ORIGINAL ARTICLE https://doi.org/10.3329/jmcwh.v22i1.86863

PREVALENCE AND DETERMINANTS OF DEPRESSION AMONG WOMEN WITH POLYCYSTIC OVARIAN SYNDROME: A CROSS-SECTIONAL STUDY

Trifa Obayed[1], Sathi Dastider[2], Ummul Khair Alam[1], Zahra Mustafiz Antora[1], Rubayath Sarmin[1], Mohammad Nurunnabi[3*]

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Reviewed by

Monowar Ahmad Tarafdar
Diabetic Association Medical College Bangladesh

Fouzia Ibrahim
Saic College of Medical Science and Technology, Dhaka, Bangladesh.

*** Corespondence:**
Mohammad Nurunnabi
Email: nur.somch@gmail.com,
Orcid id: https://orcid.org/0000-0001-9472-9369

Received: 23.12.2025.
Accepted: 10.01.2026
Published: January 2026

Cite this article:
Obayed T, Dastider S, Alam UK, Antora ZM, Sarmin R, Mohammad Nurunnabi M. Prevalence and Determinants of Depression among Women with Polycystic Ovarian Syndrome: A Cross-Sectional Study. J Med Coll Women Hosp.2026; 22(1):.124-136.

ABSTRACT

Background: Polycystic ovarian syndrome (PCOS) is a common endocrine disorder among women of reproductive age, often associated with psychological comorbidities such as depression. **Aim:** To determine the prevalence of depression and identify its associated determinants among women diagnosed with PCOS. **Materials and Method:** A hospital-based cross-sectional study was conducted at the Outpatient Departments of Obstetrics and Gynecology and Reproductive Endocrinology and Infertility of Bangladesh Medical University from January 2023 to December 2023. Women of reproductive age with a confirmed diagnosis of PCOS based on the Rotterdam criteria were included. Data were collected through face-to-face interviews using a semi-structured questionnaire, and depression was assessed using the PHQ-9.**Results:** A total of 95 women with PCOS participated. Most were aged 26–35 years, married, Muslim, and homemakers. The majority had secondary or higher education, no children, and belonged to middle-income households. Menstrual irregularity was reported by 54.7% of participants, and 38.9% were overweight or obese. Depression was highly prevalent, with 45.3% experiencing mild depression, 40.0% moderate, 13.7% moderately severe, and 1.1% severe. Significant determinants of depression included religion (p=0.04), occupation (p=0.03), age at menarche (p=0.02), menstrual cycle pattern (p=0.03), use of birth control methods (p=0.02), BMI (p=0.02), physical inactivity (p=0.04), and skipping meals (p=0.05). No significant association was found with age, marital status, education, or smoking habit. **Conclusion:** Depression is highly prevalent among women with PCOS in Bangladesh. Reproductive factors, lifestyle behaviors, and occupational status significantly influence depression severity.

Keywords: PCOS, Depression, PHQ-9, Reproductive health, Lifestyle factors, Bangladesh.

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age, characterized by ovulatory dysfunction, hyperandrogenism, and polycystic ovarian morphology[1].

1 Department of Maternal and Child Health, National Institute of Preventive and Social Medicine, Dhaka, Bangladesh.
2 Department of Population Dynamics, National Institute of Preventive and Social Medicine, Dhaka, Bangladesh.
3* Department of Community Medicine and Public Health, Sylhet Women's Medical College, Sylhet 3100, Bangladesh. Email: nur.somch@gmail.com ,
Orcid id: https://orcid.org/0000-0001-9472-9369, **[Address of Correspondence]**

Globally, the prevalence of PCOS ranges from 5% to 15%, depending on diagnostic criteria and population characteristics[2]. Beyond its reproductive and metabolic manifestations, PCOS is increasingly recognized as a condition with substantial psychological consequences, particularly depression and anxiety, which significantly impair quality of life.

Depression is a major public health problem worldwide and is more prevalent among women than men. Women with chronic hormonal and metabolic disorders, such as PCOS, appear to be especially vulnerable[3]. Evidence from studies consistently demonstrates that women with PCOS experience significantly higher rates of depressive symptoms compared to women without PCOS[4]. A large meta-analysis reported that women with PCOS have approximately a two- to three-fold increased risk of depression, with pooled prevalence estimates ranging from 30% to over 40% depending on the screening tool used[5,6]. These findings highlight depression as a common and clinically important comorbidity in PCOS.

