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# Original Research

## Combination of histopathological and immunohistochemical analysis of neoplastic and non-neoplastic lesions of the ovary: A one-year study in tertiary care centre

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***ABSTRACT:***
**Aim:** To study histopathology and immunohistochemistry of pre-malignant and malignant tumors of ovary with assess the clinical presentation, histopathological diagnosis and their correlation. **Material and methods:** Total 50 cases of ovarian lesions were studied from April 2024 to March 2025. Received biopsy after adequate fixation in 10% buffered formalin, were routinely processed and embedded in paraffin wax. Multiple sections are obtained and stained with Hematoxylin and eosin. All specimens are studied with perspective of age, clinical history, size of the tumor and panel of histochemistry markers for final histopathological diagnosis. **Result:** Total 50 cases were studied. The majority of patients were between 20-40 years old (76%) and were premenopausal (68%). Abdominal pain (62%) was the most common symptom. Benign tumors were the most frequent histopathological finding (70%), followed by malignant (24%) and borderline tumors (6%). The most common histopathological subtypes were serous cystadenoma (38%) and mucinous cystadenoma (22%). The clinical diagnosis showed a 94.3% concordance for benign tumors, 83.3% for malignant tumors and 100% for borderline tumors, with an overall concordance of 92%. **Conclusion:** All these clinical, histomorphological parameters and advanced newer diagnostic modalities like immunohistochemistry can help in typing and sub typing of ovarian lesion and to confirm the histopathological diagnosis. Early detection and timely intervention are crucial in improving patient outcomes.
**Keywords:** Histopathology, ovarian tumors, pre-malignant, malignant

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## INTRODUCTION

Ovarian tumors represent a significant gynecological concern due to their wide spectrum of clinical presentations, ranging from benign conditions to highly malignant diseases.[1] These tumors are the most common gynecological neoplasm among women worldwide, following cervical and endometrial cancers and are often associated with high morbidity and mortality rates, particularly in developing countries.[2] The clinical challenge in ovarian tumors lies in their often insidious onset and non-specific symptoms, such as abdominal pain, bloating, or menstrual irregularities, which frequently lead to delayed diagnosis.[3] This underscores the importance of robust diagnostic approaches, including clinical assessment, imaging and histopathological evaluation.[4,5]

## MATERIAL AND METHODS

This was a retrospective study over the period of one year which included 50 cases which was conducted in Department of Pathology, SBKS Medical Institute and Research Centre, Dhiraj Hospital, Waghodia, Vadodara. Specimens were received with detailed clinical history and radiological findings in 10% formalin. The specimens were analyzed in detailed macroscopically for various parameters like size, external surface and consistency. Sections were

processed and embedded in paraffin after grossing. Multiple serial sections of 4-5 microns thickness were obtained from the paraffin block and then stained with Hematoxylin and Eosin. Microscopic finding of various ovarian tumors was analyzed. Depending upon clinical history, panel of immunohistochemistry markers were applied. The non-neoplastic and neoplastic lesions from representative sections were studied and classified according to World Health Organization (WHO) classification 2014 and staging is done according to International Federation of Gynecology and Obstetrics (FIGO) staging.

**Inclusion criteria**

1. Ovarian biopsy.
2. Specimen of ovary after oophorectomy or total abdominal hysterectomy with salpingoophorectomy.
3. Ovarian cyst removal procedure.

**Exclusion criteria**

1. Obstetric hysterectomy with normal ovaries.
2. Improper clinical record (history and examination).

## RESULTS

A total 50 ovarian lesions were reported over the period of one year. The majority of patients were between 20-40 years old (76%) and were premenopausal (68%). Abdominal pain (62%) was the most common symptom. Benign tumors were the most frequent histopathological finding (70%), followed by malignant (24%) and borderline tumors (6%). The most common histopathological subtypes were serous cystadenoma (38%) and mucinous cystadenoma (22%). The clinical diagnosis showed a 94.3% concordance for benign tumors, 83.3% for malignant tumors and 100% for borderline tumors, with an overall concordance of 92%.

**Table 1: Demographic Characteristics of the Study Population.**

| Characteristics | Frequency (n=50) | Percentage |
|---|---|---|
| Age Group (years) | | |
| < 20 | 7 | 14.0% |
| 20-40 | 38 | 76.0% |
| > 40 | 5 | 10.0% |
| Menopausal Status | | |
| Premenopausal | 34 | 68.0% |
| Postmenopausal | 16 | 32.0% |

**Table 2: Clinical Presentation**

| Symptoms | Frequency (n=50) | Percentage (%) |
|---|---|---|
| Abdominal Pain | 31 | 62.0 |
| Abdominal Distension | 15 | 30.0 |
| Menstrual Irregularities | 8 | 16.0 |
| Incidentally Detected (e.g., Imaging) | 11 | 22.0 |
| Others | 5 | 10.0 |

