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ORIGINAL ARTICLE

Gynecological Evaluation of Benign Ovarian Cysts, Association with Menstrual Irregularities and Reproductive Health in Women. A Clinical Study

SHAZIA ASHRAF[1], NOSHEEN SIKANDAR BALOCH[2], LUBNA ASLAM[3], HANANA HAMEED[4], VARSHA KUMAR[5], SUMMAN FAROOQ[6]
[1]*Professor, Department of Obstetrics and Gynaecology, Gujranwala Medical College / General Teaching Hospital (GMC/GTH), Gujranwala, Pakistan.*
[2]*Associate Professor, Department of Obstetrics and Gynaecology, Bolan Medical College, Quetta, Pakistan.*
[3]*Associate Professor, Department of Obstetrics and Gynaecology, Post Graduate Medical Institute / Ameer-ud-Din Medical College / Lahore General Hospital, Lahore, Pakistan.*
[4]*Associate Professor, Department of Obstetrics and Gynaecology, Bolan Medical College, Quetta, Pakistan.*
[5]*Specialist, Department of Obstetrics and Gynaecology, Hamza Medicare Hospital, Rahim Yar Khan, Pakistan.*
[6]*Women Medical Officer, Department of Obstetrics and Gynaecology, Tehsil Headquarter Hospital, Haroonabad, Pakistan.*
Correspondence to: Shazia Ashraf, Email: shaziaashraf786@hotmail.com, Cell: +923227922221

ABSTRACT

Background: Benign ovarian cysts are a common gynecological condition among women of reproductive age and are frequently associated with menstrual irregularities and adverse effects on reproductive health.

Aim and Objectives: This study aimed to evaluate the prevalence and types of benign ovarian cysts in women aged 20 to 45 years and to investigate their association with menstrual irregularities and reproductive health outcomes, with a particular focus on the clinical spectrum of endometrioma syndrome.

Methodology: A clinical observational study was conducted involving 89 premenopausal women aged 20–45 years diagnosed with benign ovarian cysts. Each participant underwent a comprehensive gynecological evaluation, including detailed history-taking, pelvic examination, transvaginal ultrasonography, and hormonal profiling. Data on menstrual patterns, reproductive history, and associated symptoms were collected and analyzed using appropriate biostatistical models.

Results: Of the 89 patients, 64% presented with menstrual irregularities, such as oligomenorrhea, menorrhagia, and dysmenorrhea. Functional cysts were the most prevalent (37.1%), followed by serous cystadenomas (20.2%) and dermoid cysts (15.7%). Endometriomas accounted for 14.6% of cases and were significantly associated with menstrual irregularities (84.6%), infertility (69.2%), and severe dysmenorrhea (92.3%). Women with endometriomas were more likely to be over the age of 35 and had a longer duration of symptoms.

Conclusion: Although less common, endometriomas impose the highest clinical burden among benign ovarian cysts due to their strong association with menstrual disturbances, infertility, and chronic pelvic pain. Early identification and tailored management strategies are essential to improve reproductive outcomes and enhance quality of life in affected women.

Keywords: Ovarian Cysts, Endometrioma, Infertility, Dysmenorrhea, Menstruation, Ultrasound, Reproduction

INTRODUCTION

Benign ovarian cysts represent a diverse group of gynecologic entities that are frequently encountered in women of reproductive age. These cysts, though commonly asymptomatic, may exert profound effects on a woman's menstrual regularity, hormonal milieu, and overall reproductive potential [1]. Among the spectrum of benign cystic lesions, functional cysts such as follicular and corpus luteum cysts, as well as pathological types including dermoid cysts and serous or mucinous cystadenomas, pose distinct diagnostic and clinical challenges [2]. The particular concern is the presence of endometriomas chronic, estrogen-dependent cystic lesions arising from ectopic endometrial tissue known to contribute not only to pelvic pain and dysmenorrhea but also to infertility and complex hormonal dysregulation [3].

Menstrual irregularities, encompassing oligomenorrhea, polymenorrhea, menorrhagia, and amenorrhea, have been increasingly associated with the presence of benign ovarian cysts, particularly those disrupting the hypothalamic pituitary ovarian (HPO) axis [4]. The cyclical hormonal interplay essential for ovulation may be significantly altered by cystic ovarian pathology, thereby influencing both the quality and predictability of menstrual cycles. Furthermore, reproductive health outcomes especially ovulatory function, conception rates, and luteal phase adequacy may be compromised in women harboring persistent or hormonally active cysts [5].

