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A Study of the Clinico-Histopathological Spectrum of Ovarian Tumors at a Tertiary Care Hospital

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ABSTRACT
Ovarian tumors are among the most diverse and challenging malignancies in gynecology. This study aims to analyze the clinico-histopathological spectrum of ovarian tumors in patients attending a tertiary care hospital. A cross-sectional study was conducted at the department of obstetrics and gynecology, KIMS and RF, Amalapuram, Andhra Pradesh, from January 2023-2024. A total of 41 ovarian tumor cases were analyzed. Data on age, clinical symptoms, tumor characteristics, histopathology, and tumor markers were collected. Tumor size, histological subtypes and radiological findings were also evaluated. Statistical analysis was performed using SPSS version 22. The majority of cases (34.14%) occurred in the 41-50 age group, followed by 31-40 years (26.8%). Pain was the most common presenting symptom (68.2%). Histologically, surface epithelial-stromal tumors were predominant (90.2%), with serous tumors being the most frequent subtype (51.2%). Tumor marker CA-125 was elevated in 24.4% of cases and 14.6% showed elevated LDH levels. Radiologically, most tumors were cystic, with 21 cases of uniloculated cysts. Tumor size ranged between 5-15 cm in 61% of cases. This study highlights the diversity of ovarian tumors in terms of age distribution, clinical presentation, and histopathological characteristics. Surface epithelial-stromal tumors were the most common type, with significant associations observed between symptoms, tumor markers and histopathological findings. Early detection through clinical and radiological assessment remains critical in managing ovarian neoplasms.

INTRODUCTION

Ovarian tumors account for 30% of all cancers within the female reproductive system[1].On a global scale, ovarian cancer ranks as the fifth leading cause of cancer-related deaths. In India, it is the third most frequently occurring malignancy in the female genital tract, with an age-adjusted incidence rate of 6.7 per 100,000[1]. Survival rates tend to be higher for patients under the age of 35 and for those with cancer diagnosed at an early, localized stage.

The exact cause of ovarian cancer is still being explored. Recent genetic research challenges the old notion that frequent ovulation is the primary factor, suggesting instead that the cancer might originate from the fimbriae end of the fallopian tube[2]. The ovaries' deep anatomical location and complex structure often lead to late-stage diagnoses, which complicate treatment. Given the increased risk with advancing age, it is vital to maintain a high level of suspicion. Regular biochemical and radiological imaging tests are key for early detection, which can substantially decrease both morbidity and mortality[2].Gynecological oncologists encounter numerous challenges with both ovarian tumors and non-neoplastic lesions. Many non-neoplastic lesions can present as pelvic masses that mimic ovarian tumors, making accurate identification and classification essential for effective treatment[3].Ovarian cancer is the third most frequently occurring gynecologic malignancy in women, following cervical and uterine cancers[4]. The prognostic outcome for ovarian malignancies ranges from 30% 40%[5] The age-standardized incidence rate of ovarian cancer is 6.6 per 100,000, with a mortality rate of 3.9 per 100,000[6].In India, the incidence of ovarian malignancy is among the highest in the world. The larger share of cases occur in menopausal women, typically between the ages of 55 and 64, indicating that increasing life expectancy may be contributing to the rising rates of ovarian neoplasms globally[7].

The ovaries are among the least accessible reproductive organs, which often leads to delays in diagnosing ovarian disorders, including borderline tumors and malignancies[8]. Prompt diagnosis of ovarian malignancies is crucial because the disease can be highly fatal if diagnosed at later stages[8].Cancer Antigen 125 is a biomarker that is commonly elevated in ovarian tumors and can assist in its diagnosis[9] Neverthless, prompt diagnosis remains challenging due to the asymptomatic nature of the disease, its deep anatomical location and the limited application of new diagnostic techniques like cytology and biopsy. This difficulty highlights the importance of research in ovarian neoplasms[10].Tumor markers, such as CA125, are now used to help further characterize ovarian masses. Although CA125 is the most frequently employed marker for ovarian cancer, its effectiveness is not perfect. It is elevated in approximately 80% of females with ovarian epithelial carcinomas(EOC) but only in about 50% of those with early-stage disease[11].In this context, we have examined the clinical presentations and histological patterns of patients with ovarian neoplasms at a tertiary cancer care hospital.

