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Original Research Article

Unveiling the Ovarian Landscape: A Histopathological Spectrum Exploration

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Abstract

Introduction: Ovarian cancer constitutes a heterogeneous group of malignancies and remains a leading cause of gynaecologic cancer-related mortality worldwide. Histopathological classification plays a critical role in diagnosis, prognosis, and therapeutic decision-making. According to the World Health Organization (WHO) 2020 classification, ovarian neoplasms are broadly categorized into epithelial tumours, germ cell tumours, and sex cord-stromal tumours, each with unique morphological, immunohistochemical, and molecular characteristics. This study presents a comprehensive analysis of the histopathological spectrum of ovarian lesions, with emphasis on recent classification updates and diagnostic challenges.

Objectives:

1. To assess the frequency distribution of ovarian lesions based on age, laterality, and gross morphology.
2. To evaluate the neoplastic ovarian lesions using WHO 2020 classification.
3. To analyze pathological staging of malignant ovarian tumors.

Materials & Methods: A retrospective study was conducted over a two-year period, from April 2023 to March 2025, at a tertiary care hospital in Karnataka. A total of 75 ovarian lesion cases were evaluated histologically and categorized using WHO 2020 guidelines.

Results & Discussion: Non-neoplastic lesions were more frequently observed than neoplastic ones. The majority of cases occurred in the 31–50 years age group. Among neoplastic lesions, serous cystadenoma was the most common (20 cases, 26.6%). Malignant tumors included high-grade serous carcinoma (6 cases, 8%), yolk sac tumor (5 cases, 6.6%), endometrioid carcinoma (3 cases, 4%), granulosa cell tumor (3 cases, 4%), and mucinous carcinoma (2 cases, 2.6%).

Conclusion: This study highlights the wide histopathological diversity of ovarian lesions, with non-neoplastic lesions being more prevalent and serous cystadenoma as the most common neoplasm. The age distribution pattern and application of the WHO 2020 classification system contribute significantly to diagnostic accuracy and effective staging. Utilizing this standardized approach enhances clinical decision-making, particularly in the management of malignant ovarian tumours.

Keywords: High-grade serous carcinoma, Mature Teratoma, Neoplastic lesions, pTNM Classification, Serous cystadenoma, WHO 2020 classification, Yolk sac Tumor.

Introduction

The ovaries are a pair of pelvic organs that form part of the female reproductive system. They are situated on either side of the uterus, near the lateral pelvic wall, positioned behind the broad ligament and in front of the rectum. [1] A normal ovary usually has dimensions of approximately 3.5 x 2.5 x 1.5 cm. [2] Due to the cyclical physiological changes they undergo from puberty until menopause, ovaries contain multiple cell types, each of which has the potential to develop into tumours. [3] Ovarian cancer ranks as the fifth leading cause of cancer-related deaths in women and results in more fatalities than any other malignancy of the female reproductive system.

Among Indian women, it is the third most prevalent primary cancer affecting the genital tract, most commonly occurring between the ages of 45 and 50. [4] According to Globocan 2020, India recorded a total of 103,716 cases of ovarian cancer, with 45,701 being newly diagnosed. Ovarian tumours were responsible for approximately 32,077 deaths. The incidence rate is approximately 15.65 per 100,000 women, and ovarian cancer accounts for about 3% of all cancers diagnosed in women. [5,6] The World Health Organization classifies ovarian tumours based on their tissue of origin into the following categories: Surface Epithelial (65%), Germ Cell (15%), Sex Cord-Stromal (10%), Metastatic (5%), and Miscellaneous. [7] Of these, the majority of malignant tumours, about 90% originate from surface epithelial cells. [8,9] The wide morphological variability and nonspecific clinical symptoms of ovarian lesions make accurate diagnosis challenging. As a result, histopathological examination remains essential for both diagnosis and guiding appropriate treatment. [10] This study aims to analyse the histopathological spectrum of ovarian lesions in a tertiary care centre and to assess the distribution of benign and malignant tumours across different age groups.

Objectives:

1. To assess the frequency distribution of ovarian lesions based on age, laterality, and gross morphology.
2. To evaluate the neoplastic ovarian lesions using WHO 2020 classification.
3. To analyze pathological staging of malignant ovarian tumors.

