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ORIGINAL RESEARCH

A Comprehensive Analysis of Ovarian Neoplasms: Prevalence, Types, and Outcomes

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ABSTRACT

Background: Ovarian neoplasms are a significant clinical challenge due to their diverse histopathological types and frequent late-stage diagnosis. These malignancies are among the most lethal gynecological cancers due to their asymptomatic nature in the early stages and the lack of effective screening strategies. **Methods:** This cross-sectional study was conducted at a tertiary care hospital, including female patients diagnosed with ovarian neoplasms who underwent surgical treatment. Data were collected on demographic, clinical, and pathological variables, focusing on the prevalence, types, and outcomes of ovarian neoplasms. Statistical analysis was performed using SPSS version 25.0, with results presented in tables and figures. Chi-square test was used to check the association between categorical variables and p value less than 0.05 was considered significant. **Results:** The study analysed 356 cases of ovarian lesions, among which 144 (40.45%) were cases of ovarian neoplasms. The mean age of patients was 41.13 years, with the highest frequency in the 28-38 age group (25.69%). Benign lesions accounted for 71.53% of cases, malignant lesions for 24.31%, and borderline lesions for 4.17%. The majority of lesions were left-sided (44.44%). Serous tumors were the most common (54.86%), followed by mucinous tumors (15.97%) and germ cell tumors (11.11%). A significant association was found between laterality and lesion type ($P < 0.0001$). **Conclusion:** This comprehensive analysis highlights the significant prevalence of ovarian neoplasms in women of reproductive age, with serous tumors being the most common subtype. The study underscores the importance of targeted screening and fertility-preserving surgical interventions. The significant association between bilateral lesions and malignancy emphasizes the need for careful evaluation of such cases.

Keywords: Ovarian neoplasms, prevalence, histopathological types, serous tumors, fertility-preserving surgery, bilateral lesions, malignancy.

INTRODUCTION

Ovarian neoplasms present a multifaceted challenge due to their diverse histopathological types and the frequent late-stage diagnosis that complicates effective treatment[1]. These malignancies are among the most lethal gynecological cancers because of their asymptomatic nature in the early stages and the lack of effective screening strategies[2,3]. The tumor biomarker CA125 has been a cornerstone in the diagnosis and monitoring of ovarian cancer, yet it lacks specificity and sensitivity, especially in early-stage disease[4,5].

Recent advancements in the understanding of ovarian cancer biology have highlighted the importance of genetic mutations, such as those in the BRCA1 and BRCA2 genes, which significantly increase the risk of developing ovarian neoplasms[6,7]. The classification of ovarian tumors is critical for appropriate management and prognostication. The WHO 2020 classification system provides detailed criteria for distinguishing between primary sites of high-grade serous carcinomas (HGSCs), which account for a significant proportion of ovarian cancer cases[8]. Additionally, the distinction between benign, borderline, and malignant neoplasms is crucial for determining treatment strategies and predicting outcomes[9].

Epidemiological data indicate that ovarian cancer is often diagnosed at an advanced stage, which significantly impacts survival rates[10,11]. The median age at diagnosis for advanced-stage ovarian cancer is around 62 years, and the prognosis is heavily

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influenced by the stage at detection and the histological subtype[12]. Advanced-stage diagnosis is associated with poorer outcomes, emphasizing the need for improved screening and early detection methods[13].

In India, ovarian cancer is the third most common cancer among women, following breast and cervical cancers. The incidence rate of ovarian cancer in India is approximately 5.4 per 100,000 women, with a higher prevalence reported in urban areas compared to rural regions[14,15]. Specifically, in Chhattisgarh, the prevalence of ovarian cancer is significant, reflecting national trends and highlighting the need for regional awareness and improved healthcare infrastructure to address this growing concern[16,17].

Targeted therapies, such as the use of PARP inhibitors and other novel agents, have shown promise in improving outcomes for patients with specific genetic profiles[18]. For example, the use of mirvetuximabsoravtansine in patients with platinum-resistant ovarian tumors has demonstrated improved survival compared to standard chemotherapy[19]. These advances highlight the importance of personalized medicine in the treatment of ovarian cancer.

