which was done on 32 women with endometriosis and 52 women without endometriosis, it was shown that most of women diagnosed with endometriosis, their age at menarche was above 14 [16]. But the number of cases in this study was much less than our population of study or other similar studies so our study is more reliable. The number of cases in our study was 417 and in similar studies there were 1721, 598, 735, 512 [18,25,34,35] cases included.

In the mentioned cohort study it was shown that women with endometriosis had shorter menstrual cycle. It was same as findings of other studies [17,18,22,25,35,36]. These studies support the Sampson's theory in explanation of etiology of endometriosis and they claim that retrograde flow of menstruation debris into the pelvis is associated with endometriosis development. But in another control trial study over 298 women with endometriosis and 300 women without endometriosis it has been shown that in women with longer menstrual cycles (≥29days) endometriosis was more common(OR,1.73:95% CI,1.9-2.75) [34]. In this study, control group consisting of women without surgical history or chronic pelvic pain it was not approved so it could not be reliable to be referred to.

In our study and some other similar studies women with endometriosis in compare to women without endometrioses had longer menstruation phase (≥7days) [22,34]. In another study over 104 women with endometriosis and 198 women without endometriosis it was shown that in women younger than 30, longer menstruation phase (≥6 days) had direct relation with occurrence of endometriosis [37]. But in another 3 control studies there was no such significant association [17,35,36]. Long menstruation phase is one of the signs of endometriosis. We tried to collect the information of menstruation phase of patients before appearance of signs of endometriosis but since it is provided by own patients it would be a subject of bias because sometimes women cannot differentiate between normal menstruation and sign of endometriosis. Thus different studies have got various results out of which anyone could be correct.

In our study and other similar studies there has been a significant association between the amount of menstrual bleeding and risk of developing endometriosis [25,37]. But in a study by Susan et al over 268 women with endometriosis and 244 women without endometriosis there was no relation between endometriosis and amount of menstrual bleeding [35]. Heavy menstrual flow is also considered one of the common signs of endometriosis. The information regarding this factor was filled in questionnaire according to the previous menstrual cycles before emergence of endometriosis but since the information was provided by own patients there could be subjective bias here as well.

It was shown in our study that dysmenorrhea was more common in women with endometriosis rather than those without. In other studies also some findings was conclusive [35,37]. Dysmenorrhea is a diagnostic criteria for endometriosis and it is one of the commonest signs as well [38,39].

Although it is believed that pain during menstruation is due to endometriosis but it has been suggested that the pain could show an abnormality in the pelvic cavity that makes women susceptible to develop endometriosis by retrograde menstrual flow. In some physiological studies of dysmenorrhea the relation between the strength of uterine contraction and degree of pain has been pointed out. The stronger is uterine contraction, the more dysmenorrhea is common. More uterine contraction leads to retrograde entry of endometrial tissue into the peritoneal cavity so it makes the woman more prone to develop endometriosis [9,37].

In our study it has been shown that women with endometriosis have shorter stature in compare to women without endometriosis at the time of diagnosis of endometriosis in them. There was not a significant association between BMI at the time of diagnosis and developing endometriosis. In comparing of BMI of women at the time of menarche and at different age groups from 15 to 29 we could find a significant association between two so according to this finding women with endometriosis had higher BMI rather than women without endometriosis.

Since the average of BMI at the time of diagnosis was obtained according to height and weight of patients recorded in their files and shape and size of their bodies chosen from picture shown to patients was so different, it was not possible to evaluate the changes of BMI during the women's life time but comparatively it is concluded that women with endometriosis have had higher BMI at different ages. The difference between the two averages could result from fault of women in choosing the right picture which represents their BMI or discordance of each picture with corresponding BMI in that area.

In a cohort study performed by Mary et al over 84 women, women with and without endometriosis had similar weight gain at different ages but in all age groups women with endometriosis were taller and slimmer and had lower BMI [16]. In another cohort study over 1817 participants, the body size at the age of 5, 10, 20 was recorded. It was shown that with reduction in size of the body at the age of 5-20 and 10-20 the risk of endometriosis increases. But there was no significant association between body size and endometriosis [6]. In a control trial study by Nagle, et al. (2009) over 268 women of target group and 244 women of control group it was indicated that the higher body weight at the

age of 10(OR,2.8 95% CI,1.1-7.5) and lower body weight at the age of 16 was related to endometriosis [40,41]. In a cohort study by Misser, et al. (2004) they had found a reverse relation between BMI at the age of 18 and endometriosis [41]. Since in the body estrogen is produced by skin and fatty tissue using circulating androgens and estrogen stimulates endometriosis development so the relationship between higher BMI in childhood and adolescence and endometriosis development later in life which was shown by 3 recent studies seems logical. Thus it can be concluded that BMI of childhood and adolescence is related to endometriosis development [15,16].

In the study we conducted in Babol, the women with endometriosis had higher BMI at the age of menarche and afterwards which could be as a result of higher BMI in childhood or their life style. In other two control studies the women with endometriosis had lower BMI at different ages in compare to women without endometriosis .It could be as a result of the specific life style or diet of participants of those studies [16,25].

Conclusion

In women with endometriosis, earlier menarche, shorter menstrual cycle, heavy menstrual flow, longer menstruation phase, dysmenorrhea and later onset of sexual intercourse was more common. Also it was shown in this study that women with endometriosis had higher BMI in compare with women without endometriosis.

One of the limitations of our study was the fact that for getting information about signs of endometriosis we had to ask patients whether they had any sign like dysmenorrhea before or not. It might have been a long time since the first sign had appeared so it was not possible to get exact information about the first time any sign of endometriosis had appeared. The control group were not chosen from the normal population. They were a group of women with other gynecological diseases the signs of which might have masked the signs of endometriosis. The women of our study had to choose only one picture which represented the BMI at each age group. Since the average of BMI which was calculated according to height and weight at the time of diagnosis and those chosen from the pictures were not similar it is clear that women have not chosen the right picture. So we could not study the BMI changes and we were limited to superficial comparison only.

Thus according to the results obtained from comparing BMI of control group and target group of our study we suggest for every shape and size of the body the corresponding BMI should be designed specifically for local people so that the results would be more precise. Also more cohort studies in future could result in more accurate findings.

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