Polycystic Ovary Syndrome as a Determinant of Female Infertility: A Prevalence-Based Analytical Study

Hussam H. Sahib 1*, Luma hassnaui 2*

1Department of clinical laboratory sciences, College of pharmacy, University of Al-Qadisiyah, Iraq,
2Department of pharmaceutical chemistry, College of pharmacy, University of Al-Qadisiyah, Iraq

*Corresponding author**:** hussam.alfatlawi@qu.edu.iq

ABSTRACT

Polycystic ovarian syndrome (PCOS) is a prominent endocrine situation in women of a reproductive age. It is characterized by high testosterone levels, menstrual abnormalities, and/or tiny cysts on one or both ovaries. The condition may be anatomical (polycystic ovaries) or primarily biochemical (hyperandrogenemia). Hyperandrogenism, a clinical characteristic of PCOS, may impede follicular growth, result in ovarian microcysts, cause anovulation, and induce monthly irregularities. Before attempting to conceive, most women with polycystic ovarian syndrome PCOS are unaware of their condition. **OBJECTIVE:** Aim to determine the prevalence of polycystic ovary syndrome (PCOS) in infertile women visiting AL-DIWANAH maternity and children teaching hospital's Infertility Treatment and the common features of those with and without PCOS. **METHODOLOGY:** Seven-month cross-sectional research from September 2018 to March 2019 reviewed the records of all 600 women who frequented AL-DIWANAH maternity and children teaching hospital. **RESULTS**: The findings indicated that the predominant causes of infertility in women include polycystic ovary syndrome (PCOS), which exhibited a greater prevalence among women aged 20 to 44 years. **CONCLUSION:** PCOS-related

infertility accounts for around one-fourth of infertility cases and is mostly linked to primary infertility during the age period of 20 to 44 years.

Keywords: Polycystic ovary syndrome, infertility

INTRODUCTION

Among hormonal diseases affecting reproductive-aged women, polycystic ovarian syndrome (PCOS) ranks high (1, 2). Symptoms include an increase in testosterone levels, abnormal menstrual cycles, and the presence of tiny cysts on either or both ovaries (3). The condition may manifest primarily in biochemical ways (hyperandrogenemia) or in a more physical way (polycystic ovaries). Follicle inhibition, ovarian microcysts, anovulation, and menstrual abnormalities are all symptoms of hyperandrogenism, a clinical feature of polycystic ovary syndrome (4). Approximately 4% to 12% of reproductive-aged women in the general population are estimated to have polycystic ovary syndrome (5).It seems to be more common (ranging from 37% to 90%) in women who have irregular periods and is further exacerbated when certain diseases are present (6). Evaluating the ovaries in women of reproductive age and subsequently assessing morphology in PCOS might facilitate the identification of this disorder in people ions. One way to help diagnose polycystic ovary syndrome (PCOS) in individuals with a diverse clinical presentation is to screen the ovaries in women of childbearing age and then evaluate the morphology of the disease.

1.2.Etiology

The underlying causes of this syndrome are still not fully understood; however, increasing evidence indicates that PCOS may be a multifaceted disorder influenced by a combination of genetic factors, as well as significant epigenetic and environmental elements, such as dietary and lifestyle choices. This defines the diverse clinical and biochemical characteristics. (8). A variety of symptoms associated with PCOS can be attributed to elevated levels of androgens present in the body, leading to a condition known as 'hyperandrogenism'. Androgens, often referred to as 'male' hormones, include testosterone as their primary representative. It is important to note that women naturally produce small quantities of androgens in both the

ovaries and the adrenal glands. Elevated levels of androgens may hinder ovulation and disrupt the menstrual cycle, potentially leading to increased hair growth and acne. This is attributed to inappropriate gonadotropin secretion, particularly the elevated secretion of luteinizing hormone (LH).

1.3. Pathophysiology:

The underlying mechanisms of PCOS encompass fundamental issues within the hypothalamic–pituitary axis, as well as in insulin secretion and action, alongside ovarian function (10, 11). While the exact cause of PCOS remains unclear, it has been associated with insulin resistance and obesity. Clinical signs of PCOS are characterised by increased levels of luteinizing hormone (LH) and gonadotropin–releasing hormone (GnRH), while levels of follicular-stimulating hormone (FSH) remain stable or show minimal change. The increase in GnRH leads to the stimulation of the ovarian thecal cells, which subsequently results in the production of additional androgens (12).