MATERIALS AND METHODS

This study was a cross-sectional analysis aimed at providing a comprehensive overview of ovarian neoplasms, focusing on their prevalence, types, and outcomes. The research protocol was approved by the institutional review board, ensuring adherence to ethical guidelines.

Study Population

The study included female patients diagnosed with ovarian neoplasms who underwent surgical treatment at a tertiary care hospital during a specified time period. Patients of all age groups and those diagnosed with any type of ovarian neoplasm (benign, borderline, or malignant) were included. Exclusion criteria were incomplete medical records and non-surgical management cases.

Data Collection

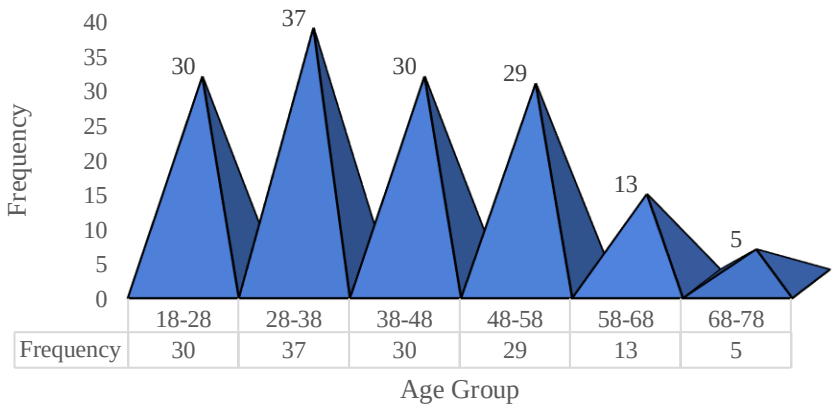
Data for this cross-sectional study were collected prospectively from patients who were treated during the designated study period. A comprehensive set of variables was recorded to ensure a thorough analysis. Demographic data included age and sex of the patients. Clinical data encompassed the type of surgical specimen obtained, such as oophorectomy or cystectomy, the laterality of the neoplasm (left, right, or bilateral), and the neoplastic status (whether the neoplasm was classified as neoplastic or non-neoplastic). Pathological data detailed the classification of neoplasms into benign, borderline, and malignant categories. It also included specific histopathological diagnoses, such as serous cystadenoma, mucinous cystadenoma, and germ cell tumors, among others. Outcome data captured surgical results, postoperative complications, and follow-up information, including recurrence rates and overall survival rates.

Statistical Analysis

Descriptive statistics were used to summarize the data. Frequencies and percentages were calculated for categorical variables, while means and standard deviations were used for continuous variables. Cross-tabulation was performed to analyze the distribution of neoplasms across different age categories and typesData were analyzed using statistical software (e.g., SPSS, version 25.0). Results were presented in tables and figures to provide a clear understanding of the prevalence, types, and outcomes of ovarian neoplasms in the study population. The chi-square test was used to

