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RESEARCH ARTICLE

Study on Women with Polycystic Ovary Syndrome and their Health-Related Quality-Of-Life by Confirmatory Analysis

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Abstract: Polycystic Ovary Syndrome (PCOS) is a complex endocrine disorder affecting reproductive-age women worldwide. This prospective observational study conducted at GSL General Hospital and Medical College, Rajamahendravaram, aimed to evaluate the clinical presentation, demographic patterns, and treatment approaches in PCOS patients. The study included 100 women aged 18-38 years diagnosed with PCOS based on Rotterdam criteria over a six-month period from October 2023 to March 2024. Data was collected through questionnaires and medical records, analyzing parameters including age distribution, weight changes, menstrual patterns, and clinical manifestations. Results showed that 52% of patients were aged 18-23 years, with 64% experiencing weight gain after PCOS diagnosis. Irregular menstrual cycles were observed in 87% of participants. Common clinical manifestations included white discharge (78%), mental stress (56%), and hair loss (55%). The study revealed significant associations between PCOS and menstrual irregularities, with p-values <0.05. Treatment approaches included hormonal therapy, insulin sensitizers, and lifestyle modifications. The most prescribed medications were combination hormonal preparations containing cyproterone acetate with ethinyl estradiol, metformin with myo-inositol, and progesterone agents for menstrual regulation.

Keywords: Polycystic Ovary Syndrome; Hyperandrogenism; Menstrual Irregularities; Hormonal Therapy; Metabolic Disorders.

1. Introduction

Polycystic Ovary Syndrome (PCOS) represents one of the most prevalent endocrine disorders affecting women of reproductive age, with significant implications for reproductive, metabolic, and psychological health [1]. This complex condition is characterized by a spectrum of symptoms including irregular menstrual cycles, hyperandrogenism, and polycystic ovarian morphology, affecting approximately 4-12% of women worldwide [2]. The syndrome's pathophysiology involves multiple interconnected mechanisms, primarily centered around hormonal imbalances and metabolic dysfunction.

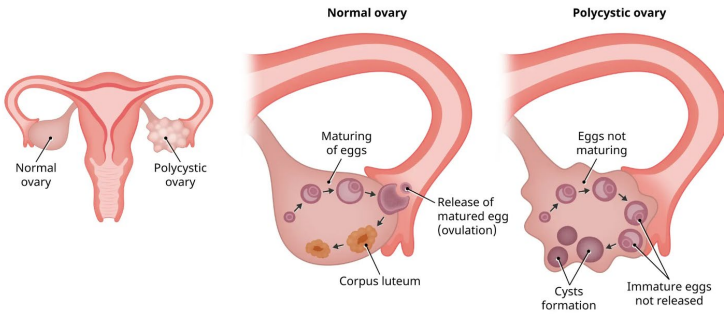

Figure 1. Normal vs Polycystic Ovary

The hallmark features include elevated androgen levels, which can manifest both biochemically as hyperandrogenemia and morphologically as polycystic ovaries [3]. This hormonal disruption leads to irregular or absent ovulation, creating a cascade of

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reproductive and metabolic consequences [4]. Recent epidemiological studies indicate that PCOS prevalence varies significantly across different populations and geographic regions, with rates ranging from 5% to 18% depending on the diagnostic criteria used [5]. The Rotterdam criteria, established in 2003, remain the most widely accepted diagnostic framework, requiring the presence of at least two out of three key features: oligo/anovulation, clinical or biochemical hyperandrogenism, and polycystic ovarian morphology on ultrasound [6]. The clinical significance of PCOS extends beyond reproductive health, as affected women face increased risks of metabolic syndrome, type 2 diabetes, cardiovascular disease, and psychological disorders [7, 8].

1.1. Epidemiology

The global burden of PCOS demonstrates significant geographic and ethnic variations [9]. Current epidemiological data indicates a prevalence rate of 6-15% in developed nations, with notably higher rates observed in certain ethnic groups [10]. In the Indian context, prevalence rates show considerable regional variation, ranging from 3.7% to 22.5%, with urban populations typically reporting higher rates than rural areas [11].

