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Histomorphological Spectrum and Clinicopathological Correlations of Ovarian Lesions in a Tertiary Care Hospital: A Two-Year Prospective Study

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KEYWORDS

Ovarian neoplasms; Ovarian cysts; Histopathology; Cystadenoma, serous; Tertiary care centers; Clinicopathological correlation

ABSTRACT:

Background: Ovarian lesions encompass a wide spectrum of non-neoplastic and neoplastic conditions and represent a significant diagnostic challenge in gynecological pathology. Histopathological examination remains the gold standard for definitive diagnosis and management planning in tertiary care settings.

Aim: To determine the demographic distribution, Histomorphological spectrum, and clinicopathological correlations of non-neoplastic and neoplastic ovarian lesions in a tertiary care hospital.

Methods: A prospective descriptive cross-sectional study was conducted over two years (June 2022–June 2024) in the Department of Pathology. All ovarian specimens and biopsies received (n=67) were analyzed for clinical, gross, and Histomorphological features and classified per WHO 2020 guidelines.

Results: Patients ranged from 14 to 77 years; peak incidence was in the 31–40-year age group (29.8%). Pain abdomen (31%) was the most common presentation. Unilateral oophorectomy was the predominant specimen type (60%). Majority of lesions were unilateral (98.5%) and purely cystic (79.1%). Neoplastic lesions (76%) outnumbered non-neoplastic lesions (24%). Surface epithelial tumors were most frequent (58.2%), followed by tumor-like lesions (23.8%) and germ cell tumors (11.9%). Among neoplastic lesions, benign tumors predominated (84.3%), with serous cystadenoma as the most common diagnosis (22.3%).

Conclusion: Benign ovarian neoplasms predominate in the reproductive age group. Clinicopathological correlation and Histomorphological analysis are essential for accurate diagnosis and appropriate management.

Introduction: The ovaries are paired intra-pelvic organs of the female reproductive system, fulfilling dual roles as the source of ova and as endocrine glands regulating secondary sexual characteristics. Owing to their structural complexity which comprises of totipotent germ cells, multipotent surface coelomic epithelium, and sex cord-stromal cells, the ovaries are capable of giving rise to an exceptionally diverse spectrum of lesions, both non-neoplastic and neoplastic in nature. This histological versatility renders ovarian pathology one of the most

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complex and diagnostically challenging domains in surgical pathology.[1,2]

Ovarian lesions represent a broad continuum that includes functional and inflammatory non-neoplastic conditions, such as follicle cysts, corpus luteal cysts, and endometriotic cysts, as well as a wide range of benign, borderline, and malignant neoplasms. Non-neoplastic lesions, commonly referred to as tumor-like conditions, are frequently encountered in the reproductive age group and may clinically and radiologically mimic neoplastic disease, making histopathological evaluation indispensable for accurate differentiation.[3] Conditions such as endometriosis, pelvic inflammatory disease, and functional cysts must be carefully distinguished from true ovarian neoplasms to avoid unnecessary surgical intervention and to guide appropriate management.[3,4]

Ovarian cancer remains the most lethal gynecological malignancy worldwide, ranking fifth among causes of cancer-related mortality in women. Globally, approximately 239,000 new cases and 152,000 deaths are reported annually. Incidence rates exceed 13 per 100,000 women in Western nations including the United Kingdom, Germany, the United States, and Scandinavia, while India reports fewer than 5 cases per 100,000 women.[5] Despite this relatively lower incidence, India bears the highest ovarian cancer mortality rate in Asia, largely attributable to late-stage diagnosis. The combined mortality of ovarian cancer surpasses that of endometrial and cervical cancers combined, underscoring the urgent need for early and accurate diagnosis.[6]

The clinical presentation of ovarian lesions is notoriously non-specific. Pain abdomen, abdominal mass, menstrual irregularities, and bloating are among the most commonly reported symptoms; however, none are pathognomonic. Ovarian malignancies, in particular, are frequently asymptomatic until advanced stages, contributing to poor prognosis. Risk factors include nulliparity, high socioeconomic status, family history, and genetic predisposition, particularly BRCA1/2 mutations.[7] The peak age of presentation varies by lesion type; benign surface epithelial tumors occur predominantly in women aged 20–45 years, borderline tumors slightly later, and malignant tumors most frequently in the 45–65-year age group. Germ cell tumors are characteristically seen in children and young adults, while sex cord-stromal tumors may present across a wider age range.[8]

