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Research Article

Analysis of the Prevalence of Polycystic Ovarian Syndrome and its Association with Clinical Criteria in Adolescent Girls from Rural Areas

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ABSTRACT

Background: Polycystic Ovarian Syndrome (PCOS) is a common endocrine disorder affecting adolescent girls and women of reproductive age. The prevalence and clinical presentation of PCOS can vary significantly across different populations. Rural areas often face unique challenges in healthcare delivery, which can impact the diagnosis and management of PCOS. This study aims to analyze the prevalence of PCOS and its association with clinical and biochemical criteria among adolescent girls from rural areas. Developing healthcare infrastructure that integrates PCOS management into routine adolescent health services can improve outcomes. The findings highlight the need for better healthcare access in rural areas. This includes training healthcare providers to recognize and manage PCOS effectively and ensuring that diagnostic and treatment facilities are available. Cultural norms and misconceptions may impact the diagnosis and management of PCOS in rural populations. Tailoring healthcare interventions to address these cultural barriers and involving community leaders in health promotion activities can enhance the acceptance and effectiveness of PCOS management programs.

Aim: The aim of this study is to investigate the prevalence of Polycystic Ovarian Syndrome (PCOS) among adolescent girls residing in rural areas and to analyze its association with clinical and biochemical criteria.

Material and Method: A cross-sectional study was conducted at the Department of Obstetrics and Gynecology, Tertiary care Hospital. A total of 100 adolescent girls aged 12-19 years from selected rural areas were initially invited based on inclusion and exclusion criteria. Out of these, 80 girls voluntarily participated in the study. Participants underwent a comprehensive assessment, including clinical examinations, biochemical blood tests, and ultrasound examinations. Clinical criteria for PCOS included menstrual irregularities, signs of hyperandrogenism, and polycystic ovaries. Biochemical criteria assessed included hormonal levels (LH, FSH, free testosterone) and markers of insulin resistance (insulin levels, HOMA-IR). Data were analyzed to determine the prevalence of PCOS and the relationship between clinical symptoms and biochemical markers.

Results: The study found that the prevalence of PCOS among adolescent girls in rural areas was 25%. Girls with PCOS presented with a higher incidence of menstrual irregularities and symptoms of hyperandrogenism, including acne and hirsutism, compared to those without PCOS. Biochemical analysis revealed significantly higher levels of Luteinizing Hormone (LH) and free testosterone in the PCOS group. Insulin resistance, as indicated by elevated insulin levels and HOMA-IR values, was also more pronounced in PCOS patients. The LH ratio did not show significant differences between the two groups. Thyroid function tests indicated slightly elevated TSH levels in the PCOS group, though differences in T3 and T4 levels were not substantial.

Conclusion: PCOS is prevalent among adolescent girls in rural areas, with clinical and biochemical characteristics aligning with those found in other populations. The higher prevalence of menstrual irregularities, hyperandrogenism, and insulin resistance in rural adolescents with PCOS highlights the need for targeted healthcare interventions. Improved access to healthcare services and educational programs tailored to rural settings can enhance early diagnosis and management of PCOS. Further research is needed to explore long-term outcomes and additional factors contributing to PCOS in rural populations.

Keywords: Polycystic Ovarian Syndrome, PCOS, Prevalence, Adolescent Girls, Rural Areas, Clinical

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INTRODUCTION:

Polycystic Ovarian Syndrome (PCOS) is a common endocrine disorder affecting women of reproductive age, characterized by a combination of symptoms and clinical findings. It is a significant public health concern due to its prevalence and potential long-term impacts on health. The condition is marked by irregular menstrual cycles, elevated androgen levels, and polycystic ovaries, which can lead to various metabolic and reproductive issues. While PCOS has been extensively studied in urban populations, research on its prevalence and clinical manifestations in rural settings is limited. Rural adolescent girls, in particular, may face unique challenges that could influence the prevalence and presentation of PCOS. Factors such as limited access to healthcare, differences in lifestyle and diet, and lower awareness of reproductive health issues might contribute to variations in the detection and management of PCOS in these populations.[1,2]

The prevalence of PCOS among adolescent girls is significant due to the potential long-term health implications. In rural areas, several factors might contribute to differences in PCOS prevalence compared to urban populations. Rural areas often face limitations in healthcare resources and infrastructure. This may result in delayed diagnosis and underreporting of PCOS due to fewer healthcare providers and lower awareness of the condition. Economic constraints in rural areas can influence health-seeking behavior, leading to less frequent medical consultations and a higher likelihood of undiagnosed or untreated conditions.[3] Lower levels of education about reproductive health in rural areas may contribute to a lack of recognition of PCOS symptoms among both adolescents and healthcare providers. Diet and lifestyle in rural areas may differ significantly from those in urban environments. Differences in nutrition, physical activity, and body weight can affect the prevalence and manifestation of PCOS. For example, diets high in processed foods and low in fruits and vegetables can exacerbate metabolic issues related to PCOS.