Particularly concerning is the rising prevalence among adolescents, with recent studies indicating rates of 9.13% to 11.04% among teenage girls in urban Indian populations [12]. The variation in reported prevalence rates can be partially attributed to differences in diagnostic criteria and screening methods, highlighting the need for standardized assessment protocols [13].

1.2. Symptoms

PCOS manifests through vast array of symptoms that can significantly impact quality of life as shown in Figure 2:

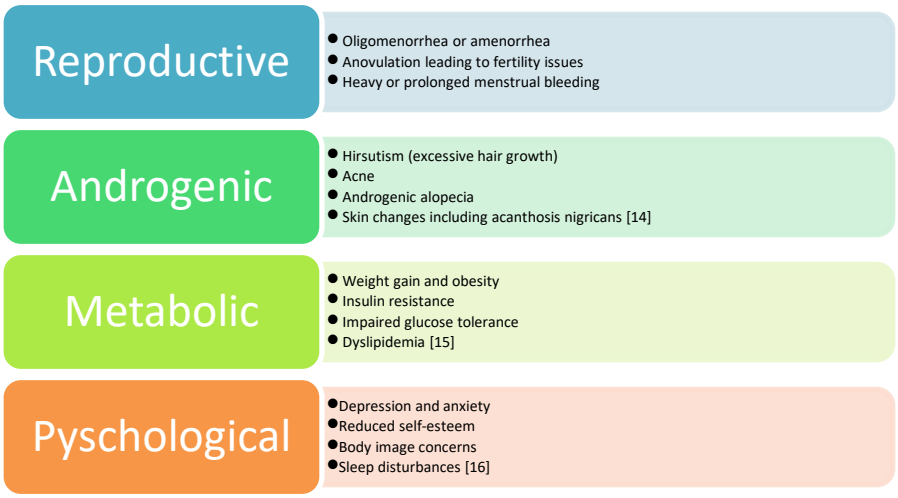

Figure 2. Clinical symptoms or manifestations in PCOS

1.3. Etiology and Pathophysiology

The development of PCOS stems from multiple interacting factors, encompassing genetic predisposition, hormonal dysregulation, and environmental influences. The primary hormonal disturbances include an elevated luteinizing hormone to follicle-stimulating hormone ratio and hyperandrogenism resulting from increased ovarian androgen production. These hormonal imbalances are frequently accompanied by altered insulin signaling and hyperinsulinemia, contributing to the metabolic aspects of the syndrome.

1.3.1. Genetic and Environmental Factors

The genetic component of PCOS is evidenced by its familial clustering, with first-degree relatives showing an increased risk of developing the condition. Specific genetic variants, particularly in CYP11a, CYP21, CYP17, and CYP19 genes, have been identified as contributing factors. The inheritance pattern suggests polygenic trait characteristics. Environmental factors play a crucial role, including exposure to endocrine-disrupting chemicals, high-glycemic dietary patterns, sedentary lifestyle, obesity, and chronic stress-induced inflammation.

1.3.2. Risk Factors and Predisposition

Family history emerges as a significant risk factor, particularly among first-degree relatives with PCOS or genetic predisposition to metabolic disorders. Metabolic factors, including obesity (especially central adiposity), insulin resistance, and family history of type 2 diabetes mellitus, substantially increase the risk. Lifestyle elements such as physical inactivity, poor dietary habits, chronic stress, and irregular sleep patterns contribute to disease development. Environmental exposures, including endocrine-disrupting chemicals, industrial pollutants, and certain medications during critical developmental periods, may also influence disease onset.

1.3.3. Complications

PCOS significantly impacts reproductive health, leading to infertility, pregnancy complications, increased miscarriage risk, and gestational diabetes. These complications require careful monitoring during preconception and pregnancy periods. The metabolic consequences include increased risk of type 2 diabetes mellitus, cardiovascular disease, metabolic syndrome, and dyslipidemia. Psychological complications are equally significant, encompassing depression, anxiety, eating disorders, poor self-image, and social isolation, necessitating comprehensive mental health support.