Aims and Objectives: The purpose of this research was to explore the extent of histopathological varieties of ovarian tumors, assess their prevalence and characteristics at a tertiary care facility and evaluate the role of histopathology in diagnosis and treatment. The study particularly focused on tumor spread across distinct age categories and their clinical presentations.

MATERIALS AND METHODS

Type of Study: This was a cross-sectional study conducted to analyze the clinico-histopathological spectrum of ovarian tumors.

Place of Study: The study was conducted in the Department of Obstetrics and Gynecology at KIMS and RF, Amalapuram, Andhra Pradesh, India.

Duration of Study: The study was conducted over a period of one year, from January 2023 -2024.

Study Procedure: This cross-sectional study included a total of 41 cases of ovarian tumors. Patient information, including age, clinical symptoms, mass characteristics (such as size and laterality), preoperative findings and histopathological details, was gathered and statistically analyzed.

The tumor specimens were received and fixed in 10% formalin. After a fixation period of 24-48 hours, representative sections of the tumor were prepared using conventional paraffin embedding techniques. Tissue sections were cut to a thickness of 4-5 microns using a microtome. These sections were stained with hematoxylin and eosin for histopathological examination.

The tumors were classified according to the World Health Organization (WHO) classification of ovarian tumors. Tumor staging was determined following the guidelines of the International Federation of Obstetrics and Gynecology (FIGO).

Selection of Patients: Patients were selected based on the following inclusion and exclusion criteria:

Inclusion Criteria: All ovarian neoplasms from patients of any age category attending the gynecology department at KIMS Hospital, Amalapuram.

Patients who provided written informed consent.

Patients who underwent diagnostic investigations, including ultrasound (USG), tumor marker tests, histopathological examination (HPR) and imaging studies like MRI and CT scans.

Exclusion Criteria: Patients with pelvic lesions not identified as ovarian tumors.
Pregnant women.
Ovarian tumors treated with conservative methods.

Statistical Analysis: The collected data were processed using SPSS version 22 (IBM Corp., Armonk, NY, USA). The cases were categorized into surface epithelial tumors (SETs), germ cell tumors (GCTs) and sex cord-stromal tumors (SSTs). The patients were grouped by age, and tumor frequency distribution was analyzed accordingly.

Ethical Approval: The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee (IEC) of KIMS & RF, Amalapuram, prior to the commencement of the study. Informed written consent was obtained from all participants after explaining the purpose, procedures, potential risks and benefits of the study. Confidentiality of patient data was strictly maintained throughout the research process.

RESULTS AND DISCUSSIONS

This study analyzed a total of 41 ovarian tumor cases, examining patient demographics, clinical symptoms, histopathological characteristics, tumor markers, radiological features, and tumor size. The key findings are summarized below:

Table 1: Age-Wise Distribution of Ovarian Neoplasms

Age Group (Years)	Number of Ovarian Lesions	Percentage (%)
11-20	3	7.31
21-30	7	17.07
31-40	11	26.8
41-50	14	34.14
51-60	1	2.43
61-80	5	12.19

