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The relationship between polycystic ovary syndrome and irritable bowel syndrome

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ABSTRACT

Introduction: Polycystic ovary syndrome (PCOS) causes endocrine disorders that affect the functioning of the reproductive system and the body's metabolic system. Bowel movement disorders and abdominal pain are common complaints of PCOS patients. Few studies have been performed on the relationship between PCOS and irritable bowel syndrome (IBS), and the association between the two syndromes is unclear.

Material and Method: In the study, 72 patients were enrolled at gynecology and obstetric clinic in Turkey. The control group were (n=34) and women with PCOS (n=38). IBS diagnosis was made by using Roma IV criteria.

Results: The results showed that IBS prevalence was similar in PCOS (52%) and the control group (50%) ($p>0.05$). No statistically significant association was found between IBS-PCOS and non-IBS-PCOS in terms of gastrointestinal symptoms ($p=0.685$). These symptoms were associated with PCOS rather than IBS. Significant differences have been observed between IBS-PCOS and non-IBS-PCOS for fasting insulin (FI), luteinizing hormone (LH) and Homeostasis model assessment for insulin resistance (HOMA-IR) ($p<0.05$). Significant differences have been observed between IBS-control and non-IBS-control for FI, fasting glucose and HOMA-IR ($p<0.05$). Aging was significantly associated with co-occurrence with IBS and PCOS.

Conclusion: Although many PCOS patients were diagnosed with IBS based on Rome IV criteria, no significant relationship was found between PCOS and IBS prevalence in the study subjects. The prevalence of gastrointestinal symptoms is similar in both groups (IBS-PCOS and PCOS only). Age was an important risk factor for the co-occurrence of IBS and PCOS.

Keywords: Polycystic ovary syndrome, Irritable bowel syndrome, gastrointestinal symptoms

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a complex endocrine disorder associated with mild to moderate inflammation (1). This syndrome is a complex and heterogeneous disorder with fertility and metabolic complications (2-4). The irregular menstrual cycle is one of the most obvious symptoms of this disease, which indicates ovarian dysfunction (2). Oligomenorrhea, hyperandrogenism symptoms such as hirsutism and acne, hair loss, and infertility are common in patients with PCOS. PCOS prevalence is 3% to 26%, depending on the region studied (5). The syndrome is related to obesity, hyperinsulinemia, increased risk of insulin resistance (IR), type 2 diabetes mellitus (DM), dyslipidemia, and cardiovascular diseases (CVDs) (6). Gastrointestinal (GI) disorders such as abdominal pain, constipation, or bloating are more reported in women with PCOS than in healthy women. Abdominal pains and discomfort are more common in women with PCOS, although it may not be a symptom of this syndrome (7).

GI dysfunction is a chronic intestinal disease that affects with a prevalence rate of 10 to 20% (8)(8). Irritable bowel syndrome (IBS) is a disorder that manifests itself with abdominal pain and discomfort and changes in defecation habits. Patients also experience symptoms such as bloating and a feeling of incomplete excretion, which can last for years and an average of 10 years (9). These symptoms significantly affect patients' quality of life and consequently impose a heavy economic and social burden on society (10). Symptoms include changes in bowel habits and abdominal pain. Changes in

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bowel habits include conditions of an unspecified type, a combination of constipation and diarrhea (IBS-M), or predominant diarrhea (IBS-D) or constipation (IBS-C). Rome IV criteria for diagnosing IBS are frequent abdominal pain and changes in stool frequency or form that begin approximately six months before diagnosis and last for approximately three months (11).

IBS occurs in all ages and genders, but it is shown that the disease is more prevalent in younger people. Women experience this disease 1.5 to 3 times more than men (12, 13). IBS-C or IBS-M is more prevalent in women, while men report more symptoms of IBS-D (14). Thus, it can be concluded that young women are more at risk of IBS. This could further study the association between hormones and IBS in future research. PCOS and IBS affect women's quality of life as well as mental and physical health, and the study of the relationship between these diseases to find targeted therapies has been considered in limited research (15-17). This study examines the relationsip between PCOS and IBS in women.

MATERIAL AND METHOD

The retrospective study was conducted with the approval of the Clinical Research Ethics Committee of Beykoz University. (Date: 26.04.2021, Decision No: 1) All study processes were conducted under the principles of the Declaration of Helsinki and ethical rules.

Seventy-two participants in this study visited Medistate Hospital Gynecology and Obstetrics department from January 2020 to February 2021. Participants ranged in age from 18 to 45 years.