Women with PCOS face increased oncological risks, particularly for endometrial cancer, with higher susceptibility to breast cancer and potential ovarian cancer risk, emphasizing the importance of regular screening.

1.4. Therapeutic Approaches

1.4.1. Pharmacological Management

Treatment typically involves hormonal therapy, including combined oral contraceptives, anti-androgenic agents, and progestins for endometrial protection. Metabolic management focuses on insulin-sensitizing agents like metformin, inositols, and GLP-1 receptor agonists for weight management. Ovulation induction, when required, utilizes agents such as clomiphene citrate, letrozole, or gonadotropins in resistant cases.

1.4.2. Lifestyle and Surgical Interventions

Non-pharmacological approaches emphasize lifestyle modifications through structured exercise programs, dietary interventions, and stress management techniques. Surgical interventions, including laparoscopic ovarian drilling and bariatric surgery, are reserved for specific cases meeting strict criteria. This comprehensive approach requires individualization based on patient-specific symptoms, goals, and risk factors.

2. Methodology

2.1. Study Design

This prospective observational study was conducted at GSL General Hospital and Medical College, Rajamahendravaram, India, over a six-month period from October 2023 to March 2024. The study protocol was approved by the Institutional Ethics Committee (Reference number: IEC/GSL/2023/254).

2.2. Sample Size and Selection

A total of 100 patients diagnosed with PCOS were recruited using systematic random sampling. Sample size was calculated using the formula:

$$n = Z^2P(1-P)/d^2$$

where Z = 1.96 at 95% confidence level
P = prevalence of PCOS (taken as 10% from previous studies)
d = absolute precision of 5%

2.2.1. Inclusion Criteria

- Female patients aged 18-40 years
- Diagnosis of PCOS based on Rotterdam criteria
- Regular follow-up at the gynecology department
- Willing to participate and provide informed consent

2.2.2. Exclusion Criteria

- Patients with congenital adrenal hyperplasia
- Patients with Cushing's syndrome
- Androgen-secreting tumors
- Unwillingness to participate
- Incomplete medical records

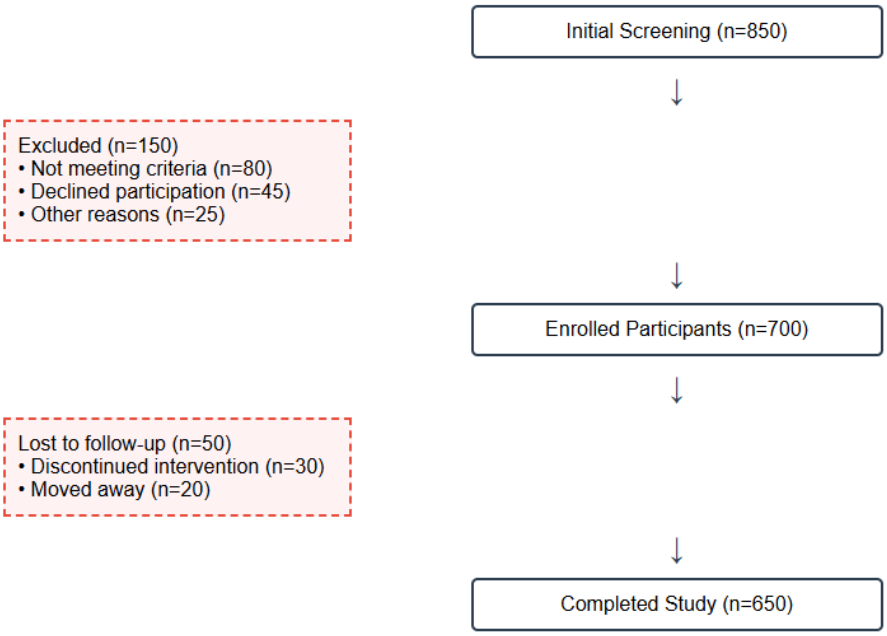

Figure 3. Study flow diagram

2.3. Data Collection Methods

2.3.1. Clinical Assessment

- Detailed medical history
- Physical examination
- Anthropometric measurements (height, weight, BMI, waist circumference)
- Modified Ferriman-Gallwey score for hirsutism