Materials and Methods: This retrospective study was carried out in the Department of Pathology at Sapthagiri Institute of Medical Sciences & Research Centre, Bangalore, India, over a two-year period from April 2023 to March 2025. A total of 75 cases were analyzed. The specimens were fixed in 10% neutral buffered formalin for 24 to 48 hours.

After adequate fixation, representative tissue sections were taken. Standard histological processing was performed, including Paraffin embedding, and tissue sections of 4–5 micrometers in thickness were prepared and stained with hematoxylin and eosin for microscopic examination.

All lesions were evaluated histologically and classified according to the WHO 2020 guidelines.

Inclusion criteria: All specimens of ovarian lesions (resected ovarian masses/ cystectomy specimens, tubo-ovarian masses and hysterectomy with salphingo-oophorectomy specimens) with complete clinical details.

Exclusion criteria:

- Inadequate specimens
- Poorly preserved specimens
- Specimens without clinical records
- Recurrent case

Results:

Histopathological spectrum of ovarian tumours: The study included a total of 75 cases of ovarian lesions. Of these, 56 cases (74.66%) were benign and 19 cases (25.33%) were malignant as shown in Table 1. The majority of the lesions (61 cases, 81.33%) were unilateral, while the remaining cases presented bilaterally as shown in Table 2.

Table 1: Nature of Ovarian lesions

Nature of lesion	Number of cases	Percentage
Benign	56	74.6%
Malignant	19	25.4%
Total	75	100.0%

Table 2: Laterality of ovarian lesions

Laterality	Benign	Malignant	Total
Unilateral	48	13	61
Bilateral	8	6	14
Total	56	19	75

On gross examination, 54 lesions (72%) appeared cystic. Malignant tumours were predominantly mixed (solid and cystic) in 12 cases (16.0%) or entirely solid in 7 cases (9.33%) as shown in **Table 3.**

Table 3: Gross appearance

Type of tumor	Number of cases	Cystic	Solid	Partly solid & partly cystic
Benign	56	54	00	02
Malignant	19	00	07	12
Total	75	54	07	14

Out of 75 cases of ovarian lesions, 14 cases were in the size range of 1.0-5.0 cm, 28 cases in the range of 6.0-10.0 cm, 27 cases in the range of 11.0-15.0 cm & 6 cases in the range of 16.0-20.0 cm as shown in **Table 4.**

Table 4: Size of ovarian neoplasm

Category	No of cases	1-5 cm	6-10 cm	11-15 cm	16-20 cm
Benign	**56**	**14**	**21**	**17**	**4**
Malignant	**19**	**00**	**7**	**10**	**2**

Histologically, surface epithelial tumours were the most common, accounting for 43 cases (57.33%), followed by germ cell tumours in 16 cases (21.33%), sex cord-stromal tumours in 3 cases (4.0%), and tumour-like lesions in 12 cases (16.0%) as shown in Table 5. Among the surface epithelial tumours, benign serous cystadenoma was the most frequently observed neoplasm with 20 cases (26.6%), followed by benign mucinous cystadenoma, which accounted for 8 cases (10.66%).

Table 5: Histopathological spectrum of ovarian lesions

Histological type	Number of cases	Percentage
Surface epithelial tumors	43	57.3%
Sex cord stromal tumors	3	4.0%
Germ cell tumors	16	21.3%
Metastatic tumors	4	5.4%
Tumor like lesions	9	12.0%
Total	75	100.0%

Among the malignant surface epithelial tumours, there were 6 cases (8.0%) of high-grade serous carcinoma, 2 cases (2.66%) of mucinous carcinoma, and 3 cases (4.0%) of endometrioid carcinoma. Sex cord-stromal tumours included 3 cases (4.0%) of granulosa cell tumour. Within the category of germ cell tumours, mature teratoma was the most frequently encountered, accounting for 9 cases (12.0%), followed by 5 cases (6.66%) of yolk sac tumour. Table 6 presents the distribution of lesions based on histopathological spectrum.