Subjects diagnosed with PCOS (n=38) and healthy subjects (n=34) were asked to partake in the investigation as the case group.

According to Rotterdam Criteria, the criteria for diagnosing PCOS is to have at least two of the following characteristics:

1) polycystic ovary on ultrasound; 2) clinical and/or biochemical hyperandrogenism signs; 3) oligoovulation or anovulation. On the other hand, in healthy women, menstrual cycles are regular, and no excess androgens were observed. IBS diagnosis was made by using Roma IV criteria (18,19). Gastrointestinal symptoms such as a postprandial saturation, functional dyspepsia, epigastric pain, early satiety, and epigastric burning were noted.

Inclusion and Exclusion Criteria

The inclusion criteria were the age of women between 18-45 years. The exclusion criteria were known chronic disease, pregnancy or lactating, premenopausal or menopausal, and active infection.

Statistical Analysis

Data were analyzed, tabulated, and subjected by SPSS (version 26). The continuous data were displayed as mean±SD. At the same time, categorical data were illustrated as percentages and numbers. The Kolmogorov-Smirnov test of normality was utilized to test the normality hypothesis. Based on the test results, proper parametric (Independent Sample t-test) and nonparametric tests (Chi-Squared test and Mann-Whitney U test) were used. A p-value of<0.05 was regarded as statistically significant.

RESULTS

72 women (mean age±SD: 36±4.06) were in the study. The participants' body mass indexes (BMIs) were 26.16±4.31. Although many participants with PCOS had symptoms of IBS based on Roma IV criteria, no significant relationship was reported between the prevalence of IBS and PCOS. **Table 1** indicates the general participants characteristics in different IBS groups.

In the IBS-PCOS group, fasting insulin (FI), luteinizing hormone (LH) and Homeostasis model assessment for insulin resistance (HOMA-IR) values were significantly lower than in the non-IBS-PCOS group (p<0.05). Age in the IBS-PCOS group was higher than non-IBS-PCOS group (P=0.009). Also, the BMI of people in the IBS-PCOS group was significantly lower than people in the non-IBS-PCOS group (P=<0.001). HOMA-IR values were significantly different between IBS-control and non-IBS-control groups, and also fasting glucose (FG) and FI in the IBS-control group were significantly lower than non-IBS-control group (p<0.05) There was significant difference in terms of age and BMI between IBS-PCOS and IBS-control patients (p<0.05). **Table 1** shows the examination of the significant relationship of variables between the PCOS and control groups and their subgroups.

As stated in **Table 2**, a chi-square test found no statistically significant association between IBS-PCOS and non-IBS-PCOS in terms of gastrointestinal symptoms (p=0.685). Whether or not they have IBS, PCOS patients have similar GI symptoms. There was a statistically significant association between IBS-control and non-IBS-control in terms of GI symptoms (p=<0.001). The majority of the IBS-control women had not symptoms. In contrast, the functional dyspepsia are most common in non-IBS-control. **Table 2** shows the symptoms present in PCOS and control groups.

As stated in **Table 3**, a chi-square test found a statistically significant association between IBS-PCOS and GI symptoms (p=<0.001). While the majority of the women

with IBS-PCOS had functional dyspepsia, most of the IBS-CON had no symptoms. The prevalence of GI symptoms in women with IBS-PCOS was functional dyspepsia (55%), postprandial saturation (10%), epigastric pain (20%), early satiety (5%), and epigastric burning (10%). Data in **Table 2 and Table 3** are presented as numbers (percentages).

Figure 1 shows that the prevalence of symptoms is similar in both groups.

Table 1. The examination of the significant relationship of variables between the PCOS and control groups and their subgroups