The etiology of depression in PCOS is multifactorial, involving complex interactions between biological, reproductive, and psychosocial factors. Hormonal disturbances such as hyperandrogenism, insulin resistance, and chronic low-grade inflammation have been implicated in mood dysregulation through their effects on neuroendocrine and neurotransmitter pathways[7]. Metabolic features commonly associated with PCOS, including obesity and dyslipidemia, are themselves independent risk factors for depression[8]. In addition, reproductive concerns such as menstrual irregularities, infertility, and hirsutism can negatively affect self-esteem, body image, and social functioning, thereby increasing psychological distress[9].

Lifestyle-related factors also play a critical role in the mental health of women with PCOS. Physical inactivity, unhealthy dietary patterns, irregular meals, and obesity have been associated with both the severity of PCOS symptoms and depressive outcomes[10]. Several cross-sectional studies have shown that higher body mass index (BMI), lack of regular exercise, and poor eating habits are significantly associated with higher depression scores among women with PCOS[11,12]. These modifiable factors provide important opportunities for prevention and intervention.

In low- and middle-income countries such as Bangladesh, the burden of PCOS-related mental health problems may be further amplified by limited awareness, delayed diagnosis, sociocultural stigma, and restricted access to mental health services. Bangladesh faces a growing burden of non-communicable diseases and mental health disorders, yet women's reproductive mental health remains under-researched and under-addressed[13]. Cultural expectations related to marriage, fertility, and motherhood may intensify psychological stress among women with PCOS, particularly when menstrual irregularities or subfertility are present. Studies from South Asia suggest that women with PCOS often experience significant emotional distress due to social pressure, body image concerns, and fear of infertility[14].

Although a few studies from Bangladesh and neighboring countries have reported a high prevalence of depression and anxiety among women with PCOS, data remain limited and fragmented[15,16]. Existing studies often focus on prevalence alone and do not comprehensively examine the socio-demographic, menstrual, and lifestyle-related determinants of depression. Understanding these determinants in the Bangladeshi context is crucial, as socioeconomic status, dietary patterns, physical activity, and reproductive health behaviors differ substantially from those in high-income countries.

Identifying factors associated with depression among women with PCOS is essential for early detection, integrated care, and targeted interventions. Routine screening using validated tools such as the Patient Health Questionnaire-9 (PHQ-9) can facilitate timely identification of depressive symptoms and improve overall management of PCOS[17]. From a public health perspective, evidence on determinants can guide policy-makers and clinicians in designing culturally appropriate mental health interventions integrated into reproductive health services.

Therefore, this study aims to determine the prevalence of depression among women with PCOS and to identify its socio-demographic, menstrual, and lifestyle-related determinants in Bangladesh. By addressing an important knowledge gap, this study seeks to contribute evidence to support holistic and context-specific management strategies for women with PCOS.

MATERIALS AND METHOD

A hospital-based cross-sectional study was conducted from January to December 2023 at the Outpatient Departments of Obstetrics and Gynecology and Reproductive Endocrinology and Infertility of Bangladesh Medical University (BMU), Dhaka, Bangladesh. BMU is a tertiary-level referral hospital with comprehensive diagnostic facilities for endocrine and gynecological disorders. Women of reproductive age attending these outpatient departments were screened for eligibility, and those with a confirmed diagnosis of PCOS based on the Rotterdam criteria were included[1]. The study population represented women from diverse socioeconomic backgrounds. Women who were severely ill or unable to participate in the interview were excluded.

The sample size was calculated using the single population proportion formula at a 95% confidence level, assuming a prevalence of anxiety of 88% among women with PCOS[18] and a margin of error of 5%, which yielded a required sample size of 163. Due to time and feasibility constraints, a total of 95 participants were enrolled in the study. A convenience sampling technique was used to recruit eligible women with PCOS attending the selected outpatient departments during the study period.