Table 6: Histopathological spectrum- Subtypes

Histopathological category	Subtypes in the category	Number of cases	Percentage
Benign Surface Epithelial tumors	Serous Cystadenoma	20	26.6%
	Mucinous Cystadenoma	08	10.6%
	Sero-mucinous Cystadenoma	04	5.3%
Malignant Surface Epithelial tumors	High grades Serous Carcinoma	06	8.0%
Sex cord stromal tumors	Mucinous Carcinoma	02	2.6%
	Endometrioid Carcinoma	03	4.0%
	Adult Granulosa cell tumor	03	4.0%
Germ cell tumors	Teratoma, Benign	09	12.0%
	Yolk sac tumor	05	6.6%
	Monodermal teratoma (Struma ovarii, NOS)	03	4.0%
Tumor like lesions	Follicle cyst	03	4.0%
	Corpus luteum cyst	09	12.0%

On analysing the pathological staging of malignant ovarian tumors, 13 cases were in pT1 stage, 4 cases in pT2 stage & 2 cases in pT3 stage according to pTNM CLASSIFICATION (AJCC 8th Edition).

Age distribution among ovarian tumours: The majority of patients with ovarian lesions were in the 31–40 years age group, accounting for 17 cases (22.66%), followed closely by the 21–30 years age group with 16 cases (21.33%). Malignant ovarian tumors (10.6%) were predominantly observed in patients over 50 years of age. The youngest patient in the study was 10 years old and diagnosed with a yolk sac tumor, while the oldest, aged 75 years, was diagnosed with high-grade serous carcinoma as shown in Table 7.

Table 7: Age distribution among ovarian tumors

Age group (in years)	Benign tumors	Malignant tumors	Total number of cases
10-20	4	3	7
21-30	14	2	16
31-40	15	2	17
41-50	12	2	14
51-60	7	6	13
61-70	2	3	5
71-80	2	1	3
Total	56	19	75

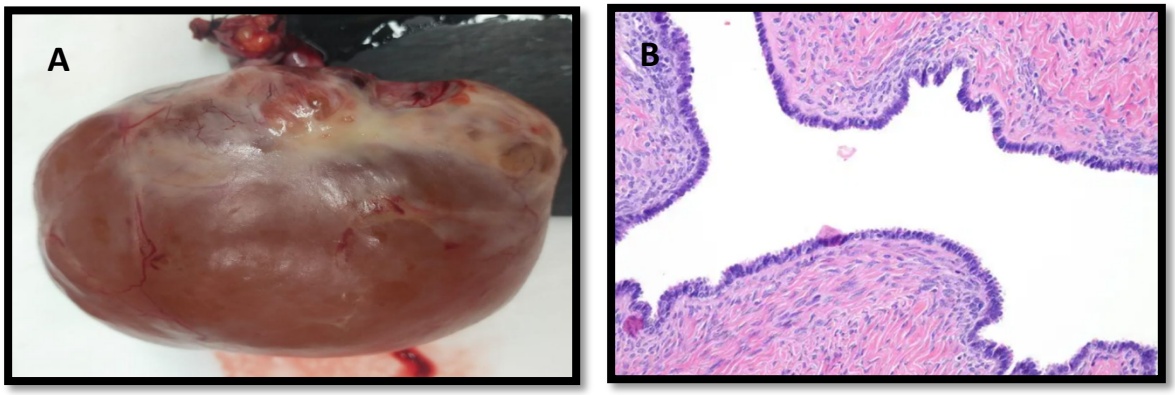

Figure 1: Serous Cystadenoma. Gross- Cystically enlarged ovary. Microscopy- Cyst wall lined by single layer of ciliated cuboidal epithelium resting on a fibrocollagenous stroma. [H&E, X400]