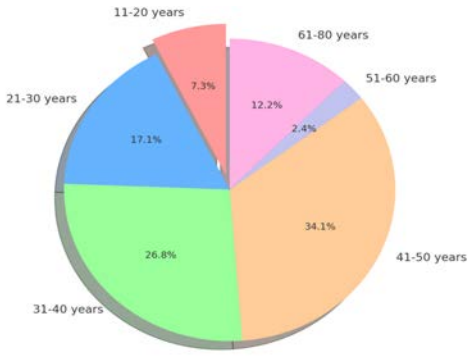

Fig. 1: Age-wise Distribution of Ovarian Neoplasms

Age-Wise Distribution of Ovarian Neoplasms: The age distribution of ovarian tumors showed that the highest number of cases were in the 41-50 age group (34.14%, 14 cases), followed by the 31-40 age group (26.8%, 11 cases). The age group of 21-30 contributed 17.07% (7 cases) and the 61-80 age group made up 12.19% (5cases). Only 7.31% (3 cases) of ovarian neoplasms occurred in the 11-20 age group, while the lowest incidence was in the 51-60 age group, at 2.43% (1 case) (Table 1 and Figure No:1).

Table 2: Symptom-Wise Distribution of Patients

Symptom	Number of Patients	Percentage (%)
Abdominal distension	1	2.4
Pain	28	68.2
Menstrual complaints	8	19.5
Other complaints	4	9.7

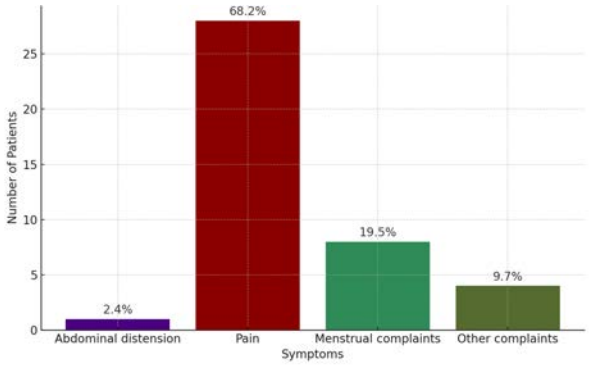

Fig. 2: Symptom-wise Distribution of Patients

Symptom-wise Distribution: Pain was the most common presenting symptom, affecting 68.2% of the patients (28 cases), followed by menstrual complaints in 19.5% (8 cases). Other complaints were seen in 9.7% of the patients (4 cases) and abdominal distension was reported by 2.4% of patients (1 case) (Table 2 and Figure No:2).

Table 3: Distribution of Patients According to Signs

Signs	Number of Patients	Percentage (%)
Palpable masses	17	41.5
Non-palpable masses	24	58.5

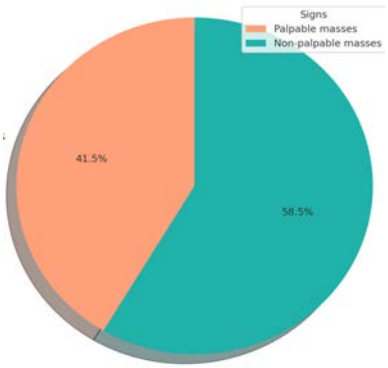

Fig. 3: Distribution of Patients According to Signs

Tumor Palpability: Physical examination revealed that 58.5% of the ovarian tumors (24 cases) were non-palpable, while 41.5% (17 cases) were palpable (Table 3 and Figure No:3).

Table 4: Distribution of Patients According to Hysterectomy Status

Hysterectomy Status	Number of Patients	Percentage (%)
Not done	30	73.1
Done	11	26.8

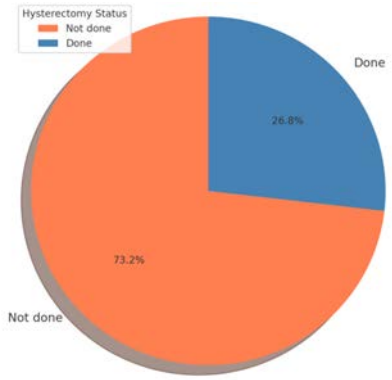

Fig. 4: Distribution of Patients According to Hysterectomy Status

Hysterectomy Status: The majority of patients (73.1%, 30 cases) had not undergone a hysterectomy, whereas 26.8% (11 cases) of the patients were hysterectomized (Table 4 and Figure No:4).

