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PREVALENCE OF POLYCYSTIC OVARY SYNDROME AND ASSOCIATED CLINICAL MANIFESTATIONS AMONG FEMALE UNIVERSITY STUDENTS

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Polycystic ovary syndrome; PCOS; prevalence; clinical manifestations; hirsutism; menstrual irregularities; university students; cross-sectional study.

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Abstract

Background

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age and is associated with menstrual disturbances, hyperandrogenism, metabolic abnormalities, and impaired psychosocial well-being. Early identification among young women is essential to reduce long-term reproductive and metabolic complications. This study aimed to determine the prevalence of polycystic ovary syndrome and describe its associated clinical manifestations among female university students.

Methods

A cross-sectional study was conducted among 383 female university students selected through convenience sampling. Data were collected using a structured questionnaire that included demographic characteristics, menstrual history, and clinical manifestations associated with PCOS. Descriptive statistics were used to summarize participant characteristics, while Chi-square tests were performed to determine associations between demographic variables and PCOS-related clinical manifestations. Statistical significance was established at $p < 0.05$.

Results

Among the 383 participants, 80 (20.9%) reported a previous diagnosis of PCOS. Most participants were aged 20–25 years (62.7%), had normal body weight (53.8%), and attained menarche between 13 and 15 years of age (55.6%). The most frequently reported clinical manifestations were chest/back hair growth (65.3%), menstrual cramps (39.7%), irregular menstrual periods (39.4%), abdominal bloating (39.2%), upper lip/chin/abdomen hair growth (21.1%), depression (15.4%), fatigue (11.5%), and milky nipple discharge (11.5%). Significant associations were observed between age and concern about overweight

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(p < 0.001), family history and headache (p = 0.002), body weight and depression (p < 0.001), body weight and excessive hair growth (p < 0.001), and obesity and difficulty maintaining ideal body weight (p < 0.001).

Conclusion

Approximately one in five female university students reported PCOS, indicating a considerable burden within this population. Menstrual disturbances, hyperandrogenic features, and weight-related concerns were common manifestations. These findings emphasize the importance of early screening, lifestyle modification, and multidisciplinary management strategies to improve reproductive, metabolic, and long-term health outcomes.

INTRODUCTION

Polycystic ovary syndrome (PCOS) is one of the most prevalent endocrine disorders affecting women of reproductive age and is characterized by a complex combination of ovulatory dysfunction, hyperandrogenism, and polycystic ovarian morphology. It is a heterogeneous disorder with diverse reproductive, metabolic, and psychological manifestations that significantly influence women's health throughout their lifespan. Although the precise etiology remains incompletely understood, accumulating evidence suggests that genetic predisposition, insulin resistance, hormonal dysregulation, chronic low-grade inflammation, and environmental factors collectively contribute to its development and progression. The Rotterdam consensus remains the most widely accepted diagnostic criterion, requiring the presence of at least two of the following after excluding other endocrine disorders: oligo- or anovulation, clinical or biochemical hyperandrogenism, and polycystic ovarian morphology on ultrasonography (1-3).

PCOS has become an important public health concern because of its increasing prevalence and its association with both short- and long-term health complications. Globally, the reported prevalence ranges from approximately 6% to 20%, depending on the diagnostic criteria, ethnicity, age group, and characteristics of the study population. Among adolescents and young adults, particularly university students, prevalence estimates are often higher because hormonal changes, lifestyle behaviors, and increasing rates of obesity contribute to the expression of clinical symptoms during early reproductive life. The growing global burden of PCOS has important implications for reproductive health services, preventive medicine, and long-term disease management(2, 4, 5).

The clinical presentation of PCOS is highly variable and extends beyond reproductive dysfunction. Menstrual irregularities, including oligomenorrhea and amenorrhea, are among the most common presenting complaints and are frequently accompanied by manifestations of hyperandrogenism such as hirsutism, acne, and androgenic alopecia. In addition, many affected women experience obesity, insulin resistance, impaired glucose tolerance, dyslipidemia, metabolic syndrome, hypertension, and an increased risk of developing type 2 diabetes mellitus and cardiovascular disease. If left untreated, PCOS may also result in infertility, recurrent pregnancy complications, and endometrial hyperplasia because of prolonged anovulation. These multisystem manifestations highlight that PCOS is not merely a gynecological disorder but a chronic endocrine and metabolic condition requiring comprehensive management (3, 6, 7).