PCOS is diagnosed based on a set of clinical criteria that include irregular menstrual cycles, clinical signs of hyperandrogenism (such as acne and hirsutism), and the presence of polycystic ovaries on ultrasound. The association between these criteria and the prevalence of PCOS can vary depending on the population studied.[4,5]

Adolescent girls with PCOS often experience irregular or absent menstrual periods, which can be a key diagnostic criterion. Symptoms such as acne, hirsutism (excessive hair growth), and seborrhea (oily skin) are indicative of elevated androgen levels and are commonly observed in PCOS. The presence of polycystic ovaries—characterized by the appearance of multiple small cysts on ultrasound is a key diagnostic criterion for PCOS. Availability of ultrasonography and other diagnostic tools may be limited in rural settings, affecting the ability to confirm the presence of polycystic ovaries.[6] Elevated levels of androgens (e.g., testosterone) and abnormalities in glucose metabolism or insulin resistance are often associated with PCOS. Rural adolescents may have different metabolic profiles due to variations in diet and lifestyle, which could influence the clinical presentation of PCOS. Cultural and educational factors may affect how symptoms are recognized and reported. For example, acne and hirsutism might be perceived differently in various cultural contexts.[7]

Identifying the prevalence of PCOS and its correlation with clinical criteria can help in developing targeted health interventions and improving diagnostic practices in rural areas. Insights from this study can guide policy makers in allocating resources and designing programs to address PCOS in rural populations, ensuring that healthcare services are equitable and effective. Enhancing awareness and education about PCOS in rural communities can lead to earlier diagnosis and better management of the condition. This study underscores the importance of analyzing PCOS prevalence and its association with clinical criteria specifically in rural adolescent girls.[8] Addressing the unique challenges faced in rural areas, such as limited healthcare access,

socioeconomic constraints, and cultural differences, is essential for improving diagnosis and management of PCOS. By highlighting these factors, the review aims to inform strategies that can enhance reproductive health outcomes and ensure that all adolescents receive appropriate care.[9,10]

Material and Methods

This study utilized a cross-sectional design to assess the prevalence of polycystic ovarian syndrome (PCOS) and its association with clinical criteria among adolescent girls from rural areas. Conducted at the O.P.D. of the Department of Obstetrics and Gynecology at Tertiary care Hospital, the study involved inviting 100 adolescent girls who met the inclusion and exclusion criteria. Out of these, 80 volunteered to participate and underwent clinical examinations, biochemical blood tests, and ultrasound scans. Informed written consent was obtained from all participants, with parental or guardian consent secured for those under 18 years. Preliminary data was collected using a self-administered questionnaire.

Inclusion Criteria:

- Adolescent girls age groups 12-19 yrs
- Adolescent girls who have attained menarche.
- Adolescents girls who have come to seek treatment from obstetrics and gynecology and adolescent OPD of the hospital for
- Menstrual complaints (irregular menses/oligomenorrhea/ an ovulation) Signs or symptoms of hyperandrogenaemia (clinical and biochemically)
- Abdominal USG showing at least 12 follicles (2-9 mm in diameter) arranged peripherally around a dense core of ovarian stroma or scattered throughout an increased amount of stroma in at least 1 ovary or ovarian volume >10cc and diagnosed as PCOS.

Exclusion Criteria:

- Adolescent girls having any major systemic illness, congenital adrenal hyperplasia, hyperprolactinemia, acromegaly, functional hypothalamic amenorrhea, and patients receiving drugs for any other systemic illness (except hypothyroidism)

Clinical Assessment:

- **Questionnaires and Interviews**: Structured questionnaires are administered to gather information on menstrual history, symptoms of hyperandrogenism (e.g., acne, hirsutism), and family history of PCOS or related disorders. Interviews with participants and their guardians help in understanding health perceptions and symptom recognition.
- **Physical Examination**: Clinical evaluations are performed to document signs of hyperandrogenism and other physical symptoms associated with PCOS.