Table 5: Association of Tumor Markers with Ovarian Tumors

Tumor Marker	Normal Cases	Elevated Cases
CA-125	31 (< 35 U/ml)	10 (> 100 U/ml)
CEA	15 (< 5 ng/ml)	3 (> 5 ng/ml)
Beta-HCG	0 (< 3 mIU/ml)	1 (> 200 mIU/ml)
CA-19-9	0 (< 38 U/ml)	1 (> 68 U/ml)
AFP	0 (< 15 ng/ml)	1 (> 100 ng/ml)
LDH	S0 (< 450 U/ml)	6 (>600-2000 U/ml)

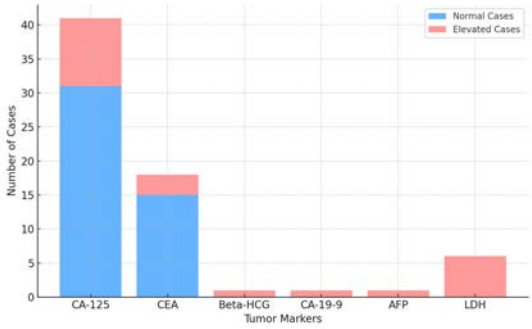

Fig. 5: Association of Tumor Markers with Ovarian Tumors

Association of Tumor Markers with Ovarian Tumors: Among the tumor markers, elevated CA-125 levels (>100 U/ml) were found in 24.4% (10 cases), while normal levels (<35 U/ml) were seen in 75.6% (31 cases). Elevated levels of LDH (>600-2000 U/ml) were observed in 14.6% (6 cases). Other tumor markers such as CEA, Beta-HCG, CA-19-9 and AFP showed elevated levels in a few cases (Table 5 and Figure No:5).

Table 6: Distribution of Patients According to Radiological Features

Consistency of Tumors	Benign	Malignant
Cystic		
Uniloculated	21	0
Multiloculated	5	1
Mixed	9	0
Solid	5	0
Ascites (Yes/No)	3	0

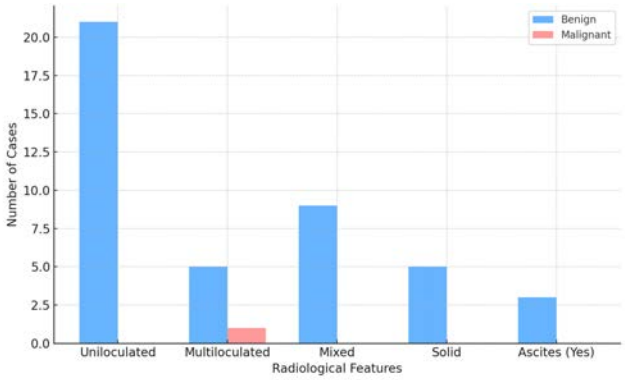

Fig. 6: Distribution of Patients According to Radiological Features

Radiological Features: Radiological assessment revealed that most tumors were cystic in consistency, with 21 uniloculated and 5 multiloculated benign tumors. A single malignant multiloculated tumor was also observed. In total, 9 tumors had mixed cystic and solid consistency and 5 were purely solid. Ascites was detected in 3 patients (Table 6 and Figure No:6).