Insulin is a hormone that controls the level of glucose (a type of sugar) in the blood. If you have PCOS, your body may not respond to insulin (this is known as insulin resistance), so the level of glucose is higher. To try to prevent the glucose levels becoming higher, your body produces even more insulin. High levels of insulin can lead to weight gain, irregular periods, fertility problems and higher levels of testosterone (13).

Symptoms include:

1-Oligomenorrhea   or   amenorrhoea
2- Loss of hair from the scalp accompanied by the presence of hair growth (hirsutism) on areas such as the face, chest, back, upper abdomen, thumbs, or toes. A significant proportion of women with PCOS, exceeding 70%, express concerns regarding hair issues attributed to elevated androgen levels. Infertility resulting from anovulation impacts 75% of women diagnosed with PCOS   (15).
Four symptoms of excessive insulin levels and insulin resistance may encompass weight gain in the upper body and alterations in skin appearance, including the presence of skin tags or dark, velvety patches of skin located under the arms, on the neck, or in the groin and genital regions. Enlarged ovaries characterised by numerous small cysts, along with a prevalence of polycystic ovaries observed on pelvic ultrasound, are noted to exceed   70%   in   patients   diagnosed   with   PCOS   (17).

6-Impact on mental well-being: It is not uncommon for individuals with PCOS to experience feelings of depression and anxiety. A significant proportion of women with PCOS experience anxiety, while a notable number also face depression. This could potentially be attributed to hormonal influences or the manifestation of symptoms including hair growth, weight fluctuations, and acne.The manifestations can differ from one individual to another. There is a notable variation among women, with some experiencing only a few mild symptoms, whereas others may encounter a broader spectrum of more severe symptoms   (13).

Assessment:

1-Conducting a thorough history-taking with a focus on menstrual patterns, obesity, hirsutism, and any occurrences of breast discharge. A clinical prediction rule indicates that the four questions presented can effectively diagnose PCOS, achieving a sensitivity of 77.1% and a specificity of 93.8% (14,   18).

2--Findings from the ultrasound (both abdominal and vaginal) indicate the size of the ovaries and the number of follicles observed in the plane line (19).

3- Hormonal profiling indicated increased serum levels of androgens, such as androstenedione   and   testosterone   (20,   21). The ratio of LH (Luteinizing hormone) to FSH (Follicle stimulating hormone) exceeds 1:1. Testing was conducted on the third day of the menstrual cycle (20, 21).

1.4.Complications:

Short-term complication:

1-Menstrual irregularities the prevalence of menstrual dysfunction in women with PCOS is 14.6% to 22.8%, and irregularities range from amenorrhea to menorrhagia with a classic peripubertal onset (17, 22).

3-Hirsutism and acne.

Pregnancy loss: Women experiencing pregnancy with PCOS may encounter a 30% to 50% heightened risk of early spontaneous abortion (23).

It is advisable to consider weight reduction and the use of medications like metformin, as evidence suggests these approaches may contribute to a decrease

in the rates of first trimester spontaneous abortion (SAB) (23). The ideal timing for the cessation of metformin remains to be clarified (24).

5- Insulin resistance and hyperinsulinemia: The most significant indicators of insulin resistance in a patient with PCOS include body mass index, hyperandrogenemia, and hirsutism (25). Weight reduction and medications like metformin and thiazolidinediones may be effective treatment options.

Infertility was initially recognized as one of the primary symptoms associated with PCOS in the earliest descriptions of the condition. A number of comorbidities associated with PCOS appear to play a role in contributing to infertility. Specifically, insulin resistance and obesity have been shown to be independently associated with a heightened risk of abortion, as well as diminished rates of pregnancy and live births. Endometrial abnormalities have been observed in women with PCOS, which may potentially influence the implantation process (29).

Long-term complications:

1- Dyslipidaemia and cardiovascular disease: Insulin-resistant states appear to be linked with an increased vulnerability to coronary artery disease. Women with PCOS exhibit a heightened risk for cardiovascular disease, characterized by factors such as obesity, metabolic syndrome, hypertension, type 2 diabetes mellitus, and dyslipidaemia.

2-Endometrial hyperplasia and carcinoma: The prolonged exposure to unopposed oestrogen in PCOS elevates the risk of developing endometrial hyperplasia and endometrial carcinoma (32). To mitigate the risk of endometrial hyperplasia, it is advisable to consider the use of COCs or intermittent progestin therapy.

3- Gestational diabetes and diabetes mellitus: Gestational diabetes mellitus is characterised by glucose intolerance that is identified or begins during the

course of pregnancy. Women who experience gestational diabetes mellitus face a notably heightened risk of developing type 2 diabetes mellitus in the future.