Data were collected conveniently through face-to-face interviews using a semi-structured questionnaire, and medical records were reviewed to confirm the diagnosis of PCOS. Each interview lasted approximately 10–15 minutes. The questionnaire collected information on socio-demographic and clinical characteristics, including age, educational status, marital status, family type, socioeconomic status, and menstrual history. Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9)[17]. The questionnaire was pre-tested among 10 women with PCOS at the Institute of Maternal and Child Health, Matuail, Dhaka, who were excluded from the final analysis, and necessary modifications were made accordingly.

Data was entered, curated, and analyzed using IBM SPSS Version 26 (New York, USA). Descriptive statistics were expressed as frequency (percentage) and; mean and (standard deviation, or SD) for categorical and continuous data, respectively. Chi-square test and Fisher exact test were used to assess the significance of associations between two nominal variables. A *p*-value of <0.05 at a 95% confidence interval (CI) was considered significant for all statistical tests.

Written informed consent was obtained from all participants, participation was voluntary, confidentiality was strictly maintained, and no invasive procedures or physical interventions were involved. Ethical approval was obtained from the Institutional Review Board of the National Institute of Preventive and Social Medicine (NIPSOM), Bangladesh. (Reference: NIPSOM/IRB/2023/06)

RESULTS

Table 1 shows that most participants were aged 26–35 years (42.1%), with a mean age of 28.0±6.1 years. The majority was Muslim (93.7%) and married (96.8%). Regarding education, secondary education and graduate & above levels were equally common (31.6% each). Most respondents were homemakers (73.7%). More than half had no children (59.8%), with a mean number of children of 0.7±0.9. In terms of income, the majority belonged to the middle-income group (20,000–50,000 BDT; 68.4%), with a mean monthly income of 30,789.5±13,402.4 BDT.

Table 2 indicates that most respondents attained menarche between 10–13 years (73.7%), with a mean age of 12.5±1.5 years. More than half had irregular menstrual cycles (54.7%). About half of the participants used some form of birth control (50.5%), while oral contraceptive pill use was low (4.2%). Regarding lifestyle factors, over half had a normal BMI (52.6%), though considerable proportions were overweight or obese (38.9% combined). The majority were non-smokers (89.5%). Nearly half reported engaging in physical exercise (48.4%). Skipping regular meals was common (62.1%), and most participants did not take meals on time (64.2%). Junk food consumption was prevalent, with 73.8% reporting occasional intake.

Table 3 shows a high burden of depressive symptoms among participants. Nearly one-third reported little interest or pleasure in activities nearly every day (31.6%). Feelings of being down or hopeless were common, with 42.1% experiencing them nearly every day. Sleep problems (50.5%) and fatigue or low energy (56.8%) were the most frequently reported symptoms occurring nearly every day. Most respondents did not report poor appetite or overeating (72.6%) or difficulty concentrating (75.8%). Psychomotor changes were rare (92.6% not at all), and the majority denied thoughts of self-harm (76.8%).

Table 4 indicates that depression was highly prevalent among women with PCOS. Most respondents had mild (45.3%) or moderate depression (40.0%). A smaller proportion experienced moderately severe depression (13.7%), while severe depression was rare (1.1%).

Table 5 demonstrations the association between depression levels and participant characteristics. Significant associations ($p<0.05$) were found for religion (Muslim: mild 43.5%, moderate 40.2%, moderately severe 14.1%, severe 1.1%), occupation (homemaker: mild 42.9%, moderate 40.0%, moderately severe 15.7%, severe 1.4%), age at menarche (10–13 years: mild 45.7%, moderate 35.7%, moderately severe 15.7%, severe 2.9%), menstrual cycle pattern (irregular: mild 44.2%, moderate 44.2%, moderately severe 9.6%, severe 1.9%), use of birth control (yes: mild 58.3%, moderate 31.3%, moderately severe 10.4%, severe 0%), BMI (≥30: mild 66.7%, moderate 41.7%, moderately severe 25.0%, severe 0%), physical exercise (no: mild 46.9%, moderate 40.8%, moderately severe 12.2%, severe 0%), and skipping meals (yes: mild 42.4%, moderate 40.7%, moderately severe 13.6%, severe 3.4%).