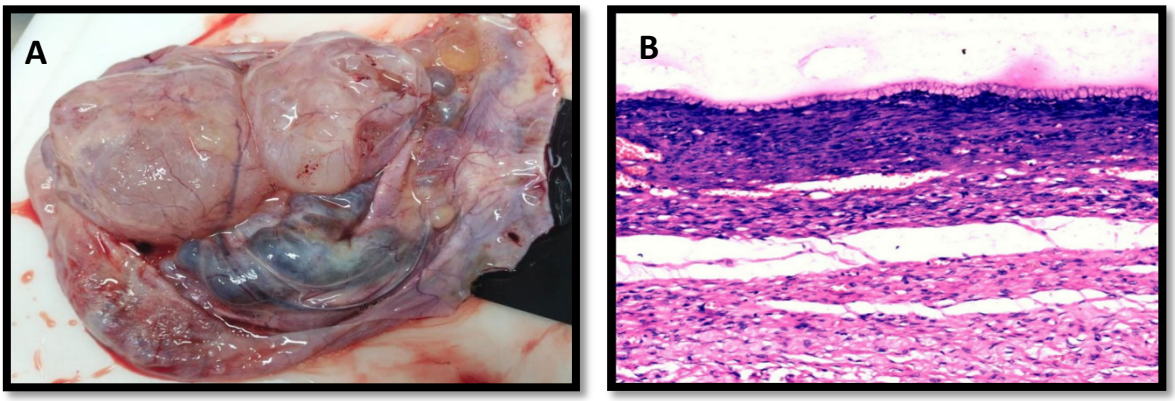

Figure 2: Mucinous Cystadenoma. Gross- Cystically enlarged ovary. Microscopy- Cyst wall lined by simple mucinous epithelium resting on a fibrocollagenous stroma. [H&E, X400]

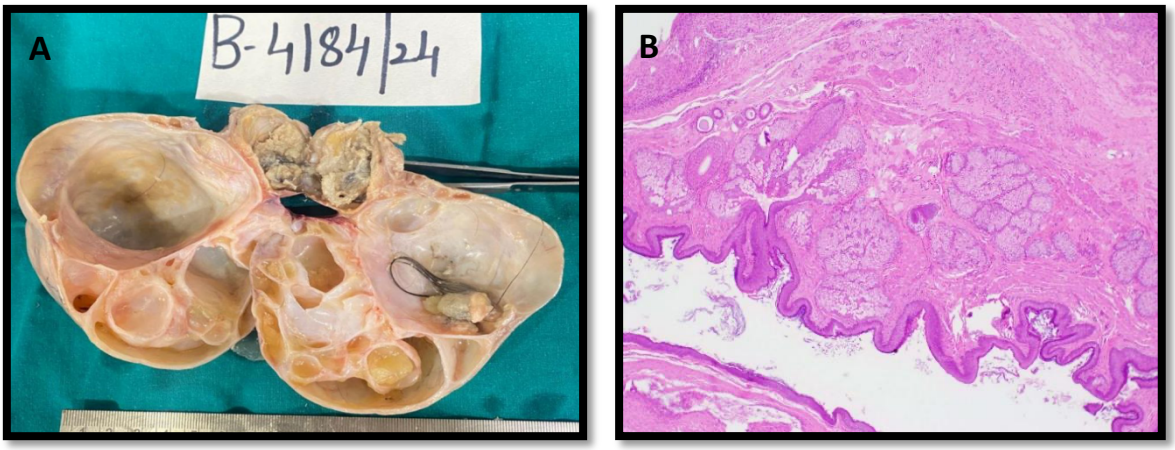

Figure 3: Mature teratoma. Gross- Hair shaft & greasy material seen. Microscopy- Squamous epithelium seen with underlying adnexal structures. [H&E, X400]