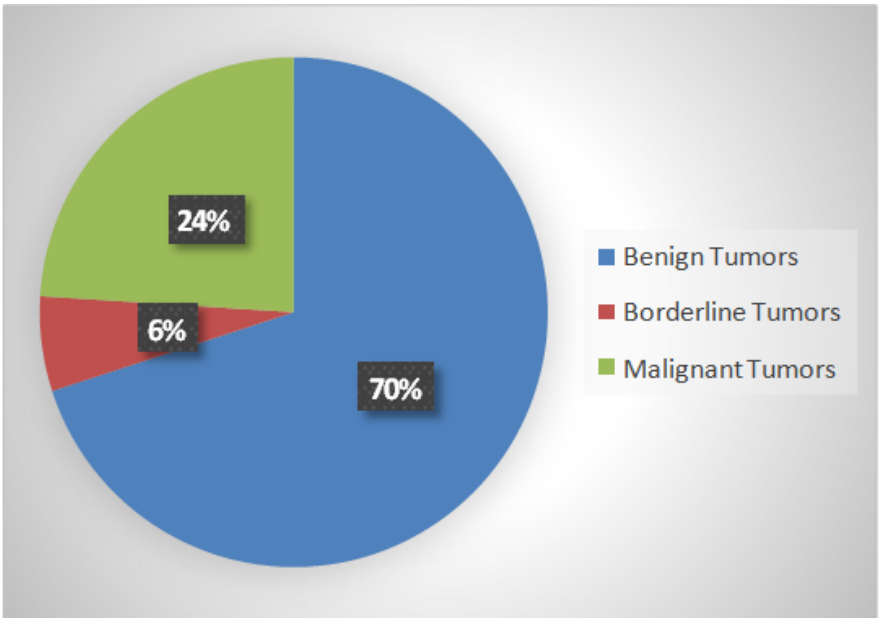


**Fig 1: Distribution of ovarian tumors based on histopathological Diagnosis.**

**Table 3: Subtypes of Ovarian Tumors**

| Tumors | No. of cases | Percentage |
|---|---|---|
| **Surface epithelial Tumor** | | |
| **1. Serous Tumor** | | |
| **Serous cystadenoma** | 19 | 38.0% |
| **Serous cystadenocarcinoma** | 5 | 10.0% |
| **2. Mucinous Tumors** | | |
| **Mucinouscystadenoma** | 11 | 22.0% |
| **Mucinous cystadenocarcinoma** | 2 | 4.0% |
| **Sex cord stromal tumors** | | |
| **Granulosa cell tumor** | 1 | 2.0% |
| **Fibrous** | 1 | 2.0% |
| **Thecoma** | 1 | 2.0% |
| **Germ cell tumor** | | |
| **Mature teratoma** | 8 | 16.0% |
| **Dysgerminoma** | 1 | 2.0% |
| **Yolk sac tumor** | 1 | 2.0% |

**Table 4: Immunohistochemistry markers used in typing and sub typing of malignant ovarian lesions.**

| Tumours | IHC markers | | | | |
|---|---|---|---|---|---|
| **Surface epithelial Tumour** | | | | | |
| **1. Serous Tumour** | **PAX-8** | **WT-1** | **ER/PR** | **P53** | |
| **Serous cystadenoma** | + | + | +/- | - | |
| **Serous cystadenocarcinoma** | + | + | +/- | + | |
| **2. Mucinous Tumours** | PAX-8 | CK-7 | CK-20 | CDx2 | |
| **Mucinous cystadenoma** | +(focalj | + | +(focal) | +(focal) | |
| **Mucinous cystadenocarcinoma** | + | + | + | +(focal) | |
| **Sex cord stromal tumours** | Inhibit | WT1 | Calretinin | Melan-A | EMA |
| **Granulosa cell tumour** | + | + | + | + | - |
| **Fibrous** | +/- | + | +/- | + | - |
| **Thecoma** | + | + | + | + | - |
| **Germ cell tumour** | **AFP** | **OCT 4** | **Glypican 3** | **EMA** | |
| **Mature teratoma** | **+** | **+** | **+** | **-** | |
| **Dysgerminoma** | **-** | **+** | **-** | **-** | |
| **Yolk sac tumour** | **+** | **-** | **+** | **-** | |
| **Mixed germ cell tumour** | **+** | **+** | **+** | **-** | |

