https://doi.org/10.48047/AFJBS.6.5.2024.6253-6267

African Journal of Biological Sciences

Prevalence and Impact of Poly cystic Ovary Syndrome and Its Associated Irritable Bowel Syndrome among the Students: A Cross Sectional Study

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rticle History
olume 6, Issue 5, 2024
eceived: 25 May 2024
ccepted: 02 Jun 2024
oi: *10.48047/AFJBS.6.5.2024. 6253-6267*

ABSTRACT

Objective:

To determine the prevalence and impact of poly cystic ovary syndrome (PCOS) and its associated irritable bowel syndrome (IBS) among college students.

Materials and Methods:

A cross-sectional study involving 280 female college students aged 17 to 28 years was conducted. Data collection was carried out using a structured questionnaire administered through Google Forms. The questionnaire gathered information on the following aspects: Demographic characteristics: Age at menarche. PCOS status: Presence or absence of PCOS diagnosis, family history of PCOS or infertility. Menstrual cycle characteristics: Duration of Menstrual bleeding, flow of menstrual bleeding, severity of menstrual pain. Hyper androgenic symptoms : Acne score, hirsutism score. IBS symptoms: Abdominal pain, cramping, diarrhoea, constipation, and psychological distress.

Statistical analysis:

The collected data was analyzed using descriptive statistics, including frequencies and percentages. Chi-square tests were used to assess the association between PCOS and IBSsymptoms.

Results:

The prevalence of PCOS among the study participants was 21.4% (n = 59). Participants with PCOS were significantly more likely to experience IBS symptoms compared to those without PCOS ($p < 0.001$). The prevalence of abdominal pain, cramping, diarrhoea, constipation, and psychological distress was higher among PCOS patients compared to non-PCOS participants

Conclusion:

This study demonstrates a significant association between PCOS and IBS symptoms among college students. These findings highlight the importance of screening for IBS in women withPCOS to ensure timely diagnosis and management of both conditions.

Key words:

Polycystic ovary syndrome (PCOS), Irritable bowel syndrome (IBS).

INTRODUCTION

Polycystic Ovary Syndrome (PCOS) stands out as one of the most frequently encountered endocrine disorders among women, affecting approximately 5 to 10% of those in their reproductive years [1]. PCOS's reproductive manifestations encompass an increase in androgen production and irregular gonadotropin secretion, resulting in menstrual irregularities, hirsutism, and fertility challenges. Hyperandrogenism, acne, acanthosis nigricans, insulin resistance, and chronic anovulation define PCOS. Beyond chronic anovulation, PCOS exhibits associations with various metabolic disturbances, including type 2 diabetes mellitus, dyslipidaemia, hypertension, cardiovascular ailments, and, over the long term, a heightened risk of developing endometrial cancer [2]. The pathophysiology of PCOS involves primary defects in the hypothalamic-pituitary axis, insulin secretion, and ovarian function. Various pathogenetic mechanisms contribute to PCOS, including abnormal regulation of gonadotropinreleasing hormone (GnRH), leading to increased luteinizing hormone (LH) and decreased folliclestimulating hormone (FSH) levels.

Additionally, there is a reduced response of ovarian follicles to FSH, increased anti-Mullerian hormone levels, follicular arrest, and elevated secretion of testosterone, oestradiol,and dehydroepiandrosterone (DHEA). Obesity, particularly abdominal fat deposition, stands as the major predisposing factor for the metabolic phenotype observed in PCOS [3]. Insulin plays a crucial role in the molecular mechanisms associated with androgenic hypersecretion and the inhibition of hepatic synthesis of sex hormone-binding globulin (SHBG) in liver cells [4]. Approximately 25% to 30% of women with PCOS will exhibit impaired glucose tolerance by the age of 30, and 8% of affected women will develop type 2 diabetes [5]. Obesity is a common observation among women with PCOS, with approximately 40% to 80% of individuals affected by this condition being overweight or obese. The strong familial aggregation of PCOS provides substantial evidence for a genetic susceptibility to this disorder [6]. Research suggests a potential link between Polycystic Ovary Syndrome (PCOS) and Irritable Bowel Syndrome (IBS), with female sex hormones like estrogen and progesterone believed to influence gut function [7, 8].Additionally, emotional factors such as low mood, anxiety, and difficulty managing emotions have been linked to IBS [9]. Furthermore, changes in the gut microbiota, known as gut dysbiosis, can potentially lead to increased gut permeability, which may result in systemic inflammation [7]. Irritable Bowel Syndrome (IBS) is categorized as a functional gastrointestinal disorder, characterized by symptoms such as abdominal pain coupled with alterations in stool form or frequency [10]. IBS is prevalent in the general population, with an estimated incidence of 10-20% worldwide [11]. Women diagnosed with Polycystic Ovary Syndrome (PCOS) often report symptoms similar to those seen in individuals with IBS. These shared symptoms include sensations of bloating, episodes of constipation and/or diarrhoea, and the presence of stomach and pelvic pain [12]. Both Irritable Bowel Syndrome (IBS) and Polycystic Ovary Syndrome (PCOS) share similarities in their treatment approaches. Both conditions benefit from a holistic approach involving adjustments to nutrition, lifestyle, stress management, exercise, and sleep [13].In the

