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Risk Factors of Polycystic Ovary Syndrome Among Bangladeshi Women of Reproductive Age

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Abstract: ***Background:*** Polycystic Ovary Syndrome (PCOS) is a prevalent hormonal disorder affecting women of reproductive age, characterized by irregular menstrual cycles, elevated androgen levels, and ovarian cyst formation. As the most common endocrine disorder in this demographic, understanding its risk factors is crucial. ***Methods:*** This case-control study was conducted in a district-level hospital at Cox's Bazar from January 2023 to December 2023. As study subjects, 60 women diagnosed with Polycystic Ovary Syndrome (PCOS), aged between 15 and 45 years, were included in the case group. Additionally, 60 age-matched healthy women were randomly selected for the control group. Data analysis was performed using SPSS Version 23.0. ***Results:*** In this study, in risk factor analysis, BMI (Body Mass Index; p=0.023), education level (p=0.013), regular tea drinking (0.030), marital status (p=0.034), gravidity (p=0.017), parity (p=0.003), family relationship (p<0.001), family history of PCOS (p=0.006), diabetes (p<0.001), family history of infertility (p=0.006), and mother's irregular menstruation (p=0.003) showed notable significance. Additionally, lack of physical exercise was significantly associated with the case group (p=0.030). ***Conclusion:*** Common risk factors for polycystic ovary syndrome (PCOS) among Bangladeshi women encompass various factors such as lower education levels, unmarried status, lower gravidity and parity, poor family relationships, insufficient physical exercise, family history of PCOS, diabetes, and infertility, along with a mother's irregular menstruation.

Keywords: Risk factors, Polycystic Ovary Syndrome, PCOS, Bangladeshi women, Reproductive age.

Original Research Article

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Article at a glance:

Study Purpose: *The purpose of this study was to evaluate the risk factors associated with PCOS among Bangladeshi women of reproductive age.*
Key findings: *Obesity and insulin resistance are significant risk factors for polycystic ovary syndrome (PCOS) among Bangladeshi women, leading to metabolic disturbances.*
Newer findings: *There is growing evidence that genetic predisposition plays a larger role than previously understood, with specific gene polymorphisms being associated with PCOS susceptibility in South Asian populations.*
Abbreviations: *PCOS: Polycystic ovarian syndrome, IR: Insulin resistance.*

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INTRODUCTION

Polycystic ovarian syndrome (PCOS) is a prevalent endocrine condition affecting women of reproductive age, associated with increased risk of type-2 diabetes, dyslipidemia, heart diseases, and endometrial carcinoma, along with significant psychological complications.[1,2,3] Polycystic ovary syndrome (PCOS) is a prevalent endocrine and

metabolic disorder that impacts approximately 7% of women of childbearing age globally.[4] It is characterized by a range of metabolic, cardiovascular, and psychological factors. Another study reported a global prevalence estimate of PCOS ranging from 4% to 20%.[5] The prevalence of diagnosed PCOS showed variation based on race/ethnicity, with rates at 1.6% among white women, ranging higher at 3.5% among South Asian women, and lower at 1.1% among Chinese women.[6] In a study, it was found that the prevalence of PCOS is 6.11% among women attending gynecology outpatient visits at the Department of Obstetrics and Gynecology at Bangabandhu Sheikh Mujib Medical University (BSMMU) in Dhaka, Bangladesh.[7] Despite evidence of complex genetic, behavioral, and environmental factors influencing its onset, the exact pathophysiology of PCOS remains unknown.[8] According to the Rotterdam criterion, PCOS is defined by the presence of at least two of the following criteria: irregular or absent ovulation, clinical or biochemical hyperandrogenemia, and polycystic ovaries, with the exclusion of other causes of hyperandrogenism. In contrast, the National Institute of Health (NIH) criteria for diagnosing PCOS include ovulatory failure combined with biochemical and clinical hyperandrogenism, after ruling out other associated illnesses.[9]