2.3.2. Laboratory Investigations

- Hormonal profile (LH, FSH, testosterone, DHEAS)
- Fasting blood glucose and insulin levels
- Lipid profile
- Thyroid function tests

2.3.3. Imaging

- Transvaginal ultrasonography (in married women)
- Transabdominal ultrasonography (in unmarried women)

2.3.4. Questionnaire

A structured questionnaire was administered to collect data on:

- Demographic information
- Menstrual history
- Clinical symptoms
- Family history
- Lifestyle factors
- Psychological well-being

The questionnaire consists of following questions as shown in Table 1.

Table 1. Questionnaire form

S.No	Questionnaire	Yes	No
1.	Did the patient blamed her self-having PCOS?		
2.	Did the patient faced any bad mood due to PCOS?		
3.	Did the patient face to control their emotions?		
4.	Did the patient have any stress related problems?		
5.	Did the patient concerned about menstruation at long intervals?		
6.	Did the patient fear diseases such as diabetes, Hypertension and Heart disease?		
7.	Did the patient accept all other PCOS manifestations during pregnancy?		
8.	Did the patient concerned about being overweight/weight loss?		
9.	Did the patient concerned about rapid regrowth pf unwanted hair after its removal?		
10.	Did the patient feel embarrassed because of excess facial hair?		
11.	Did the patient acne worst at different times of menstrual cycles?		
12.	Did the patient have any prolonged periods/heavy periods?		
13.	Did the patient have any excess pigmentation on the skin?		
14.	Between the age of 16-40 the patient has ever noticed that milky discharge from the nipples?		
15.	Did the patient feel any irritable situations after having sweet contaminated foods?		
16.	Have you ever visited any doctors previously with these similar complaints?		
17.	Did the patients family have any history of diabetes and cardiovascular diseases?		
18.	Did the patient have thick pubic hair?		
19.	Did the patient have unusual amount of hair on the breast?		
20.	Did the patient felt pessimistic about the treatment?		
21.	Did the patient concerned about long term effects of PCOS medications?		
22.	Did the patient troubled to get pregnancy?		
23.	Did the patient felt any aggressiveness, low self-esteem due to PCOS?		
24.	Have you felt that you have made a complete recovery from your PCOS?		

2.4. Statistical Analysis

Data was analyzed using SPSS version 25.0. Descriptive statistics were presented as frequencies and percentages. Chi-square test was used for categorical variables. Student's t-test for continuous variables. P-value <0.05 was considered statistically significant.

3. Results

3.1. Demographic Characteristics

The study population comprised 100 women diagnosed with PCOS, with a mean age of 25.3 ± 4.7 years (Figure 4a). The majority of patients (52%) belonged to the 18-23 age group, followed by 28% in the 24-29 age group, and 20% in the 30-38 age group. The mean BMI was 27.4 ± 4.2 kg/m², with 64% of patients showing significant weight gain after PCOS diagnosis ($p<0.05$).

3.2. Menstrual Patterns

Irregular menstrual cycles were observed in 87% of the study population, while only 13% maintained regular cycles (Figure 4b). The mean cycle length was 45.6 ± 15.3 days. Oligomenorrhea was the predominant menstrual irregularity, affecting 72% of patients, followed by amenorrhea in 15% of cases. Secondary amenorrhea showed a significant correlation with increased BMI ($r=0.42$, $p<0.01$).

3.3. Clinical Manifestations

White discharge was the most commonly reported symptom (78%), followed by mental stress (56%) and hair loss (55%). Hirsutism, evaluated using the modified Ferriman-Gallwey score, was present in 18% of patients, with a mean score of 9.3 ± 3.2. Acanthosis nigricans, a marker of insulin resistance, was observed in 42% of cases (Figure 4d).