case of IBS, a significant dietary approach is the low fermentable Oligosaccharides, disaccharides, Monosaccharides, and Polyols (FODMAP) diet. For managing PCOS, the primary focus lies in achieving hormone balance and stabilizing blood sugar levels to enhance insulin sensitivity. This is accomplished by reducing foods associated with inflammation, balancing carbohydrates with Fiber, and making lifestyle modifications to support hormone equilibrium and reduce inflammation [13]. A study led by Mathur and their research team revealed a significantly higher incidence of IBS, with 41.7% among women with PCOS in contrast to 10.3% in healthy female controls [14]. IBS is more frequently diagnosed in women than in men, partially due to women experiencing slower gastrointestinal transit, attributed to the sluggish activity of nerve cells in the intestines [15]. In this study, the majority of PCOS patients exhibited prominent IBS symptoms, likely due to elevated hormone levels in PCOS affecting bowel function [14]. Female sex hormones, such as oestrogen and progesterone, play pivotal roles in modulating susceptibility to stress, gut motility, and the perception of visceral pain by interacting with neuromodulator systems. For example, progesterone influences the colonic serotonin (5-HT) system, a critical component in the communication between the brain and the gut, as well as in functional gastrointestinal disorders. Variations in 5-HT levels are linked to various disorders in the central nervous system, including anxiety, depression, and psychiatric conditions like schizophrenia [16]. Notably, women with PCOS are more likely to report symptoms of anxiety and depression, and changes in 5-HT signaling are common coexisting factors in functional gastrointestinal disorders, including IBS [17]. Therefore, the objective of this study is to assess the prevalenceof Polycystic Ovary Syndrome and its association with Irritable Bowel Syndrome (IBS) among college students.

MATERIAL AND METHODS

This cross-sectional study was conducted by the Department of Pharmacology at Swamy Vivekanandha College of Pharmacy in Tiruchengode, Namakkal, Tamil Nadu, India, over a six-

month period from April 2020 to September 2020. The study involved 280 female pharmacy students from various colleges in Namakkal district, Tamil Nadu, India, who volunteered to participate. All participants were between 17 and 28 years old and were randomly selected according to specific inclusion and exclusion criteria. A standardized questionnaire covering PCOS-related symptoms and IBS-related symptoms was designed Using Google Forms and distributed via individual email addresses. Before distributing the questionnaire, participants attended a brief orientation session conducted in the local language through video conferencing (Google meet).The study ensured that most privacy and confidentially.

Study Parameters:

Data collection involved a structured knowledge questionnaire, which encompassed primary demographic information such as age, height, weight, education, residence, age at menarche, family history of PCOS, and family history of infertility. Body mass index (BMI) was calculated using the formula: weight (kg) / height (meter), with Asian criteria for BMI categories applied: <18 for underweight, 18-22.99 for normal, and >23 for overweight (18). Menstrual pain severity was assessed on a 3-point scale as mild, moderate, or severe (19-22). Furthermore, information regarding the presence of clinical features like diabetes/insulin resistance, hypertension, dyslipidaemia, and thyroid disorders was collected (23). Symptomsassociated with irritable bowel syndrome, including digestive issues, bacterial infections, psychological concerns, abdominal pain, cramping, diarrhoea, and constipation, were also documented. Clinical hyper androgenism was evaluated using the Ferriman–Gallwey ScoringSystem (F/G score), with scores exceeding seven indicating hirsutism.

Statistical Analysis:

Statistical analysis was performed using Graph Pad Prism (Version 9). The chi-square test was employed to assess differences in proportions for nominal (categorical) variables, while unpaired t-tests were utilized to compare means between two independent groups.