Young women attending universities constitute a particularly vulnerable population for the development and progression of PCOS. The transition to university life is frequently accompanied by reduced physical activity, prolonged sedentary behavior, irregular dietary habits, inadequate sleep, and elevated academic stress, all of which contribute to metabolic disturbances and hormonal imbalance. Furthermore, many university students have limited awareness of PCOS and often regard menstrual irregularities or excessive hair growth as normal physiological variations, delaying medical consultation and diagnosis. Consequently, early

Frontier in Medical & Health Research

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adulthood provides an important opportunity for screening, health education, and timely intervention to reduce future reproductive and metabolic complications (4, 5, 8).

Several studies conducted in different regions of the world have reported a considerable prevalence of PCOS among university students. Investigations from the United Arab Emirates, Egypt, Palestine, India, and South Korea have documented prevalence estimates ranging from approximately 5% to over 20%, depending on the diagnostic criteria and study population. These studies consistently identify menstrual irregularities, hirsutism, obesity, and acne as the most common clinical manifestations. Importantly, a substantial proportion of affected students remain undiagnosed despite experiencing characteristic symptoms, emphasizing the need for greater awareness and routine screening within educational institutions (5, 9, 10).

Evidence from Pakistan also suggests that PCOS is an increasingly important health concern among young women. Previous studies have reported a high frequency of menstrual abnormalities, obesity, hyperandrogenic manifestations, and depressive symptoms among women diagnosed with PCOS. However, most available research has focused on hospital-based populations or women seeking infertility treatment, limiting the generalizability of findings to apparently healthy young adults. Population-based evidence describing the prevalence and clinical characteristics of PCOS among female university students remains limited, particularly within educational institutions where opportunities for early identification and preventive interventions are substantial (6, 7, 11).

Despite the increasing recognition of PCOS as a major reproductive and metabolic disorder, there remains a paucity of evidence regarding its prevalence and associated clinical manifestations among female university students in Pakistan. Understanding the burden of PCOS and its common clinical features in this population is essential for developing targeted awareness programs, implementing early screening strategies, and facilitating timely referral and multidisciplinary management. Such evidence may also support institutional health policies aimed at improving reproductive health among young women.

Therefore, the present study was conducted to determine the prevalence of polycystic ovary syndrome and describe its associated clinical manifestations among female university students.

OBJECTIVE

General Objective

To determine the prevalence of polycystic ovary syndrome and associated clinical manifestations among female university students.

Specific Objectives

1. To determine the prevalence of PCOS among female university students.
2. To identify the common clinical manifestations associated with PCOS.
3. To examine the association between selected demographic characteristics and PCOS-related clinical manifestations.

Research Question(s)

1. What is the prevalence of PCOS among female university students?
2. What are the most common clinical manifestations associated with PCOS?
3. Are demographic variables associated with PCOS-related clinical manifestations?

METHODOLOGY

Study Design

A cross-sectional study was conducted to determine the prevalence of polycystic ovary syndrome (PCOS) and to identify the associated clinical manifestations among female university students.

Study Setting

The study was conducted at Fauji Foundation University and Zohra Institute of Health Sciences.

Study Duration

The study was completed over a period of four months following the approval of the research synopsis.

Frontier in Medical & Health Research

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Study Population

The study population comprised female university students enrolled at the selected institutions.

Sampling Technique

Participants were recruited using a convenience sampling technique.

Sample Size

The sample size was calculated using the OpenEpi sample size calculator based on the estimated population of female university students in Rawalpindi and the expected prevalence of PCOS reported in previous studies. The final calculated sample size was 383 participants.

Eligibility Criteria

Inclusion Criteria

Participants were included in the study if they fulfilled all the following criteria:

- Female university students enrolled at Fauji Foundation University and Zohra Institute of Health Sciences.
- Aged between 16 and 25 years.
- Willing to participate and provide written informed consent.
- Able to read and understand the questionnaire in the language used for data collection.
- Physically and mentally capable of completing the self-administered questionnaire.

Exclusion Criteria

Participants were excluded from the study if they:

- Declined to provide informed consent or withdrew from the study at any stage.
- Submitted incomplete or inadequately completed questionnaires.
- Had cognitive impairment or any medical or psychological condition that prevented them from understanding or completing the questionnaire independently.
- Were currently pregnant, as pregnancy may influence menstrual patterns and hormonal status, potentially confounding the assessment of PCOS-related clinical manifestations

Study Instruments

Data was collected using a structured, self-administered questionnaire designed to obtain information on participants' demographic characteristics and clinical features related to polycystic ovary syndrome (PCOS). The questionnaire included items on age, family history of PCOS, body weight, age at menarche, menstrual history, and common clinical manifestations such as menstrual irregularities, menstrual cramps, excessive hair growth, abdominal bloating, fatigue, depression, and milky nipple discharge. The collected information was used to determine the prevalence of PCOS and to describe the associated clinical manifestations among the study participants.

