

Study on the proportion and determinants of polycystic ovarian syndrome among health sciences students in South India

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Abstract

Introduction: Polycystic ovarian syndrome (PCOS) constitutes most cases of endocrine disorder among females. **Objectives:** This study was done to assess the proportion of university students with PCOS and to study its risk factors. **Materials and Methods:** Data were collected from students of a private medical, dental, and nursing college using a self-administered questionnaire. Height and weight of all participants were recorded by standard procedures. **Results:** The mean age of students was 20.4 ± 1.5 years. Of the 480 participants, 39 (8.1%) were already diagnosed with PCOS. Out of the remaining 441 participants, 40 (9.1%) were at high risk, and 401 (90.9%) were at low risk for PCOS. Greater proportion of PCOS cases was seen in the age group 23-25 years ($P = 0.026$), among those with family history of PCOS ($P = 0.002$), among those who were permanent residents of urban areas ($P = 0.048$), and among those who were overweight or obese ($P = 0.004$). About 90% of PCOS cases and those at high risk for PCOS, each had difficulty in controlling excess weight or were experiencing difficulty in maintaining ideal weight. About 36 (92.3%) of PCOS cases and all those at high risk had emotional problems such as feeling moody or experiencing fatigability over the previous 2 weeks. **Conclusion:** PCOS is a common disorder among young women in this settings and this warrants periodic screening activities. A multidisciplinary approach is required to bring about lifestyle modification and help those with emotional problems due to this endocrine disorder.

Key words: Polycystic ovarian syndrome, risk factors, university students

INTRODUCTION

Polycystic ovarian syndrome (PCOS) constitutes most cases of endocrine disorder among females.^[1] It affects approximately 4-6% of adolescent girls and young women.^[2]

This syndrome constitutes a variable combination of menstrual irregularity, hirsutism, acne, and obesity.^[3] Women with this condition are known to have an average

of about five visits to different consultants before actual diagnosis.^[4] They would have consulted a gynecologist for menstrual irregularity and infertility, physician for obesity, dietician for nutritional counseling, dermatologist for hair and skin ailments, and psychiatrist for depression as a result of body image disturbances. Each time they get treated for isolated morbidities, further delaying the diagnosis of this multidimensional syndrome.^[5] PCOS

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accounts for significant healthcare costs,^[6] distress and has been found to impact quality of life of patients.^[7] Even though a common problem among women, it is a complex trait with unclear etiology.^[8-10] A number of cases in the community also remain undiagnosed.^[5,11-13] Thus, risk assessment in the form of a survey would be the ideal strategy to identify this condition early so as to encourage young women to seek timely treatment and prevent its long-term complications. Studies during early adulthood would also provide new insights about natural history of the disease and might also reveal any different insights of its health risks.^[14] With this background, this study was done to assess the proportion of university students with PCOS and to study its risk factors in a coastal city in South India.

MATERIALS AND METHODS

This cross-sectional study was done in a private medical, dental, and nursing college in Mangalore City situated in Karnataka State of South India in February 2014. Approval was taken from the Institutional Ethics Committee.

Based on the findings of a previous study,^[15] where proportion of college students with PCOS was 9.13%, the sample size of 956 was calculated at 95% confidence level and relative precision of 20%. The sample size was then adjusted for finite population to 436 by assuming the total female students in all these colleges to be 800. Adding a nonresponse rate of 10%, the final sample size was calculated as 480 students. The sample was further stratified into 300 medical, 100 dental, and 80 nursing students' proportion to their population size at these colleges. Using convenience sampling method, all participants who gave written informed consent were enrolled for this study. A total of 510 participants took part in this study. Students who were known case of thyroid disorders, Cushing's syndrome, and who were nonconsenting were excluded from this study.

Use of a simple questionnaire-based survey was found to be sufficient and appropriate tool for initial screening for PCOS.^[16] As there is no validated tool available for making clinical diagnosis of PCOS,^[17] a modified version of the Cronin *et al.* questionnaire^[18] was used in this study.

The final version of the instrument after item reduction, for most important parameters to assess risk of PCOS, had 10 items from four domains, namely menstrual problems, weight, skin problems, and hair distribution.^[5,19] Each item was rated on a 7-point Likert scale, in which level of functioning when poorest was scored as 7 and when optimal without any problem was scored as 1. Question on acne was scored nil when absent, one for mild, two for

moderate, and three for severe. Questions on skin changes and variation of pimples with menstrual cycle were scored 1 if present and 0 if absent. The time frame was set as past 2 weeks for most items in the questionnaire. However, for few items such as menstrual and weight-related problems, the time frame was referred to previous 6 months.