Hyperandrogenism is diagnosed through self-reported hirsutism or high levels of total or free testosterone. Ovulatory dysfunction is exemplified by irregular menstrual cycles or the use of oral contraceptives to regulate periods. Clinical manifestations of PCOS vary, with 85%–90% of women experiencing oligomenorrhea, 30%–40% experiencing amenorrhea, and 80% exhibiting symptoms of androgen excess, such as hirsutism (seen in up to 70% of cases) and acne (affecting 15-30% of women with PCOS). PCOS affects 90 to 95 percent of ovulatory women seeking infertility treatment, and approximately 40 percent of women with PCOS experience infertility.[10] Spontaneous abortion rates range from 42% to 73% among women with PCOS. PCOS is influenced by both modifiable and non-modifiable risk factors, including negative lifestyle habits, lack of physical activity, and a family history of diabetes and infertility. Other factors such as irregular menstrual cycles, a BMI of 25 or higher, a waist-hip ratio exceeding 0.86, dyslipidemia, impaired glucose tolerance, abdominal obesity, elevated blood pressure, and insulin resistance also contribute to the condition.[11] Despite extensive research on the prevalence and clinical features of PCOS in various regions, there is a lack of literature exploring the association between these common risk factors and PCOS.[12,13] The objective of this study was to assess the risk factors of polycystic ovary syndrome among Bangladeshi women of reproductive age.

METHODS

This was a case-control study that was conducted in a district-level hospital at Cox's Bazar from January 2023 to December 2023. The study included 60 women diagnosed with Polycystic Ovary Syndrome (PCOS), aged between 15 and 45 years, in the case group. Furthermore, 60 age-matched healthy women were randomly selected for the control group. Data were collected using a structured interview questionnaire, which covered socio-demographic status, medical and family history, menstrual and obstetrical history, lifestyle habits, and clinical examination. Properly written consent was obtained from all participants before data collection. The inclusion criteria for this study were women between the ages of 15 and 45 who consented to participate. Conversely, women with psychiatric disorders, malignancies such as virilizing neoplasms, and those diagnosed with endocrine disorders like Cushing's disease, thyroid disease, and adrenal disease, were excluded based on the exclusion criteria. Statistical analysis was conducted using SPSS Version 23.0. A P-value less than 0.05 was considered statistically significant.

RESULT

In this study, the mean age was 30.01 ± 5.98 years in the control group and 28.44 ± 5.77 years in the case group. The mean ±SD BMIs were 21.04 ± 2.76 and 21.24 ± 2.82 Kg/m^2 respectively. In terms of education, a higher percentage of cases had primary level education (20.0% vs. 23.3%) while controls had higher secondary education (56.7% vs. 60.0%). Most participants in both groups were tea drinkers, with irregular consumption more prevalent in cases (70.0% vs. 86.7%). Furthermore, a larger proportion of cases were married compared to controls (73.3% vs. 46.7%). In our study, the mean age of menarche was 13.89 ± 1.31 years in the control group and 13.70 ± 1.38 years in the case

group. For the length of the period, the control group had a mean of 4.96 ± 1.45 days while the case group had 4.91 ± 1.56 days. Regarding gravidity, the control group had a mean of 1.83 ± 1.08 pregnancies, whereas the case group had 1.33 ± 1.17 pregnancies. However, in terms of parity, a significant difference was observed, with the control group having a mean parity of 1.31 ± 0.96 and the case group having 0.77 ± 0.97. In terms of family status, significant differences were observed between the control and case groups. A higher percentage of cases reported experiencing bad family relationships (30.0% vs. 63.3%), having a family history of PCOS (6.7% vs. 26.7%), diabetes (30.0% vs. 66.7%), infertility (6.7% vs. 26.7%), and mothers with irregular menstruation (46.7% vs. 73.3%) compared to controls. Additionally, a larger proportion of cases reported a lack of physical exercise compared to controls (70.0% vs. 87.0%). In risk factor analysis, age did not differ significantly between the control and case groups (p=146). But significant associations were observed in BMI (Body Mass Index; p=0.023), education level (p=0.013), regular tea drinking (p=0.030), marital status (p=0.034), gravidity (p=0.017), parity (p=0.003), family relationship (p<0.001), family history of PCOS (p=0.006), diabetes (p<0.001), family history of infertility (p=0.006), mother's irregular menstruation (p=0.003), and lack of physical exercise (p=0.030).