Data Collection Procedure

Eligible participants were approached at the selected institutions after obtaining the necessary administrative approvals. The objectives and procedures of the study were explained to all eligible participants, and written informed consent was obtained before data collection. Participants completed a structured self-administered questionnaire comprising demographic characteristics, menstrual history, family history, body weight, and clinical manifestations related to PCOS. The completed questionnaires were reviewed for completeness and accuracy before data entry and statistical analysis. Participant confidentiality and voluntary participation were maintained throughout the study.

Ethical Considerations

Ethical principles were followed throughout the study. Written informed consent was obtained from all participants before data collection. Participation was voluntary, and participants were informed of their right to withdraw from the study at any stage without any consequences. Confidentiality and anonymity of participant information were maintained throughout the research process. Every effort was made to protect participants from physical, psychological, or emotional harm, and their dignity and privacy were respected during data collection.

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Frontier in Medical & Health Research

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RESULTS

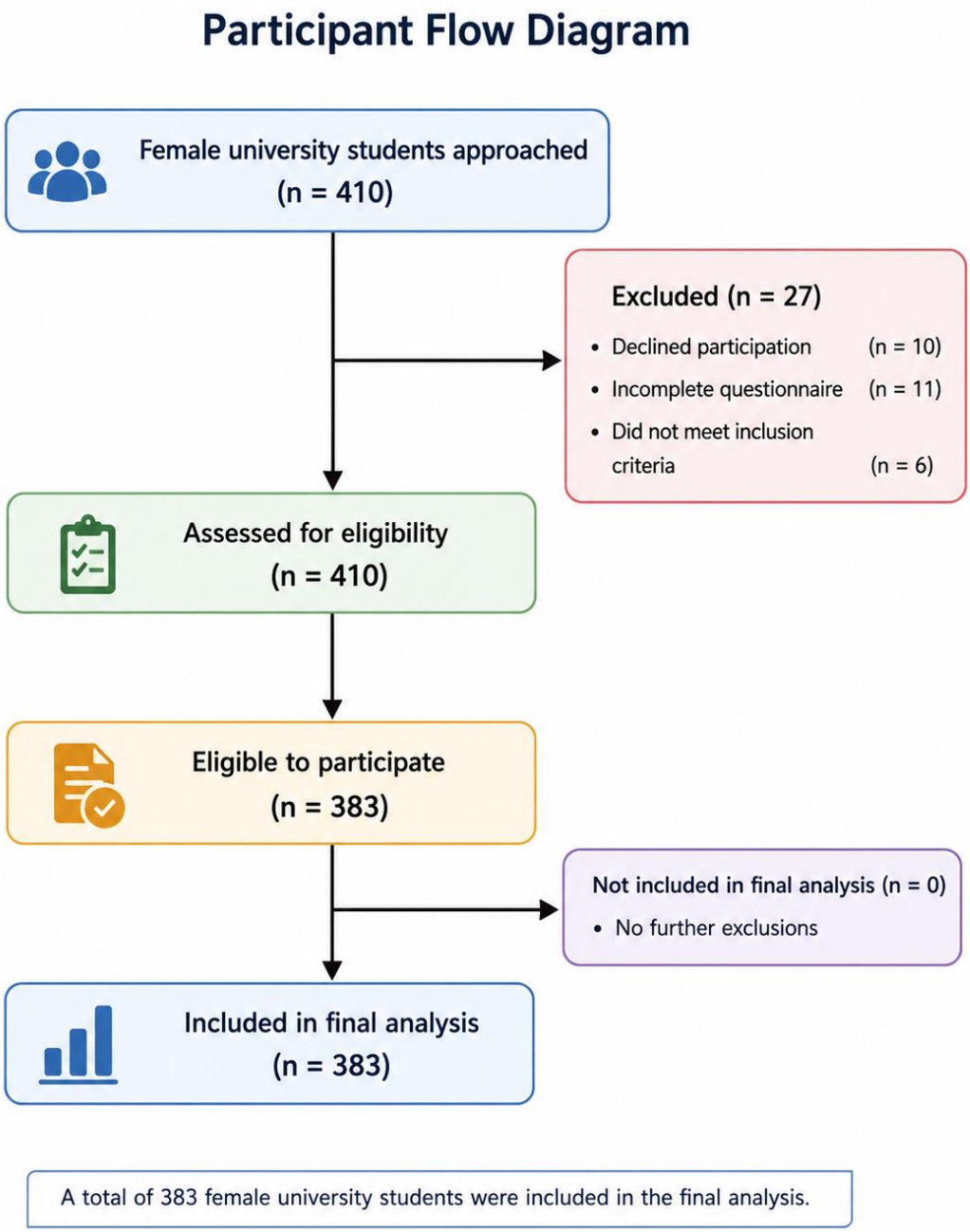


Figure 1. Participant Flow Diagram

A total of 410 female university students were assessed for eligibility. Following the application of the inclusion and exclusion criteria, 383 participants were enrolled and included in the final analysis. The participant recruitment and selection process is illustrated in Figure 1.