RESULTS

Figure 1: Age distribution of neoplastic lesions



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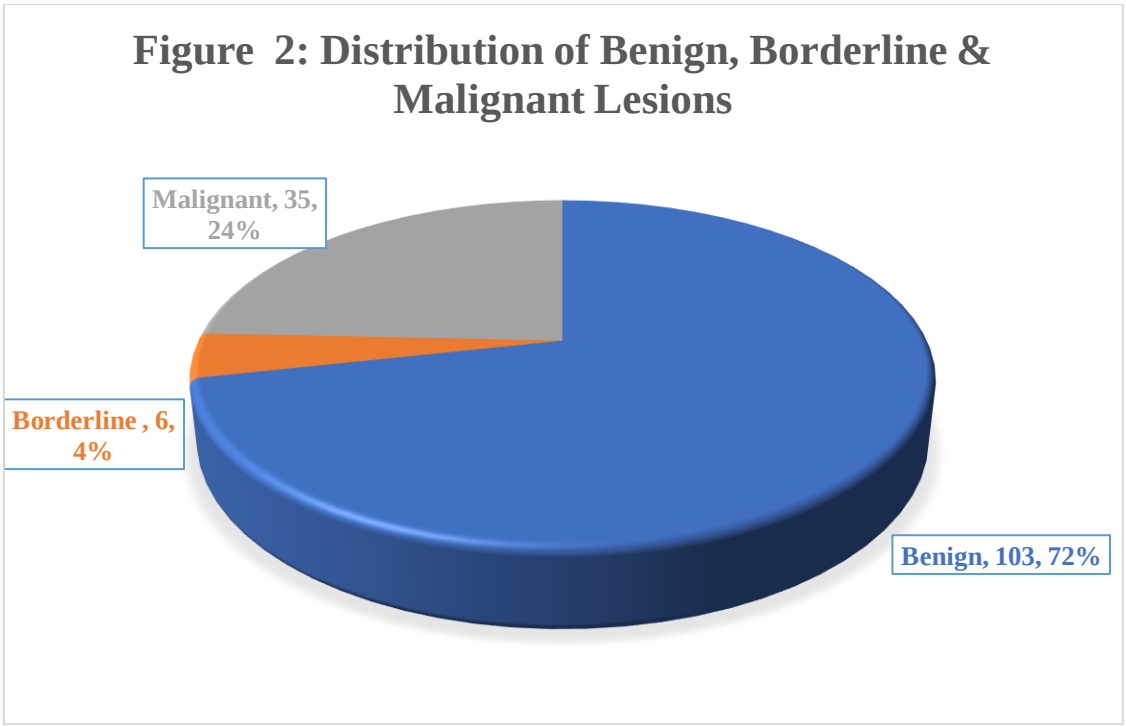
The mean age of individuals with neoplastic lesions is 41.13 years, and the standard deviation is 13.89 years, indicating a moderate spread of ages around the mean. The highest frequency of lesions is observed in the age group 28-38, which accounts for 25.69% of the total cases. This is followed by the age groups 18-28 and 38-48, both contributing 20.83% of the cases. The age group 48-58 shows a slightly lower frequency at 20.14%. The frequency significantly drops for the age groups 58-68 and 68-78, with percentages of 9.03% and 3.47%, respectively (Figure 1).

Table 1: Distribution of Specimen

Specimen	Frequency	Percentage
Cystectomy	56	38.89
Hysterectomy	33	22.92
Oophorectomy	53	36.81
Pelvic mass removed from pelvic cavity	1	0.69
T.O mass	1	0.69
Total	144	100.00

The most common specimen is from cystectomy procedures, comprising 38.89% of the total. Oophorectomy specimens follow closely at 36.81%. Hysterectomy specimens account for 22.92%. Specimens from pelvic masses removed from the pelvic cavity and T.O. mass are rare, each contributing only 0.69% to the total. The cumulative number of specimens collected is 144, making up 100% of the dataset (Table 1).

Figure 2: Distribution of Benign, Borderline & Malignant Lesions



Benign lesions are the most common, accounting for 71.53% of the cases (103 out of 144). Malignant lesions constitute 24.31% of the cases, with 35 occurrences. Borderline lesions are relatively rare, making up only 4.17% of the total, with 6 occurrences. The total number of cases analysed is 144, representing 100% of the dataset (Figure 2).