Endometrioma syndrome, a clinical subset of endometriosis characterized by ovarian endometriotic cysts, embodies a particularly severe manifestation of benign ovarian disease. It is often linked with deep dyspareunia, chronic pelvic pain, and impaired fertility [6]. The pathophysiological mechanisms underlying endometrioma-associated infertility are multifactorial, including altered folliculogenesis, impaired oocyte quality, inflammatory peritoneal environment, and disrupted endometrial receptivity. Despite its benign histology, endometrioma exhibits a unique biological behavior that closely interacts with reproductive endocrinology, necessitating early recognition and careful management in women seeking conception [7].

The clinical burden of benign ovarian cysts especially when compounded by endometrioma syndrome necessitates a thorough gynecological evaluation to elucidate their association with menstrual disturbances and fertility-related complications [8]. However, the current literature from developing nations, including Pakistan, remains sparse on integrative clinical data assessing these parameters in a population-based manner. There is a critical need for context-specific studies that delineate the patterns, types, and clinical implications of benign ovarian cysts among women presenting with menstrual and reproductive complaints in gynecologic clinics [9].

This clinical study aims were to evaluate the prevalence and types of benign ovarian cysts in women aged 20 to 45 years, and to investigate their association with menstrual irregularities and reproductive health outcomes, with special consideration of the clinical spectrum and impact of endometrioma syndrome. The findings are anticipated to contribute significantly to the evidence base for individualized reproductive health strategies and to inform optimal gynecological surveillance protocols in similar low-resource healthcare settings [10].

MATERIALS AND METHODS

This prospective, observational, clinic-based study was conducted over a 12-month period from January 2022 to December 2022 in the Departments of Obstetrics and Gynaecology at two tertiary care teaching hospitals in Pakistan: Gujranwala Medical College / General Teaching Hospital (GMC/GTH), Gujranwala, and Lahore General Hospital, Lahore, Pakistan. These institutions cater to a wide gynecological patient load, making them ideal for assessing the clinical presentation of benign ovarian cysts among reproductive-aged women. Ethical clearance for the study was

obtained from the Institutional Review Boards of both hospitals. Prior to inclusion, all participants were provided with detailed information about the study objectives and procedures, and informed written consent was obtained.

The study population included 89 premenopausal women between 20 and 45 years of age who presented to the gynecology outpatient clinics with menstrual irregularities or reproductive health complaints, particularly infertility and chronic pelvic pain. Purposive non-probability sampling was employed. Women were included if they had ultrasound-confirmed benign ovarian cysts measuring ≥2 cm. Patients with malignant ovarian neoplasms, diagnosed polycystic ovary syndrome (PCOS), prior oophorectomy, or recent use (within 3 months) of hormonal therapy were excluded to prevent confounding.

Each participant underwent a thorough clinical evaluation beginning with structured history-taking. Data were collected on menstrual cycle characteristics such as frequency, regularity, cycle length, volume of bleeding, and the presence or severity of dysmenorrhea. Parity status and obstetric history were recorded, and infertility was defined as failure to conceive after at least 12 months of regular unprotected intercourse. Symptoms such as pelvic pressure, pain, or lower abdominal discomfort were documented. General physical examination included height and weight measurements to calculate body mass index (BMI), while gynecological examination was carried out by experienced gynecologists using a bimanual pelvic approach to detect adnexal masses or uterine abnormalities.

Radiological assessment involved transvaginal ultrasonography (TVUS) using a high-resolution 5–7.5 MHz probe. For unmarried or virginal patients, transabdominal ultrasonography was used. Ovarian cysts were evaluated based on size, echogenicity, wall thickness, internal septations, and presence of papillary projections. Cysts were categorized into three major types: functional cysts (including follicular and corpus luteum types), benign neoplastic cysts (such as serous and mucinous cystadenomas and dermoid cysts), and endometriomas (characterized by homogeneous low-level internal echoes and a classic “ground-glass” appearance). Patients with characteristic imaging features of endometriosis, especially when accompanied by infertility, severe dysmenorrhea, or chronic pelvic pain, were designated as having endometrioma syndrome.

For women presenting with subfertility or infertility, hormonal profiling was conducted between the second and fifth day of the menstrual cycle. Serum levels of follicle-stimulating hormone (FSH), luteinizing hormone (LH), estradiol, and anti-Müllerian hormone (AMH) were measured. Ovulatory function was further evaluated through mid-luteal phase serum progesterone estimation. Additional fertility assessments included review of partner semen analyses and hysterosalpingography (HSG) reports where available.