Variable		PCOS patients (n=38)			Controls(n=34)			IBS-PCOS vs. IBS-CON(P)
		IBS-PCOS (n=20) Mean(SD) n(%)	non-IBS-PCOS (n=18) Mean(SD) n(%)	P	IBS-CON (n=17) Mean(SD) n(%)	non-IBS-Control (n=17) Mean(SD) n(%)	P	
Age		33.05(1.87)	29.94(3.74)	0.009⁑	28.23(3.75)	26.82(3.86)	0.288*	<0.001⁑
BMI		25.85(2.03)	31.37(4.41)	<0.001*	23.42(2.46)	23.77(2.52)	0.693*	<0.001*
FG		91.1(8.19)	94.94(7.59)	0.142*	86.70(5.82)	97.41(7.96)	<0.001*	0.066*
FI		6.23(1.89)	15.56(6.35)	<0.001⁑	7.22(1.39)	12.72(3.15)	<0.001*	0.076*
FSH		6.15(1.88)	6.16(1.06)	0.974*	5.68(1.77)	6.30(1.79)	0.319*	0.444*
LH		4.78(2.02)	10.02(4.25)	<0.001*	4.84(1.46)	5.71(1.91)	0.306⁑	0.917*
Prolactin		15.83(5.83)	16.18(5.61)	0.854*	16.16(4.90)	16.87(6.76)	0.731*	0.851*
TSH		1.92(0.68)	2.02(1.24)	0.534⁑	1.83(0.94)	2.23(1.34)	0.413⁑	0.413⁑
E2		42.85(9.30)	41.05(16.44)	0.264⁑	45.29(20.81)	35.27(12.61)	0.182⁑	0.639*
HOMA-IR		1.38(0.36)	3.81(1.60)	<0.001⁑	1.54(0.27)	3.26(0.94)	<0.001⁑	0.159*
Infertility type	1	16(80)	15(83)	0.791†	12(70)	16(94)	0.072†	0.506†
	2	4(20)	3(17)		5(30)	1(6)		
Infertility duration	1	0(0)	0(0)	0.911†	0(0)	1(5)	0.511†	0.863†
	2	18(90)	16(89)		15(88)	13(76)		
	3	2(10)	2(11)		2(12)	3(17)		
Cigarette	1	12(60)	10(55)	0.782†	12(70)	15(88)	0.203†	0.501†
	2	8(40)	8(45)		5(30)	2(12)		

†Chi-Squared test ⁑Mann-Whitney U test *Independent Sample t-test, BMI , body mass index ; TSH, thyroid-stimulating hormone; LH, luteinizing hormone; FI, Fasting Insulin; E2, estradiol; HOMA-IR, homeostasis model assessment for insulin resistance; FSH, follicle-stimulating hormone; FG, Fasting Glucose; IBS-PCOS, polycystic ovary syndrome patients with irritable bowel syndrome; IBS-CON, controls with irritable bowel syndrome; non-IBS-PCOS, polycystic ovary syndrome patients without irritable bowel syndrome; non-IBS-CON, controls without irritable bowel syndrome.

Table 2. The symptoms present in PCOS and control groups

Variable	PCOS patients (n=38)			Controls(n=34)		
	IBS-PCOS (n=20)	non-IBS-PCOS (n=18)	P	IBS-Control (n=17)	non-IBS-Control (n=17)	P
Gastrointestinal Symptoms			0.685			<0.001*
No Symptoms	0(0)	0(0)		14(82.4)	3(17.6)	
Functional Dyspepsia	11(55)	12(66.7)		2(11.7)	14(82.4)	
Postprandial Saturation	2(10)	3(16.7)		1(5.8)	0(0)	
Epigastric Burning	2(10)	1(5.5)		0(0)	0(0)	
Epigastric Pain	4(20)	1(5.5)		0(0)	0(0)	
Early Satiety	1(5)	1(5.5)		0(0)	0(0)	

*A chi-square test

Table 3. The symptoms present in IBS-PCOS and IBS-CON

Symptoms	IBS-PCOS (n=20) n(%)	IBS-CON (n=17) n(%)	P-value
No Symptoms	0(0)	14(82.3%)	<0.001*
Functional Dyspepsia	11(55%)	2(11.7%)	
Postprandial Saturation	2(10%)	1(5.8%)	
Early Satiety	1(5%)	0(0)	
Epigastric Pain	4(20%)	0(0)	
Epigastric Burning	2(10%)	0(0)	

*A chi-square test

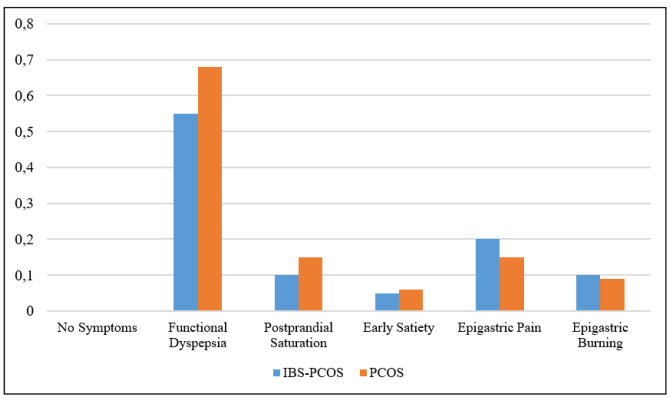

Figure 1. Prevalence of symptoms in IBS-PCOS and PCOS groups

DISCUSSION

Based on the present study's findings, IBS has a high prevalence, and in this regard, the group of PCOS patients is not significantly different from the control group. Among PCOS and control patients, IBS-C was the IBS most common type. Age was an important risk factor for co-occurrence of IBS and PCOS.