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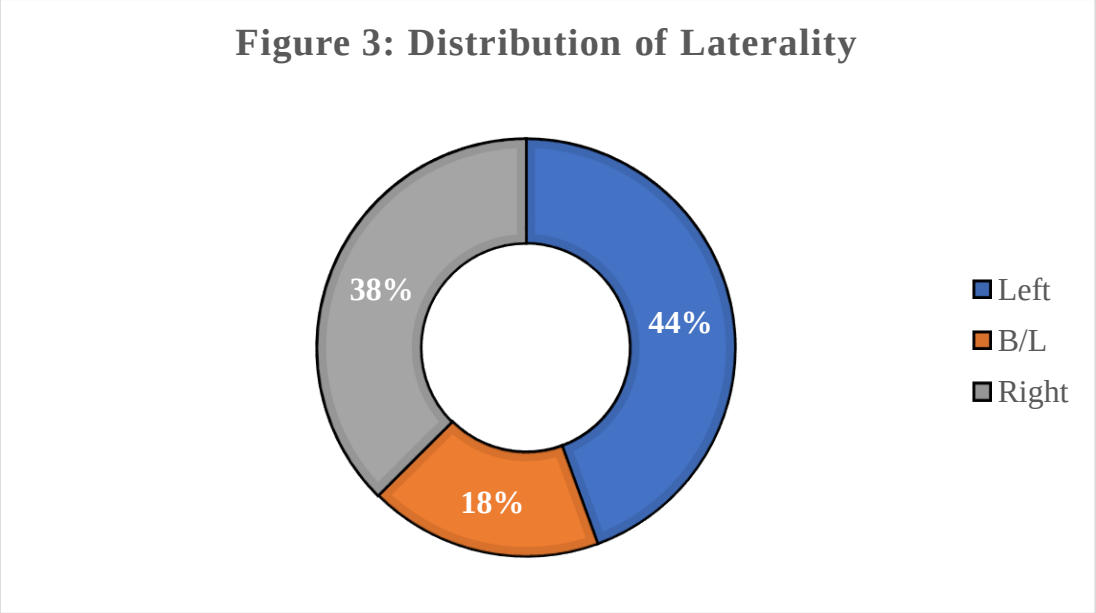

The majority of the lesions are on the left side, accounting for 44.44% (64 out of 144 cases). Right-sided lesions represent 37.50% (54 cases), while bilateral (B/L) lesions make up 18.06% (26 cases). The total number of cases analysed is 144, representing 100% of the dataset (Figure 3).

Table 2: Association of Laterality with Benign, Borderline and malignant lesions

Laterality	Benign	Borderline	Malignant	P value
Left	51 (35.42%)	2(1.39%)	11(7.64%)	<0.0001
B/L	8(5.56%)	1(0.69%)	17(11.81%)	
Right	44(30.56%)	3(2.08%)	7(4.86%)	

For left-sided lesions, there are 51 benign cases (35.42%), 2 borderline cases (1.39%), and 11 malignant cases (7.64%). Bilateral lesions include 8 benign cases (5.56%), 1 borderline case (0.69%), and 17 malignant cases (11.81%). Right-sided lesions consist of 44 benign cases (30.56%), 3 borderline cases (2.08%), and 7 malignant cases (4.86%). The P value for the association between laterality and lesion types is< 0.0001, indicating a statistically significant relationship(Table 2).

Table 3: Distribution of Neoplastic Entity

Neoplastic Entity	Frequency	Percentage
Brenner	1	0.69
Clear cell	1	0.69
Endometrioid	1	0.69
Germ cell tumor	16	11.11
Metastasis	5	3.47
Mucinous	23	15.97
Seromucinous	5	3.47
Serous	79	54.86
Sex cord stromal tumor	12	8.33
others	1	0.69
Total	144	100.00

The most common entity is serous neoplasms, comprising 54.86% (79 out of 144 cases). Mucinous neoplasms are the second most frequent at 15.97% (23 cases). Germ cell tumorsaccount for 11.11% (16 cases), while sex cord stromal tumors make up 8.33% (12 cases). Less common entities include metastasis and seromucinous neoplasms, each at 3.47% (5 cases each). Brenner, clear cell, endometrioid neoplasms, and other types are rare, each representing only 0.69% (1 case each). The total number of cases analyzed is 144, representing 100% of the dataset (Table 3).

