

Fertile Insights: Exploring the Interplay between Poly Cystic Ovary Syndrome (PCOS) and Female Infertility

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ABSTRACT

Objective: To assess the role of polycystic ovarian syndrome and hormonal abnormalities in female infertility.

Methodology: This cross-sectional, observational study was conducted at Benazir Bhutto Hospital Rawalpindi. A Total of 423 females aged between 18-45 were enrolled between July 2023 to December 2023 who is not getting pregnant for some years. These patients came to the outpatient department (OPD) in the gynecology department with the symptoms of acne, hirsutism, menstrual irregularity, anxiety, and weight gain. A sample of patients was drawn from the medial cubital vein and kept in a gel tube. These samples were analyzed on Special Chemistry analyzer, Beckman coulter access 2. Hormones LH and FSH were done in the follicular phase of menstrual cycle. Infertility was categorized as primary and secondary infertility. Statistical analysis was done with version 25 of SPSS.

Results: The mean age of study participant was 28.73±5.618 with min=18-max=45. The highest percentage of females (52.2%) were in the age group of 18-28 years, 372 (87.9%) belonged to urban areas whereas (12.1%) were from rural areas, 376(88.9%) were housewives and 47(11.1%) are working women. Primary infertile patients are 69.7% and secondary infertile patients are 30.3%, thirty-four percent had infertility duration of 4 to 6 years. Other prevalent risk factors were, irregular cycles (22.5%), weight gain (44.9%), dysmenorrhea (49.6%), hypertensive (7.1%), acne (18.4%), hirsutism (27.7%), galactorrhea (4%), tenderness (3.8%), PCOS (18.9%), on contraceptives (31%), cysts in adnexal USG (12%), thyroid disorders (5%) and diabetes (14%). Means along with S.D of hormone FSH (low=2.65±0.98, high=11.1±4.1, normal=5.6±1.068), LH (low=.22±0.16, high=11.7±6.52, normal=3.66±1.28) and prolactin (normal=13.01±5.76, high=38.19±17.52). Women with PCOS were likely to have low levels of FSH (OR=4.846, 95% CI=1.880-12.493, P-value 0.001).

Conclusion: polycystic ovarian syndrome is the main endocrine disorder that leads to infertility in females.

Keywords: Polycystic ovarian syndrome, hirsutism, infertility, Follicle Stimulating Hormone, Luteinizing Hormone

Introduction

Polycystic Ovarian Syndrome (PCOS) is a well-recognized endocrine disorder among reproductive age female. It is a condition of dysfunctional ovulation.¹ Multiple ovarian cyst development, which causes hormonal instability in females, is a characteristic of PCOS. As the age declines, the number of follicles decreases leads to less chance of PCOS.² The onset of irregular or absent menstrual cycles is one of the most distinctive symptoms of PCOS. For some women, the menstrual flow may last for weeks, while for others, it may not occur for several months. PCOS-afflicted women face difficulties with fertility.

The primary cause of PCOS is unknown.³ The main hormonal disturbance in PCOS is lessening in level of follicle stimulating hormone (FSH) and rising

in the level of luteinizing hormone (LH).⁴ The overproduction of androgens is caused by the elevated amount of LH. Overproduction of androgens raises the levels of oestrogens, which in turn produce feedback inhibition of FSH, resulting in a decrease in FSH. Thus, anovulation brought on by a lower FSH level causes infertility and the formation of follicular cysts.⁵

The primary link between PCOS and infertility is that the women with that condition do not ovulate eggs or eggs are immature which results in miscarriages, early births or may leads a condition of caesarian section.⁶ Due to increase levels of androgens, there are acne and hirsutism (hair growth on face) problem.⁷ Heavy bleeding, amenorrhea, endometrial hyperplasia, pelvic pains

are the main symptoms.⁸ Two important risk factors for PCOS are insulin resistance and gestational diabetes mellitus.⁹

Hyperprolactenemia is observed in PCOS patients accompanied by galactorrhea.¹⁰ Women with high BMI present with hyper-androgenism. Obesity promotes the development of cysts in ovaries. That's why most of patients are obese and overweight.¹¹ In patients with PCOS, multiple risk factors of cardiovascular diseases involve metabolic syndrome, hypertension, and dyslipidemia and type 2 diabetes mellitus.¹² According to the Rotterdam criteria, PCOS is defined by a collection of symptoms, including irregular menstrual periods, hyper-androgenism, and polycystic ovaries.¹³

According to estimates; PCOS affects 4% to 20% of women worldwide with a global prevalence of 5.5%.¹⁴ While some communities, such those from South Asia, the Mediterranean, and the Middle East, appear to experience it more frequently. In South Asia, 52% of people have PCOS, compared to 22% in the UK.¹⁵ We designed a study to determine the frequencies of endocrine diseases in our women based on hormonal analysis and symptom analysis, as well as to identify any notable differences in biochemical characteristics between these disorders.