Table 1: Socio-demographic characteristics of participants (N=95)

Variables	Category	Frequency (n)	Percentage (%)
Age (years)	18–25	25	26.3
	26–35	40	42.1
	36–45	30	31.6
	Mean±SD		28.0±6.1
	Range		18-44
Religion	Muslim	89	93.7
	Hindu	6	6.3
Marital status	Married	92	96.8
	Unmarried	3	3.2
Education	No formal education	6	6.3
	Primary	6	6.3
	Secondary	30	31.6
	Higher secondary	23	24.2
	Graduate & above	30	31.6
Occupation	Homemaker	70	73.7
	Student	13	13.7
	Service holder	12	12.6
Number of children	0	55	59.8
	≤2	34	37.0
	>2	3	3.3
	Mean±SD		0.7±0.9
Monthly income (BDT)	<20,000	23	24.2
	20,000–50,000	65	68.4
	>50,000	7	7.4
	Mean±SD		30,789.5±13,402.4

N= number of participants

Table 2: Menstrual history and lifestyle-related factors (N=95)

Variables	Category	Frequency (n)	Percentage (%)
Menstrual history related factors			
Age at menarche (years)	10–13	70	73.7
	14–16	25	26.3
	Mean±SD		12.5±1.5
Pattern of menstrual cycle	Regular	43	45.3
	Irregular	52	54.7
Utilization of birth control method	Yes	48	50.5
	No	47	49.5

Variables	Category	Frequency (n)	Percentage (%)
Oral contraceptive pill	Yes	4	4.2
	No	91	95.8
Lifestyle related factors			
BMI category	Underweight (<18.5)	8	8.4
	Normal (18.5–24.9)	50	52.6
	Overweight (25–29.9)	25	26.3
	Obese (≥30)	12	12.6
	Mean±SD		24.3±3.0
Smoking habit	Yes	10	10.5
	No	85	89.5
Physical exercise	Yes	46	48.4
	No	49	51.6
Skipped regular meal	Yes	59	62.1
	No	36	37.9
Meals on time	Yes	34	35.8
	No	61	64.2
Consumption of junk food	Never	19	20.0
	Occasionally	68	73.8
	Frequently	8	8.4

N=number of participants

Table 3: Determinants of Depression by PHQ-9 (N=95)

Variables	Category	Frequency (n)	Percentage (%)
Little interest or pleasure in doing things	Not at all	33	34.7
	Several days	32	33.7
	Nearly every day	30	31.6
Feeling down, depressed, or hopeless	Not at all	18	18.9
	Several days	37	38.9
	Nearly every day	40	42.1
Trouble sleeping or staying asleep/ sleeping too much	Not at all	34	35.8
	Several days	13	13.7
	Nearly every day	48	50.5
Feeling tired / little energy	Not at all	14	14.7
	Several days	27	28.4

Variables	Category	Frequency (n)	Percentage (%)
	Nearly every day	54	56.8
Poor appetite or overeating	Not at all	69	72.6
	Several days	21	22.1
	More than half the days	1	1.1
	Nearly every day	4	4.2
Feeling bad about yourself / failure	Not at all	28	29.5
	Several days	36	37.9
	More than half the days	2	2.1
	Nearly every day	29	30.5
Trouble concentrating	Not at all	72	75.8
	Several days	21	22.1
	Nearly every day	2	2.1
Moving / speaking slowly or being restless	Not at all	88	92.6
	Several days	5	5.3
	Nearly every day	1	1.1
Thoughts of being better off dead or self-harm	Not at all	73	76.8
	Several days	20	21.1
	Nearly every day	2	2.1
Problems doing work / taking care / getting along	Not at all	43	45.6
	Somewhat difficult	30	31.6
	Very difficult	20	21.1
	Extremely difficult	2	2.1

N=number of participants

Table 4: Prevalence of Depression by PHQ-9 (N=95)

Measures	Level	Frequency (n)	Percentage (%)
Prevalence of Depression	Mild	43	45.3
	Moderate	38	40.0
	Moderately severe	13	13.7
	Severe	1	1.1

N=number of participants

Table 5: Association between level of depression and participant characteristics (N=95)