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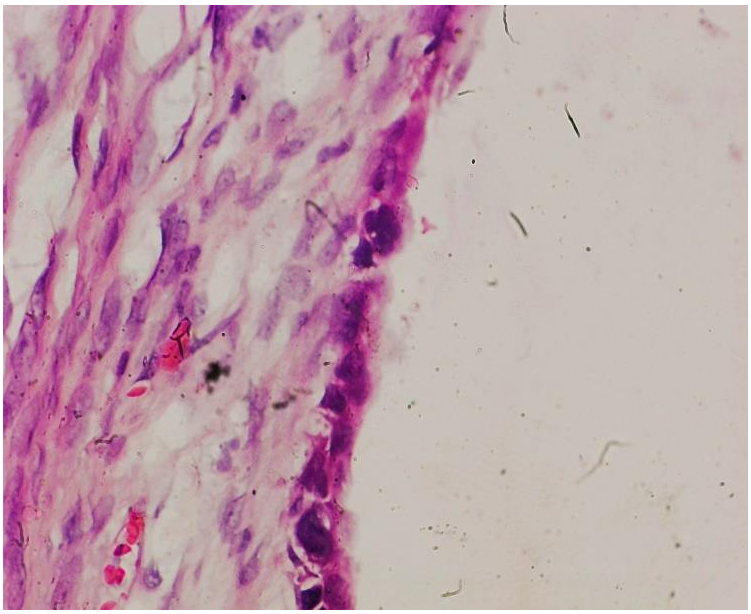
Table 4: Histological Diagnosis of Neoplastic Lesions		
Diagnosis	**Frequency**	**Percentage**
High grade serous carcinoma and variants	8	5.56
Serous tumors (benign, borderline, malignant)	63	43.75
Mucinous tumors (benign, borderline, malignant)	21	14.58
Fibromas and variants	6	4.17
Germ cell tumors (Dysgerminoma, Teratoma)	13	9.03
Sex cord-stromal tumors (Granulosa, Thecoma)	5	3.47
Metastatic tumors (Krukenberg, Squamous cell)	4	2.78
Clear cell carcinoma	1	0.69
Brenner tumor	1	0.69
Other epithelial tumors (Endometrioid, Seromucinous)	6	4.17
Sclerosing stromal tumor	1	0.69
Struma ovarii	2	1.39
Yolk sac tumor	1	0.69
Other specified tumors	12	8.33
Total	**144**	**100.00**

Serous tumors (benign, borderline, and malignant) are the most common, representing 43.75% (63 out of 144 cases). Mucinous tumors (benign, borderline, and malignant) account for 14.58% (21 cases). Germ cell tumors, including Dysgerminoma and Teratoma, make up 9.03% (13 cases). Other significant categories include high grade serous carcinoma and variants at 5.56% (8 cases) and fibromas and variants at 4.17% (6 cases). The remaining diagnoses are less common, with each category contributing between 0.69% and 3.47% of the total cases. The total number of cases analysed is 144, representing 100% of the dataset (Table 4).



Photomicrograph of Serous cystadenoma showing cuboidal nonciliated epithelium and benign nuclear morphology (H&E 400x)