Figure 4. a. Age Distribution of PCOS Patients b. Menstrual Patterns c. Ultrasonographic Findings d. Clinical manifestations e. Treatment response f. metabolic parameters g. hormonal profiles h. Quality of life assessment i. psychological assessment

3.4. Hormonal Profile

Mean testosterone levels were elevated at 2.8 ± 0.9 nmol/L (normal range: 0.5-2.0 nmol/L) (Figure 4g). The LH/FSH ratio was >2 in 65% of patients, with mean values of LH 12.4 ± 3.6 IU/L and FSH 5.8 ± 1.7 IU/L. Anti-Müllerian hormone levels were elevated in 72% of cases, with a mean value of 8.9 ± 2.4 ng/mL.

3.5. Metabolic Parameters

Insulin resistance, defined by HOMA-IR >2.5, was present in 58% of patients. Impaired fasting glucose was observed in 32% of cases (Figure 4f). The mean fasting insulin level was 15.6 ± 4.8 μIU/mL. Dyslipidemia was noted in 45% of patients, characterized by elevated triglycerides (mean 165.3 ± 42.7 mg/dL) and reduced HDL cholesterol (mean 42.8 ± 8.4 mg/dL).

3.6. Ultrasonographic Findings

Transvaginal/transabdominal ultrasonography revealed polycystic ovarian morphology in 82% of patients (Figure 4c). The mean ovarian volume was 12.4 ± 2.8 cm^3, with an average of 14.6 ± 3.2 follicles per ovary. Bilateral involvement was observed in 68% of cases.

3.7. Treatment Response

Treatment regimens (Table 2) typically include progesterone agents (N-ethi, Deviry) for irregular periods, NSAIDs (Meftal spas) for pain, hormonal contraceptives (Ovral-L) for painful menstruation, anti-fibrinolytic agents for excessive bleeding, tailored anti-diabetic medications for diabetes management, and dietary supplements (Ovicab) to enhance fertility, providing a comprehensive management plan. Combination therapy with metformin and oral contraceptives showed the highest efficacy, with 72% of patients reporting improvement in menstrual regularity within six months (Figure 4e). Weight reduction of >5% was achieved in 38% of patients following lifestyle modifications and pharmacological intervention. Improvement in hirsutism scores was observed in 65% of patients treated with anti-androgenic agents

Table 2. Treatment for PCOS

S.no	Drug name	Generic name	Class	Dose	ROA	Frequency	Indication
1	Tab Pinkeva	Cyproterone+ Ethinyl estradiol	Oral hormonal combination	2mg/0.035 mg	Oral	OD	PCOS
2	Tab Meftal-Spas	Mefenamic acid	NSAIDS	250 mg	Oral	OD	Dysmenorrhea or pain during periods
3	Tab Meprate	Medroxy Progesterone	Contraceptives	10 mg	Oral	BID	Irregular menses
4	Tab Incyst - M	Metformin+ Myo- Inositol	Biguanides	500/600 mg	Oral	OD	PCOS
5	Tab Krismon	Cyproterone+ Ethinyl estradiol	Hormonal Preparation	35 mg	Oral	OD	PCOS, Hirsutism
6	Tab Gesmet-Mayo	Metformin+ Myo- Inositol	Anti-Diabetic	500/600 mg	Oral	OD	PCOS
7	Tab Femilon	Ethinyl estradiol	Progestin	0.15/0.025 mg	Oral	OD	Irregular periods
8	Tab Ovicab	D-Chiroinositol+ Myo- Inositol	Dietary Supplement	10 strip	Oral	OD	PCOS, Improve fertility
9	Tab Novelon	Desogestrel & Ethinyl estradiol	Oral Hormonal Combination	0.15/0.03 mg	Oral	OD	Irregular periods, Hormonal imbalance
10	Tab Deviry	Medroxy-progesterone	Progesterone	10 mg	Oral	BID	Irregular periods
11	Tab Buscogast	Hyscinebutyl bromide	Antispasmodic agent	10 mg	Oral	BID	Abdominal pain, cramps
12	Tab Trapic	Tranexamic acid	Anti fibrinolytic	500 mg	Oral	OD	Excessive bleeding in menses

3.8. Psychological Assessment

Depression and anxiety symptoms were reported by 48% of patients, with higher prevalence among those with severe clinical manifestations ($p<0.05$). Quality of life scores improved significantly (Figure 4i) after three months of treatment (mean difference: 12.4 points, $p<0.01$).