4- **Hypertension**: Women with PCOS tend to have high blood pressure, which is likely to be related to insulin resistance and to being overweight rather than to the PCOS itself. High blood pressure can lead to heart problems and should be treated.

1.5.Management

It is advisable for women with PCOS to undergo screening for cardiovascular risk, which includes assessing body mass index, fasting lipid and lipoprotein levels, as well as evaluating factors associated with metabolic syndrome. Management emphasizes the importance of addressing the risk factors associated with cardiovascular disease. Medications such as statins are utilized to effectively reduce LDL-C levels, alongside the use of anti-hypertensive agents (35). This study was undertaken to ascertain the prevalence of polycystic ovary syndrome (PCOS) among infertile women receiving treatment at the Al Diwaniyah Maternity and Children Teaching Hospital. Additionally, it aims to delineate certain common characteristics of infertile women diagnosed with PCOS in comparison to those without the condition.

PATIENTS AND METHODS

The current research was conducted at the Al Diwaniyah maternity and children teaching hospital, focussing on infertility treatment. This study employs descriptive statistical methods. We commenced the process of entering data from January 9, 2018, to January 3, 2019.The information obtained from the files includes various details such as social status, age, age at marriage, years of education, address, and symptoms. A cross-sectional study was carried out over a period of approximately seven months, during which a comprehensive review of the records of all women attending the hospital during this time was undertaken, encompassing a total of six hundred women.

The information obtained from the files is as follows. 1-Demographic information such as age, age at marriage, occupation, years of education,

address, and health data concerning infertile women, including duration of marriage, duration of infertility, gravida, parity, and abortion. The body mass index (BMI) was excluded from the study due to the absence of this information in certain records regarding the type of infertility, whether primary or secondary. 3- A review of past experiences with any contraceptive methods.4- Factors contributing to infertility include PCOS, various ovarian disorders, cervical issues, uterine-tubal factors, male-related

RESULTS

The findings indicated that the predominant factors contributing to infertility were PCOS, about (70%) , more than the percentage of the other causes for infertility (30%) during the study period as shown in table and figure (1).

The occurrence of infertility related to PCOS was notably more prevalent in women between the ages of 20 and 44 years. (80%) followed by women aged 15-19 years (5%) and then followed by women aged 10-14 years (3%) and finelly women aged 45-65 years (2%) as shown in table and figure (2).
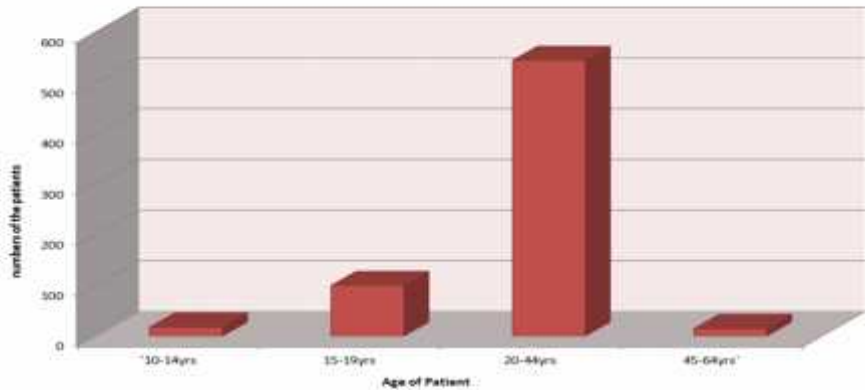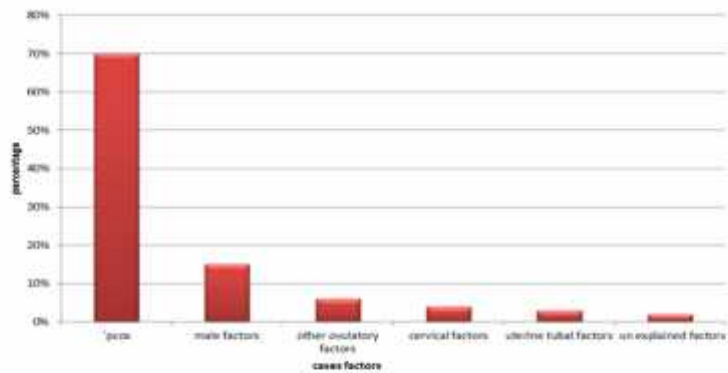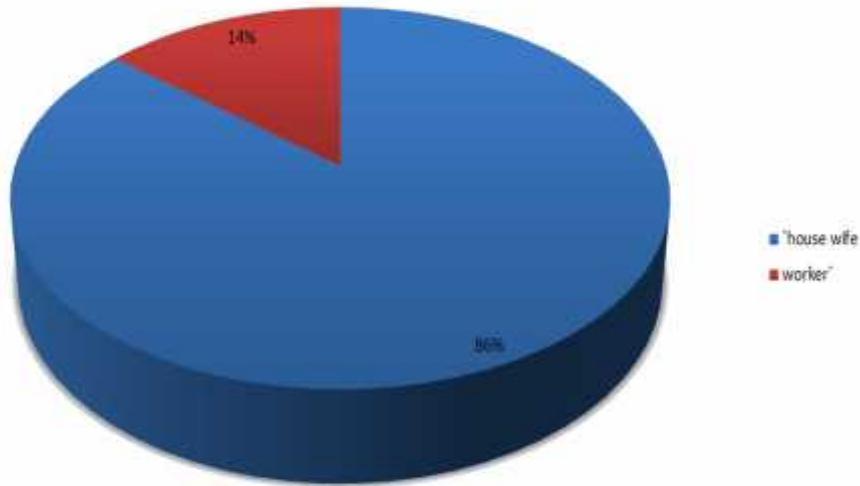