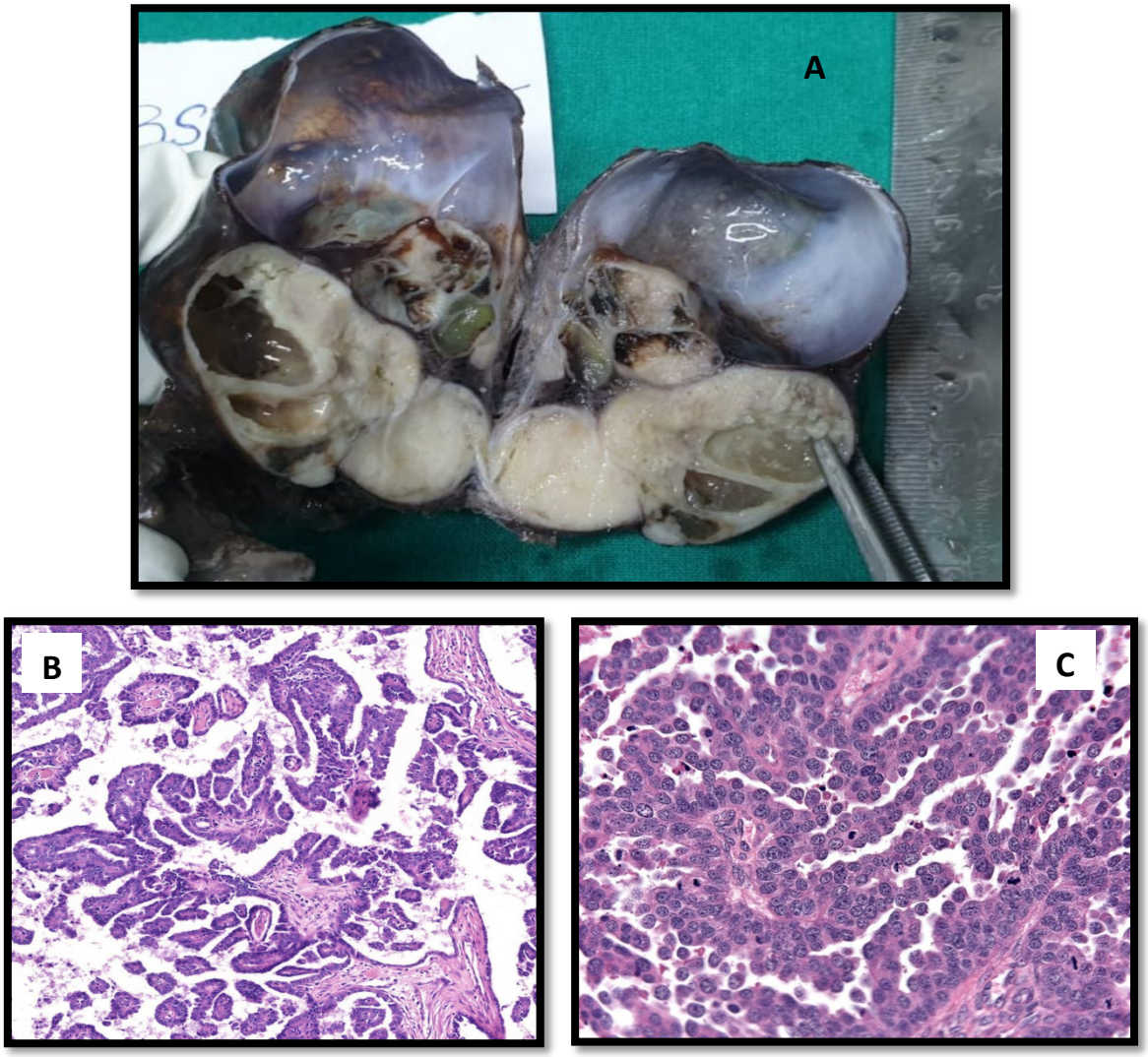

Figure 4: High grade serous carcinoma. Gross- Solid, grey-white to cystic ovary. Microscopy- Tumor cells showing papillary architecture with solid nests infiltrating the stroma. [H&E, X100 & X400]