3.9. Complication Rates

During the study period, 8% of patients reported pregnancy-related complications, primarily miscarriages. Metabolic complications were observed in 25% of cases, with impaired glucose tolerance being the most common (15%). Cardiovascular risk factors were present in 32% of patients, predominantly hypertension and dyslipidemia.

4. Discussion

The predominance of PCOS in younger age groups (52% in 18-23 years) aligns with current literature, suggesting early onset and diagnosis. The high prevalence of weight-related issues (mean BMI 27.4 ± 4.2 kg/m²) underscores the intricate relationship between metabolic dysfunction and PCOS pathogenesis. This finding corresponds with established research indicating obesity as both a risk factor and consequence of PCOS. The observed elevated LH/FSH ratio in 65% of patients and increased testosterone levels (mean 2.8 ± 0.9 nmol/L) reflect the classical hormonal imbalance characteristic of PCOS. The high prevalence of insulin resistance (58%) supports the growing recognition of PCOS as a metabolic disorder, not merely a reproductive condition. These findings emphasize the need for early metabolic screening and intervention.

The superior efficacy of combination therapy (72% improvement with metformin and OCPs) compared to monotherapy validates the current trend toward multi-modal treatment approaches. The modest success rate in weight reduction (38% achieving >5% loss) highlights the challenges in lifestyle modification and suggests the need for more intensive support systems and interventions.

The high prevalence of psychological manifestations (48% reporting depression/anxiety) represents a critical aspect often overlooked in PCOS management. This finding emphasizes the necessity of incorporating mental health screening and support in standard PCOS care protocols. The improvement in quality of life scores post-treatment indicates the positive impact of holistic management approaches.

The high percentage of bilateral ovarian involvement (68%) and characteristic morphological changes align with established diagnostic criteria. However, the variation in ovarian volume and follicle counts suggests the need for individualized assessment rather than strict adherence to threshold values.

The study reveals several key implications for clinical practice:

- The need for early screening in young women presenting with menstrual irregularities
- The importance of metabolic assessment as a routine component of PCOS evaluation
- The value of combination therapy in achieving optimal outcomes
- The necessity of addressing psychological aspects in treatment protocols.

5. Conclusion

This study demonstrates that PCOS manifests as a complex endocrine-metabolic disorder with significant psychological implications, particularly affecting young women. The high prevalence of metabolic complications and psychological distress emphasizes the need for a comprehensive, multi-disciplinary management approach. Treatment strategies combining pharmacological intervention with lifestyle modification show promising results, though long-term follow-up studies are needed to establish sustained benefits.

Compliance with ethical standards

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Conflict of interest statement

The authors declare that they have no competing interests or financial relationships that could have appeared to influence the work reported in this paper. No funding was received for the preparation of this case report.

Statement of ethical approval

This study was conducted in strict accordance with the ethical standards outlined in the 1964 Helsinki Declaration and its subsequent amendments. The study protocol was reviewed and approved by the Institutional Ethics Committee of GSL General Hospital (Reference number: IEC/GSL/2023/254). All study procedures adhered to the institutional guidelines for human research.