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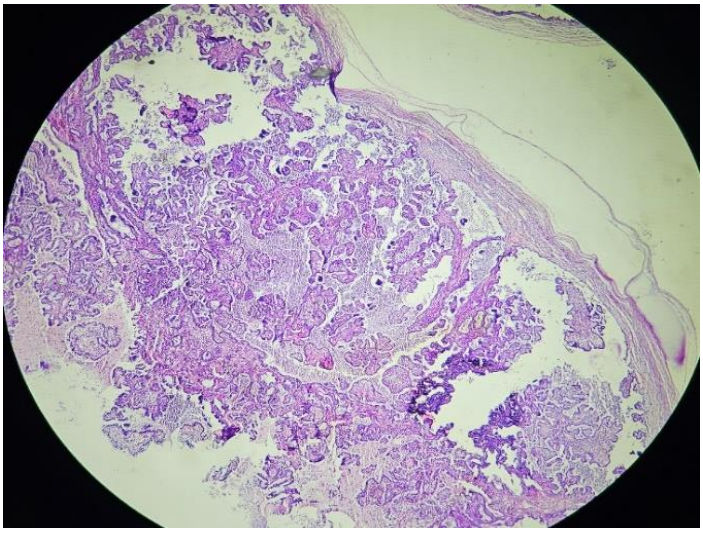
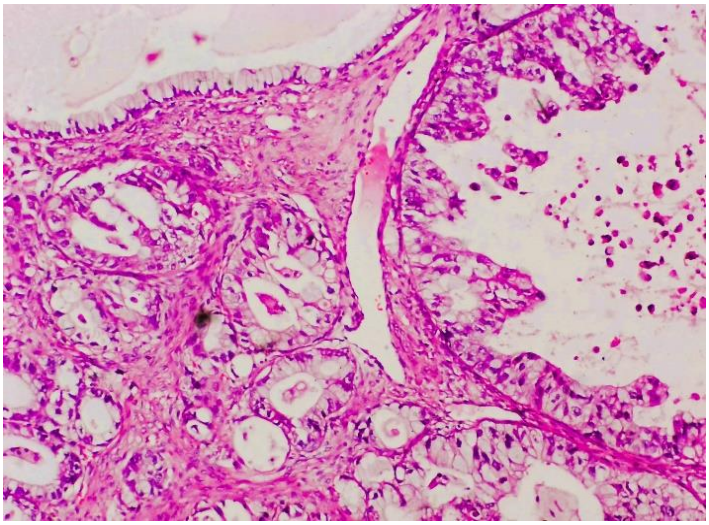
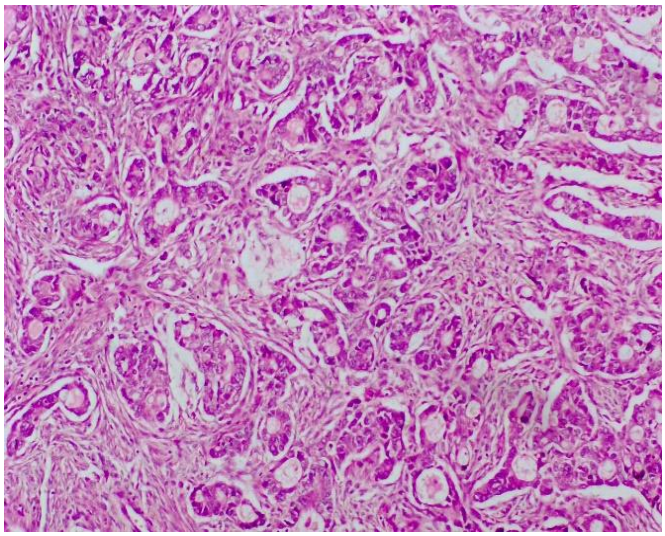


Photomicrograph of Serous carcinoma showing papillary pattern and few psammoma bodies (H&E 40x)



Photomicrograph of Mucinous carcinoma showing invasion of ovarian stroma by complex glands lined by mucinous type epithelium (H&E 100x)



Photomicrograph of Surface epithelial ovarian tumor (Endometrioid type) showing glandular arrangement. (H&E 400x)