RESULTS & DISCUSSION:

Dermatological Characteristics:

Among the 268 participants, a significant difference was observed in hirsutism ($P < 0.01$) andacne ($P < 0.01$) scores between PCOS and non-PCOS participants **(Figure 1)**

Baseline Characteristics:

Among the 268 participants, the body mass index (BMI) of the PCOS group was significantly ($P < 0.05$) higher at 24.19 ± 4.86 kg/m2 compared to the non-PCOS group at 21.70 ± 4.17 kg/m2. Participants in the PCOS group had a higher prevalence of family history of PCOS (21.5%) compared to the non-PCOS group (4.2%). Additionally, 7.14% of PCOS study participants had a family history of infertility problems compared to 1.7% in the non-PCOS group. **(Table 1)**

Menstrual characteristic among the selected participants:

The results of menstrual characteristic analysis revealed that PCOS participants were significantly ($P < 0.001$) more likely to experience oligomenorrhea (25%) and irregular menstrual cycles (54%) compared to non-PCOS participants. This confirms the association of PCOS with the major clinical features of oligomenorrhea and irregular menses. Menstrual flow and menstrual pain were also moderately higher in the PCOS group compared to the non-PCOS group **(Table 2).**

Hyperandrogenism Characteristics: Among the 268 participants, the occurrence of acne was significantly ($P < 0.01$) higher in the PCOS participants. Additionally, hyper androgeniccharacteristics such as unwanted hair growth on the body, face, and lips were significantly higher in the PCOS group compared to the non-PCOS group **(Table 3).**

Co-morbidities:

In this study, the occurrence Diabetes mellitus/Insulin resistance was significantly ($P<0.05$) higher in the PCOS participants. Also, the co-morbid conditions like hypertension and thyroid disorder were significantly higher in the PCOS group when compared with the non PCOS group. Other conditions like weight gain and alopecia were higher percentage in the PCOS participants when compared to the

non PCOS participants (**Table 4**).

Assessment of irritable bowel syndrome

The occurrence of digestive problem and bacterial infection problem was significantly (P<0.0001) higher in the PCOS group when compared to the non PCOS group. Psychologicalproblems in the form of Anxiety, Depression, and Stress were significantly (P<0.05) higher in the PCOS group when compared to the non PCOS group. Also, the Clinical features like abdominal pain, cramping and diarrhea (or) constipation were significantly (P <0.001) higher in the PCOS participants (**Table 5**).

CONCLUSION:

In this cross-sectional study we included 268 female participants to ascertain the prevalence and impact of polycystic ovary syndrome and its associated irritable bowel syndrome. The present study reported prevalence of IBS in PCOS participants were 75%, in the age group of17-28 years. Also, the study results show that the PCOS patients were at a higher risk of developing Diabetes mellitus/ insulin resistance, hypertension, and thyroid Disorder. So, the early detection of this syndrome offers an opportunity to treat this disease and prevent future Co-morbidities. Special attention must be given for overweight because obese patients were having highest possibility of development of the disease. Hence, a lifestyle modification change including regular exercise, stress management, and healthy dietary habits is the best first line treatment for PCOS and IBS.

CONFLICT OF INTEREST:

The authors of this research declare no potential conflicts of interest.

ACKOWLEDGEMENT:

We extend our deepest gratitude to our esteemed mentor, whose insightful guidance, invaluable advice and unwavering support propelled this study forward .We are also immensely thankful to all the participants and respondents whose cooperation and willingness to share their experience and

insights were pivotal in enriching this research endeavor. We assured to obtain the explicit permission and consent from each student's data was utilized in this study, prioritizing ethical standards and respecting their confidentiality. This article endeavors to contribute meaningfully to the expanding realm of knowledge concerning the prevalence and impact of poly cystic ovary syndrome (PCOS) and its associated irritable bowel syndrome (IBS) among college students.

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the Greek Island of Lesbos: Hormonal and Metabolic Profile. The journal of clinical Endocrinology & Metabolism. 1996; 84(11): 4006-4011.

FIGURE LEGENDS:

Figure: 1

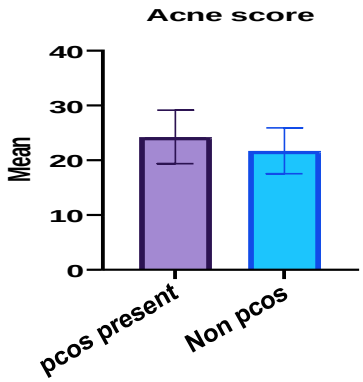

Figure1: a) Acne score

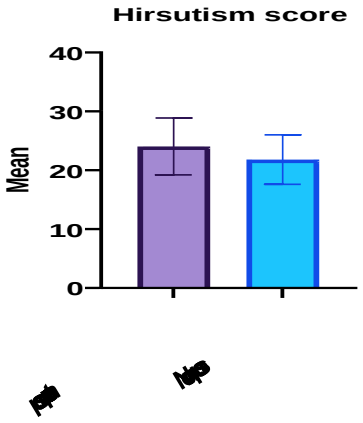

Figure1: b) Hirsutism Score

TABLES:

