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Original Research Article

Prevalence and clinical manifestations of polycystic ovarian syndrome among adolescent and adult women in Davangere, Karnataka

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ABSTRACT

Background: The prevalence of a disease in a particular region is always a necessary tool for any control measures. There are no full-fledged published data on PCOS prevalence and clinical manifestation patterns in our study setting geographic location. This study aimed to study the prevalence and clinical manifestation of PCOS among adolescents and adult women.
Methods: This is a prospective cross-sectional observational study conducted with total of 426 participants. A structured questionnaire was given to all the participants and collected data was assessed. Questionnaire included the following components; (i) Knowledge assessment, (ii) Anthropometric assessment, (iii) Clinical history, and (iv) Menstrual history included irregularity as well as presence of oligomenorrhea after one year of menarche, wait gain and hirsutism/ androgen production assessment (skin problems, and hair distribution).
Results: 27% of adolescent PCOS cases were found to be in the age group of 10-18 years. While, 11% of adult women with PCOS were found to be in the age group of 19-45 years. Majority of the study participants with PCOS were found to be obese (49.1%) followed be overweight (31.7%), and non-obese (19.2%) indicating an association of BMI with PCOS. Majority of the PCOS cases i.e., 37.3% were presented with acne/oily skin followed by alopecia (17.4%), mood swings/depression (16.8%), pigmentation (16.1%), and hirsutism (12.4%).
Conclusions: PCOS is increasingly encountered during adolescence with clinical manifestation of acne/oily skin in our study setting. Furthermore, PCOS was associated with overweight and obesity. Therefore, our study is indicative of the fact that all overweight and/or obese adolescence with acnes and/or oily skin should be screened for PCOS for early diagnosis and management.

Keywords: Adolescence, Acne, Hirsutism, Obese, Overweight, PCOS

INTRODUCTION

Gynaecological disorders are commonly encountered in clinical practice and frequently begin to manifest during adolescence as a result of physiological maturation, hormonal fluctuations, psychological influences, and evolving lifestyle patterns. When such conditions are unrecognized or inadequately managed, they may progress and contribute to long-term reproductive complications including subfertility or infertility. Among these disorders, polycystic ovarian syndrome (PCOS), also known as Stein-Leventhal syndrome, represents one of the most prevalent endocrine disorders affecting women. PCOS is characterized by hormonal dysregulation that interferes with normal ovarian physiology during the reproductive years. These endocrine disturbances impair follicular development and ovulatory function, resulting in the accumulation of multiple immature follicles within the ovaries. Ultrasonographic findings typically reveal enlarged ovaries with numerous small follicles arranged

peripherally, producing the characteristic "string of pearls" or "necklace" appearance. The condition may develop as early as adolescence and is most frequently observed among women of reproductive age.[1]

PCOS is recognized as a complex and heterogeneous disorder with diverse clinical manifestations. Although it predominantly affects women in their reproductive years, the syndrome may also occur in adolescents and occasionally persist beyond menopause.[2] The prevalence of PCOS among women of reproductive age has been estimated to range between 15% and 20%, although the reported rates vary widely depending on the population studied and the diagnostic criteria applied.[3] Several epidemiological studies have reported prevalence rates ranging from 2.2% to 26% among women aged 18-45 years. In adolescents aged 10-19 years, confirmed PCOS cases are estimated to occur in approximately 5-10% of individuals, with higher prevalence when undiagnosed but symptomatic individuals are included according to established criteria.[4] The etiology of PCOS is multifactorial and is believed to involve an interaction between genetic susceptibility, hormonal imbalance, metabolic disturbances, and environmental or lifestyle-related influences.[5]

Hyperandrogenism is a hallmark feature of PCOS and is frequently accompanied by alterations in the secretion of gonadotropin-releasing hormone (GnRH). These hormonal abnormalities contribute to a range of clinical manifestations including menstrual irregularities, hirsutism, acne, and infertility. Women affected by PCOS often exhibit elevated androgen levels, which disrupt normal ovarian function and ovulation. Menstrual disturbances such as oligomenorrhea and amenorrhea are particularly common among adolescents with PCOS.[6] In addition to reproductive abnormalities, individuals with PCOS are at increased risk for metabolic complications such as insulin resistance, metabolic syndrome, impaired glucose tolerance, and type 2 diabetes mellitus. These metabolic abnormalities may occur even in individuals without obesity or overt insulin resistance.[7] Nevertheless, obesity is frequently observed in women with PCOS and may exacerbate both endocrine and metabolic disturbances. A positive family history of obesity, diabetes mellitus, thyroid disorders, or PCOS further supports a possible genetic predisposition for the syndrome. Additionally, modern lifestyle factors including unhealthy dietary patterns, sedentary habits, environmental exposures, and psychosocial stress are increasingly recognized as contributing factors in the development and progression of PCOS.[6]