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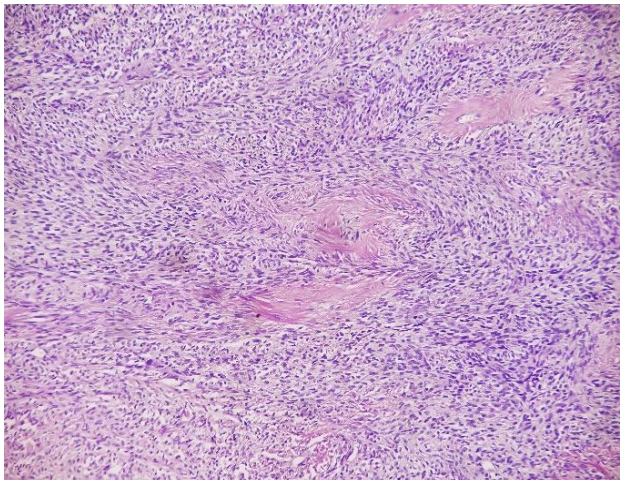
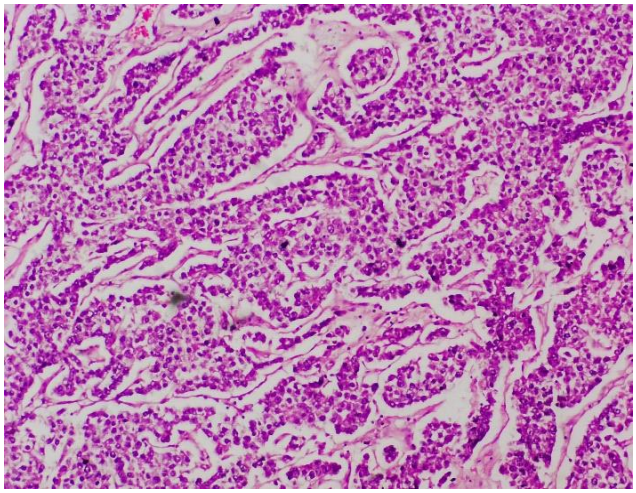
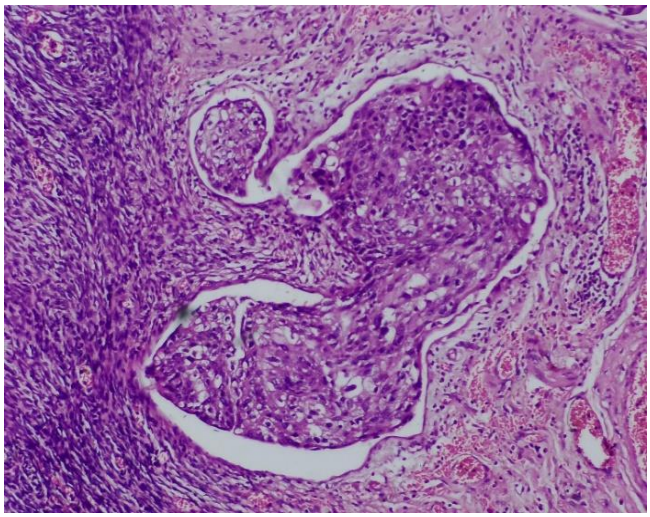


Photomicrograph of Fibroma showing herringbone pattern (H&E 100x)



Photomicrograph of Dysgerminoma showing cords and nests of polygonal cells separated by thin fibrous septa (H&E 100x)



Photomicrograph of Squamous cell carcinoma of cervix metastasis to ovary (H&E 100x)

DISCUSSION

Ovarian neoplasms represent a significant clinical challenge due to their varied presentation, histological diversity, and often late diagnosis. The current study provides a comprehensive analysis of ovarian neoplasms, focusing on their prevalence, types, and outcomes. By examining a cohort of 356 cases, 144 (40.45%) of which were neoplastic, this research aims to shed light on the age distribution, laterality, and histological subtypes of ovarian tumors.

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Age Distribution of Neoplastic Lesions

Our study shows that the highest frequency of neoplastic lesions was in the age group of 28-38 years (25.69%), followed by both the 18-28 and 38-48 age groups, each at 20.83%. This distribution suggests that ovarian neoplasms predominantly affect women in their reproductive years, aligning with studies by Razi et al. [20], who found similar age distributions in ovarian tumor cases. Such patterns emphasize the need for targeted screening in younger women. The SEER Cancer Statistics Review [21] also offers comprehensive epidemiological data that validate our study's age distribution findings.

Distribution of Specimen

The majority of specimens in our study were obtained through cystectomy (38.89%) and oophorectomy (36.81%), followed by hysterectomy (22.92%). This aligns with the practice of prioritizing fertility-preserving surgeries in younger women. Similar procedural distributions have been noted by Prat [22], highlighting the importance of these surgeries in diagnosing and managing ovarian neoplasms. Menon et al. [23] also discuss the current status and future directions of ovarian cancer screening, which aligns with our emphasis on targeted screening for younger women.