Table 7: Distribution According to Various Histological Types of Tumors

Type of Tumor	Number of Cases	Percentage (%)
Surface Epithelial-Stromal Tumors	37	90.2
a) Serous Tumors	21	
b) Mucinous Tumors	16	
Benign	15	
Malignant	1	
Sex Cord-Stromal Tumors	1	2.4
a) Granulosa Cell Tumor	1	
Germ Cell Tumor	3	7.3
a) Teratoma 3		

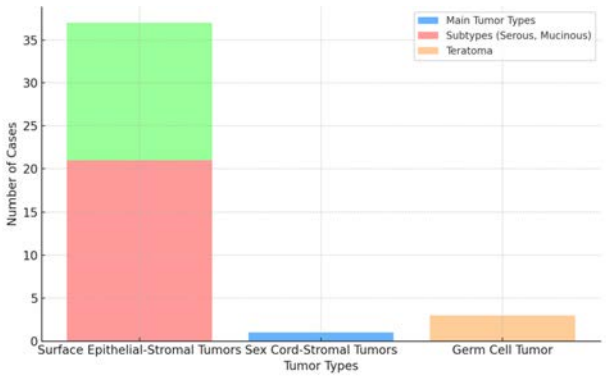

Fig. 7: Distribution According to Various Histological Types of Tumors

Histological Types of Ovarian Tumors: The majority of the tumors were surface epithelial-stromal tumors (90.2%, 37 cases), with serous tumors (21 cases) being the most common subtype. Mucinous tumors accounted for 16 cases, 15 of which were benign and 1 malignant. Germ cell tumors (7.3%, 3 cases) included teratomas, while sex cord-stromal tumors represented 2.4% (1 case) of the total, with granulosa cell tumor being the subtype (Table 7 and Figure No:7).

Table 8: Distribution of Ovarian Tumors According to Size

Size of Ovarian Tumor	Number of Ovarian Tumors
<5 cm	0
5-15 cm	25
>15 cm	16

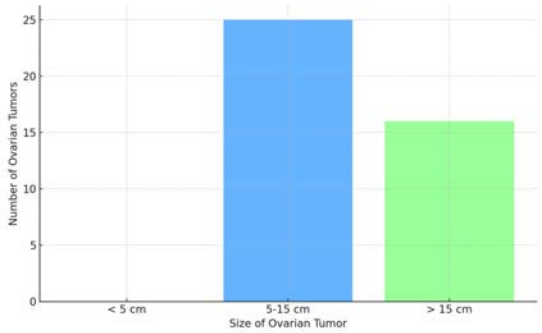

Fig. 8:Distribution of Ovarian Tumors According to Size

Tumor Size: Most ovarian tumors (61%) measured between 5-15 cm in size (25 cases), while 39% (16 cases) were larger than 15 cm. There were no tumors smaller than 5 cm (Table 8 and Figure No:8).

The present study provides a detailed analysis of ovarian tumors, focusing on clinico-histopathological features, age distribution, parity, clinical presentation, hysterectomy status, tumor markers and histological findings. The results of this study align with the global trends in ovarian tumor characteristics.

Surface epithelial ovarian tumors, which constitute more than 90% of ovarian malignancies, were the most frequently encountered tumors in our study, consistent with existing literature (Gupta[3], 2007). Surface epithelial tumors are known to predominate in individuals in their 50s and 60s, but benign variants are typically seen in younger patients (Bray[4]., 2018). This trend was reflected in our study, with most benign tumors occurring in younger patients, while malignant neoplasms were more common in patients over 50 years of age.

Mucinous tumors were the second most common subtype of ovarian epithelial tumors observed in our study and the majority were classified under FIGO stages 1 and 2, which is in agreement with previous studies (Puri[7]., 2018). Mucinous adenomas have a favorable prognosis, with lower grades of malignancy, as confirmed in our findings.

Sex cord-stromal tumors, though less common, were predominantly seen in younger patients in our study. These tumors are typically low-grade and present with a variety of clinical symptoms such as precocious puberty, menorrhagia and postmenopausal bleeding (Kanthikar[10]., 2014). In our study, granulosa cell tumors were linked to cases of endometrial hyperplasia and in some instances, to endometrial carcinoma, with vaginal bleeding as a presenting symptom.

Ovarian germ cell tumors are more common in juveniles and young adults. In our study, dermoid cysts, a subtype of germ cell tumors, were predominantly found in younger women, consistent with previous reports (Hellstrom[9]., 2003). Although these cysts are benign, they can present at varying age extremes, as observed in our patient cohort.