Demographic Characteristics of the Participants

The socio-demographic characteristics of the participants are summarized in Table 1. Most participants belonged to the 20–25 years age group (62.7%), followed by those aged 15–20 years (33.2%). A positive family history of PCOS was reported by 14.4% of participants, whereas 85.6%

Frontier in Medical & Health Research

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had no family history. More than half of the participants (53.8%) had a normal body weight, while 24.0% were overweight and 22.2% were underweight. Regarding reproductive characteristics, the majority (55.6%) attained menarche between 13 and 15 years of age.

Table 1. Demographic characteristics of the participants (N = 383)

Variable	Category	n
Age (years)	15–20	127
	20–25	240
	25–30	16
Family history of PCOS	Yes	55
	No	328
Body weight	Underweight	85
	Normal	206
	Overweight	92
Age at menarche	10–12 years	107
	13–15 years	213
	16–17 years	63

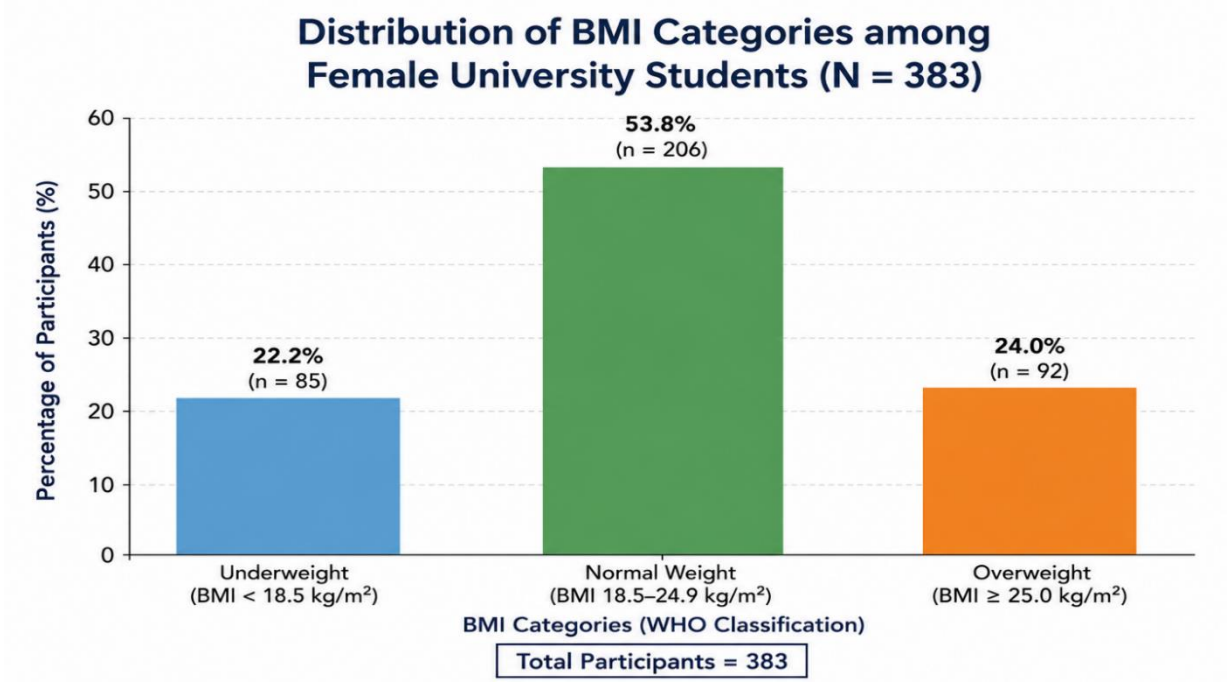


Figure 2. Distribution of Body Mass Index (BMI) Categories

Prevalence and Menstrual Characteristics of PCOS

The prevalence and menstrual characteristics of PCOS are presented in Table 2. Among the 383 participants, 80 students (20.9%) reported having been diagnosed with PCOS, while 79.1% had no diagnosis. Menstrual disturbances were common, with 39.4% reporting irregular menstrual periods and 39.7% experiencing menstrual cramps. Most participants (72.3%) reported menstrual cycle intervals of less than 25 days.