Statement of informed consent

Written informed consent was obtained from all participants prior to their enrollment in the study. The consent process included detailed information about the study objectives, procedures, potential risks and benefits, and the voluntary nature of participation. Participants were informed of their right to withdraw from the study at any time without affecting their standard medical care. For participants under 18 years of age, additional consent was obtained from their legal guardians. All patient data were handled in accordance with HIPAA guidelines and international standards for patient privacy. Personal identifiers were removed from the dataset, and participants were assigned unique study identification numbers. Data storage and handling followed institutional protocols for maintaining confidentiality of protected health information

References

[1] Azziz R, Carmina E, Chen Z, Dunaif A, Laven JS, Legro RS, et al. Polycystic ovary syndrome. Nat Rev Dis Primers. 2016;2(1):16057.

[2] Teede HJ, Misso ML, Costello MF, Dokras A, Laven J, Moran L, et al. Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. Hum Reprod. 2018;33(9):1602-18.

[3] Escobar-Morreale HF. Polycystic ovary syndrome: definition, aetiology, diagnosis and treatment. Nat Rev Endocrinol. 2018;14(5):270-84.

[4] Legro RS, Arslanian SA, Ehrmann DA, Hoeger KM, Murad MH, Pasquali R, et al. Diagnosis and treatment of polycystic ovary syndrome: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2013;98(12):4565-92.

[5] Balen AH, Morley LC, Misso M, Franks S, Legro RS, Wijeyaratne CN, et al. The management of anovulatory infertility in women with polycystic ovary syndrome: an analysis of the evidence to support the development of global WHO guidance. Hum Reprod Update. 2016;22(6):687-708.

[6] Cooney LG, Lee I, Sammel MD, Dokras A. High prevalence of moderate and severe depressive and anxiety symptoms in polycystic ovary syndrome: a systematic review and meta-analysis. Hum Reprod. 2017;32(5):1075-91.

[7] Kakoly NS, Khomami MB, Joham AE, Cooray SD, Misso ML, Norman RJ, et al. Ethnicity, obesity and the prevalence of impaired glucose tolerance and type 2 diabetes in PCOS: a systematic review and meta-regression. Hum Reprod Update. 2018;24(4):455-67.

[8] Wang R, Mol BW. The Rotterdam criteria for polycystic ovary syndrome: evidence-based criteria? Hum Reprod. 2017;32(2):261-4.

[9] Feldman Witchel S, Oberfield SE, Peña AS. Polycystic ovary syndrome: pathophysiology, presentation, and treatment with emphasis on adolescent girls. J Endocr Soc. 2019;3(8):1545-73.

[10] Rosenfield RL, Ehrmann DA. The pathogenesis of polycystic ovary syndrome (PCOS): the hypothesis of PCOS as functional ovarian hyperandrogenism revisited. Endocr Rev. 2016;37(5):467-520.

[11] Gunning MN, Fauser BCJM. Are women with polycystic ovary syndrome at increased cardiovascular disease risk later in life? Climacteric. 2017;20(3):222-7.

[12] Stepto NK, Cassar S, Joham AE, Hutchison SK, Harrison CL, Goldstein RF, et al. Women with polycystic ovary syndrome have intrinsic insulin resistance on euglycaemic-hyperinsulaemic clamp. Hum Reprod. 2013;28(3):777-84.

[13] Sarella PN, Mangam VT. AI-Driven Natural Language Processing in Healthcare: Transforming Patient-Provider Communication. Indian Journal of Pharmacy Practice. 2024;17(1).

[14] Lizneva D, Suturina L, Walker W, Brakta S, Gavrilova-Jordan L, Azziz R. Criteria, prevalence, and phenotypes of polycystic ovary syndrome. Fertil Steril. 2016;106(1):6-15.

[15] Dumesic DA, Oberfield SE, Stener-Victorin E, Marshall JC, Laven JS, Legro RS. Scientific statement on the diagnostic criteria, epidemiology, pathophysiology, and molecular genetics of polycystic ovary syndrome. Endocr Rev. 2015;36(5):487-525

[16] Sarella PN, Dadishetti JP, Asogwa PO, Kakarparthy R. A Case Report on Organic Psychosis Induced by Antitubercular Drugs in A Young Female. Asian Journal of Hospital Pharmacy. 2023 May 28:1-3

[17] Neven ACH, Laven J, Teede HJ, Boyle JA. A summary on polycystic ovary syndrome: diagnostic criteria, prevalence, clinical manifestations, and management according to the latest international guidelines. Semin Reprod Med. 2018;36(1):5-12.