Histopathological examination remains the unequivocal gold standard for the definitive diagnosis of ovarian lesions. While clinical presentation, tumor markers, and imaging modalities including ultrasonography and magnetic resonance imaging provide valuable diagnostic pointers, none can replace microscopic tissue evaluation for final diagnosis, subtyping, and prognostication. The WHO 2020 classification of female genital tumors provides a standardized framework for Histomorphological subtyping, facilitating uniform reporting, therapeutic decision-making, and epidemiological comparison across studies.[9,10]

Despite a growing body of global literature, data on the clinicopathological profile of ovarian lesions from Indian tertiary care centers remain limited and regionally heterogeneous. Understanding the local demographic distribution, lesion spectrum, and clinicopathological correlates is essential for guiding institutional protocols and improving diagnostic accuracy. There exists a need for systematic, prospective studies from tertiary care hospitals that analyze the full Histomorphological spectrum. In light of this, the present study was undertaken with the aim to determine the demographic distribution, Histomorphological spectrum, and clinicopathological correlations of non-neoplastic and neoplastic ovarian lesions in a tertiary care hospital setting, and to compare the findings with published literature from India and other geographic regions.

Material And Methods:

Study Design and Setting: A prospective, descriptive, cross-sectional study was conducted in the Department of Pathology, Bharati Vidyapeeth Deemed to be University and Medical College, Pune, over a period of two years from June 2022 to June 2024.

Sample Size: Sample size was calculated using power analysis for a single proportion (SPSS version 29.0). Based on previous departmental records, the population proportion of ovarian lesions among gynecological specimens was determined to be 0.041 (16 ovarian lesion cases out of 388 gynecological cases). With a power of 80%, a significance level of 5%, and a null value of 15%, the minimum calculated sample size was 64. A total of 67 cases were enrolled during the study period.

Inclusion Criteria: All surgical specimens and biopsies containing ovarian lesions received in the Department of Pathology during the study period were included.

Exclusion Criteria: Specimens that were inadequate for processing or showed autolysis rendering histopathological evaluation impossible were excluded.

Specimen Processing: All received specimens which included total abdominal hysterectomies (TAH), unilateral oophorectomies, and bilateral salpingo-oophorectomies (BSO) were subjected to standard gross pathological examination. Gross features including size,

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shape, external surface, consistency, cut surface appearance (cystic, solid, or solid-cystic), and content were documented. Representative tissue sections were processed by paraffin embedding, sectioned at 4–5 microns, and stained with Hematoxylin and Eosin (H&E). Special stains and immunohistochemistry were performed where necessary to confirm diagnosis.

Histopathological Classification: All lesions were classified and subtyped according to the WHO 2020 Classification of Female Genital Tumors. Lesions were broadly categorized as non-neoplastic (tumor-like lesions) and neoplastic. Neoplastic lesions were further subclassified by morphological type (benign, borderline, malignant) and by WHO-defined histopathological category.

Clinical Data Collection: Clinical details including patient age, presenting symptoms, menstrual history, surgical indication, and laterality of involvement were obtained from clinical records and the proforma designed for the study. Ethical approval was obtained from the Institutional Ethics Committee, and informed written consent was obtained from all patients prior to enrollment.

Statistical Analysis: Data were compiled in Microsoft Excel and analyzed using SPSS version 29.0. Descriptive statistics including frequencies, percentages, and cross-tabulations were used to present demographic, clinical, gross, and histopathological findings. Findings were compared with published literature from Indian and international studies.

Results

A total of 67 ovarian specimens were received and analyzed in the Department of Pathology between June 2022 and June 2024. The observations are presented under the following headings.

Table 1. Age Distribution of Patients with Ovarian Lesions (n=67)

Age Group (Years)	Number of Cases	Percentage (%)
≤10	0	0
11–20	6	8.9
21–30	13	19.4
31–40	20	29.8
41–50	18	26.8
51–60	5	7.4
61–70	4	5.9
71–80	2	2.9
Total	67	100

The age of patients in the present study ranged from 14 to 77 years, with a mean age of 38.6 years. The maximum number of cases was observed in the 31–40-year age group (29.8%), followed by the 41–50-year age group (26.8%). Together, the third and fourth decades accounted for 56.6% of all ovarian lesions, indicating a peak incidence during the reproductive and perimenopausal years. The youngest patient was 14 years of age, presenting with a germ cell tumor, and the oldest was 77 years, diagnosed with a malignant neoplasm.

