Original Article
DOI: https://doi.org/10.70749/ijbr.v3i4.2054

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

Frequency of Polycystic Ovaries as a Causative Factor in Primary Infertility of Patients Undergoing Laparoscopy in Lady Reading Hospital

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ARTICLE INFO

Keywords: Polycystic Ovaries, Primary Infertility, Laparoscopy, Prevalence.

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Declaration
Authors' Contribution
All authors equally contributed to the study and approved the final manuscript

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 07-02-2025 Revised: 03-04-2025
Accepted: 19-04-2025 Published: 30-04-2025

ABSTRACT

Background: Polycystic ovary is commonly seen in primary infertile women and tends to impact diagnostic as well as management plans considerably. Laparoscopy continues to be helpful in confirming it, but its association with several demographic as well as clinical parameters needs to be studied further in local populations. **Objective:** To determine the frequency of polycystic ovaries in patients with primary infertility undergoing laparoscopy in Lady Reading Hospital Peshawar. **Study Design:** Cross-sectional study. **Duration and Place of Study:** April 2024 to September 2024, Department of Obstetrics and Gynaecology, Lady Reading Hospital, Peshawar. **Methodology:** A total of 143 married women aged 18–45 years, unable to conceive despite ≥12 months of regular unprotected intercourse, and scheduled for diagnostic laparoscopy, were included through consecutive sampling. Women with prior laparoscopic procedures, endocrine disorders, or liver disease were excluded. Demographic and clinical details were recorded, and laparoscopy was performed under general anesthesia. Polycystic ovaries were diagnosed when three or more characteristic features—enlarged ovarian volume, smooth and tense surface with prominent vascularity, multiple subcapsular cysts, or cysts with clear/yellow fluid—were present. **Results:** The mean age was 29.92±6.10 years, with a mean infertility duration of 5.01±3.21 years. Polycystic ovary was present in 28% of participants. Significant associations were observed with age ($p<0.001$), infertility duration ($p<0.001$), and socioeconomic status ($p=0.038$). **Conclusion:** Polycystic ovaries was common in women with primary infertility, particularly among older age groups, prolonged infertility duration, and higher socioeconomic strata.

INTRODUCTION

Infertility in female is among the significant reproductive health concerns, defined as inability to conceive after 12 months of regular unprotected intercourse.[1] It impacts a significant percentage of couples worldwide, causing emotional issues as well as social issues.[2] Female infertility can occur due to multiple etiologies, including those that include dysfunction of ovulation, tubal disease, endometriosis, uterine anomalies, as well as hormonal imbalance.[3] Ovulatory disorders lead predominantly among these etiologies, and polycystic ovary syndrome (PCOS) is among the most common underlying etiology.[4] Prompt identification and specific evaluation for etiology are key in guiding specific approaches to treatment and optimal conception success.[5]

Laparoscopy has also been an important diagnostic and treatment tool in female infertility evaluation since it provides direct visualization of pelvic anatomy with minimal invasion.[6] It allows identification of subtle pathology that might be missed in imaging studies, such as peri-tubal adhesions, early stage endometriosis, and structural anomalies of the reproductive tracts. When diagnosis is unclear after ordinary evaluation, laparoscopy provides helpful clarification and allows concomitant intervention, such as adhesiolysis, ovarian drilling, or tuboplasty.[7] By combining diagnosis and specific therapy in one intervention, laparoscopy is particularly helpful in optimizing reproductive success in patients with inexplicable infertility or suspected complex pelvic pathology.[8]

Polycystic ovaries, which are typical features of PCOS, are almost solely accountable for sterility due to their impact on functions of ovulation.[9] An anovaluation or oligo-ovaluation, ultrasonically evident multiple minute antral follicles in ovaries, visible at ultrasonography or laparoscopy, are features of the syndrome. Immaturity of follicles in excess and associated hormonal dysfunction create disturbance in orderly maturation of follicles with resultant oligo- or an-ovaluation. Laparoscopic ovarian drilling, which is performed in carefully selected cases, facilitates ovaries being rejuvenated by stromal androgen-producing tissue reduction with resultant correction of

hormonal balance and improvement in spontaneous pregnancy opportunities.[10] Surgical correction of polycystic ovaries using laparoscopic techniques still forms an integral branch of fertility care where conservative therapy and medical intervention are not sufficient.[11]

Arain F et al. reported that polycystic ovaries were identified in 38.5% of patients with primary infertility undergoing laparoscopic evaluation.[12]

With the high prevalence of infertility and considerable contribution from polycystic ovaries as an etiology, there is an evident need to gauge its burden among female populations in Peshawar. Regional differences in lifestyle, dietary patterns, and access to health care may affect the occurrence as well as manifestation of the condition. Performing research in this background will offer locally framed information to facilitate prompt diagnosis, maximize strategies for control, and better reproductive outcomes among patients affected by the condition.