Menstrual irregularities were categorized according to the PALM-COEIN classification system of the International Federation of Gynecology and Obstetrics (FIGO), with particular focus on ovulatory dysfunction-related patterns. The types of abnormalities included oligomenorrhea, polymenorrhea, menorrhagia, amenorrhea, and intermenstrual bleeding. Dysmenorrhea severity was assessed based on patient-reported symptoms using a numeric pain scale.

Data collection was performed using structured proformas and later analyzed using SPSS version 25.0. Quantitative variables such as age, cyst size, BMI, and hormone levels were expressed as mean ± standard deviation (SD). Categorical data, including cyst types and the presence of menstrual irregularities or infertility, were presented as frequencies and percentages. The relationship between cyst type and menstrual or reproductive outcomes was analyzed using chi-square tests for categorical variables, and independent samples t-tests were used to compare mean values between groups (such as endometrioma versus non-endometrioma cysts). Binary logistic regression was applied to adjust for confounding variables such as age and BMI when assessing predictors of infertility and severe dysmenorrhea. A p-value less than 0.05 was considered statistically significant for all tests.

RESULTS

The demographic profile of the study population (n = 89) revealed **a** mean age of 31.6 ± 6.2 years**,** with the largest age group being 26–30 years (23.6%)**,** followed closely by 36–40 years (22.5%)**.** The majority of participants fell within the reproductive age range of 20–40 years. In terms of marital status, 89.9% of women were married, while 7.9% were unmarried and 2.2% were divorced or widowed, reflecting a predominantly married population. The mean body mass index (BMI) was 24.7 ± 3.5 kg/m²**,** with 46.1**%** of participants having a normal BMI, while 35.9% were overweight and 18% obese**,** suggesting a notable proportion of women with elevated BMI levels. The mean duration of symptoms prior to clinical presentation was 7.4 ± 3.1 months, indicating a tendency toward delayed healthcare-seeking behavior in this cohort. This demographic distribution provides essential context for interpreting the clinical correlations of benign ovarian cysts in relation to reproductive health and menstrual abnormalities as shown in table 1.

Table -1: Demographic Characteristics of Study Participants (n = 89)

Variable	Value
Age (years)	31.6 ± 6.2
Age Groups	
– 20–25 years	18 (20.2%)
– 26–30 years	21 (23.6%)
– 31–35 years	17 (19.1%)
– 36–40 years	20 (22.5%)
– 41–45 years	13 (14.6%)
Marital Status	
– Married	80 (89.9%)
– Unmarried	7 (7.9%)
– Divorced/Widowed	2 (2.2%)
Body Mass Index (BMI)	24.7 ± 3.5
BMI Categories	
– Normal (18.5–24.9 kg/m²)	41 (46.1%)
– Overweight (25–29.9 kg/m²)	32 (35.9%)
– Obese (≥30 kg/m²)	16 (18.0%)
Mean Duration of Symptoms	7.4 ± 3.1 months

The comparative analysis of demographic variables between patients with endometrioma (n = 13) and those with other benign ovarian cysts (n = 76) revealed important clinical insights. The mean age of women with endometrioma was slightly higher (33.9 ± 5.2 years) compared to those with other cysts (31.2 ± 6.4 years), though this difference was not statistically significant (p = 0.118). However, a significantly higher proportion of women aged ≥35 years was observed in the endometrioma group (53.8%) versus the other cyst group (27.6%), with a p-value of 0.047, suggesting a notable age-related predilection for endometrioma.

The marital status was comparable between the two groups, with 92.3% of endometrioma patients and 89.5% of other cyst patients being married (p = 0.758). The mean BMI was marginally higher in the endometrioma group (25.6 ± 3.7 kg/m²) compared to others (24.5 ± 3.4 kg/m²), but the difference was not statistically significant (p = 0.211). Similarly, the proportion of women who were overweight or obese (BMI ≥25 kg/m²) was higher in the endometrioma group (69.2%) versus the other group (51.3%), though this did not reach statistical significance (p = 0.203).

Importantly, the mean duration of symptoms was significantly longer in patients with endometrioma (9.1 ± 2.8 months) compared to those with other cysts (6.9 ± 2.9 months), with a highly significant p-value of 0.004. This finding reflects the chronic and often insidious nature of endometrioma-related symptoms and highlights the potential for diagnostic delays in this subgroup as shown in table 2.