**High Grade Serous Cystadenocarcinoma; Gross, Microscopy and Immunohistochemistry**

Figure - 2: Serous cystadenocarcinoma - Gross specimen

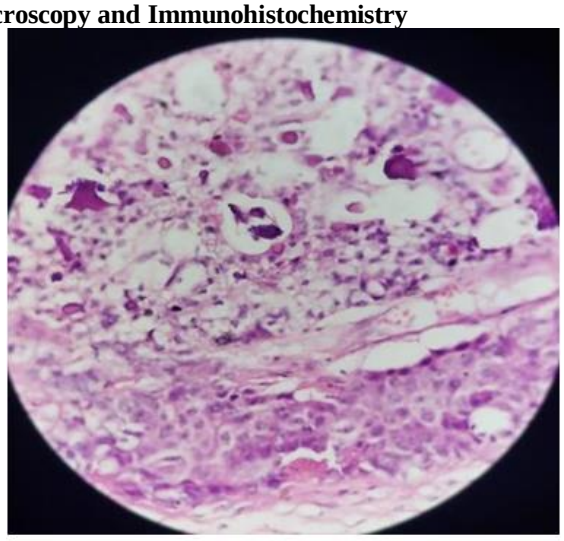

Figure - 3: Serous cystadenocarcinoma - (H&E stain, 40X)

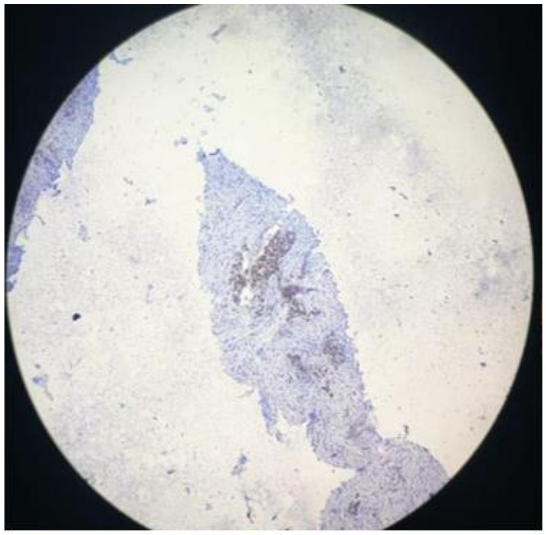

Figure - 4: Serous cystadenocarcinoma - Wilm's tumor protein 1 marker positive

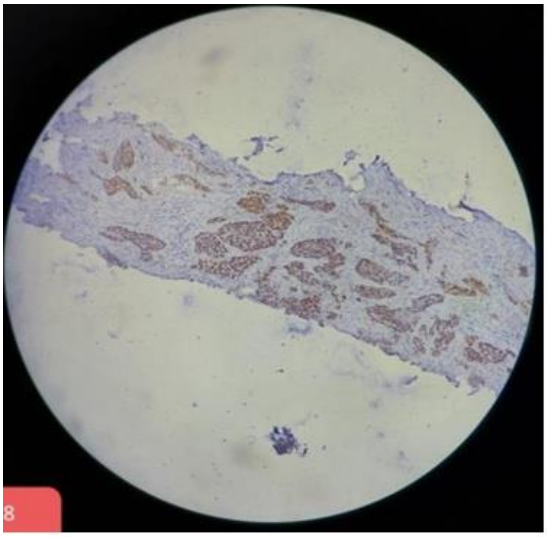

Figure - 5: Serous cystadenocarcinoma - PAX-8 marker positive

**Yolk Sac Tumor; Gross, Microscopy and Immunohistochemistry**

Figure - 6: Yolk Sac Tumor- Gross specimen

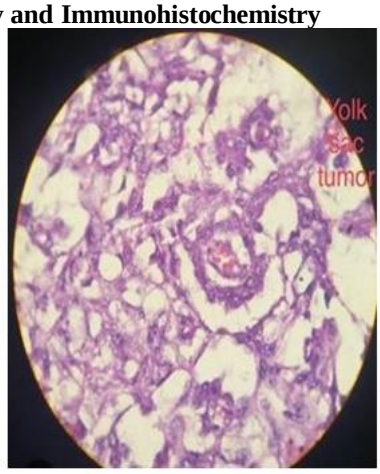


Figure - 7: Yolk Sac Tumor- (H&E stain, 40X)

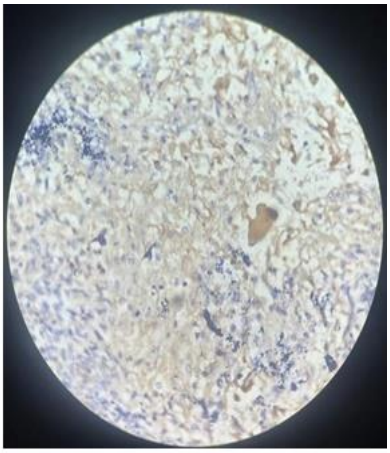

Figure - 8: Yolk Sac Tumor- AFP positive

**Mucinous cystadenoma; Gross, Microscopy and Immunohistochemistry**

Figure - 9: Mucinous Tumor- Gross specimen

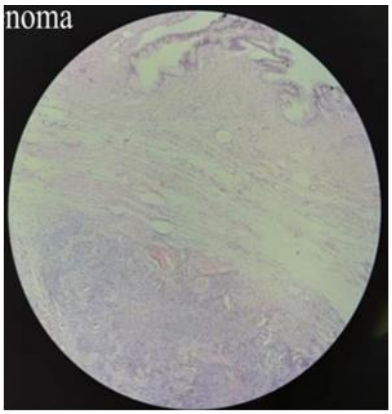


Figure - 10: Mucinous Tumor- (H&E stain, 10X)

