Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/3hsxhn05

STUDY OF HISTOPATHOLOGICAL SPECTRUM OF OVARIAN LESIONS IN A TERTIARY CARE HOSPITAL.

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Abstract

Background:

Ovarian lesions encompass a wide spectrum of non-neoplastic and neoplastic disorders with variable morphology and clinical behavior. Because many lesions remain asymptomatic until an advanced stage, histopathological examination remains the gold standard for definitive diagnosis, classification, and management planning.

Objectives:

To study the histopathological spectrum of ovarian lesions, assess their age distribution, and analyze the association between age and tumor behavior in specimens received at a tertiary care center.

Materials and Methods:

A prospective observational study was conducted in the Department of Pathology, Maharaja's Institute of Medical Sciences, Nellimarla, Vizianagaram, from January 2020 to August 2021. A total of 48 ovarian specimens were examined. Gross and microscopic features were studied, and lesions were classified as non-neoplastic, benign, borderline, or malignant according to the WHO 2020 classification. Data were analyzed using descriptive statistics, and the Chi-square test was applied to assess the association between age and tumor behavior.

Results:

Out of 48 cases, 35 (72.91%) were neoplastic and 13 (27.08%) were non-neoplastic. Benign tumors predominated (88.57%), followed by malignant (8.57%) and borderline (2.85%) lesions. Among benign neoplasms, *serous cystadenoma* (51.42%) was the most common, followed by *mucinous cystadenoma* (20%) and *benign cystic teratoma* (17.14%). Non-neoplastic lesions were mainly cystic follicles (38.46%) and follicular cysts (23.07%). The majority of lesions occurred in women aged 31–50 years. A statistically significant association was found between age and tumor behavior ($\chi^2 = 10.8$; $p = 0.046$).

Conclusion:
Benign surface epithelial tumors constituted the majority of ovarian neoplasms, with a higher frequency among women in the reproductive and perimenopausal age groups. Malignant tumors were less common but showed a clear predilection for older age. Histopathological evaluation remains indispensable for accurate diagnosis and prognostication of ovarian lesions.

Keywords:
Ovary, Neoplastic lesions, Non-neoplastic lesions, Serous cystadenoma, Histopathology, Ovarian tumor, WHO classification, Age distribution

Introduction

Ovarian lesions encompass a broad spectrum of non-neoplastic and neoplastic disorders that differ in their etiology, morphology, and clinical behavior. They pose a significant diagnostic and therapeutic challenge because of their diverse presentation and frequent asymptomatic course in the early stages. The ovary is a dynamic organ that undergoes cyclical physiological changes throughout the reproductive life of a woman, predisposing it to the development of various cystic and neoplastic lesions [1,2]. These lesions may remain clinically silent until they attain a large size or present with complications such as torsion, rupture, or hemorrhage.

Globally, ovarian cancer remains the seventh most common malignancy among women and the fifth leading cause of cancer-related deaths, accounting for a substantial disease burden due to late detection [3,4]. The incidence of ovarian neoplasms varies widely depending on age, geography, and environmental and genetic factors. In India, a rising trend has been observed in recent years, with epithelial tumors constituting the majority of ovarian malignancies [3,5].

Histopathological examination continues to be the gold standard for the diagnosis and classification of ovarian lesions, allowing differentiation between non-neoplastic cysts and neoplastic tumors, and between benign, borderline, and malignant variants [6,7]. Accurate histological typing and behavioral categorization are crucial, as they have direct implications for prognosis, management, and fertility preservation, particularly in younger women [8].

The World Health Organization (WHO) classification provides a standardized framework for categorizing ovarian tumors based on histogenesis into surface epithelial-stromal, germ cell, and sex cord-stromal types [9,10]. Among these, surface epithelial tumors are the most frequent, accounting for about 60% of all ovarian neoplasms and nearly 90% of ovarian malignancies [11]. Germ cell and sex cord-stromal tumors, though less common, exhibit distinctive clinical and pathological features that are essential for accurate diagnosis and treatment planning [12,13].

Considering the wide variation in the frequency and spectrum of ovarian lesions reported across different regions of India, institutional studies play a vital role in understanding local trends and guiding clinical decision-making. The present study was therefore undertaken to analyze the morphological patterns of ovarian lesions, determine their age distribution and histological behavior, and correlate the findings with previous studies for a comprehensive understanding of their pathological profile.