The schedule also contained questions relating to the sociodemographic information of the participant, awareness, and source of information about PCOS, age at menarche, family history of PCOS, and other related comorbidities. Two items to assess emotional problems such as feeling moody or easy fatigability were also added to the questionnaire designed in a 7-point Likert scale. Questionnaire was content validated by experts and later pretested among ten students before its use in this study.

Range of scores (allotted to the 10 items) from 7 to 32 was categorized as low risk and from 33 to 54 as high-risk status for PCOS among participants. No invasive procedure for the diagnosis of PCOS was used in this study as the diagnostic criteria for PCOS in adults may be controversial in youngsters. This primarily because the diagnostic pathological features in adults may be normal physiological pubertal events in younger age groups.^[20,21] Height was recorded using a stadiometer, and weight was recorded using a standard weighing scale. Body mass index (BMI) was categorized as per Asian classification.

Data were entered and analyzed using SPSS Inc., version 17.0, Illinois, USA. Test of association between various determinants with risk/presence of PCOS among students was done using Chi-square test. $P \leq 0.05$ was taken as the cutoff for significant association.

RESULTS

Of the 510 participants who took part in this study, 25 were excluded as there were known cases of thyroid disorders and five were excluded as their forms were incomplete. The mean age of the rest 480 participants was 20.4 ± 1.5 years ranging from 18 to 25 years. Majority of these participants were medical students (298 [62.1%]) and were from urban areas (428 [89.2%]) [Table 1].

All participants had heard about this disease. The most common source of information about PCOS was from doctors (192 [40%]), friends (93 [19.4%]), internet (37 [7.7%]), books (33 [6.9%]), relatives (23 [4.8%]), newspapers (18 [3.8%]), and television (7 [1.5%]).

Of the 480 participants, 39 (8.1%) were already diagnosed with PCOS. Among them, 24 (61.5%) were not on any

medications, 9 (23.1%) were on hormonal treatment with either progesterone or estrogen, 4 (10.3%) were on metformin, and 2 (5.1%) underwent surgery.

Among the rest 441 participants, 40 (9.1%) were at high risk and 401 (90.9%) were at low risk for PCOS.

PCOS cases were significantly more in the age group 23-25 years ($P = 0.026$), among those with family history of PCOS ($P = 0.002$), those who were permanent residents of urban areas ($P = 0.048$), and participants who were overweight or obese ($P = 0.004$) [Table 2].

Family history of PCOS was reported by 27 participants. History was reported positive among mothers in six, sisters in ten, cousins in seven, aunts in three, and relative in one case by the participants.

Hyperpigmented patches over the skin were reported by 11 (28.2%) PCOS cases, and it was significantly associated with the presence of PCOS ($P < 0.001$). Hirsutism was reported by 35(89.7%) PCOS cases, and

its presence was significantly associated with PCOS ($P < 0.001$) [Table 3].

Table 1: Sociodemographic and body mass index distribution of study participants

Characteristics	n (%)
Age (years)	
≤19	143 (29.8)
20	132 (27.5)
21	108 (22.5)
22	56 (11.7)
≥23	41 (8.5)
Course	
Medicine	298 (62.1)
Dentistry	99 (20.6)
Nursing	83 (17.3)
Native place	
Urban area	428 (89.2)
Rural area	52 (10.8)
BMI	
Underweight	59 (12.3)
Normal	329 (68.5)
Overweight	85 (17.7)
Obese	7 (1.5)
Total	480 (100.0)

BMI: Body mass index

Table 2: Association between sociodemographic variables and body mass index with polycystic ovarian syndrome risk status among participants