The clinical manifestations of PCOS commonly include irregular menstrual cycles, hirsutism, acne, and weight gain.[8] Diagnostic evaluation typically involves laboratory assessment of hormonal parameters including testosterone, luteinizing hormone (LH), follicle-stimulating hormone (FSH), and insulin levels. Women with PCOS frequently demonstrate elevated androgen concentrations, increased LH levels, and an elevated LH/FSH ratio.[9] Imaging studies such as transvaginal ultrasonography may reveal enlarged ovaries containing multiple small follicles. The Rotterdam criteria remain the most widely accepted diagnostic framework for PCOS and require the presence of at least two of the following three features: oligo- or anovulation, clinical or biochemical evidence of hyperandrogenism, and polycystic ovarian morphology on ultrasound.[10] Despite the availability of these diagnostic guidelines, variability in clinical presentation and diagnostic interpretation continues to pose challenges in establishing a definitive diagnosis. Depending on the clinical profile and associated risk factors, further investigations such as lipid profile, liver function tests, and cardiovascular risk assessment may also be recommended.[11]

Acne vulgaris is a chronic inflammatory disorder involving the pilosebaceous unit and is commonly observed during puberty and early adulthood. According to epidemiological studies, acne affects nearly 80% of individuals between the ages of 11 and 30 years, making it one of the most prevalent dermatological conditions worldwide.[12] The severity of acne may range from mild comedonal lesions to severe inflammatory forms that can lead to permanent scarring, post-inflammatory hyperpigmentation, and considerable psychological distress.[13] In recent years, acne has increasingly been recognized not only as a dermatological condition but also as a possible clinical manifestation of underlying systemic disorders, particularly endocrine abnormalities such as PCOS.[14-16]

Diagnosing PCOS during adolescence presents unique clinical challenges. Many physiological changes associated with normal puberty including hormonal fluctuations, irregular ovulatory cycles, and multifollicular ovarian morphology can overlap with the diagnostic features of PCOS. This overlap makes it difficult to distinguish normal pubertal development from early manifestations of the syndrome.[17] Consequently, the application of diagnostic criteria developed for adult women may lead to overdiagnosis or misclassification in adolescents.[18] Nevertheless, early identification of PCOS is essential because timely lifestyle modification and appropriate clinical management during adolescence can reduce the risk of long-term metabolic and reproductive complications.[7] Given the heterogeneous nature of the disorder, early recognition requires careful clinical assessment and appropriate diagnostic evaluation.

Furthermore, understanding the regional prevalence and clinical characteristics of PCOS is essential for developing effective healthcare strategies. However, comprehensive data regarding the prevalence and clinical manifestations of PCOS in the local population remain limited. Therefore, the present study was undertaken to determine the prevalence and clinical manifestations of PCOS among adolescents and adult women attending the Gynaecology outpatient department.

METHODS

Study design and patients

This is a prospective cross-sectional observational study conducted with total of 426 participants attended OPD at Department of Obstetrics and Gynaecology, S. S. Institute of Medical Science and Research Centre (SSIMRC) Davangere, Karnataka. This study was done was done between March 2024 and February 2025. The ethical committee approval and written informed consent were obtained before the conduct of study.

Inclusion criteria

Inclusion criteria consisted adolescent girls aged between 10-19 years, and not married, adolescent girls that had attained menarche, women aged between 20-45 years and not pregnant.

Exclusion criteria

Exclusion criteria consisted participants with thyroid disorders hyperprolactinemia Cushing's syndrome**,** married and pregnant adolescents/women**,** and women who were not willing to participate.