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Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Table 2. Prevalence and menstrual characteristics of PCOS (N = 383)

Variable	Category	n	%
Diagnosed with PCOS	Yes	80	20.9
	No	303	79.1
Menstrual cycle interval	<25 days	277	72.3
	25–34 days	78	20.4
	>60 days	19	5.0
Irregular menstrual periods	Yes	151	39.4
Menstrual cramps	Yes	152	39.7

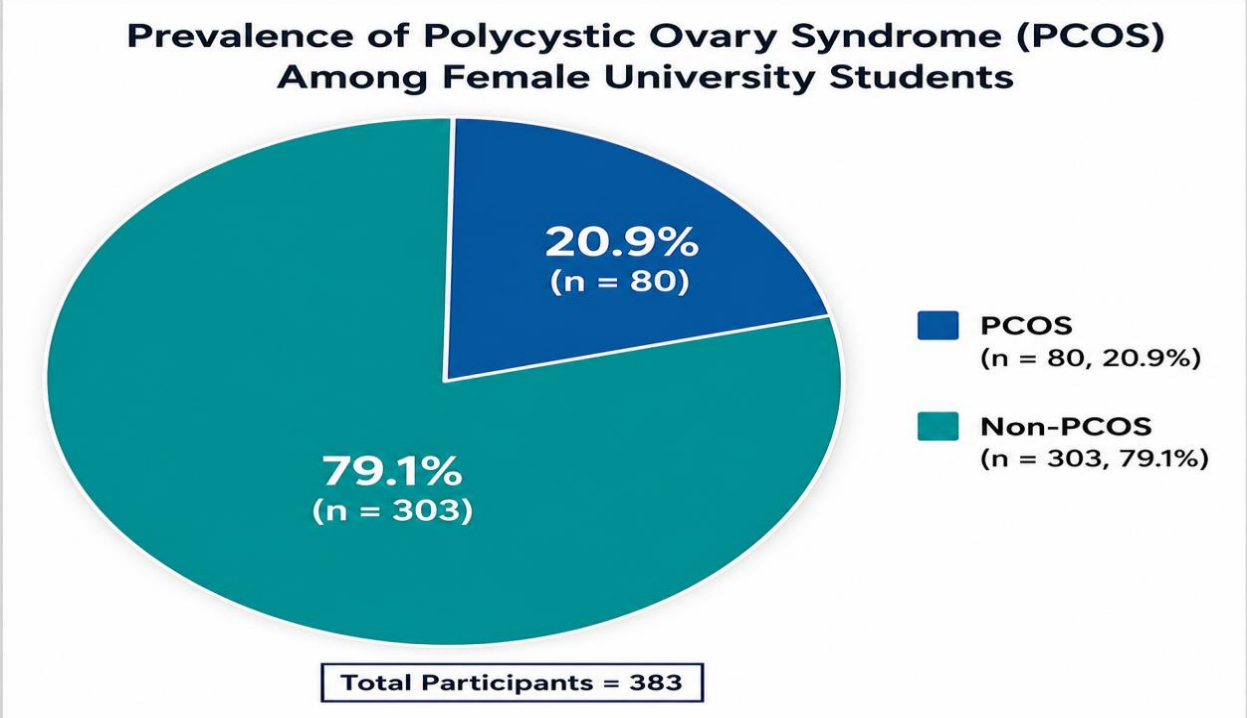


Figure 3. Prevalence of Polycystic Ovary Syndrome (PCOS)

Clinical Manifestations of PCOS

The frequency of common clinical manifestations associated with PCOS is shown in Table 3. Excessive hair growth over the chest and back was the most frequently reported symptom (65.3%). Hair growth over the upper lip, chin, or abdomen was reported by 21.1% of participants. Menstrual cramps and abdominal bloating were observed in approximately two-fifths of the participants (39.7% and 39.2%, respectively). Depression related to PCOS was reported by 15.4%, whereas fatigue and milky nipple discharge were each reported by 11.5% of participants.