Table 1: Base line characters associated with the polycystic ovary syndrome

Parameters		**PCOS (n=28)**	**NON PCOS (n=240)**	**Chi-square test P value**
Education	Undergraduate	18 (64.3)	194 (80.0)	0.0415
	Postgraduate	10 (35.7)	46 (20.0)	
Residence	Hosteller	15 (53.6)	143 (59.6)	0.5405
	Days scholar	13(46.4)	97 (40.4)	
Food Habits	Non vegetarian	22 (78.6)	204 (85.0)	0.3759
	Vegetarian	6 (21.4)	36 (30.0)	
Menarche age	7 to 11	5 (17.9)	16 (6.7)	0.1137
	12 to 15	21 (25.0)	205 (85.4)	
	>15	2 (7.14)	19 (7.9)	
Headache	Yes	24 (85.7)	213 (11.2)	0.6346
	No	4 (14.3)	27 (96.2)	
Family members in PCOS problem	Yes	6 (21.5)	10 (4.2)	0.0002
	No	22 (78.6)	231 (96.3)	
Family members in infertility problem	Yes	2 (7.1)	4 (1.7)	0.0409
	No	26 (92.9)	236 (98.3)	

Table 2: Menstrual characteristic among the selected participants

Menstrual parameters		**PCOS (n=28)**	**NON PCOS (n=240)**	**Chi-square testP value**
Status of menstrual cycle	Normal	20 (71.4)	231 (96.2)	<0.0001
	Oligomenorrhea	7 (25.0)	6 (2.5)	
	Polymenorrhea	1 (3.6)	3 (1.2)	
Frequency of menstrual cycle	Regular	13 (46.4)	229 (95.4)	<0.0001
	Irregular	15 (53.6)	11 (4.6)	
Bleeding duration	1 to 3	5 (17.9)	74 (30.6)	0.3154
	4 to 5	18 (64.3)	131 (54.6)	
	5 to 7	4 (14.3)	33 (13.7)	
	> 7	1 (3.6)	2 (0.83)	
Flow of bleeding	Mild	2 (7.1)	25 (10.4)	0.7383
	Moderate	24 (86.0)	204 (85.0)	
	Severe	2 (7.1)	11 (4.6)	
Menstrual pain severity	Mild	7 (25.0)	82 (34.1)	0.3839

Table 3: Assessment of hyperandrogenism among the selected participants

Parameters		**PCOS (n=28)**	**Non PCOS (n=240)**	**Chi-square test P value**
Acne problem	Mild	8 (28.6)	61(25.4)	0.009
	Moderate	11 (39.2)	37 (15.4)	
	Severe	-	6 (2.5)	
	No problem	9 (32.1)	136 (56.7)	
Unwanted hair growth in body	Yes	8 (28.6)	27 (11.2)	0.0101
	No	20 (71.4)	213 (88.8)	
Unwanted hair growth in face	Yes	10 (35.7)	24 (10.0)	0.0001
	No	18 (64.3)	216 (90.0)	
Unwanted hair growth in upper lip	Mild	11 (39.3)	52 (21.7)	0.0003

Table 4: Co- morbidities conditions among the study participants

co-morbidities		PCOS(n=28)	Non PCOS (n=240)	Chi-square test P value
Diabetes mellitus/ Insulin resistance	Fatigue	12(43)	6(3)	0.0340
	Increased thirst	3(11)	8(3)	
	Frequent urination	10(36)	3(1)	
Hypertension	Sweating	4(14)	18(8)	0.0016
	Headache	12(43)	10 (4)	
	Vision problem	9 (32)	1 (0.4)	
	Kidney damage	1 (4)	1 (0.4)	
Dyslipidaemia	Chest pain	3 (11)	2(0.8)	0.7093
	Heart palpitation	17 (61)	12 (5)	
	Dizziness	8 (14)	3(1)	
Thyroid disorder	Yes	15(54)	7(3)	<0.0001
	No	13(46)	233(97)	
Other conditions	Weight gain	19(68)	5(2)	0.0461
	Alopecia	5(18)	6(3)	

Table: 5 Assessment of irritable bowel syndrome among the study participants

IBS Parameters		**PCOS(n=28)**	**Non PCOS (n=240)**	**Chi-square test P value**
Digestive problem	Yes	25 (89)	11 (5)	<0.0001
	No	3 (11)	201(84)	
Bacterial infection problem	Yes	21(75)	8(3)	<0.0001
	No	7(25)	204(85)	
Psychological problem	Anxiety	4 (14)	6 (3)	0.0207
	Depression	10 (36)	8 (3)	
	Stress	7 (25)	30 (13)	
Clinical features	Abdominal pain	12(42)	34(14)	0.0037
	Cramping	5(18)	8(3)	
	Diarrhoea (or) Constipation	10(36)	3(1)	