Characteristics	Low risk of PCOS	High risk of PCOS	Confirmed cases	Total	χ^2, P
Age (years)					
≤19	124 (86.7)	10 (7)	9 (6.3)	143	26, 0.026
20	106 (80.3)	13 (9.9)	13 (9.8)	132	
21	92 (85.2)	8 (7.4)	8 (7.4)	108	
22	47 (83.9)	5 (8.9)	4 (7.2)	56	
≥23	32 (78)	4 (9.8)	5 (12.2)	41	
Age at menarche					
≤10	11 (78.6)	3 (21.4)	0 (0)	14	10.7, 0.383
11	43 (75.4)	7 (12.3)	7 (12.3)	57	
12	102 (81.6)	10 (8)	13 (10.4)	125	
13	132 (85.2)	12 (7.7)	11 (7.1)	155	
14	76 (86.4)	7 (7.9)	5 (5.7)	88	
≥15	37 (90.2)	1 (2.4)	3 (7.4)	41	
Family history of PCOS					
Yes	18 (66.7)	2 (7.4)	7 (25.9)	27	12.2, 0.002
No	383 (84.5)	38 (8.4)	32 (7.1)	453	
Family history of infertility					
Yes	25 (80.6)	2 (6.5)	4 (12.9)	31	1.11, 0.575
No	376 (83.7)	38 (8.5)	35 (7.8)	449	
Family history of breast cancer					
Yes	31 (83.8)	5 (13.5)	1 (2.7)	37	2.74, 0.254
No	370 (83.5)	35 (7.9)	38 (8.6)	443	
Family history of ovarian cancer					
Yes	5 (62.5)	2 (25)	1 (12.5)	8	3.33, 0.189
No	396 (83.9)	38 (8.1)	38 (8.1)	472	
Native place					
Urban area	352 (82.2)	40 (9.3)	36 (8.4)	428	6.1, 0.048
Rural area	49 (94.2)	0 (0)	3 (5.8)	52	
BMI					
Under weight	56 (94.9)	3 (5.1)	0 (0)	59	15.6, 0.004
Normal	277 (84.2)	28 (8.5)	24 (7.3)	329	
Overweight/obesity	68 (73.9)	9 (9.8)	15 (16.3)	92	
Total	401	40	39	480	

BMI: Body mass index, PCOS: Polycystic ovarian syndrome

As many as 36 (90%) participants at high risk and 34 (87.2%) PCOS cases had difficulty to control excess weight, whereas 37 (92.5%) at high risk and 36 (92.3%) PCOS cases had difficulty to maintain ideal weight over the previous 6 months. These items were also significantly associated with the presence of PCOS ($P < 0.001$) [Table 4].

As many as 34 (87.2%) PCOS cases had irregular menstrual periods and 33 (84.6%) had menstrual cramps during the previous 6 months. Presence of these symptoms was significantly associated with the presence of PCOS ($P < 0.001$) [Table 5].

Among PCOS cases, 36 (92.3%) each had emotional problems such as feeling moody or easy fatigability over the previous 2 weeks and presence of these symptoms were significantly associated with the presence of PCOS ($P < 0.001$). All cases at high risk of PCOS also had emotional problems [Table 6].

DISCUSSION

In this study, 8.1% of university students were confirmed cases of PCOS. In other Indian studies, it was 15% among university students in a study done in Kottayam, Kerala,^[22] and 3.7% among university students in Lucknow, India.^[19] Among preuniversity college students, it was reported by 9.13% in a study done in Andhra Pradesh,^[15] and 9.8% in a study done in Trivandrum, Kerala.^[20] However, the prevalence of PCOS among university students in Korea was only 4.9%.^[23] The reason for a greater proportion of PCOS in Indian population could be the greater prevalence of insulin resistance which is central to the pathogenesis of PCOS.^[19]

It is important that every such diagnosed cases have to be made fully aware of their condition, and they require support from various groups for improving their quality of life. The support should be in relation to overcoming depression, weight management, and medication therapy.

Table 3: Association between dermatological ailments with level of risk of polycystic ovarian syndrome among participants