Variables	Category	n	Level of Depression				*p*-value
			Mild	Moderate	Moderately severe	Severe	
			x(%)	x(%)	x(%)	x(%)	
Age (years)	18–25	25	10 (40.0)	10 (40.0)	5 (20.0)	0 (0.0)	0.72
	26–35	40	20 (50.0)	15 (37.5)	5 (12.5)	0 (0.0)	
	36–45	30	13 (43.3)	13 (43.3)	3 (10.0)	1 (3.3)	
Religion	Muslim	89	40 (43.5)	37 (40.2)	13 (14.1)	1 (1.1)	0.04*
	Hindu	6	3 (100)	1 (33.3)	0 (0.0)	0 (0.0)	
Marital status	Married	92	40 (43.5)	37 (40.2)	13 (14.1)	1 (1.1)	0.89
	Unmarried	3	3 (100)	1 (33.3)	0 (0.0)	0 (0.0)	
Education	No formal education	6	2 (33.3)	3 (50.0)	1 (16.7)	0 (0.0)	[I]0.87
	Primary	6	2 (33.3)	3 (50.0)	1 (16.7)	0 (0.0)	
	Secondary	30	12 (40.0)	13 (43.3)	5 (16.7)	0 (0.0)	
	Higher secondary	23	11 (47.8)	9 (39.1)	3 (13.0)	0 (0.0)	
	Graduate & above	30	16 (53.3)	10 (33.3)	3 (10.0)	1 (3.3)	
Occupation	Homemaker	70	30 (42.9)	28 (40.0)	11 (15.7)	1 (1.4)	0.03*
	Student	13	7 (53.8)	4 (30.8)	2 (15.4)	0 (0.0)	
	Service holder	12	6 (50.0)	6 (50.0)	0 (0.0)	0 (0.0)	
Age at menarche (years)	10–13	70	32 (45.7)	25 (35.7)	11 (15.7)	2 (2.9)	0.02*
	14–16	25	11 (44.0)	13 (52.0)	2 (8.0)	0 (0.0)	
Pattern of menstrual cycle	Regular	43	20 (46.5)	15 (34.9)	8 (18.6)	0 (0.0)	0.03*
	Irregular	52	23 (44.2)	23 (44.2)	5 (9.6)	1 (1.9)	
Utilization of birth control method	Yes	48	28 (58.3)	15 (31.3)	5 (10.4)	0 (0.0)	0.02*
	No	47	15 (31.9)	23 (48.9)	8 (17.0)	1 (2.1)	
BMI category	<18.5	8	3 (37.5)	3 (37.5)	1 (12.5)	1 (12.5)	0.02*
	18.5–24.9	50	25 (50.0)	18 (36.0)	5 (10.0)	2 (4.0)	
	25–29.9	25	10 (40.0)	12 (48.0)	4 (16.0)	0 (0.0)	
	≥30	12	8 (66.7)	5 (41.7)	3 (25.0)	0 (0.0)	
Physical exercise	Yes	46	20 (43.5)	18 (39.1)	7 (15.2)	1 (2.2)	0.04*
	No	49	23 (46.9)	20 (40.8)	6 (12.2)	0 (0.0)	
Smoking habit	Yes	10	5 (50.0)	4 (40.0)	1 (10.0)	0 (0.0)	0.88
	No	85	38 (44.7)	34 (40.0)	12 (14.1)	1 (1.1)	
Skipped regular meal	Yes	59	25 (42.4)	24 (40.7)	8 (13.6)	2 (3.4)	0.05*
	No	36	18 (50.0)	14 (38.9)	5 (13.9)	0	

Chi-square and Fisher's exact test were done, $p<0.05$ considered as statistically significant value;N=number of participants; n=number of participants divided into groups as per their characteristics; x=number of participants in each level of depression;%: percentage of participants in each level of depression

DISCUSSION

This study highlights a substantial burden of depression among women with PCOS in Bangladesh. Using the PHQ-9 scale, 100% of participants had some degree of depressive symptoms, with 45.3% mild, 40.0% moderate, 13.7% moderately severe, and 1.1% severe depression. These findings reinforce global evidence that women with PCOS experience markedly higher rates of depression than the general female population[19–21].