METHODOLOGY

This analytical cross-sectional study was conducted from April 2024 to September 2024 in the Department of Obstetrics and Gynaecology at Lady Reading Hospital, Peshawar. A total of 143 women were enrolled, with the sample size calculated using the WHO sample size calculator, applying a 95% confidence level, an 8% margin of error, and an estimated prevalence of polycystic ovaries of 38.5% in women with primary infertility undergoing laparoscopy.[12] Participants were recruited through a non-probability consecutive sampling method. Eligible women were married, aged 18 to 45 years, and had never conceived despite engaging in regular vaginal intercourse for at least 12 consecutive months. Only those undergoing diagnostic laparoscopy were included. Women with a history of liver disease, prior laparoscopic interventions, hormonal treatment, or endocrine disorders such as Cushing's syndrome or congenital adrenal hyperplasia were excluded from the study.

Ethical clearance was obtained before the initiation of the study. After explaining the objectives, maintaining confidentiality, and clarifying that participation posed no additional risk, written informed consent was taken from each participant. Baseline details including age, body mass index (BMI), duration of infertility, monthly household income, occupation, residential status, educational attainment, socioeconomic classification, and diabetes status were recorded. Diagnostic laparoscopy was performed using a 10 mm laparoscope inserted via a primary sub-umbilical port under general anesthesia. Polycystic ovarian morphology was considered present when at least three of the following laparoscopic features were identified: ovarian volume exceeding 10 cm^3, a smooth and tense ovarian surface with a distinct vascular arrangement or loops, the presence of multiple subcapsular cysts, or sectioning revealing small cysts containing transparent or yellowish fluid. Following completion of the procedure, the instruments were withdrawn, the incision sites closed, and patients were observed in the recovery area before discharge with postoperative care instructions.

All findings were documented by the principal investigator on a structured proforma. Statistical analysis was carried out using IBM SPSS Statistics version 26. Categorical variables, such as residential status, educational level, socioeconomic category, occupation, diabetes, and presence of polycystic ovaries, were presented as frequencies and percentages. Continuous variables, including age, BMI, and infertility duration, were expressed as mean ± standard deviation or as median with interquartile range, depending on the data distribution assessed using the Shapiro–Wilk test. Potential confounding factors such as age, BMI, infertility duration, occupation, residence, education, diabetes, and socioeconomic status were adjusted through stratification. Post-stratification, either the chi-square test or Fisher's exact test was applied, with a p-value ≤0.05 considered statistically significant.

RESULTS

The study included 143 patients with primary infertility undergoing laparoscopy, with a mean age of 29.92±6.10 years, mean BMI of 24.29±3.43 kg/m^2, and mean duration of infertility of 5.01±3.21 years (as shown in Table-I). The majority of patients were housewives (123, 86.0%) compared to those with jobs (20, 14.0%), and most resided in rural areas (88, 61.5%) versus urban areas (55, 38.5%). Regarding education level, 59 patients (41.3%) were uneducated, 33 (23.1%) had primary education, 31 (21.7%) had secondary education, and 20 (14.0%) had higher education. Socioeconomic distribution showed 79 patients (55.2%) were poor, 45 (31.5%) were middle class, and 19 (13.3%) were rich. Diabetes was present in only 8 patients (5.6%) while 135 patients (94.4%) did not have diabetes (as shown in Table-I).

Table I

Patient Demographics

Demographics	Mean ± SD
Age (years)	29.92±6.10
BMI (kg/m^2)	24.29±3.43
Duration of infertility (years)	5.01±3.21
Profession	
Housewife n (%)	123 (86.0%)
Job n (%)	20 (14.0%)
Residential status	
Rural n (%)	88 (61.5%)
Urban n (%)	55 (38.5%)
Education level	
Uneducated n (%)	59 (41.3%)
Primary n (%)	33 (23.1%)
Secondary n (%)	31 (21.7%)
Higher n (%)	20 (14.0%)
Socioeconomic status	
Poor n (%)	79 (55.2%)
Middle n (%)	45 (31.5%)
Rich n (%)	19 (13.3%)
Diabetes	
Yes n (%)	8 (5.6%)
No n (%)	135 (94.4%)

The frequency of polycystic ovaries among the study population was 28.0% (40 patients), while 72.0% (103 patients) did not have polycystic ovaries (as shown in Table-II).