Table 2. Clinical Presentation of Patients with Ovarian Lesions (n=67)

Clinical Presentation	Number of Cases	Percentage (%)
Pain abdomen	31	46.2
Mass per abdomen	30	44.7
Menstrual abnormalities	3	4.4
Ascites	6	8.9
Incidental finding	5	7.4
Infertility	2	2.9

Note: Some patients presented with more than one symptom; percentages exceed 100.

Pain abdomen was the most common clinical presentation, noted in 31 cases (46.2%), followed closely by mass per abdomen in 30 cases (44.7%). Menstrual abnormalities including dysmenorrhea and menorrhagia were observed in 3 cases (4.4%). Ascites was a presenting feature in 6 cases (8.9%), predominantly associated with malignant and borderline lesions. Five cases (7.4%) were incidental findings detected on routine ultrasonographic examination performed for unrelated gynecological complaints. These non-specific presentations underscore the diagnostic challenge posed by ovarian lesions in clinical practice and emphasize the critical role of histopathological evaluation in definitive diagnosis.

Table 3. Type of Surgical Specimen and Laterality of Ovarian Lesions (n=67)

		Number of Cases (n=67)	Percentage (%)
Type of Specimen Received	**Unilateral oophorectomy**	40	59.7
	Total abdominal hysterectomy (TAH)	19	28.3

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	Bilateral salpingo-oophorectomy (BSO)	8	11.9
Laterality of Ovarian Lesions	**Right ovary**	43	64.1
	Left ovary	23	34.3
	Bilateral	1	1.4

Unilateral oophorectomy was the most common surgical procedure, accounting for 59.7% of specimens, followed by total abdominal hysterectomy (28.3%) and bilateral salpingo-oophorectomy (11.9%). With regard to laterality, the right ovary was involved in the majority of cases (64.1%), followed by the left ovary (34.3%). Bilateral involvement was observed in only one case (1.4%), which on histopathological examination was identified as a malignant neoplasm. The overwhelmingly unilateral nature of ovarian lesions in this study is consistent with the general behavior of primary ovarian tumors, in which bilaterality is more characteristic of metastatic disease and serous carcinomas.

Table 4. Gross Appearance and Categorization of Ovarian Lesions (n=67)

		Number of Cases	**Percentage (%)**
Gross Appearance	**Purely cystic**	53	79.1
	Solid-cystic	9	13.4
	Purely solid	5	7.4
Categorization	**Non-neoplastic (Tumor-like lesions)**	16	23.9
	Neoplastic	51	76.1

On gross examination, the majority of ovarian lesions (79.1%) presented as purely cystic masses, followed by solid-cystic lesions (13.4%) and purely solid lesions (7.4%). Purely cystic lesions were predominantly associated with benign neoplasms and non-neoplastic conditions, while solid-cystic morphology was observed more frequently in malignant and borderline lesions. Purely solid lesions were largely represented by sex cord-stromal tumors and the single metastatic case. On histopathological categorization, neoplastic lesions (76.1%) significantly outnumbered non-neoplastic lesions (23.9%), indicating a higher frequency of true neoplasms among surgically resected ovarian specimens in the present study population.

Table 5. Histopathological Classification of All Ovarian Lesions (n=67)

Histopathological Category		**Number of Cases**	**Percentage (%)**
Neoplastic Lesions (n=51)	**Surface epithelial tumors**	39	58.2
	Germ cell tumors	8	11.9
	Sex cord-stromal tumors	3	4.4
	Metastatic tumors	1	1.4
Non-Neoplastic Lesions (n=16)	**Follicle cyst**	9	13.4
	Hemorrhagic corpus luteal cyst	3	4.4
	Simple ovarian cyst	2	3.0
	Other hemorrhagic/necrotic cysts	2	3.0
	Total	67	100

Among all 67 ovarian lesions, surface epithelial tumors were the most common histopathological category, comprising 58.2% of all cases. This was followed by tumor-like (non-neoplastic) lesions at 23.9% and germ cell tumors at 11.9%. Sex cord-stromal tumors and metastatic tumors accounted for 4.4% and 1.4%, respectively. Within non-neoplastic lesions, follicle cyst was the most frequently encountered entity, seen in 9 cases (13.4%), followed by hemorrhagic corpus luteal cyst (4.4%). Among neoplastic lesions, the morphological breakdown revealed a predominance of benign tumors (84.3%), with malignant tumors accounting for 11.7% and borderline tumors for 3.9% of neoplastic cases.