PCOS was defined by Rotterdam's criteria having presence of any two of the following three features: 1) Oligo/amenorrhea: Absence of menstruation for 45 days or more and/or less than 8 menses per year, 2) Clinical hyperandrogenism: Modified Ferriman and Gallway (mFG) score of 8 or higher, 3) Polycystic ovaries: Presence of more than 10 cysts, 2-8mm in diameter, usually combined with increased ovarian volume of more than 10cm^3, and an echo-dense stroma in pelvic ultrasound scan.

Data collection and assessment parameters

A structured questionnaire was given to all the participants. Questionnaire included the following components; (i) Knowledge assessment, (ii) Anthropometric assessment, (iii) Clinical history, and (iv) Menstrual history included irregularity as well as presence of oligomenorrhea after one year of menarche, weight gain and hirsutism/ androgen production assessment (skin problems, and hair distribution).

Evidence of ovulatory dysfunction included consecutive menstrual intervals of more than 90 days, 1 year after menstrual onset; menstrual intervals persistently less than 21 days or more than 45 days 2 or more years after menarche. Evidence of androgen excess included moderate to severe hirsutism; persistent acne unresponsive to topical therapy; and persistent elevation of serum total and/or free testosterone. Body mass index of up to 23 was taken as normal, between 23 to 24.9kg/m^2 was taken as overweight, and more than 25kg/m^2 was considered as obese according to the WHO criteria.

Statistical analysis

The total number of participants were 426. Data were entered in Microsoft Excel 2021 and statistical analysis was done using IBM Statistical Software for Social Sciences (SPSS) version 22. Categorical variables were represented in the form of percentages and frequencies. Continuous variables were presented as descriptive statistics (Mean and Standard deviation).

RESULTS

Total 27% of adolescent PCOS cases were found to be in the age group of 10-18 years. 11% of adult women with PCOS were found to be in the age group of 19-45 years. Total prevalence of confirmed PCOS was found to be 38% (Table 1).

Table 1: Distribution of PCOS cases based on age.

Age group in years	Frequency	Percentage
Adolescence (10-18)	115	27.0
Adult women (19-45)	46	11.0
Total	161	38.0

The results of association between PCOS cases and BMI were represented in Table 2. Results depicted that nearly half of participants with PCOS were found to be obese (49.1%) followed be overweight (31.7%), and non-obese (19.2%). Whereas, majority of participants without PCOS were found to be overweight (40%) followed by obese (30.2%), and non-obese (29.2%). These findings depicted that higher prevalence of PCOS was observed in obese and overweight patients indicating an association of BMI with PCOS.

Table 2: Association between PCOS and BMI.

Variables	PCOS	Non-PCOS
Non-obese	31 (19.2)	79 (29.8)
Overweight	51 (31.7)	106 (40.0)
Obese	79 (49.1)	80 (30.2)
Total	161 (100.0)	265 (100.0)

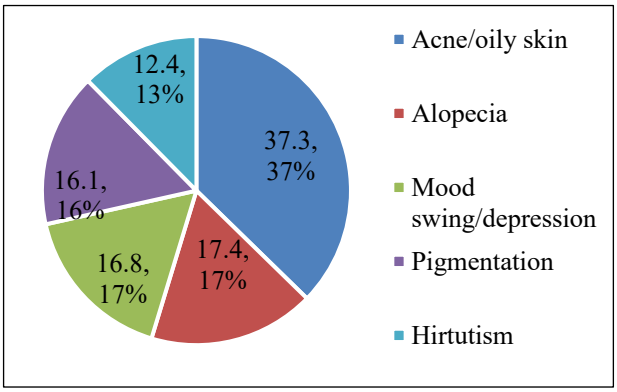

Figure 1: Distribution of PCOS cases based on clinical manifestations.

The distribution of PCOS cases based on clinical manifestations were illustrated in Figure 1. Results revealed that majority of the PCOS cases i.e., 37.3% were presented with acne/oily skin followed by alopecia (17.4%), mood swings/depression (16.8%), pigmentation (16.1%), and hirsutism (12.4%).