Methodology

The type of study design is cross sectional observational, done at the Department of pathology, Benazir Bhutto Hospital, Rawalpindi. Study duration is about 6 months after the finalization of synopsis that is between July 2024 to December 2024. This study includes patients show weight gain, irregular periods, hirsutism, and acne symptoms. The Rawalpindi Medical University Ethical Review Board approved the research protocols. The subject's personal details were kept confidential.

Patients with the complaint of high blood pressure, depression and ultrasonography results like cysts are also included. Females who were pregnant and breastfeeding their babies were excluded from this study. Sampling technique used is random. A total of 423 non pregnant females are involved in this study who met the exclusion and inclusion criteria. Data was collected after taking the informed written consent from patients and history

is taken by some conversations with them. Samples are drawn for hormonal evaluation on second day of follicular phase of menstrual cycle and was taken into gel tube. Those samples were run on special chemistry analyzer, Beckman coulter access 2. The sample size was calculated by Rao soft calculator by assuming 95% CI, 5% margin of error, and Z of 1.96. The population of Rawalpindi is 2.37 million and the sample size is 350. For statistical analysis SPSS version 25 is used. In descriptive analysis, categorical study parameters like educational level, worth status, occupation etc. are analyzed and presented in frequency and percentages. Continues variables are analyzed as mean and standard deviation. In inferential analysis, Spearman's Correlation is utilized and p value less than 0.05 are thought about significant. Continues variables like hormones were taken as dependent variables and PCOS is taken as independent variable. Detection and diagnosis of PCOs involve various parameters like taking history, physical examination, pelvic ultrasound and hormonal findings.

Results

In the study a total of 423 non pregnant females are present. Mean age of study participant is 28.73 ± 5.618 with 18-45 years. Highest percentage of females (52.2%) were in the age group of 18-28 year. Primary infertile patients are 69.7% and secondary infertile patients are 30.3%, (34%) had Infertility duration of 4 to 6 years. Some of clinical findings are irregular cycles (22.5%), weight gain (44.9%), dysmenorrhea (49.6%), hypertensive (7.1%), acne (18.4%), Hirsutism (27.7%), galactorrhea (4%), tenderness (3.8%), PCOs (18.9%).

Spearman's rank is applied in inferential analysis to know about the association between continues variables. FSH p-value is 0.001 which is less than 0.05 so it is significant while LH, prolactin, age is non-significant. So Women with PCOS were likely to have low levels of FSH (OR=4.846, 95% CI=1.880-12.493, P-value 0.001). Inferential analysis of continues variables are shown in above.

Table II: Frequencies of categorized prevalent risk factors			
Categorical parameters Prevalent risk factors		Total (n=423)	Frequency (%)
Acne	Yes	78	18.4%
	No	345	81.6%
Menstrual cycles	Irregular	95	22.55%
	Regular	305	72.1%
	On medicine	23	5.4%
PCOS	Yes	80	18.9%
	No	345	81.6%
Thyroid patients	Yes	21	5.0%
	No	402	95.0%
BP	Hypotensive	3	0.7%
	Hypertensive	30	7.1%
	Normal	390	92.2%
Hirsutism	Yes	117	27.7%
	No	306	72.3%
Obesity	Weight loss	22	5.2%
	Normal	211	49.9%
	Weight gain	190	44.9%
Dysamenorrhea	Yes	210	49.6%
	No	213	50.4%
Contraception	Yes	31	7.3%
	No	392	92.7%
Galactorrhea	Yes	17	4.0%
	No	406	96%
Infertility	Primary	295	69.7%
	Secondary	128	30.3%
Surgical history	Yes	318	75.2%
	No	105	24.8%
USG uterus	Endometrial thickened	44	10.4%
	Fibroid	32	7.6%
	Normal	347	82.0%
Adenexal USG	Cysts	51	12.1%
	Follicles	195	46.1
	No follicles	177	41.8%
Diabetes	Yes	14	3.3%
	No	409	96.7%