Symptoms	Low risk	High risk	Confirmed cases	Total	χ^2, P
Brownish/blackish discoloration of skin					
Yes	39 (64)	11 (18.0)	11 (18.0)	61	19.5, 0.001
No	362 (86.4)	29 (6.9)	28 (6.7)	419	
Acne					
Absent	165 (85.4)	14 (7.3)	14 (7.3)	193	6.32, 0.389
Mild	167 (85.6)	15 (7.7)	13 (6.7)	195	
Moderate	64 (75.3)	10 (11.8)	11 (12.9)	85	
Severe	5 (71.4)	1 (14.3)	1 (14.3)	7	
Variation of pimples with menstrual cycles					
Yes	121 (81.8)	12 (8.1)	15 (10.1)	148	1.16, 0.56
No	280 (84.4)	28 (8.4)	24 (7.2)	332	
Body hair distribution					
Severe problem	2 (20)	2 (20)	6 (60)	10	155.1, 0.001
Major problem	8 (61.5)	4 (30.8)	1 (7.7)	13	
Moderate problem	25 (51)	17 (34.7)	7 (14.3)	49	
Some problem	20 (55.6)	6 (16.7)	10 (27.8)	36	
Little problem	72 (87.8)	8 (9.8)	2 (2.4)	82	
Hardly any problem	106 (90.6)	2 (1.7)	9 (7.7)	117	
No problem	168 (97.1)	1 (0.6)	4 (2.3)	173	
Hair on the face					
Severe problem	1 (12.5)	1 (12.5)	6 (75)	8	168.5, 0.001
Major problem	4 (50)	1 (12.5)	3 (37.5)	8	
Moderate problem	16 (44.4)	15 (41.7)	5 (13.9)	36	
Some problem	16 (53.3)	7 (23.3)	7 (23.3)	30	
Little problem	47 (77)	8 (13.1)	6 (9.8)	61	
Hardly any problem	86 (87.8)	5 (5.1)	7 (7.1)	98	
No problem	231 (96.7)	3 (1.2)	5 (2.1)	239	
Hair on the upper lip					
Severe problem	1 (12.5)	2 (25)	5 (62.5)	8	138.2, 0.001
Major problem	6 (54.5)	3 (27.3)	2 (18.2)	11	
Moderate problem	23 (48.9)	16 (34)	8 (17)	47	
Some problem	19 (63.3)	4 (13.3)	7 (23.3)	30	
Little problem	49 (80.3)	9 (14.8)	3 (4.9)	61	
Hardly any problem	106 (88.3)	4 (3.3)	10 (8.3)	120	
No problem	197 (97)	2 (1)	4 (2)	203	
Total	401	40	39	480	

Table 4: Association between domain related to weight with risk status of polycystic ovarian syndrome among participants

Issues related to weight control	Low risk	High-risk status	Confirmed cases	Total	χ^2, P
Trouble to control excess weight					
All of the time	8 (40)	6 (30)	6 (30)	20	92.7, 0.001
Most of the time	29 (74.4)	7 (17.9)	3 (7.7)	39	
Good bit of the time	18 (48.6)	9 (24.3)	10 (27)	37	
Some of the time	42 (76.4)	7 (12.7)	6 (10.9)	55	
A little bit of the time	53 (91.4)	2 (3.4)	3 (5.2)	58	
Hardly any of the time	52 (82.5)	5 (7.9)	6 (9.5)	63	
None of the time	199 (95.7)	4 (1.9)	5 (2.4)	208	
Difficulty in staying in ideal weight					
All of the time	22 (55)	10 (25)	8 (20)	40	74.8, 0.001
Most of the time	24 (60)	10 (25)	6 (15)	40	
Good bit of the time	25 (71.4)	3 (8.6)	7 (20)	35	
Some of the time	49 (83)	7 (11.9)	3 (5.1)	59	
A little bit of the time	45 (84.9)	2 (3.8)	6 (11.3)	53	
Hardly any of the time	67 (85.9)	5 (6.4)	6 (7.7)	78	
None of the time	169 (96.6)	3 (1.7)	3 (1.7)	175	
Total	401	40	39	480	

Table 5: Association between domain related to menstrual problems with risk status of polycystic ovarian syndrome among participants

Menstrual problems	Low risk	High-risk status	Confirmed cases	Total	χ^2, P
Irregular menstrual periods					
Severe problem	7 (28)	5 (20)	13 (52)	25	150.1, 0.001
Major problem	16 (48.5)	9 (27.3)	8 (24.2)	33	
Moderate problem	27 (71.1)	7 (18.4)	4 (10.5)	38	
Some problem	30 (68.2)	9 (20.4)	5 (11.4)	44	
Little problem	46 (86.8)	3 (5.7)	4 (7.5)	53	
Hardly any problem	76 (98.7)	1 (1.3)	0 (0)	77	
No problem	199 (94.8)	6 (2.9)	5 (2.4)	210	
Menstrual cramps					
Severe problem	27 (60)	13 (28.9)	5 (11.1)	45	58.6, 0.001
Major problem	54 (77.1)	7 (10)	9 (12.9)	70	
Moderate problem	48 (71.6)	12 (17.9)	7 (10.4)	67	
Some problem	49 (83)	5 (8.5)	5 (8.5)	59	
Little problem	81 (92)	1 (1.1)	6 (6.9)	88	
Hardly any problem	60 (96.8)	1 (1.6)	1 (1.6)	62	
No problem	82 (92.1)	1 (1.1)	6 (6.8)	89	
Total	401	40	39	480	

In this study, the probable number of cases with PCOS among the 441 unconfirmed participants was 9.1% which was lower than that detected in studies done among university students in Lucknow, India,^[19] (13.1%) and in Udupi, India^[12] (13.6%).