figure (1) the relationship between number of patient with PCOS and Age

Age	10-14yrs	15-19yrs	20-44yrs	45-64yrs	total
Numbers	18 women	100 women	544 women	15 women	677 women
Percentage%	3%	5%	80%	2%	100%

figure (2)Distribution of cases of infertility by causes of infertility

cases	Pcos	Male factors	Other ovulatory factors	Cervical factors	Uterine tubal factors	Un explained factors	total
Number of patients	473	101	41	28	21	13	677
percentage	70%	15%	6%	4%	3%	2%	100%

figure (3) the percentge of PCOS occurance withe the occupation

CONCLUSION

We concluded the following:

1.The age for the female patient who had polycystic ovary syndrome may play a major role in the manifestation and development of the complication, the results of this study concluded that the female patient in the age group (20-44 years) who suffering from complications are more than other age groups.

2. During the period of study conclude that the infertility state is the most occurrences in female patient with polycystic ovary syndrome while the unexplained factors are the least occurrence.

3. The body mass index, fasting lipid and lipoprotein levels, as well as metabolic syndrome, play a significant role in the manifestation and occurrence of the complication.

REFRENCES

1-Norman RJ, Dewailly D, Legro RS, Hickey TE. Polycystic ovary syndrome. Lancet. 2007;370:685-97 .

2-Cela E, Robertson C, Rush K .women with acne: hormone profiles and clinical findings. J Pakistan Association of Dermatologists 2010; 20: 194-98.

3-Umland EM, Weinstein LC, Buchanan EM. Menstruation-related disorders. In: DiPiro JT, Talbert RL, Yee GC, et al., editors. Pharmacotherapy: A Pathophysiologic Approach. 8th ed. New York: McGraw-Hill; 2011. p. 1393.

4-Lin LH, Baracat MC, Gustavo AR, et al. Androgen receptor gene polymorphism and polycystic ovary syndrome. Int J Gynaecol Obstet. 2013;120:115–118.

5-Joan C. Lo, Seth L. Feigenbaum, Jingrong Yang, Alice R. Pressman, Joe V. Selby and Alan S. Epidemiology and Adverse Cardiovascular Risk Profile of

Diagnosed Polycystic Ovary Syndrome. J Clinical Endocrinology & Metabolism (JCEM) 2006; 91: 1357.

6-Zacur HA. Epidemiology, clinical manifestations and pathophysiology of polycystic ovary syndrome. Adv. Stud Med. 2003; 3: S733-S739

7-Review Article Polycystic ovary syndrome: definition, etiology, diagnosis and treatment,https://doi.org/10.1038/nrendo.2018.24,

8-Xita N, Georgiou I, Tsatsoulis A. The genetic basis of polycystic ovary syndrome. Eur J Endocrinol. 2002;147:717–725.

9-Polycystic ovary syndrome fact sheet - Updated April 2014, jeanhailes.org.au/health-a-z/pcos.

10-Diamanti-Kandarakis E, Kandarakis H, Legro RS. The role of genes and environment in the etiology of PCOS. Endocrine. 2006;30:19–26.

11-Shannon M, Wang Y. Polycystic ovary syndrome: A common but often unrecognized condition. J Midwifery Womens Health. 2012;57:221–230.

12-Urbanek M. The genetics of polycystic ovary syndrome. Natl Clin Pract Endocrinol Metab. 2007;3:103–111.