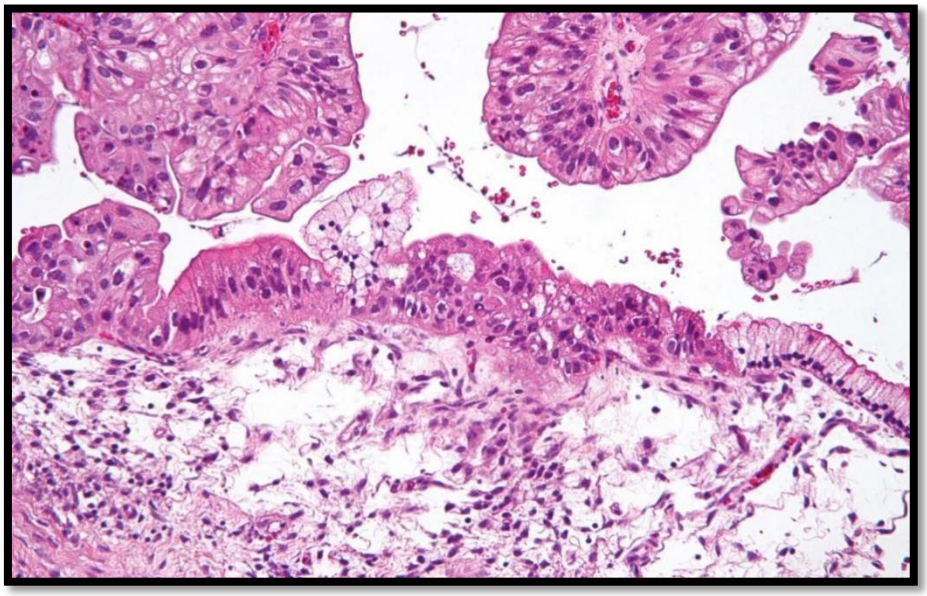

Figure 5: Mucinous carcinoma showing tumor cells with intestinal type & columnar epithelium containing intraepithelial mucin & goblet cells. [H&E, X400]

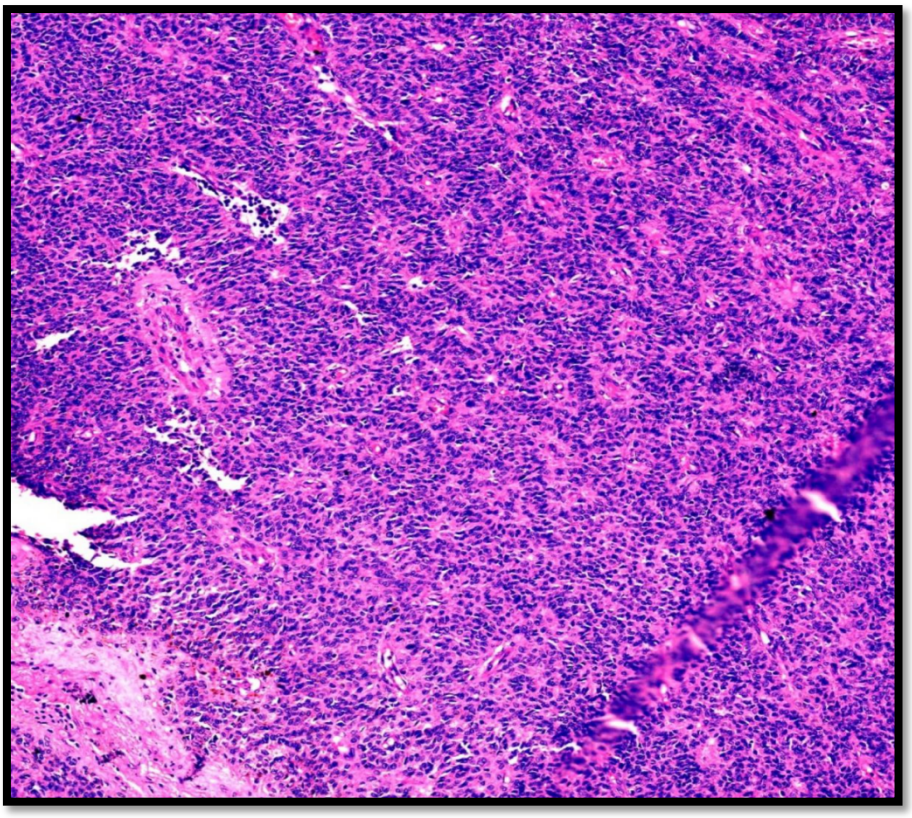

Figure 6: Granulosa cell tumor showing round to oval tumors with Call-exner bodies. [H&E, X400]