The mean age of participants was 28.0±6.1 years, and the majorities (42.1%) were aged 26–35 years, which aligns with studies from South-East Asia where PCOS is most frequently identified during early reproductive life[22–24]. In India, a study reported depressive symptoms in nearly two-thirds of women with PCOS, predominantly in the mild-to-moderate range[22], comparable to the 85.3% mild-to-moderate depressionobserved in our study. Similar patterns have been reported from Sri Lanka and Malaysia, suggesting that severe depression is relatively uncommon in South-East Asian PCOS populations[23,24].

Menstrual and reproductive factors were strongly associated with depression severity in this study. Irregular menstrual cycles, reported by 54.7% of participants, showed a significant association with higher depression levels ($p<0.05$). Among women with irregular cycles, 44.2% had mild and 44.2% had moderate depression, compared with lower proportions among those with regular cycles. This finding is consistent with reports from India, China, and Iran, where menstrual irregularity has been identified as a major psychological stressor in PCOS[22,25,26]. Early menarche (10–13 years), reported by 73.7% of participants, was also significantly associated with higher depression levels, supporting evidence that early pubertal timing increases long-term vulnerability to mood disorders[27].

Lifestyle and metabolic factors played a prominent role. Although 52.6% of women had a normal BMI, 38.9% were overweight or obese, and obesity showed a significant association with greater depression severity ($p<0.05$). Notably, among obese women, 66.7% had mild and 25.0% had moderately severe depression. Similar associations between higher BMI and depression among women with PCOS have been documented in South-East Asia and Western countries[21,23,28,29]. Physical inactivity was common, with 51.6% reporting no regular exercise, and lack of physical activity was significantly associated with depression ($p<0.05$). Additionally, 62.1% skipped regular meals, and this behavior was linked to higher depression levels, highlighting the role of unhealthy lifestyle patterns in mental health among women with PCOS.

Socio-demographic factors showed mixed associations. Occupation was significantly related to depression severity, with homemakers (73.7%) experiencing higher levels of depression compared with students and service holders ($p<0.05$). This may reflect sociocultural pressures, economic dependency, and fertility-related stress, similar to findings from India and Pakistan[22,30]. Religion showed a statistically significant association; however, this should be interpreted cautiously due to the predominance of Muslim participants (93.7%) in the sample. No significant associations were found with age, marital status, education level, or smoking habit, findings consistent with several South-East Asian studies[22,23].

The study demonstrates that reproductive factors (irregular menstruation, early menarche), metabolic status (BMI), and lifestyle behaviors (physical inactivity and meal skipping) are crucial determinants of depression severity among women with PCOS in Bangladesh. These results underscore the importance of integrating routine mental health screening, lifestyle modification, and psychosocial support into PCOS management, particularly in low- and middle-income settings.

CONCLUSION

Depressive symptoms were highly prevalent among women with PCOS in this study. Depression severity was significantly associated with reproductive factors such as age at menarche, menstrual irregularity, and use of birth control methods, as well as lifestyle-related factors including body mass index, physical inactivity, and irregular eating habits. Occupational status also showed a meaningful association. In contrast, age, marital status, education, and smoking habit were not significantly related to depression. These findings indicate that both biological and lifestyle factors play an important role in the mental health of women with PCOS.

RECOMMENDATIONS

Routine screening for depression should be integrated into PCOS management. Holistic care models addressing mental health, reproductive health, and lifestyle modification are recommended. Counseling on healthy diet, regular physical activity, and weight management should be emphasized. Awareness programs for women and healthcare providers are needed to recognize and address psychological distress associated with PCOS. Further research with larger samples and longitudinal designs is recommended to strengthen evidence and guide interventions.

AUTHOR'S CONTRIBUTION

Concepts, methods and literature reviews: Obayed T, Dastider S, and Alam UK; Data collection: Obayed T; Statistical analysis: Obayed T, and Nurunnabi M; Draft manuscript: Obayed T, Dastide S, Alam UK, Antora ZM, Sarmin R, Mohammad Nurunnabi M. All the authors work and approved the final manuscript.

ACKNOWLEDGMENTS

The authors are thankful to all the participants for their heartfelt cooperation.

FINANCIAL DISCLOSURE

The author(s) received no specific funding for this work.

CONFLICT OF INTEREST

There is no conflict of interest.

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