Table II

Frequency of Polycystic Ovaries Among Patients with Primary Infertility Undergoing Laparoscopy

Polycystic ovaries	Frequency	% age
Yes	40	28.00%
No	103	72.00%
Total	143	100%

Age demonstrated a highly significant association (p<0.001), with patients >30 years having substantially higher prevalence of polycystic ovaries (33, 53.2%) compared to those ≤30 years (7, 8.6%). Duration of infertility also showed a highly significant association (p<0.001), with patients having >5 years of infertility showing markedly higher prevalence (32, 68.1%) compared to those with ≤5 years (8, 8.3%). Socioeconomic status demonstrated a significant association (p=0.038), with increasing prevalence from poor (16, 20.3%) to middle (15, 33.3%) to rich (9, 47.4%) categories. Diabetes showed no significant association (p=1.000), with similar prevalence between diabetic (2, 25.0%) and non-diabetic patients (38, 28.1%). Other factors including BMI categories ≤25 kg/m^2 (22, 24.4%) versus >25 kg/m^2 (18, 34.0%) showed no significant association (p=0.221), profession with housewives (34, 27.6%) versus job holders (6, 30.0%) was not significant (p=0.828), residential status comparing rural (20, 22.7%) versus urban (20, 36.4%) areas showed no significant association (p=0.077), and education level across uneducated (12, 20.3%), primary (8, 24.2%), secondary (14, 45.2%), and higher education (6, 30.0%) categories showed no significant association (p=0.089) as shown in Table-III.

Table III

Association of Polycystic Ovaries with Demographic Factors

Demographic Factors		Polycystic ovaries		p-value
		Yes n(%)	No n(%)	
Age (years)	≤30	7 (8.6%)	74 (91.4%)	<0.001
	>30	33 (53.2%)	29 (46.8%)	
BMI (Kg/m^2)	≤25	22 (24.4%)	68 (75.6%)	0.221
	>25	18 (34.0%)	35 (66.0%)	
Profession	Housewife	34 (27.6%)	89 (72.4%)	0.828
	Job	6 (30.0%)	14 (70.0%)	
Residential Status	Rural	20 (22.7%)	68 (77.3%)	0.077
	Urban	20 (36.4%)	35 (63.6%)	
Education level	Uneducated	12 (20.3%)	47 (79.7%)	0.089
	Primary	8 (24.2%)	25 (75.8%)	
	Secondary	14 (45.2%)	17 (54.8%)	
	Higher	6 (30.0%)	14 (70.0%)	
Socioeconomic Status	Poor	16 (20.3%)	63 (79.7%)	0.038
	Middle	15 (33.3%)	30 (66.7%)	
	Rich	9 (47.4%)	10 (52.6%)	
Diabetes	Yes	2 (25.0%)	6 (75.0%)	1.000*
	No	38 (28.1%)	97 (71.9%)	
Duration of infertility (years)	≤5	8 (8.3%)	88 (91.7%)	<0.001
	>5	32 (68.1%)	15 (31.9%)	

*Fischer Exact Test

DISCUSSION

The current study found a significant prevalence of polycystic ovaries in 28.0% of primary infertile patients proceeding to laparoscopy, which is in agreement with the known link between polycystic ovarian syndrome and reproductive dysfunction. The significantly elevated prevalence in patients aged more than 30 years (53.2% vs. 8.6% in younger patients) would probably be due to the cumulative nature of hormone imbalance and metabolic dysfunction defining polycystic ovarian syndrome, whereby prevention of insulin resistance and hyperandrogenism worsens with increasing age, causing greater ovarian morphologic change. The marked association between longer-standing duration of infertility (>$5 years) and polycystic ovaries (68.1% vs. 8.3% in shorter duration) would attest to the notion that the underlying pathophysiology leading to polycystic ovarian change would also cause irreversible anovulation and subfertility, giving rise to self-perpetuating mechanism whereby metabolic and hormonal disturbances further compromise reproductive function with time. Positive correlation with higher socioeconomic class, which exhibited rising prevalence from poor (20.3%) to middle (33.3%) to rich (47.4%) groups, would probably mirror lifestyle factors frequently connoted with wealthy status such as sedentary lifestyle, calorie-intensive dieting, and enhanced stress level that would further precipitate impairments in insulin resistance and hormone imbalance leading to polycystic ovarian growth. Lack of significant correlations with BMI, occupation, residential status, schooling level, and diabetes would attest to polycystic ovarian syndrome occurring among varying demographic profiles, leading to the inference that etiology of polycystic ovarian syndrome would involve multifactorial transactions between inherent susceptibilities and environmental exposures transcending simplistic sociodemographic classifications.