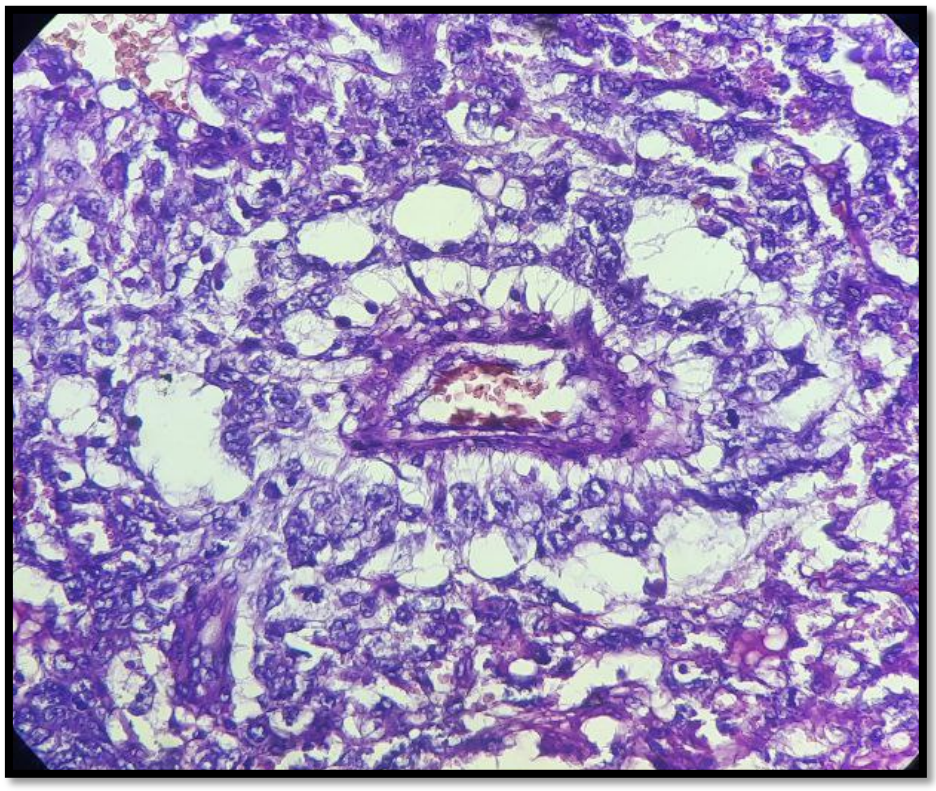

Figure 7: Yolk sac tumor, showing Schiller-Duval body with a single vessel, surrounded by several layers of tumor cells. [H&E, X400]

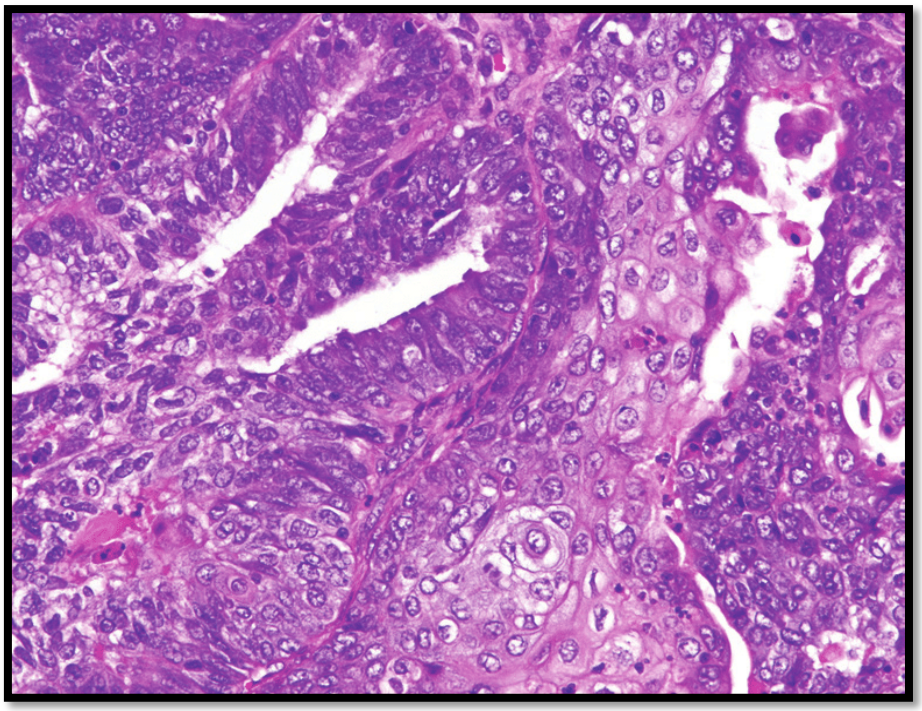

Figure 8: Endometrioid carcinoma showing tumor cells arranged in back to back glandular pattern. [H&E, X400]