Table I: Frequencies of demographic characteristics and other categorized prevalent risk factors			
Demographic characteristics		Total(n=423)	Frequency %
Residence			
	Rural	372	(87.9%)
	Urban	51	(12.1%)
Educational status			
	Illiterate	86	(20.3%)
	Primary school	80	(18.9%)
	Intermediate	47	(11.1%)
	Read and write	21	(5.0%)
	Secondary school	111	(26.2%)
	University	78	(18.4%)
Working status			
	Employer	47	(11.1%)
	House wife	376	(88.9%)

Table 3: Hormonal profile and continues variables and inferential analysis			
Parameters	Descriptive statistics	Inferential analysis	
	Mean with Std. Deviation	ODD’S RATIO (95% C. I.)	P-VALUE
Age	28.73±5.618	1.028	0.238
FSH			
Low	2.65±0.98	4.846	0.001
High	11.1±4.1		
Normal	5.6±1.068		
LH			
Low	0.22±0.16	0.727	0.411
High	11.7±6.52		
Normal	3.66±1.28		
PRL			
Normal	13.01±5.67	0.937	0.863
High	38.19±17.52		

Discussion

Polycystic ovary syndrome is a complex, multifactorial endocrine disorder of women of reproductive age that has gathered increase level of attention in recent past years because of the high ratio of its prevalence for affecting women’s health. Prevalence of polycystic ovary syndrome in our study is 18.9%. Whereas the global prevalence is 9.8% in adolescents according to Rotterdam criteria and international sevidence-based criteria mark it up to 6.3%.¹⁶ Its prevalence varies throughout the world according to consideration of different diagnostic criteria and due to lack of awareness. The

main origin of this disease is unknown but frequency of this is high in our country as compared to Srilanka (6.3%) and in India (9%).¹⁷ The majority of the samples used by few studies who have examined PCOS prevalence in India was convenience based so the results may not accurately represent the true prevalence of PCOS in the population. Young adolescent females were evaluated in a pilot cross sectional study carried out in Tamil Nadu, which revealed an 18% PCOS prevalence. They also came to conclusion that urban women had a larger percentage of PCOS than did rural women. according to a comparable urban community-based study carried out in Mumbai, the prevalence of PCOS was 10.7% by Androgen Excess Society criteria and 22.5% by the Rotterdam criteria.¹⁸ In a recent study in Pakistan, ratio of having PCOs is high among urban adolescent girls 34.1%. Among all diagnostic categories, a constant finding for PCOS women is their younger age. This means that patients of younger age might visit the infertility clinic earlier. FSH and LH both are secreted from anterior pituitary gland but alteration in their mechanism results in hormonal imbalances that are frequently linked to PCOS. The menstrual cycle and the generation of eggs in the ovaries are two processes that are significantly impacted by the hormone FSH. Our study shows the prevalence of low levels of FSH is 24.6%. When treatments like clomiphene and follicle stimulating hormones were available, medical treatments took preference over surgical ootectomy. According to regression and correlation analysis, FSH is significant so the women with PCOS were likely to have low levels of FSH. Due to decreased level of FSH in PCOs, LH/FSH ratio is increased.¹⁹ Along with hormonal imbalance other

symptoms are of great importance like acne, menstrual irregularity, hirsutism, obesity. Weight gain patients in our study are frequent (44.9%) that's the major clinical feature. Insulin resistance (IR) is frequently found in women with PCOS, although it is not involved in any diagnostic criteria. Our study shows that most of females were from rural side, poor living style and were illiterate. Females who are not getting pregnant after regular sex must be evaluated for infertility. PCOS is the main cause of infertility but before making its definitive diagnosis, other etiologies of infertility (hyperprolactinemia, thyroid disorder) must be ruled out. Our study patients are from just Rawalpindi so generalization can be an issue. Life style modification involve healthy diets; weight loss can improve fertility challenge. PCOS evaluation is crucial in order to improve women's life satisfaction.²⁰

Conclusion

According to this study, the primary endocrine condition causing infertility in women is polycystic ovarian syndrome. Young women with low FSH and elevated LH levels are more likely to experience it, and common symptoms include irregular menstruation, hirsutism, and weight gain. The necessity of early screening and focused hormonal medical treatments in at-risk groups is highlighted by the high percentage of primary infertility. In order to reduce the risk of infertility, our findings support the combined therapy of PCOS and concomitant illnesses (such as diabetes and thyroid disorders).

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