Measurements include:

- Body Mass Index (BMI): Weight and height are measured to calculate BMI.
- Hirsutism Score: Hirsutism is assessed using the Ferriman-Gallwey score.
- Acne Assessment: Acne severity is evaluated based on standard dermatological criteria.

Biochemical Assessment:

- **Blood Sample Collection**: Blood samples are collected after an overnight fast to measure biochemical markers. Blood is drawn from the antecubital vein, and samples are processed and analyzed in a certified laboratory.

Hormonal Assays:

- **Testosterone**: Total and free testosterone levels are measured using immunoassays.
- **Luteinizing Hormone (LH) and Follicle-Stimulating Hormone (FSH)**: Serum levels of LH and FSH are assessed to evaluate gonadal function.
- **Insulin and Glucose**: Fasting insulin and glucose levels are measured, and insulin resistance is evaluated using the Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) if necessary.

- **Androstenedione**: Serum levels of androstenedione are measured to assess androgenic activity.

Ultrasonography:

- **Transabdominal or Transvaginal Ultrasound**: Depending on the age and comfort of the participants, ultrasound is performed to visualize the ovaries and identify the presence of cysts. PCOS is diagnosed based on the presence of 12 or more follicles measuring 2-9 mm in diameter or increased ovarian volume.

Statistical Analysis

SPSS 20 software (SPSS Inc. Chicago, and II, USA) was used for the statistical analysis. Continuous variables were expressed in mean ± standard deviation (SD) and categorical variables were expressed as proportions. Pearson's Chi-square χ^2) test was used to evaluate the differences in proportion between the groups. Students t-tests were used to compare continuous variables. **Result: -**

A total of 100 adolescent girls who met the inclusion and exclusion criteria were invited to participate in the study. Of these, 80 girls agreed to participate, were enrolled, and completed clinical examinations, biochemical blood tests, and ultrasound evaluations.

Table No. 1: Show the Difference in metabolic profiles between PCOS and Non-PCOS

Variable	PCOS as per Rotterdam	
	NON PCOS	PCOS
BSL(Blood Sugar Level)	62.08 ±11.05	60.22±3.55
I(Insulin Level)	8.13±10.13	11.33±05.01
HOMA IR(Homeostasis Model Assessment of Insulin Resistance)	1.19± 2.02	1.12± 1.05

There is a slight decrease in mean blood sugar levels in the PCOS group compared to the non-PCOS group, with less variability among PCOS patients. Girls with PCOS have a higher mean insulin level with less variability, indicating more consistent hyperinsulinemia. The insulin resistance measure is similar between the two groups, with less variability in the PCOS group. These comparisons help to understand how biochemical and metabolic profiles differ between adolescent girls with and without PCOS, potentially reflecting differences in insulin regulation and metabolic stability.

Table 2: Show the Association between TFT among PCOS and Non-PCOS populations.

Variable	PCOS as per Rotterdam	
	NON PCOS	PCOS
T3	95.41 ± 23.01	101.04 ± 21.46
T4	5.15± 4.10	5.18 ± 1.10
TSH	1.70 ± 1.58	2.12 ± 2.19

Girls with PCOS have higher mean T3 levels compared to those without PCOS, with similar variability in both groups. Mean T4 levels are similar between the two groups, but there is less variability in T4 levels among girls with PCOS. Girls with PCOS have higher mean TSH levels and more variability compared to girls without PCOS. These comparisons help understand potential differences in thyroid function between adolescents with and without PCOS. Higher TSH levels in the PCOS group may indicate subtle thyroid dysfunction or adaptive responses, which could be relevant for understanding the endocrine disturbances associated with PCOS.

Table No. 3: Show the Endocrine factors and Hyperandrogenism among PCOS and Non-PCOS population

Variable	PCOS as per Rotterdam	
	NON PCOS	PCOS
LH	4.50 ± 4.001	7.55± 5.30
FSH	6.47 ± 5.23	5.18± 1.68
LH: FSH Ratio	1.38± 1.43	1.30 ± 1.62
Free Testosterone	1.11± 1.18	2.38 ± 1.44
MFG(Mean Follicular Growth)	2.21± 1.10	4.42± 1.11

Girls with PCOS have higher LH levels compared to those without PCOS. Girls with PCOS have lower average FSH levels, but with less variability. The ratio is similar between both groups, indicating no significant difference in the balance of these hormones. Higher levels of free testosterone are observed in girls with PCOS, reflecting elevated androgenic activity. Girls with PCOS have greater follicular growth compared to those without PCOS. These comparisons provide insights into how hormonal profiles and follicular dynamics differ between adolescent girls with and without PCOS, highlighting endocrine disturbances commonly associated with the syndrome.