Table 2: Comparison of Demographic Characteristics Between Endometrioma and Non-Endometrioma Groups

Variable	Endometrioma (n=13)	Other Cysts (n=76)	p-value
Mean Age (years)	33.9 ± 5.2	31.2 ± 6.4	0.118 †
Age ≥35 years	7 (53.8%)	21 (27.6%)	0.047 *
Married	12 (92.3%)	68 (89.5%)	0.758 *
Mean BMI (kg/m²)	25.6 ± 3.7	24.5 ± 3.4	0.211 †
Overweight/Obese (BMI ≥25)	9 (69.2%)	39 (51.3%)	0.203 *
Mean Duration of Symptoms (months)	9.1 ± 2.8	6.9 ± 2.9	0.004 †

Table 3: Distribution of Ovarian Cyst Types and Associated Clinical Features (n=89)

Cyst Type	n (%)	Menstrual Irregularity (%)	Infertility (%)	Severe Dysmenorrhea (%)
Functional Cysts	33 (37.1)	21 (63.6)	9 (27.3)	5 (15.2)
Serous Cystadenoma	18 (20.2)	12 (66.7)	7 (38.9)	6 (33.3)
Mucinous Cystadenoma	11 (12.3)	6 (54.5)	4 (36.4)	4 (36.4)
Dermoid Cyst	14 (15.7)	7 (50.0)	5 (35.7)	3 (21.4)
Endometrioma	13 (14.6)	11 (84.6)	9 (69.2)	12 (92.3)

The distribution of clinical features across different types of benign ovarian cysts revealed significant variation in menstrual and reproductive health outcomes. Functional cysts were the most common, accounting for 33 cases (37.1%), with 63.6% of these patients experiencing menstrual irregularities, 27.3% reporting infertility, and only 15.2% presenting with severe dysmenorrhea. Serous cystadenomas were observed in 18 patients (20.2%), and showed a slightly higher prevalence of menstrual irregularities (66.7%) and infertility (38.9%), while 33.3% reported severe dysmenorrhea. Mucinous cystadenomas were diagnosed in 11 women (12.3%), with 54.5% experiencing menstrual disturbances, 36.4% reporting infertility, and 36.4% suffering from severe dysmenorrhea. Dermoid cysts were found in 14 patients (15.7%), among whom 50.0% had menstrual irregularities, 35.7% faced infertility, and 21.4% reported severe pelvic pain.

Endometriomas, comprising 13 cases (14.6%), demonstrated the strongest association with adverse gynecologic outcomes. A striking 84.6% of endometrioma patients experienced menstrual irregularities, 69.2% were infertile, and 92.3% reported severe dysmenorrhea. These values were markedly higher than those associated with other cyst types, highlighting the distinct clinical burden of endometrioma syndrome on both menstrual and reproductive health. This pattern underscores the chronic and hormonally active nature of endometriomas and their substantial impact on fertility and quality of life as shown in table 3.

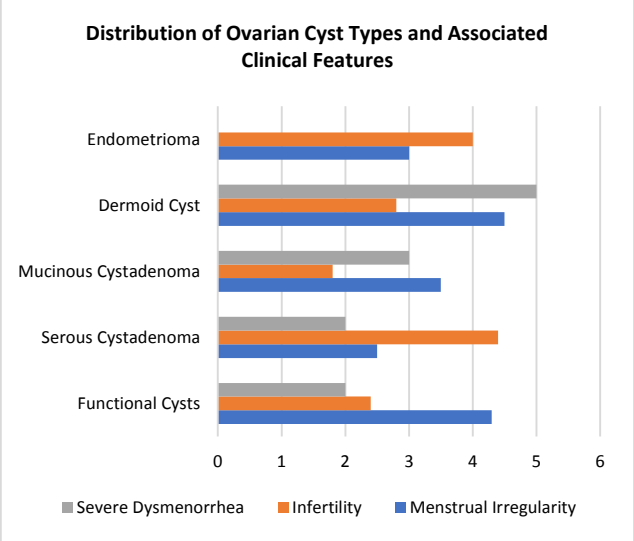

Fig-1: Distribution of key clinical symptoms across different types of benign ovarian cysts.

The bar graph in Fig-1 illustrated the distribution of clinical features severe dysmenorrhea, infertility, and menstrual irregularities across five types of benign ovarian cysts. Endometriomas are shown to have the highest association with severe dysmenorrhea (almost 5 cases), as well as significant rates of infertility and menstrual irregularity (4 each). Dermoid cysts are also associated with notable dysmenorrhea (nearly 5) and menstrual irregularity (about 4), though infertility is slightly lower. Functional cysts primarily correlate with menstrual irregularity (around 4.2), with less infertility and minimal dysmenorrhea. Serous cystadenomas show a balanced yet moderate association with all three symptoms, particularly infertility. Mucinous cystadenomas display a similar pattern but at a slightly lower frequency. Overall, the chart highlights endometriomas as the most clinically burdensome, particularly in relation to pain and reproductive dysfunction. In graph 2,3,4,5,6 considered as scale presentation.