Table 3. Clinical manifestations associated with PCOS

Clinical manifestation	n	%
Chest/back hair growth	250	65.3
Hair growth on upper lip/chin/abdomen	81	21.1
Menstrual cramps	152	39.7
Irregular menstrual periods	151	39.4
Abdominal bloating	150	39.2

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Depression	59	15.4
Easily tired	44	11.5
Milky nipple discharge	44	11.5

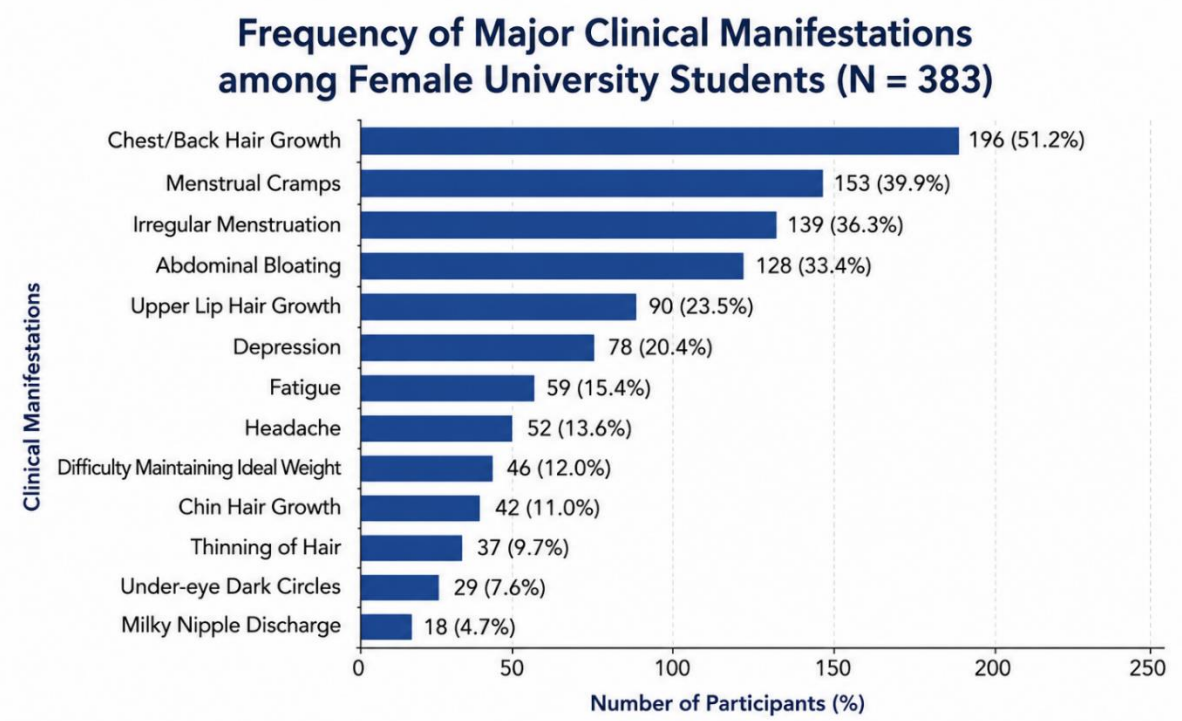


Figure 4. Frequency of Major Clinical Manifestations

Association Between Demographic Variables and PCOS-Related Symptoms

The associations between demographic characteristics and PCOS-related symptoms were examined using Pearson's Chi-square test and are summarized in Table 4. Age demonstrated a statistically significant association with concerns regarding overweight status (χ^2 = 41.485, p < 0.001). Likewise, family history of PCOS was significantly associated with headache symptoms (χ^2 = 21.218, p = 0.002). Body weight showed significant associations with depression (χ^2 = 85.611, p < 0.001) and excessive hair growth (χ^2 = 26.173, p < 0.001). Furthermore, overweight and obesity were significantly associated with difficulty maintaining ideal body weight (χ^2 = 109.382, p < 0.001). Conversely, no significant association was observed between family history and upper-lip hair growth (p = 0.386) or between marital status and concern about overweight (p = 0.190).