13-www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg33

14-Marshall K. Polycystic ovary syndrome clinical consideration. Altern Med Rev. 2001; 6:272-292.

15-Patel SM, Nestler JE. Fertility in polycystic ovary syndrome. *Endocrinol Metab Clin North Am.* 2006;35(1):137-155.

16-Ehrmann DA ,Barnes RB, Rosefield RL ,Cavaghan MK , Imperial J . Prevalence of impaired glucose tolerance and diabetes in women with polycystic ovary syndrome .Diabetes Care.1999; 22:141_6

17-Azziz R, Carmina E, Dewailly D, et al. Position statement: Criteria for defining polycystic ovary syndrome as a predominantly hyper-androgenic syndrome. An Androgen Excess Society guideline. J Clin Edocrinol Metab. 2006;91:4237–4245.

18-Norman RJ. Wu R, Stankiewicz MT. Polycystic ovary syndrome.MJA. 2004;180(3):132-137

19-Hanaa Rahman Eleawi*, Enas Talib Abdul-Karim**, Anam Rasheed AL-Salihi***,2015-Study of Occurrence of Polycystic Ovarian Syndrome Among Infertile Women.

20-Balen A, Mickelmore K. What is polysystic ovary syndrome. Human Reproduction. 2002; 17(9):2219-2227.

21-Hunter MH, Sterrett JJ. Polycystic Ovary Syndrome: it`s Not Just Infertility. American Academy of Family Physicians. 2000; 62(5).

22-Stankiewicz M, Norman R. Diagnosis and management of polycystic ovary syndrome: a practical guide. Drugs. 2006;66(7):903-912**.2-**

23-Glueck CJ, Wang P, Goldenberg N, Sieve-Smith L.Pregnancy outcomes among women with polycystic ovary syndrome treated with metformin. Hum Reprod. 2002;17(11):2858-2864.

24-Thatcher SS, Jackson EM. Pregnancy outcome in infertile patients with polycystic ovary syndrome who were treated with metformin. Fertil Steril. 2006;85(4):1002-1009

25-Svendsen PF, Madsbad S, Nilas L. The insulin-resistant phenotype of polycystic ovary syndrome. Fertil Steril. 2010;94(3):1052-1058

26-Norman RJ, Davies MJ, Lord J, Moran LJ. The role of lifestyle modification in polycystic ovary syndrome. Trends Endocrinol Metab. 2002;13(6):251-257.

27-Ortega-Gonzalez C, Luna S, Hernandez L, et al. Responses of serum androgen and insulin resistance to metformin and pioglitazone in obese, insulin-resistant women with polycystic ovary syndrome. J Clin Endocrinol Metab. 2005;90(3):1360-1365.

28-Tian L, Shen H, Lu Q, Norman RJ, Wang J. Insulin resistance increases the risk of spontaneous abortion after assisted reproduction technology treatment. J Clin Endocrinol Metab. 2007;92(4):1430–1433.

29-Jungheim ES, Lanzendorf SE, Odem RR, Moley KH, Chang AS, Ratts VS. Morbid obesity is associated with lower clinical pregnancy rates after in vitro fertilization in women with polycystic ovary syndrome. Fertil Steril. 2009;92(1):256–261.

30-Goodarzi MO, Korenman SG. The importance of insulin resistance in polycystic ovary syndromeFertil Steril. 2003;80(2):255-258.

31-Farrell K, Antoni MH. Insulin resistance, obesity, inflammation, and depression in polycystic ovary syndrome: biobehavioral mechanisms and interventions. Fertil Steril. 2010;94(5):1565-1574.

32-Hardiman P, Pillay OC, Atiomo W. Polycystic ovary syndrome and endometrial carcinoma. Lancet. 2003;361(9371):1810-1812.

33-Barth JH, Cherry CA, Wojnarowskaf, Dawber RPR. Cyproterome acetate for sever hirsutism: result of a double-blind dose-ranging study. Clin Endocrinal 1991; 35: 5-10

34-Edwar Z.Khosho, Ahlam Abdul-Hadi & Hutham W.A. Al-Serrai , REVALENCE OF POLYCYSTIC OVARIES IN GYNAECOLOGICAL POPULATION, Department of Obstetrics & Gynecology, College of Medicine, University of Basrah, Iraq, 2010.

35-Sharma ST, Nestler JE. Prevention of diabetes and cardiovascular disease in women with PCOS: treatment with insulin sensitizers. Best Pract Res Clin Endocrinal Metab. 2006;20(2): 245-260.