Table 1: Socio-demographic status of participants (N=120)

Variables	Control (n=60) Mean ±SD/n (%)		Case (n=60) Mean ±SD/n (%)	
Age (Mean ±SD)				
Years	30.01 ± 5.98		28.44 ± 5.77	
BMI (Mean ±SD)				
Kg/m^2	21.04 ± 2.76		21.24 ± 2.82	
Education				
Primary level	12	20.0%	14	23.3%
Secondary level	34	56.7%	36	60.0%
Higher Secondary	6	10.0%	6	10.0%
Graduate & above	8	13.3%	4	6.7%
Tea drinking				
Regular	18	30.0%	8	13.3%
Irregular	42	70.0%	52	86.7%
Marital status				
Married	28	46.7%	44	73.30%
Unmarried	32	53.3%	16	26.70%

Table 2: Clinical status of participants

Parameter	Control (n=60)	Case (n=60)
Age of menarche		
Years	13.89 ± 1.31	13.70 ± 1.38
Length of period		
Days	4.96 ± 1.45	4.91 ± 1.56
Gravidity		
Frequency	1.83 ± 1.08	1.33 ± 1.17
Parity		
Frequency	1.31 ± 0.96	0.77 ± 0.97

Table 3: Family status of participants

Family status	Control (n=60)		Case (n=60)	
	n	%	n	%
Bad family relationship	18	30.0%	38	63.3%
Family history of PCOS	4	6.7%	16	26.7%
Family history of diabetes	18	30.0%	40	66.7%
Family history of infertility	4	6.7%	16	26.7%
Mother's irregular menstruation	28	46.7%	44	73.3%
Lack of physical exercise	42	70.0%	52	87.0%

Table 4: Analysis of risk factors

Variables		Control (n=60) Mean ±SD/n (%)		Case (n=60) Mean ±SD/n (%)		P-value
Age (Mean ±SD)						
Years		30.01 ± 5.98		28.44 ± 5.77		0.146
BMI (Mean ±SD)						
Kg/m^2		21.04 ± 2.76		22.21 ± 2.79		0.023
Education						
Primary level		12	20.0%	14	23.3%	0.013
Secondary level		34	56.7%	36	60.0%	
Higher Secondary		6	10.0%	6	10.0%	
Graduate and above		8	13.3%	4	6.7%	
Tea drinking						
Regular		18	30.0%	8	13.3%	0.030
Irregular		42	70.0%	52	86.7%	
Marital status						
Married		28	46.7%	44	73.30%	0.034
Unmarried		32	53.3%	16	26.70%	
Age of menarche						
Years		13.89 ± 1.31		13.70 ± 1.38		0.441
Length of period						
Days		4.96 ± 1.45		4.91 ± 1.56		0.856
Gravidity						
Frequency		1.83 ± 1.08		1.33 ± 1.17		0.017
Parity						
Frequency		1.31 ± 0.96		0.77 ± 0.97		0.003
FR	Bad	18	30.0%	38	63.3%	<0.001
	Good	42	70.0%	22	36.7%	
FH of PCOS	Yes	4	6.7%	16	26.7%	0.006
	No	56	93.3%	44	73.3%	
FH of diabetes	Yes	18	30.0%	40	66.7%	<0.001
	No	42	70.0%	20	33.3%	
FH of infertility	Yes	4	6.7%	16	26.7%	0.006
	No	56	93.3%	44	73.3%	
Mother's IM	Yes	28	46.7%	44	73.30%	0.003
	No	32	53.3%	16	26.70%	
Lack of PE	Yes	42	70.0%	52	87%	0.030
	No	18	30.0%	8	13%	

FR: Family relationship, FH: Family history, IM: Irregular menstruation, PE: Physical exercise.