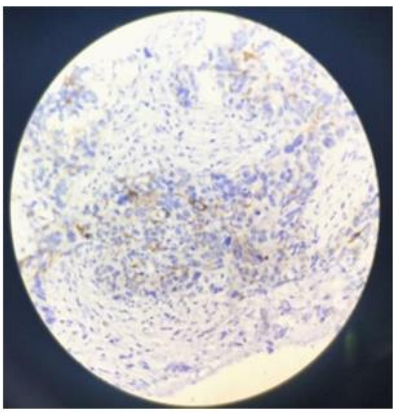

Figure - 11: Mucinous Tumor- CK-7 Positive

## DISCUSSION

This study focused on the clinical and histopathological correlation of ovarian tumors in a tertiary hospital in India. The findings highlight significant patterns in the presentation and classification of ovarian tumors, as well as the diagnostic accuracy between clinical and histopathological assessments.

Our results are consistent with similar studies conducted in other parts of the world, shedding light on regional patterns and trends in ovarian tumor presentation and management. The study revealed that the majority of the patients (76%) were in the reproductive age group (20- 40 years), which is consistent with findings from other studies. For instance, in a study conducted by Mohyuddin et al. a similar age distribution was noted, with most ovarian tumor cases found in the 20-40-year age group, emphasizing the importance of early detection and management of these tumors in younger women, premenopausal women (68%) were more commonly affected, which is consistent with the study by Junejo et al., who also found that the majority of ovarian tumors were diagnosed in premenopausal women.[6,7]

Abdominal Pain (62%) was the most common presenting symptom, followed by abdominal distension (30%), which is in line with studies by Iyoke et al. and Haroon et al., who identified abdominal pain as the primary symptom in their cohorts of patients with ovarian tumors.[8,9] The relatively hs diagnosed incidentally through imaging (22%) also aligns with previous findings, such as those by Sabageh et al., highlighting the importance of imaging techniques in detecting ovarian tumors that may not present with obvious symptoms.[10]

Histopathologically, benign tumors are majority of the cases (70%), similar to findings reported in studies by Wasim et al. and Sharma et al., where benign ovarian tumors were more prevalent than malignant types.[11,12] Among the benign tumors, serous cystadenoma, constituting 38% of the cases. This is consistent with the findings of Yogambal et al., who also reported serous cystadenomas as the predominant subtype in their study from South India.[13] Mucinous cystadenoma (22%) and teratoma (16%) were the next most cases, further corroborating patterns observed in other studies, such as those by Menon et al. and Das et al.[14,15]

In terms of malignancy, our study found 24% of ovarian tumors to be malignant in some other regional studies, such as that by Iyoke et al., where the incidence of malignant ovarian tumors was reported to be high.[8] Among malignant tumors, serous cystadenocarcinoma was the most frequent subtype, aligning with that of Rafiq et al., who noted the dominance of serous carcinoma among malignant ovarian tumors.[15] The lower percentage of malignant tumors in our cohort could be due to regional differences in healthcare arenes and diagnostic practices.

The clinical diagnosis correlated well with histopathological findings, demonstrating a high level of diagnostic accuracy. A total concordance of 92% was observed, with benign tumors showing the highest concordance rate of 94.3%, which is similar to the 94% concordance rate reported by Das et al., in their study on cytohistological correlation.[16] The accuracy of diagnosing malignant tumors was slightly lower (83.3%), which is consistent with findings by Prameela et al., who also found a moderate discordance in malignant cases due to challenges in clinical differentiation between benign and malignant lesions.[17]

## CONCLUSION

In conclusion, this study provides valuable insights into the clinical and histopathological correlation of ovarian tumors in a tertiary hospital. Our findings demonstrate a high concordance rate between clinical diagnosis and histopathological results. Number of various clinical parameters such as age of the patient, presenting complaints, location of lump, dimensions of lump, on one hand and histological type of ovarian neoplasm on the other hand are all interrelated. All these clinical and histomorphological parameters and advanced newer diagnostic modalities like immunohistochemistry can help in typing and sub typing of ovarian lesion and to confirm the histopathological diagnosis. Benign ovarian tumors were more common than malignant ones across all age groups. On morphological grounds, tumors originating from surface epithelium were the most common variant.

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**Conflict of Interest:** None

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