Table 6. Age Distribution of Ovarian Lesions by Histological Category (n=67)

Age Group (Years)	**Tumor-like Lesions n (%)**	**Benign Tumors n (%)**	**Borderline Tumors n (%)**	**Malignant Tumors n (%)**	**Total n (%)**

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11–20	1 (1.4)	3 (4.4)	0	1 (1.4)	6 (7.4)
21–30	5 (7.4)	8 (11.9)	0	0	13 (19.4)
31–40	5 (7.4)	14 (20.8)	0	1 (1.4)	20 (29.8)
41–50	4 (5.9)	11 (16.4)	1 (1.4)	2 (2.9)	18 (26.8)
51–60	1 (1.4)	3 (4.4)	1 (1.4)	0	5 (7.4)
61–70	0	3 (4.4)	0	1 (1.4)	4 (5.9)
71–80	0	1 (1.4)	0	1 (1.4)	2 (2.9)
Total	16 (23.8)	43 (64.1)	2 (2.9)	6 (8.9)	67 (100)

Age-stratified analysis revealed distinct patterns across histological categories. Tumor-like lesions were most prevalent in the 21–40-year age group, consistent with the reproductive-age predominance of functional cysts. Benign tumors showed peak incidence in the 31–40-year age group (20.8%), followed by the 41–50-year group (16.4%). Borderline tumors were confined to the 41–60-year age range, while malignant tumors demonstrated a bimodal distribution, with cases detected across a wider age spectrum from the second to the eighth decade. Malignant tumors were most frequent in the 41–50-year age group (2.9%), with additional cases in the 61–70 and 71–80-year groups, reflecting the known association of ovarian malignancy with advancing age. The single malignant case in the 11–20-year age group was a mixed germ cell tumor, consistent with the known predilection of malignant germ cell tumors for younger patients.

Discussion:

Ovarian lesions represent one of the most diagnostically challenging entities in gynecological pathology, owing to their broad Histomorphological diversity encompassing both non-neoplastic and neoplastic conditions across a wide age spectrum. Histopathological examination, supported by thorough clinical and gross pathological correlation, remains the unequivocal gold standard for definitive diagnosis and surgical planning.[3,7] The present study was conducted over a period of two years at a tertiary care hospital with the aim of analyzing the complete Histomorphological spectrum of ovarian lesions using the WHO 2020 classification framework. The findings are discussed herein in the context of contemporary published literature from Indian and international tertiary care settings.

The peak incidence in the present study was in the 31–40-year age group (29.8%), followed by the 41–50-year group (26.8%), reflecting a strong predilection for reproductive and perimenopausal years. This finding was concordant with Sampurna K et al, who reported peak incidence in the 3rd and 4th decades among 200 cases from Hyderabad.[11] Solanki SH et al similarly documented the majority of cases in the 20–39-year age group (49.78%) in their study of 225 ovarian lesions from Ahmedabad.[12] Samalla S et al from Nizamabad reported maximum incidence in the 21–30-year group among neoplastic cases. In contrast, Patel N et al, in a large series of 480 cases from western Maharashtra, identified peak incidence in the 41–50-year age group (52%), suggesting demographic variation attributable to referral pattern differences.[13] Mehra P et al, classifying 110 neoplasms using WHO 2020 guidelines, reported comparable predominance in the third decade, consistent with the present study.[14] Ahuja S et al from Uttarakhand reported a mean age of 38.51 years, with the majority of cases in the 30–40-year age range, further supporting this pattern.[15]

Pain abdomen was the most common presenting symptom (46.2%), followed by mass per abdomen (44.7%). This pattern was concordant with Sheela KM et al, who identified abdominal pain as the predominant complaint (40.8%) in their large cohort of 597 ovarian tumors from Thiruvananthapuram.[16] Chalana JN et al similarly reported pain abdomen as the most frequent symptom (51.7%), followed by mass per abdomen and abnormal uterine bleeding, closely mirroring the present findings.[17] Maharjan S et al reported lower abdominal pain (82%) as the predominant presentation followed by abdominal mass (48.7%) in their Nepalese cohort.[18] The consistently non-specific nature of these symptoms, observed across studies irrespective of geographic region, emphasizes that clinical presentation alone is inadequate for definitive diagnosis and underscores the indispensability of histopathological examination in achieving a conclusive and clinically actionable diagnosis.