Table 4. Association between demographic variables and PCOS-related symptoms

Variables	χ^2	df	p-value
Age × Concern about being overweight	41.485	12	<0.001
Family history × Headache	21.218	6	0.002
Weight × Depression	85.611	12	<0.001
Weight × Hair growth	26.173	4	<0.001
Obesity × Difficulty maintaining ideal weight	109.382	6	<0.001
Family history × Upper-lip hair growth	6.346	6	0.386
Marital status × Concern about overweight	16.017	12	0.190

Frontier in Medical & Health Research

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DISCUSSION

The present study determined the prevalence of polycystic ovary syndrome (PCOS) and described its associated clinical manifestations among female university students. The findings revealed that approximately one in five participants (20.9%) reported having PCOS, indicating that the disorder constitutes a substantial health concern in this population. Menstrual irregularities, menstrual cramps, excessive hair growth, abdominal bloating, depressive symptoms, fatigue, and milky nipple discharge were among the most frequently reported clinical manifestations. Furthermore, significant associations were observed between selected demographic characteristics, particularly body weight, age, and family history, and several PCOS-related symptoms. These findings reinforce the multifactorial nature of PCOS and emphasize the need for early identification and comprehensive management among young women.

The prevalence of PCOS observed in the present study is consistent with findings from several international studies conducted among university students and women of reproductive age, where prevalence estimates generally range between 10% and 25%, depending on the diagnostic criteria employed and the characteristics of the study population (2, 5, 7). Studies applying the Rotterdam diagnostic criteria often report higher prevalence than those using the NIH criteria because the Rotterdam criteria encompass a broader spectrum of clinical phenotypes (3). Comparable prevalence estimates have also been reported from South Asian countries, where genetic susceptibility, increasing obesity, sedentary lifestyles, dietary habits, and psychosocial stress contribute to the growing burden of PCOS among young women (6, 12). The present findings therefore support existing evidence that PCOS represents an important public health issue requiring greater awareness and early intervention.

The relatively high prevalence identified among university students may be attributed to several lifestyle and environmental factors associated with early adulthood. University life is frequently characterized by prolonged sedentary behavior, reduced physical activity, unhealthy dietary patterns, irregular sleep schedules, and increased academic stress, all of which may contribute to insulin resistance and endocrine dysfunction (13). Insulin resistance is considered a key mechanism in the pathogenesis of PCOS because it stimulates ovarian androgen production and suppresses hepatic synthesis of sex hormone-binding globulin, ultimately resulting in hyperandrogenism and ovulatory dysfunction (4). Consequently, university students represent a population at increased risk of developing PCOS and should be considered a priority group for preventive health initiatives.

Menstrual abnormalities were among the most prominent findings in this study. Approximately two-fifths of the participants reported irregular menstrual cycles and menstrual cramps, highlighting the reproductive consequences of ovulatory dysfunction. Menstrual irregularities are widely recognized as one of the earliest and most common clinical manifestations of PCOS and frequently serve as the primary reason for seeking medical care (3, 4). Similar observations have been reported by Azziz et al. and Teede et al., who identified chronic anovulation and menstrual dysfunction as hallmark features of the syndrome (2, 3). Persistent menstrual disturbances may adversely affect fertility and increase the long-term risk of endometrial hyperplasia and other gynecological complications if left untreated (14).

Hyperandrogenic manifestations were also frequently reported in the present study. Excessive hair growth involving the chest, back, upper lip, chin, and abdomen was common among participants, reflecting one of the characteristic clinical features of PCOS. Hyperandrogenism develops because of increased ovarian androgen secretion combined with reduced concentrations of sex hormone-binding globulin, leading to elevated levels of biologically active testosterone (4). Previous epidemiological studies have similarly demonstrated that hirsutism is one of the most prevalent manifestations of PCOS and often contributes to delayed diagnosis because many women initially perceive these symptoms as cosmetic rather than endocrine problems (5, 9). Recognition of these manifestations is therefore

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essential for facilitating timely diagnosis and intervention.

In addition to reproductive symptoms, several participants reported abdominal bloating, fatigue, and depressive symptoms. Although these manifestations are frequently regarded as secondary complaints, emerging evidence suggests that hormonal imbalance, chronic low-grade inflammation, insulin resistance, and metabolic dysfunction collectively contribute to these clinical features (15). Depression has been consistently reported to occur more frequently among women with PCOS than among women without the condition, reflecting the complex interaction between endocrine abnormalities, physical symptoms, and psychosocial factors (11). These findings support the concept that PCOS should be managed as a multisystem disorder requiring comprehensive clinical evaluation rather than focusing exclusively on reproductive dysfunction.

Body weight demonstrated significant associations with several PCOS-related manifestations in the present study. Participants with higher body weight experienced significantly greater frequencies of depressive symptoms, excessive hair growth, and difficulty maintaining an ideal body weight. These findings are consistent with previous research demonstrating that obesity exacerbates insulin resistance, hyperinsulinemia, and hyperandrogenism, thereby intensifying both metabolic and reproductive abnormalities associated with PCOS (4, 10). Excess adipose tissue further contributes to chronic inflammation and hormonal dysregulation, worsening symptom severity. Consequently, lifestyle modification through weight management, balanced nutrition, and regular physical activity remains a fundamental component of evidence-based PCOS management.