In terms of age distribution, the majority of ovarian tumors were seen in patients aged 41-50 years (34.14%), followed by the 31-40 age group (26.8%). This pattern aligns with global trends, which indicate that ovarian neoplasms are more frequently diagnosed in the fifth and sixth decades of life (Allemani[5]., 2015).

Regarding parity, our findings showed that 82.9% of patients with ovarian tumors were multigravida, 12.1% were nulligravida and 4.8% were single gravida. These results suggest that multigravida women are more prone to developing ovarian tumors, a finding that is consistent with the existing literature on ovarian tumor risk factors (Zhou[6]., 2019).

Pain was the most common symptom among our study population, affecting 68.2% of the patients. Menstrual irregularities were noted in 14.6% of cases, while 2.4% of patients presented with abdominal distension. These clinical presentations are similar to those reported in other studies (Earle[8]., 2006). Furthermore, our study found that non-hysterectomized patients (73.1%) had a significantly higher association with ovarian tumors than hysterectomized patients (26.8%).

Ultrasound (USG) findings revealed that most ovarian tumors (65.8%) were cystic, with 51.2% being uniloculated and benign, while 14.6% were multiloculated. Solid and mixed tumors accounted for 12.1% and 21.9% of cases, respectively. These findings are consistent with previous studies that highlighted the predominance of cystic ovarian tumors (Puri[7]., 2018).

Tumor markers play a vital role in the diagnosis and management of ovarian tumors. In our study, CA-125 was the most commonly elevated tumor marker, followed by LDH and CEA. Elevated CA-125 is known to be strongly associated with surface epithelial ovarian tumors, particularly in cases of malignancy (Rosen[11]., 2005). Our findings support this association, as CA-125 was elevated in a significant number of cases in our cohort.

Histologically, surface epithelial tumors were the most common type of ovarian tumor in our study, with serous tumors being the predominant subtype. Mucinous tumors, although less frequent, were mostly benign, in line with the low malignancy rates reported in the literature (Kanthikar[10]., 2014).

In line with the findings from our study, the histopathological spectrum of ovarian tumors shows a consistent pattern with previous research. Batoo[12]

observed that surface epithelial tumors were the most common ovarian neoplasms, similar to our results, which identified over 90% of cases as epithelial in origin. Ibrahimkhil[13] also highlighted the predominance of surface epithelial tumors in a cross-sectional study from Afghanistan, emphasizing the global consistency of these tumor types across different populations. Additionally, Farag[14] found significant age-related variations in ovarian tumor types, with epithelial tumors being more frequent in older age groups, a trend corroborated by our study, where the majority of cases were seen in the 41-50 year age group. These studies reinforce the importance of histopathological evaluation for accurate diagnosis and management of ovarian neoplasms across diverse populations.

CONCLUSION

The present study highlights the predominance of surface epithelial ovarian tumors, accounting for over 90% of cases, with serous tumors being the most common subtype. Mucinous tumors were the second most frequent, mainly benign, and presenting in early FIGO stages. Ovarian tumors were most prevalent in the 41-50 year age group, with a significant number also occurring in the 31-40 year age range. Multigravida women were found to be at higher risk compared to nulligravida and single gravida women. Clinically, pain was the most frequent symptom, reported by 68.2% of patients. Tumor markers, particularly CA-125, were elevated in a substantial number of cases, reinforcing its utility in diagnosing and monitoring ovarian tumors. Ultrasound findings revealed that most tumors were cystic, with benign uniloculated cysts being the most common type. A smaller proportion of tumors were multiloculated or solid. Our study emphasizes the importance of early diagnosis and accurate histopathological evaluation in the management of ovarian tumors. The findings underscore the need for routine use of imaging modalities and tumor markers, particularly in high-risk groups, to facilitate early detection and improve patient outcomes.

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