DISCUSSION

Polycystic ovary syndrome (PCOS) ranks among the foremost causes of female infertility because it disrupts or completely halts ovulation. As a result, many young women with PCOS encounter difficulties when trying to conceive, leading to emotional strain and complications in planning a family. Beyond fertility concerns, PCOS also heightens the long-term risk of conditions such as type 2 diabetes, cardiovascular disease, and endometrial cancer. Accordingly, young adults affected by PCOS must take proactive steps through lifestyle modifications and routine medical oversight to lessen these future health threats.[11] Reliable regional prevalence data are critical for guiding appropriate control measures, yet comprehensive reports detailing PCOS frequency and its clinical patterns in our locale remain unavailable. To fill this gap, we undertook a prospective, cross-sectional, observational study at our tertiary-care centre to determine the prevalence of PCOS and to characterise its clinical manifestations among adolescent and adult female patients.

Our study findings showed adolescent prevalence of 27%. These findings were comparable with literature studies reported by various other research investigators. Desai et al, conducted a cross-sectional study to determine prevalence, etiology of PCOS and its association with various factors in school going girls in Ahmadabad city of Gujarat state. Their findings revealed the prevalence of 13.54% PCOS in sample of adolescent girls.[6] These findings were comparatively lesser when compared with our study findings. Furthermore, the prevalence of PCOS in another study carried out by Rasht et al, was found to be 11.34%, and which was also comparatively lesser when compared to prevalence of PCOS observed among adolescents in our study.[7] Different studies in India on PCOS have reported a prevalence ranging from 3.7% to 22.5% and even up to 36% in adolescents. The significant variation in different studies is due to lack of consensus on diagnostic criteria.[19] Furthermore, the high proportion of adolescent suffering from PCOS in the present study might be due to the difference in the ethnic background of study participants.

In a recent study carried out by Ganie et al., have reported that PCOS was seen more commonly in the age group between 18 to 40 years.[20] Furthermore, in another recently conducted study by Deswal et al, showed that PCOS was seen more in the females of age group between 16 to 45 years.[21] In accordance with literature findings, in our study also 11% adult women participants with PCOS were found to be in the age group of 19-45 years.

In our study higher prevalence of PCOS was observed in obese (49.1%) and overweight (31.7%) patients as compared to non-obese participants (19.2%) indicating an association of BMI with PCOS. In concurrence with our study findings BMI was significantly higher in cases confirmed with PCOS in the study published by Joseph et al., from Karnataka state.[22] Moreover, in a study carried out by Joshi et al, in Mumbai city of Maharashtra state, reported that among those diagnosed with PCOS, 71.8% were non-obese, 7.5% cases were overweight, and 20.7% were obese.[23] These findings were more or less comparable with our study findings.

Acne vulgaris is an inflammatory disease of pilosebaceous gland that usually affects people from puberty to young adulthood. The lesions are located predominantly on the face, neck, chest and back, places with more follicles.[24] The main pathogenic factors of acne are high sebaceous gland secretion, follicular hyperproliferation, high androgen effects, *Propionibacterium acnes* colonization and inflammation.[25] The prevalence of PCOS among women with acne vary widely in the literature.[26] In our study the predominance clinical manifestation of PCOS cases was found to be acne observed in about 37.3% of PCOS cases. The reported prevalence of PCOS among acne patients in other previous studies was found to 26.9%, 28.8%, 30.0%, 48.3%, 51.2%, 52.2%, and 70%.[27-33] Other studies have also mentioned hirsutism as a significant association with PCOS among acne patients.[34,35] Concurrently, in our study 12.4% of PCOS cases were presented with hirsutism. The substantial heterogeneity of results of clinical manifestations of the current study as compared to other studies might not just be due to the different kind materials and methods used, but can also be attributed to the varied age groups, ethnic background, geographical location and, socio-economic status of the women.[36]

This study has certain limitations. Being a hospital-based study, it may be subject to selection bias. Additionally, as it was conducted at a single tertiary care center, the generalizability of the findings may be limited. There is also a possibility of diagnostic misclassification using the Rotterdam criteria. The inclusion of a wide age range may introduce heterogeneity in clinical features. Furthermore, recall bias may be present in self-reported symptoms, and asymptomatic cases in the community were not included.

CONCLUSION

PCOS is increasingly encountered during adolescence. At this age, life style modification is imperative to prevent long term metabolic and reproductive complications. Early diagnosis is important to inculcate early lifestyle modifications which will prevent metabolic and reproductive complications. Life style modifications for weight reduction and dietary modifications and psychological counselling plays important role in these young girls for preventing long term complications. One of the early steps in prevention and management of PCOS

could be to create awareness and understanding of this disorder in the community through schools and colleges.

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