A very high IBS prevalence was observed in the case and control groups in this study. IBS prevalence is 52% in the PCOS group, 50% in the control group, and approximately 50% in the general group. Niemyjska et al. (20) reported a prevalence of IBS symptoms based on the diagnosis criterion of Roma III in Polish women at 40%. Akbayram et al. (21) reported a general prevalence of 16.2% among students in Turkey. In Turkey, as in other countries, the prevalence is higher among women than men (22-24). Oka et al. (8) has reviewed dozens of studies on the IBS prevalence and reported the prevalence of the disease based on the criterion of diagnosis of Rome III, 9.3%, and based on Roma IV, 3.8% prevalence was reported. All studies have emphasized the higher IBS prevalence in women than men (8). The general prevalence of IBS in the present study is higher than in other studies, which may be related to the number of samples or differences in the diagnostic criteria.

The IBS prevalence in the PCOS and control groups is approximately 50% in this study, and there is no statistically significant difference. Mathur et al. (17) reported IBS prevalence in PCOS patients of 41.7% versus 10.3% of healthy individuals. Bazarganipour et al. (25) reported a 29.7% prevalence in PCOS patients versus an 11% prevalence in healthy individuals. In these two studies, Roma I and III diagnostic criteria were used, respectively, and a significant difference was reported between the prevalence of IBS in the two groups. Kałużna et al. (26) reported the IBS prevalence based on the criterion of Roma IV diagnosis in 24% of the PCOS group and 21% in the control group and did not report a significant relationship between the IBS prevalence and PCOS disease. The present study results show no significant difference between the IBS prevalence in the PCOS and control groups, although further studies with the presence of young women with PCOS with a high number of samples are recommended.

Among PCOS and control patients, IBS-C was the most prevalent type of IBS. The IBS-C type had the highest prevalence in the present study, and IBS-M had the lowest prevalence in PCOS and control women. Half of the women in both groups had IBS-C, which is consistent with Kim et al. (12), reported a prevalence of 40% in subjects. Bazarganipour et al. (25) reported the highest prevalence of IBS-C type in PCOS group 70% and control 45%. Also, Galica et al. (27) reported the prevalence of IBS as follows IBS-C (58%), IBS-D (28%) and IBS-M (14%). According to research done by Palsson et al. (28) the distribution of IBS types in different studies significantly affects the identification method. The use of the Roma III or Roma IV method can significantly change the results related to the distribution of IBS types(28). To more accurately measure the IBS prevalence subtypes in PCOS patients, it is recommended that future studies be conducted with larger populations of different ethnicities.

In the present study, the mean BMI in the IBS-PCOS group was significantly lower than in the non-IBS-PCOS group. Thus, the hypothesis of an adverse effect of obesity on the development of IBS in PCOS women is rejected. However, in the IBS-PCOS group, the average BMI is higher than in the IBS-CON group because overweight PCOS patients is very common. Mathur et al. (17) reported the highest average BMI in the IBS-PCOS group. Sadik et al. (29) considers high BMI to be effective in aggravating IBS symptoms. In contrast, Kałużna et al. (26) and Bazarganipour et al. (25) did not show a significant relationship between BMI and IBS occurrence in PCOS patients. More studies are needed on the relationship between IBS occurrence in obese PCOS patients.

Patients with IBS-PCOS were older than non-IBS-PCOS. IBS-PCOS patients were also older than IBS-control. Accordingly, older women were more prone to getting PCOS and IBS simultaneously. FI, LH, and HOMA-IR levels were higher in IBS-PCOS than in non-IBS-PCOS. FG, FI, and HOMA-IR levels were also higher in IBS-control than in non-IBS-control.

CONCLUSION

Although many PCOS patients were diagnosed with IBS according to Roma IV criteria, there was no significant relationship between PCOS and the IBS prevalence in the study population. The prevalence of GI symptoms is similar in both groups (IBS-PCOS and PCOS only). Aging increases the risk of co-occurring with IBS and PCOS, but more research is required on the effect of obesity on this issue.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Beykoz University Clinical Research Ethics Committee (Date: 26.04.2021, Decision No: 1)

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The author has no conflicts of interest to declare.

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Author Contributions: The author declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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