DISCUSSION

In this study, individuals in the control group had an average age of 30.01 ± 5.98 years, while those in the case group had an average age of 28.44 ± 5.77 years.[14] Another investigation reported mean ages of 26.18±0.45 and 26.02±6.58 for the case and control groups, respectively.[10] Concerning education, a higher percentage of cases had received primary level education (20.0% vs. 23.3%), while the control group showed a higher prevalence of higher secondary education (56.7% vs. 60.0%). Most participants in both cohorts reported being tea drinkers, with irregular consumption being more common among cases (70.0% vs. 86.7%). Furthermore, cases were more likely to be married compared to controls (73.3% vs. 46.7%), aligning with findings from a different study.[15] In our study, the average gravidity was 1.68 ± 1.13 in the control group and 1.46 ± 1.19 in the case group, while the average parity was 1.28 ± 0.98 in the control group and 0.85 ± 0.96 in the case group. The mean age of menarche was 13.89 ± 1.31 years in the control group and 13.70 ± 1.38 years in the case group.[16] Shinde et al. highlighted menstrual irregularity since menarche as a risk factor for PCOS. Lower education levels, higher BMI, being unmarried, lower gravidity and parity, poor family relationships, family history of PCOS, diabetes, and infertility, as well as a mother's irregular menstruation, were significantly more common in the case group.

Additionally, lack of physical exercise was significantly associated with the case group. These findings were comparable with the findings of a previous study.[15] The onset of irregular menstruation since adolescence is commonly experienced by most PCOS patients, indicating a close relationship between PCOS and irregular menstruation.[17] Insulin resistance (IR) emerged as a notable contributor to PCOS in some of our cases, consistent with studies reporting IR prevalence among PCOS patients ranging from 50% to 70%.[18] A family history of diabetes, particularly inherited metabolic disorders, also significantly increases the risk of PCOS, aligning with findings from Roe et al. [15] Additionally, Tian et al. reported an odds ratio of mother's infertility at 8.599, whereas our study found it to be 11.953, suggesting a hereditary component to PCOS.[20] The etiology of PCOS remains inconclusive due to its complexity. One study attributed its cause to the interaction between genetic and environmental factors.[21] PCOS patients commonly exhibit hyperandrogenemia, making male hormones a recognized biomarker for the condition. Additionally, PCOS is associated with obesity, insulin resistance, and type 2 diabetes, which contribute to elevated androgen levels. Adolescent obesity has been linked to an increased risk of PCOS later in life, and insulin resistance and hyperinsulinemia may stimulate LH secretion, leading to hyperandrogenemia.[22,23] In a Bangladeshi study, common risk factors for PCOS included urban living, higher education, employment, low income, anemia, hypertension, cancer, family history of PCOS or infertility, elevated BMI, fast food consumption, and coffee intake.[10] Another study in Bangladesh revealed that women with PCOS face challenges and have limited access to information and resources.[24]

Limitation of the study

This single-centered study, with a limited sample size and short duration, may not fully capture the nationwide scenario. Findings should be interpreted cautiously, recognizing the potential limitations in generalizing results to the broader population of the entire country.

CONCLUSION

Among Bangladeshi women, several potential risk factors for polycystic ovary syndrome (PCOS) have been identified. These include lower education levels, unmarried status, lower gravidity and parity, strained family relationships, inadequate physical exercise, a family history of PCOS, diabetes, or infertility, and a mother's history of irregular menstruation. Recognizing these risk factors is crucial for early identification and intervention, empowering healthcare providers to implement targeted preventive strategies and promote lifestyle modifications that can mitigate the risk and impact of PCOS in this population. By addressing these factors comprehensively, healthcare efforts can contribute to improved reproductive health outcomes for Bangladeshi women affected by PCOS.

Authors' contributions

FJ, MAQ, MS: Concept and design, data acquisition, interpretation and drafting. MSA, MJKB and OR: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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