DISCUSSION

This clinical study investigated the gynecological presentation, reproductive implications, and symptom burden associated with benign ovarian cysts in women of reproductive age, with particular attention to endometrioma syndrome. Our findings demonstrate that benign ovarian cysts are a common gynecological condition among women aged 20 to 45 years, with significant clinical variability depending on cyst type. Functional cysts were the most frequently observed, consistent with their known association with normal ovulatory cycles and self-limiting behavior [11]. However, endometriomas, though less common, were associated with a more severe clinical profile marked by higher rates of menstrual irregularity, infertility, and dysmenorrhea [12].

The mean age of participants in this study was 31.6 years, aligning with previous literature suggesting that the reproductive age group is particularly vulnerable to both functional and pathological cyst development [13]. Notably, women with endometriomas were older on average and more likely to be above 35 years of age. This age-related pattern supports existing hypotheses that endometriosis and its ovarian manifestation endometrioma are progressive diseases that often manifest more severely with advancing reproductive age [14].

A substantial proportion (74.1%) of women in this study presented with menstrual irregularities, emphasizing the disruptive effect of ovarian cysts on hormonal balance and endometrial cycling [15]. Endometrioma, in particular, showed a strong association with abnormal uterine bleeding patterns, likely due to chronic pelvic inflammation and hormonal dysregulation. The high prevalence of oligomenorrhea and menorrhagia in this subgroup aligns with prior research suggesting that endometriotic lesions alter local estrogen production and disrupt hypothalamic-pituitary-ovarian (HPO) axis signaling [16].

The association between benign ovarian cysts and infertility was a major focus of this study. Infertility was reported in 43.8% of participants overall, with the highest prevalence seen among women with endometriomas (69.2%) [17]. This supports previous clinical observations and mechanistic studies indicating that

endometriomas impair fertility through multiple pathways, including altered folliculogenesis, decreased oocyte quality, disrupted tubal motility, and inflammatory changes in the peritoneal environment. Furthermore, hormonal profiling in these patients revealed higher LH:FSH ratios and lower AMH levels, indicative of compromised ovarian reserve and ovulatory dysfunction [18].

Dysmenorrhea was another prominent symptom reported by 37.1% of all patients, with a striking 92.3% of endometrioma patients experiencing severe menstrual pain. The classic "chocolate cyst" appearance on ultrasound, along with persistent pelvic pain and cyclical exacerbation, aligns well with the endometriotic nature of these lesions [19]. These findings are consistent with existing evidence describing endometrioma as a hormonally active, estrogen-dependent lesion that induces both nociceptive and inflammatory pain mechanisms.

Interestingly, the mean duration of symptoms was significantly longer in patients with endometrioma compared to those with other cyst types (9.1 vs. 6.9 months), suggesting a diagnostic delay often associated with the subtle and chronic onset of endometriosis-related symptoms. This highlights the urgent need for increased awareness, early ultrasonographic evaluation, and timely gynecological referral for women presenting with cyclical pelvic pain and infertility [12,15,20].

Although other cyst types such as serous and mucinous cystadenomas and dermoid cysts also showed associations with menstrual irregularities and reproductive complaints, these associations were of lower magnitude and more variable. Functional cysts, as expected, demonstrated the least clinical burden and were mostly self-limited [11]. This study adds to the limited body of literature from South Asian populations, particularly Pakistan, regarding the spectrum and clinical behavior of benign ovarian cysts. It reinforces the importance of cyst type-specific evaluation when assessing menstrual and fertility-related symptoms and supports a more individualized approach to management. The findings underline the significant clinical burden posed by endometrioma syndrome and support its inclusion as a separate category in future classification and treatment guidelines[13,20].

CONCLUSION

This study highlighted the significant clinical impact of benign ovarian cysts, particularly endometriomas, on menstrual irregularities, infertility, and pelvic pain in reproductive-aged women. While functional cysts were more common, endometriomas were associated with the most severe symptom burden, including a strong correlation with infertility and severe dysmenorrhea. The findings emphasize the need for early identification and individualized management of cyst types, especially in patients presenting with chronic pelvic pain and reproductive concerns. Enhanced gynecological surveillance and timely intervention may improve reproductive outcomes and quality of life in affected women.

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Authors' Contributions: SA conceived the study, supervised the clinical work, and finalized the manuscript. NSB and LA contributed to data collection and patient evaluation. HH and VK performed ultrasound and reproductive assessments. SF conducted statistical analysis and assisted in drafting the results. All authors critically reviewed and approved the final manuscript.

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