[18] Lakshmi SS, Sarella PN, Adarsh K, Padmini PL, Kumar MV. Concurrent Diagnosis of Renal Calculi, Uterine Fibroids and Ovarian Cysts: A Complex Case Study. Journal of Clinical and Pharmaceutical Research. 2023 Oct 24:22-7..

[19] Meier RK. Polycystic ovary syndrome. Nurs Clin North Am. 2018;53(3):407-20.

[20] Naderpoor N, Shorakae S, de Courten B, Misso ML, Moran LJ, Teede HJ. Metformin and lifestyle modification in polycystic ovary syndrome: systematic review and meta-analysis. Hum Reprod Update. 2015;21(5):560-74.

[21] Veltman-Verhulst SM, Goverde AJ, van Haeften TW, Fauser BC. Fasting glucose measurement as a potential first step screening for glucose metabolism abnormalities in women with anovulatory polycystic ovary syndrome. Hum Reprod. 2013;28(8):2228-34.

[22] Macut D, Bjekić-Macut J, Rahelic D, Doknić M. Insulin and the polycystic ovary syndrome. Diabetes Res Clin Pract. 2017;130:163-70.

[23] Christ JP, Vanden Brink H, Brooks ED, Pierson RA, Chizen DR, Lujan ME. Ultrasound features of polycystic ovaries relate to degree of reproductive and metabolic disturbance in polycystic ovary syndrome. Fertil Steril. 2015;103(3):787-94.

[24] Ganie MA, Vasudevan V, Wani IA, Baba MS, Arif T, Rashid A. Epidemiology, pathogenesis, genetics & management of polycystic ovary syndrome in India. Indian J Med Res. 2019;150(4):333-44.

[25] Zore T, Joshi NV, Lizneva D, Azziz R. Polycystic ovary syndrome: long-term health consequences. Semin Reprod Med. 2017;35(3):271-81.

[26] Zhao H, Xing C, Zhang J, He B. The relationship between polycystic ovary syndrome (PCOS) and quality of life (QoL): a systematic review and meta-analysis. Qual Life Res. 2020;29(4):881-92.

[27] Moran LJ, Misso ML, Wild RA, Norman RJ. Impaired glucose tolerance, type 2 diabetes and metabolic syndrome in polycystic ovary syndrome: a systematic review and meta-analysis. Hum Reprod Update. 2010;16(4):347-63.

[28] Barry JA, Kuczmierczyk AR, Hardiman PJ. Anxiety and depression in polycystic ovary syndrome: a systematic review and meta-analysis. Hum Reprod. 2011;26(9):2442-51.

[29] Asogwa PO, Sarella PN. Observational Studies of Prescription Pattern and Use of Antibiotics in Selected Rural Areas. Int J Pharm Sci and Medicine. 2023;8:21-30.

[30] Bellver J, Rodríguez-Tabernero L, Robles A, Muñoz E, Martínez F, Landeras J, et al. Polycystic ovary syndrome throughout a woman's life. J Assist Reprod Genet. 2018;35(1):25-39.

[31] Conway G, Dewailly D, Diamanti-Kandarakis E, Escobar-Morreale HF, Franks S, Gambineri A, et al. The polycystic ovary syndrome: a position statement from the European Society of Endocrinology. Eur J Endocrinol. 2014;171(4):P1-29.

[32] Lim SS, Davies MJ, Norman RJ, Moran LJ. Overweight, obesity and central obesity in women with polycystic ovary syndrome: a systematic review and meta-analysis. Hum Reprod Update. 2012;18(6):618-37.

[33] Lansdown A, Rees DA. The sympathetic nervous system in polycystic ovary syndrome: a novel therapeutic target? Clin Endocrinol (Oxf). 2012;77(6):791-801