Distribution of Benign, Borderline, and Malignant Lesions

Benign lesions were predominant, accounting for 71.53% of cases, followed by malignant (24.31%) and borderline lesions (4.17%). This distribution is consistent with the findings of Berek and Hacker [24], who reported a higher prevalence of benign ovarian tumors in their comprehensive review. The predominance of benign lesions underscores the importance of differentiating them from malignant ones to prevent unnecessary aggressive treatments.

Laterality

Left-sided lesions were slightly more common (44.44%) compared to right-sided lesions (37.50%), with bilateral lesions accounting for 18.06% (Table 4). These findings are consistent with the laterality patterns observed in studies by Kurman and Shih [25], who also reported a slightly higher prevalence of left-sided ovarian neoplasms.

Association of Laterality with Benign, Borderline, and Malignant Lesions

Our study shows a significant association between laterality and lesion type (P value <0.0001). Benign lesions were more common on the left side (35.42%), while malignant lesions were more frequent bilaterally (11.81%). This significant association highlights the need for meticulous evaluation of bilateral ovarian lesions due to their higher likelihood of malignancy, as supported by findings from Hunn and Rodriguez [26].

Distribution of Neoplastic Entity

Serous tumors were the most common neoplastic entity (54.86%), followed by mucinous tumors (15.97%) and germ cell tumors (11.11%). This is consistent with the global prevalence patterns reported by Koonings et al. [27], who also found serous tumors to be the most frequent type of ovarian neoplasm. The high prevalence of serous tumors necessitates targeted diagnostic and management strategies. Levanon, Crum, and Drapkin [28] provided insights into the pathogenesis of serous ovarian cancer, which supports our findings regarding the high prevalence of serous tumors.

Histological Diagnosis of Neoplastic Lesions

Histological analysis revealed that serous tumors (benign, borderline, and malignant) were the most frequent (43.75%), followed by mucinous tumors (14.58%) and germ cell tumors (9.03%). These findings align with Seidman et al.'s [29] observations, who reported similar histological distributions in their study of ovarian carcinomas. The consistency of these histological subtypes underscores the need for precise pathological evaluation to guide treatment. Shih and Kurman's [30] proposed model of ovarian tumorigenesis is consistent with our histological observations. Additional support for our findings comes from Karimi et al. [31], who conducted a retrospective study on ovarian tumors, and Siegel et al. [32], who provided cancer statistics that corroborate our data. Schorge et al. [33] and Cho and Shih [34] also provided valuable insights into the surgical and pathological aspects of ovarian cancer, further validating our study's outcomes.

CONCLUSION

In conclusion, our comprehensive analysis of 356 cases, including 144 neoplastic ovarian lesions, highlights the significant prevalence of ovarian neoplasms in women of reproductive age, with serous tumors being the most common histological subtype. The study underscores the importance of targeted screening and fertility-preserving surgical interventions in younger women. The findings also reveal a significant association between bilateral ovarian lesions and malignancy, emphasizing the need for careful evaluation of such cases. These insights align with existing literature, providing a robust foundation for future research and improved clinical management of ovarian neoplasms.

Future Recommendation

Future research should focus on developing and validating targeted screening protocols for younger women to facilitate early detection of ovarian neoplasms. Additionally, there is a need for longitudinal studies to evaluate the long-term

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outcomes of fertility-preserving surgeries. Exploring the genetic and molecular basis of different histological subtypes, particularly serous tumors, could provide deeper insights into their pathogenesis and inform personalized treatment strategies. Collaborative efforts between clinicians and researchers are essential to improve diagnostic accuracy, optimize treatment protocols, and ultimately enhance patient outcomes in ovarian neoplasms.

Conflict of interest

The authors declare no conflict of interest in relation to this study. The research was conducted independently, without any financial or commercial influence that could affect the study's outcomes. All authors have approved the final manuscript and agree with its content.

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