In a study done in Korea among university students, 20% cases with PCOS were obese in comparison to 38.5% cases found to be either overweight or obese in this study.^[23] In a study done in Trivandrum, India, among PUC students, 8.6% PCOS cases were overweight and 2.6% were obese.^[20]

BMI was significantly higher in students confirmed with PCOS in this study as also observed in the study done in Korea.^[23] However, the study done in Trivandrum, India, reported no association.^[20] Previous studies have reported that young women with PCOS described excessive weight

as the factor that had the greatest impact on their quality of life.^[5,24] This concern was expressed by PCOS patients to be even more concerning than other issues such as menstrual problems.^[5]

The BMI was also significantly associated with high risk of PCOS among participants in this study. However, no association was seen in another study done in Udupi, India.^[12] Previous studies have found that a minimal loss of weight of 5% was sufficient to help in restoring menstrual cycle regularity and ovulation by lowering androgen levels as well as by reducing the insulin resistance. The overall mental well-being was also found to improve.^[25,26] These observations support the importance of weight control in improving the clinical condition in PCOS. In this study also significantly greater proportion of PCOS cases and participants at high risk for PCOS reported trouble in

Table 6: Association with domain related to emotional problems with risk status of polycystic ovarian syndrome among participants

Emotional problems	Low risk	High risk	Confirmed cases	Total	χ^2, P	
Moody						
Severe problem	11 (57.9)	7 (36.8)	1 (5.3)	19	75.7, 0.001	
Major problem	30 (71.5)	4 (9.5)	8 (19)	42		
Moderate problem	58 (66.7)	17 (19.5)	12 (13.8)	87		
Some problem	76 (82.6)	12 (13)	4 (4.4)	92		
Little problem	102 (93.6)	0 (0)	7 (6.4)	109		
Hardly any problem	66 (94.3)	0 (0)	4 (5.7)	70		
No problem	58 (95.1)	0 (0)	3 (4.9)	61		
Feeling easily tired						
Severe problem	8 (36.4)	11 (50)	3 (13.6)	22		86.0, 0.001
Major problem	18 (69.2)	3 (11.5)	5 (19.3)	26		
Moderate problem	60 (73.2)	12 (14.6)	10 (12.2)	82		
Some problem	72 (80.9)	10 (11.2)	7 (7.9)	89		
Little problem	89 (91.7)	3 (3.1)	5 (5.2)	97		
Hardly any problem	79 (91.9)	1 (1.1)	6 (7)	86		
No problem	75 (96.2)	0 (0)	3 (3.8)	78		
Total	401	40	39	480		

controlling excess weight and difficulty in staying at ideal weight. PCOS though an incurable condition is controllable with healthy lifestyle choices. Hence, a lifestyle modification program that promotes healthy diet, exercise, and that which supports behavioral change is the best first line treatment for PCOS.^[27,28]

In this study, 34 (87.2%) PCOS cases had irregular menstrual periods as compared to the study done in Lucknow, India, where all the confirmed cases had this problem.^[19]

In this study, among PCOS cases, acne was present in 64.1% cases and variation in pimples with menstrual cycle in 38.5% cases. In a study done in Trivandrum, India, among PUC students, 50% of PCOS cases had acne but was not associated with PCOS which was similar to our findings.^[20]

In this study, 89.7% participants already diagnosed with PCOS had hirsutism which was much higher than the observations of other studies where it was found in

11.4%^[20] and 20%^[23] college students. This is another concern in the management of PCOS as hirsute women have been found to have greater emotional problems such as having low self-esteem, feeling moody, worried, and depressed.^[5]

Emotional problems were present in 92.3% cases with PCOS and all cases at high risk of PCOS which supports the need for counseling services in the management of this condition.

In this study, family history of PCOS was significantly associated with development of PCOS. Increased frequency of PCOS in first-degree relatives of affected women has been supported by genetic studies. These studies have proposed several candidate genes involved in the development of this heterogeneous syndrome.^[29]

CONCLUSION

From the observations in this study, it is clear that PCOS is a common disorder among young women. Therefore, periodic screening is required particularly for those with positive family history of PCOS. This will enable early diagnosis of this condition so as to facilitate prompt referral and management to prevent long-term complications. Lifestyle modification for weight reduction and dietary modification along with counseling services for addressing emotional problems should support other management options. Hence, a multidisciplinary approach involving professionals is required to manage young women with this endocrine disorder.

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Conflicts of interest

There are no conflicts of interest.

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