Discussion

Polycystic Ovarian Syndrome (PCOS) is a prevalent endocrine disorder affecting adolescent girls and women of reproductive age. Recent research emphasizes the importance of understanding PCOS's prevalence and its association with clinical and biochemical markers, especially in under-researched populations such as rural adolescents. The analysis reveals that PCOS is a significant concern among adolescent girls in rural areas. The prevalence data provides insight into how common the condition is in this population.[11]The relatively high prevalence underscores the need for increased awareness and healthcare resources in rural settings, where PCOS may often go undiagnosed or inadequately managed due to limited access to healthcare services. Irregular menstrual cycles are a hallmark of PCOS, and their prevalence in rural adolescent girls reflects the typical presentation of the condition. Rural adolescents may experience delays in diagnosis due to less frequent medical check-ups and lower health literacy regarding menstrual health. Clinical signs such as acne and hirsutism are commonly observed in PCOS. The prevalence of these symptoms in rural populations may be underreported due to cultural norms or lack of awareness. Therefore, comprehensive clinical evaluations are essential for accurate diagnosis.[12,13]

Elevated LH levels and a relatively lower FSH in PCOS patients are consistent with findings in urban studies. The higher LH levels in PCOS patients reflect the disrupted hormonal regulation often seen in PCOS, while the lower FSH levels indicate altered follicular development. The LH ratio is frequently used in diagnosing PCOS; however, in this study, the ratio showed little difference between the groups, which might be influenced by individual variability and the stage of the menstrual cycle during testing. Higher levels of free testosterone in girls with PCOS compared to those without align with the clinical presentation of hyperandrogenism.[13] Elevated testosterone levels contribute to symptoms such as acne and hirsutism, and may also influence metabolic disturbances. Variations in thyroid hormones such as T3, T4, and TSH between PCOS and non-PCOS groups highlight the potential overlap between thyroid dysfunction and PCOS. Higher TSH levels in PCOS patients could suggest a subtle thyroid dysfunction or an adaptive response to the hormonal imbalance characteristic of PCOS. The similar levels of T3 and T4 between groups, however, suggest that thyroid function may not be a primary factor in the differences observed.[14,15]

Although the differences in insulin levels and HOMA-IR between PCOS and non-PCOS groups were not pronounced, elevated insulin levels in PCOS patients may still reflect a tendency towards insulin resistance. This metabolic disturbance is a common feature of PCOS and contributes to long-term health risks such as type 2 diabetes and cardiovascular disease. The variability in HOMA-IR

values highlights the need for individualized assessment and management of insulin resistance.[16]

Recent research underscores the prevalence and impact of PCOS among adolescent girls in rural areas, with significant associations between clinical and biochemical criteria. There is a need for enhanced healthcare strategies and research to address the unique challenges faced by this population.

Rural areas often face challenges related to health education and awareness. Programs aimed at educating adolescents and their families about PCOS symptoms, risks, and management options are essential. Improving awareness can lead to earlier diagnosis and better management of the condition. The study underscores the importance of improving access to healthcare services in rural areas.[17] Establishing mobile clinics or telemedicine options could help bridge the gap in healthcare access, enabling timely diagnosis and management of PCOS. Interventions should be tailored to address the specific needs of rural populations, considering cultural and socioeconomic factors that may influence health behaviors and attitudes. Strategies should focus on integrating PCOS management into existing healthcare frameworks and addressing barriers to care. Long-term studies are needed to track the progression of PCOS and its long-term health impacts in rural adolescents. Additionally, research should explore the interactions between PCOS and other health conditions prevalent in rural areas, such as metabolic syndrome and thyroid disorders.[18]

Conclusion:

The analysis underscores the significance of PCOS among adolescent girls in rural areas and highlights the association with various clinical and biochemical criteria. Addressing the prevalence and impact of PCOS requires a multi-faceted approach, including improved healthcare access, educational initiatives, and culturally sensitive interventions. By focusing on these areas, healthcare systems can better manage PCOS and improve the overall health and quality of life for rural adolescents. Continued research and targeted health strategies are essential for advancing our understanding and management of PCOS in these underserved populations. Research should explore the interactions between PCOS and other health conditions prevalent in rural areas, such as metabolic syndrome and thyroid disorders. Additionally, studies should investigate potential environmental and genetic factors contributing to PCOS prevalence in these populations.

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