Age and family history were also significantly associated with selected clinical manifestations. Participants with a positive family history were more likely to report headache symptoms, while increasing age was associated with greater concern regarding overweight status. Familial clustering of PCOS has been well documented in previous genetic and epidemiological studies, supporting the role of inherited susceptibility in disease development (16). However, genetic predisposition alone is insufficient to explain disease occurrence, as environmental and lifestyle factors substantially influence the clinical expression and severity of the syndrome. These findings further highlight the multifactorial etiology of PCOS and the importance of addressing modifiable risk factors alongside genetic susceptibility.

The findings of the present study emphasize the importance of early identification of PCOS among university students. Many young women consider irregular menstruation, excessive hair growth, or weight gain to be normal physiological variations and therefore delay seeking medical attention. Educational institutions provide an ideal setting for implementing reproductive health education, awareness campaigns, and screening initiatives aimed at improving recognition of early symptoms and facilitating timely referral to healthcare professionals. Early diagnosis, combined with multidisciplinary management involving gynecologists, endocrinologists, physiotherapists, nutritionists, and mental health practitioners, may reduce the long-term reproductive, metabolic, and cardiovascular complications associated with PCOS.

The present study has several strengths. It provides one of the few recent assessments of PCOS prevalence and associated clinical manifestations among female university students in Pakistan. The relatively large sample size and comprehensive assessment of demographic characteristics and clinical symptoms contribute to the robustness of the findings. Nevertheless, certain limitations should be acknowledged. The cross-sectional design limits the ability to establish causal relationships, while the use of convenience sampling may reduce the generalizability of the findings to other populations. In addition, the diagnosis of PCOS and the reported clinical manifestations were based primarily on self-reported information, which may have introduced recall and reporting bias. Furthermore, the presence of PCOS was determined based on participants' self-reported previous diagnosis and was not independently confirmed using standardized diagnostic criteria, hormonal

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investigations, or ultrasonographic examination. Therefore, some degree of misclassification bias may have occurred, which could have influenced the estimated prevalence of PCOS. Future multicenter studies incorporating biochemical investigations, hormonal profiling, ultrasonographic confirmation, and probability-based sampling are recommended to provide more accurate estimates of PCOS prevalence and to further elucidate its clinical and metabolic characteristics among young women.

Clinical Implications

The findings of this study have several important clinical implications. The relatively high prevalence of PCOS among female university students highlights the need for early identification and routine screening within educational institutions. Healthcare professionals, including gynecologists, endocrinologists, primary care physicians, physiotherapists, nutritionists, and mental health practitioners, should adopt a multidisciplinary approach to the management of PCOS. Lifestyle interventions focusing on weight management, regular physical activity, healthy dietary habits, and psychological support should be incorporated into routine care to improve reproductive, metabolic, and psychological health outcomes. Universities should also implement awareness programs to educate young women about the early signs and symptoms of PCOS, encouraging timely medical consultation and appropriate referral. Early diagnosis and individualized management may reduce disease progression and decrease the risk of long-term complications such as infertility, type 2 diabetes mellitus, metabolic syndrome, cardiovascular disease, and other endocrine disorders.

CONCLUSION

Polycystic ovary syndrome (PCOS) is a common endocrine disorder among female university students, with approximately one in five participants reporting a diagnosis of the condition. Menstrual irregularities, menstrual cramps, excessive hair growth, abdominal bloating, fatigue, and depressive symptoms were among the most frequently reported clinical manifestations, highlighting the substantial clinical burden of the disorder in this population. Significant associations between body weight, age, family history, and selected PCOS-related symptoms further emphasize the multifactorial nature of PCOS and the influence of demographic and clinical factors on symptom presentation. The findings underscore the importance of early identification and comprehensive management of PCOS among young women. Routine screening programs, reproductive health education, lifestyle modification, nutritional counseling, and timely referral to appropriate healthcare professionals may facilitate earlier diagnosis, improve reproductive, metabolic, and psychological health outcomes, and reduce the risk of long-term complications such as infertility, type 2 diabetes mellitus, metabolic syndrome, and cardiovascular disease. Future multicenter studies employing probability sampling, biochemical investigations, and ultrasonographic confirmation are recommended to provide more accurate estimates of PCOS prevalence and to further investigate the clinical and metabolic characteristics of affected women in diverse populations

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