Discussion

Ovarian neoplasms originate from different tissue types and display a wide range of clinical behaviours and malignancy potential. Due to their vague and nonspecific symptoms, early detection is often challenging, leading to diagnosis at more advanced stages, hence the term "silent killer." Histopathological evaluation plays a critical role in accurate staging and classification, which are essential for guiding treatment decisions and determining prognosis. [11]

In this study, 75 cases were analysed, with 56 cases (74.66%) identified as benign and 19 cases (25.33%) as malignant.

These findings are consistent with previous studies. Thakkar N. N. et al. reported that benign tumours constituted 84.50% of cases, while malignant tumours accounted for 13.20%. [12] Similarly, Kuladeepa A. V. K. et al. found 82.35% benign tumours and 13.97% malignant tumours in their study. [13]

In the present study, surface epithelial tumours were the most common, accounting for 43 cases (57.33%), followed by germ cell tumours with 16 cases (21.33%) and sex cord-stromal tumours with 3 cases (4.0%). This pattern is in agreement with the findings of Krishna M and Maurya G, who reported epithelial tumours in 77.70% of cases, germ cell tumours in 15.50%, and sex cord-stromal tumours in 6.10%. [14] Similarly, a study by Badge S et al. reported surface epithelial tumours comprising 77% of cases, germ cell tumours 16%, and sex cord-stromal tumours 6%. [15]

Regarding age distribution, the highest incidence of ovarian lesions in this study was observed in the 31–40 years age group, followed by the 21–30 years group. These results are consistent with findings from Kuladeepa A V K et al., who noted 36.61% of cases in the 31–40 years age group and 22.32% in the 21–30 year group.13 However, a study by Pilli G S et al. showed a slightly different trend, with the majority of cases (30.11%) occurring in the 21–30 years age group, followed closely by 28.25% in the 31–40 years group. [16]

In this study, the majority of ovarian tumours were unilateral, accounting for 81.33% of cases, while bilateral tumours were observed in 18.66%. These findings are in line with those reported by Misra R et al., who found 95.50% of cases to be unilateral and 4.50% bilateral. [17] Similarly, Prabakar et al. documented 90.90% unilateral and 9.10% bilateral cases. [18] On gross examination, most tumours (72.0%) displayed a cystic consistency. Malignant tumours predominantly showed a mixed (solid and cystic) consistency in 16.0% of cases, followed by a solid consistency in 9.33%. These findings align with the study conducted by Shaik M et al., which reported that the majority of tumors (31.50%) were cystic and primarily benign, whereas malignant tumors generally showed a mixed consistency. [4]

Table 8: Comparison of ovarian lesions in present study with other studies

Nature of lesion	Thakkar N N et al.	Kuldeepa A V K et al	Gupta et al	Pilli et al	Present study
Benign	84.50%	82.35%	72.5%	75%	74.6%
Malignant	13.20%	13.97%	22.9%	21%	25.3%

Conclusion:

This study highlights the wide histopathological range of ovarian lesions, with non-neoplastic types being more common and serous cystadenoma the most frequent neoplasm. A rising incidence of malignancies in younger women and late-stage diagnoses emphasize the need for early detection. Accurate histopathological evaluation, guided by the WHO 2020 classification, is crucial for effective staging and treatment planning. Routine assessment of all ovarian lesions, increased awareness, and regular screening in high-risk groups are vital for improving outcomes and survival rates.

Limitation: A key limitation of this study is the absence of immunohistochemistry and molecular analysis, which are essential for confirming and refining the diagnosis.

Ethical Committee Approval: The study was conducted after obtaining the necessary approval from our institute's ethics committee.

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