The polycystic ovary frequency of 28.0% in our study aligns closely with Ramzan M, et al. [13] who reported a PCOS frequency of 26.93% among infertility cases in their outpatient department cohort. Similarly, our findings are comparable to Ullah I, et al. [14] who documented a PCO frequency of 21.1% in their cross-sectional laparoscopic study of 90 infertile women. In a study done by Ullah I, et al. [14] show results similar to ours, with a mean age of 29.39±4.83 years and mean BMI of 28.54±3.64 kg/m^2, though their infertility duration was shorter at 3.98±2.11 years compared to our 5.01±3.21 years.

But, Arain F, et al. [12] reported a higher PCOS frequency of 38.5% among 446 women with identifiable female-factor infertility in their prospective study of 1,289 infertile couples. This higher frequency may be attributed to their inclusion criteria focusing specifically on women with identifiable female factors, potentially creating a selection bias toward hormonal and ovulatory disorders.

Additionally, Saif M, et al. [15] documented a lower PCO frequency of 16.2% in their larger cohort of 370 infertile women, with participants having a higher mean age of 33.93±5.81 years and similar BMI of 27.59±4.98 kg/m^2.

The variation in reported frequencies can be attributed to several methodological factors. Studies by Hameed N, et al. [16] Mujeeb S, et al. [17] and Deliwala KJ, et al. [18] reported 100% PCO frequencies because their study designs specifically enrolled only women with established PCOS diagnoses, making these studies unsuitable for frequency comparison but valuable for treatment outcome assessment. These studies focused on therapeutic interventions rather than diagnostic prevalence, which explains their homogeneous populations.

Our study's demographic profile showed predominantly rural residents (61.5%) and housewives (86.0%), with 41.3% being uneducated and 55.2% from poor socioeconomic backgrounds. This contrasts with some urban-based studies and may influence the observed PCO frequency through factors such as delayed healthcare seeking, nutritional status, and lifestyle differences.

While our study focused on diagnostic frequency, comparison with treatment outcomes from other studies provides clinical context. Hameed N, et al. [16] reported an 82.61% ovulation rate and 47.82% pregnancy rate following laparoscopic ovarian drilling in CC-resistant PCOS women. Similarly, Ramzan M, et al. [13] achieved a 66% conception rate within 6 months post-LOD. Deliwala KJ, et al. [18] demonstrated varying pregnancy rates across different treatments: clomiphene citrate 50%, letrozole 63%, metformin 33.3%, and laparoscopic ovarian drilling 80%. These outcomes suggest that despite the diagnostic challenges and varying frequencies, effective treatment options remain available for PCO-related infertility.

Our study uniquely identified a significant association between socioeconomic status and PCO frequency (p=0.038), with increasing prevalence from poor (20.3%) to middle (33.3%) to rich (47.4%) categories. This novel finding may reflect better nutritional status, lifestyle factors, or increased healthcare access leading to earlier and more accurate diagnosis in higher socioeconomic groups. Previous Pakistani studies [12-18] did not systematically evaluate socioeconomic associations, making this a distinctive contribution to understanding PCO epidemiology in our population.

The variation in PCO frequencies across Pakistani studies (16.2% to 38.5% in general infertile populations) highlights the need for standardized diagnostic criteria and uniform study methodologies. Differences in ultrasound techniques, laparoscopic assessment protocols, and patient selection criteria may contribute to this variation. Future multicenter studies with standardized protocols would provide more reliable prevalence estimates and better guide clinical practice and resource allocation for infertility management in Pakistan.

Some limitations, however, must be taken into account in our study. As it is a single-center study from one tertiary care center, applicability of our findings to the general Pakistani population may be limited, particularly given predominance of rural and lower socioeconomic participants in our study. With a fairly modest sample size of 143 patients, adequate for statistical analysis but potentially restrictive precision in our estimation of prevalence and power to detect weak but clinically significant associations, our study may lose somewhat in terms of precision. Furthermore, due to its cross-sectional nature, casual relationships between risk factors and development of polycystic ovaries cannot be ascertained. Lack of hormonal profiling and standardized ultrasound criteria with laparoscopic findings may have introduced diagnostic heterogeneity. One also must consider that since our study population consisted only of women coming in for evaluation for infertility, prevalence may have been artificially elevated as compared with that in the general reproductive-age population.

CONCLUSION

This research concluded that polycystic ovaries still constitute a significant proportion of female infertility cases among patients offering diagnostic laparoscopy. These results indicate important associations between an increasing maternal age, longer periods between conception attempts, and high socioeconomic status and polycystic ovaries, indicating they may serve as important clinical predictors.

Acknowledgments

Particular gratitude is owed to departmental medical staff for dedicated work, precise documentation, and systematic organization of data regarding patients, without which this work would have been impossible.

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