With respect to laterality, 98.5% of ovarian lesions were unilateral, with the right ovary more frequently involved (64.1%). This was consistent with Anitha Pallikkara V et al, who noted unilateral involvement in 97.55% of 245 cases from Kerala, and with Nair RV et al, who documented unilaterality in 92% of 150 cases from Sree Mookambika Institute.[19,20] A higher bilateral rate of 12.44% was reported by Solanki SH et al, possibly attributable to their larger sample size and greater inclusion of malignant cases. The single bilateral case in the present study was malignant, consistent with the well-recognized association between bilaterality and

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ovarian malignancy. Unilateral oophorectomy was the most common surgical procedure (60%), reflecting the predominantly benign lesion profile of this study.[21]

On gross examination, 79.1% of lesions were purely cystic. Samalla S et al reported cystic morphology in 73.7% of cases from Nizamabad, while Ahuja S et al similarly noted cystic predominance among benign lesions in their North Indian series.[13,15] Marachapu J et al documented cystic consistency as predominant among benign ovarian lesions in their retrospective study. Solid-cystic morphology (13.4%) was predominantly associated with malignant and borderline lesions across comparison literature.[21] Patel N et al confirmed that complex or solid tumor morphology was significantly associated with increased malignancy risk. Purely solid lesions (7.4%) corresponded primarily to sex cord-stromal tumors and the single metastatic case, consistent with their established gross characteristics.[22]

The present study demonstrated a predominance of neoplastic lesions (76.1%) over non-neoplastic lesions (23.9%). This contrasts with Gaikwad SL et al, who reported non-neoplastic lesions in 54.5% from their rural Maharashtra cohort, and Kannan S et al, whose five-year study of 350 samples from Puducherry found non-neoplastic conditions to predominate.[23,24] This discrepancy likely reflects the tertiary care referral bias of the present study. Among non-neoplastic lesions, follicle cyst was the most common entity (13.4%), consistent with Nair RV et al, who reported follicular cysts as the predominant non-neoplastic lesion (49.1%), and Samalla S et al, who documented follicular cysts in 43.3% of tumor-like lesions.[13,20] This contrasted with Gaikwad SL et al, where corpus luteal cyst predominated (27.7%), and Maharjan S et al, where hemorrhagic corpus luteum cysts constituted 70% of non-neoplastic cases, suggesting regional variation in non-neoplastic lesion profiles across Indian institutions.[18,23]

Among 51 neoplastic cases, benign tumors predominated (84.3%), followed by malignant lesions (11.7%) and borderline tumors (3.9%). This was concordant with Samalla S et al (93.4% benign) and Gaikwad SL et al (88.1% benign).[13,23] Azad S et al from Dehradun reported 76.9% benign cases in their 114-case series, while Mehra P et al documented a benign proportion of 69%. Surface epithelial tumors were the most common neoplastic category (58.2%), consistent with Anitha Pallikkara V et al (76.32%) and Mehra P et al (70%), reinforcing their dominant position across all published Indian comparative studies.[14,19,25]

Patel N et al further established through chi-square analysis that postmenopausal status, nulliparity, increasing age, and bilaterality were all statistically significant predictors of malignancy, findings clinically relevant in stratifying patients with ovarian masses in a tertiary care setting. The observation that 79.1% of lesions were grossly cystic in the present study, compared to 50.83% in Patel N et al's larger series, may partly reflect institutional differences in the proportion of functional and non-neoplastic cysts included in the cohort, as functional cysts are predominantly cystic and formed a substantial component of the non-neoplastic group in this study.[22]

The present study is limited by its single-center design and relatively small sample size of 67 cases, which restricts generalizability. Retrospective retrieval of selected clinical data introduces potential documentation bias. Despite these limitations, the prospective design, rigorous WHO 2020-based classification, and comprehensive inclusion of both neoplastic and non-neoplastic categories with correlated clinical, gross, and microscopic parameters represent significant methodological strengths, providing a complete institutional ovarian pathology profile rarely achieved in subspecialty-focused research. Clinically, the findings reinforce that benign lesions dominate the reproductive-age surgical specimen pool and that early histopathological evaluation remains indispensable for differentiating non-neoplastic functional lesions from true neoplasms, guiding appropriate and timely surgical decision-making in practice. The overwhelmingly unilateral nature of ovarian lesions supports conservative and fertility-preserving surgical approaches in younger patients, an important therapeutic consideration given the reproductive-age predominance documented in this study.

Conclusion: The present study demonstrates that ovarian lesions encompass a broad Histomorphological spectrum with a predominance of benign neoplastic lesions in the reproductive age group. Surface epithelial tumors were the most common neoplastic category, while follicle cyst was the most frequent non-neoplastic lesion. Clinicopathological correlation, including clinical history, gross examination, and Histomorphological analysis using WHO 2020 classification, remains the gold standard for definitive diagnosis. Early and accurate histopathological evaluation is essential for guiding appropriate surgical management and improving patient outcomes in tertiary care settings.

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