Materials and Methods

The present study was a prospective observational study conducted in the Department of Pathology, Maharaja's Institute of Medical Sciences (MIMS), Nellimarla, Vizianagaram, over a period of one year and eight months from January 2020 to August 2021. A total of 48 ovarian specimens received in the department during the study period were included for detailed gross and histopathological evaluation. Prior permission and ethical clearance were obtained from the Institutional Ethics Committee, the Superintendent of MIMS Hospital, and the Heads of the Departments of Pathology and Obstetrics and Gynaecology before commencing the study.

All surgical specimens received in the form of cystectomy, salpingo-oophorectomy, or total abdominal hysterectomy with bilateral salpingo-oophorectomy (TAH + BSO) were processed following standard histopathological techniques. Clinical details such as patient identification, age,

clinical presentation, and operative findings were recorded from requisition forms and case records. The inclusion criteria comprised all ovarian specimens showing neoplastic and non-neoplastic lesions irrespective of age, whereas normal ovaries and cases with inadequate clinical information were excluded from the study.

Gross examination was carried out meticulously, noting the size, shape, external surface, wall thickness, consistency, and contents of the ovarian mass. Representative tissue samples were obtained from different areas of the lesion, especially from solid, cystic, papillary, and hemorrhagic regions, to ensure diagnostic accuracy. The tissues were fixed in 10% neutral buffered formalin, dehydrated through graded alcohols, cleared in xylene, and embedded in paraffin wax using an automatic tissue processor. Thin sections of 3–4 µm thickness were cut using a rotary microtome, mounted on albuminised glass slides, and stained with hematoxylin and eosin (H&E) for microscopic examination.

Each slide was evaluated under light microscopy to determine the histopathological pattern and tumor behavior. The lesions were classified according to the World Health Organization (WHO) classification of ovarian tumors (2020 revision) [9], and categorized as non-neoplastic, benign, borderline, or malignant. The findings were analyzed and compared with similar studies from national and international literature for correlation and validation [6,7,8]. Statistical analysis was performed using descriptive methods, and associations between variables such as age and tumor behavior were assessed using the Chi-square test, considering $p < 0.05$ as statistically significant.

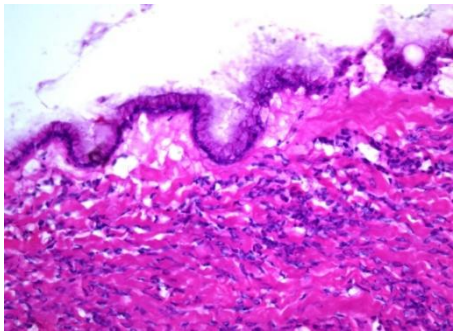
Fig 1- Benign Tumors.



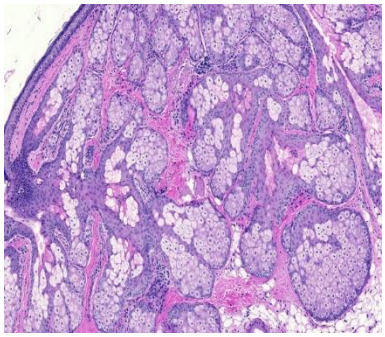
Benign mucinous cystadenoma



Benign cystic teratoma



Lining epithelial cells show lack of atypia and mitosis



On 10x power view, squamous epithelium with underlying sebaceous glands and adipose tissue

Fig 2-Malignant Tumours



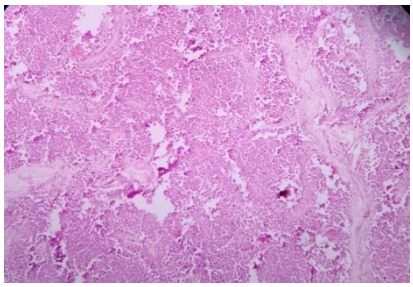
Dysgerminoma



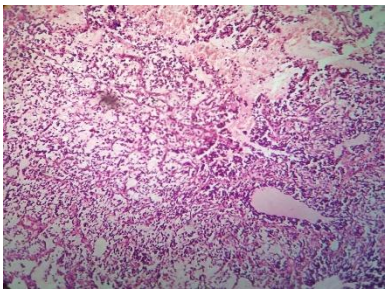
Small round blue cell tumour



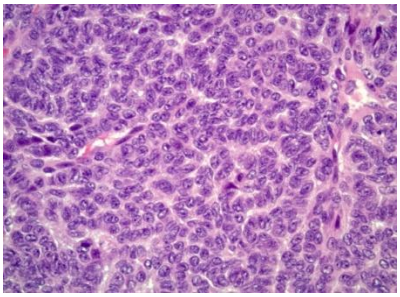
Granulosa cell tumour



4x view showing tumour cells arranged in lobules with foci of necrosis



Low power view showed tumour cells arranged in lobules, nests and cords.



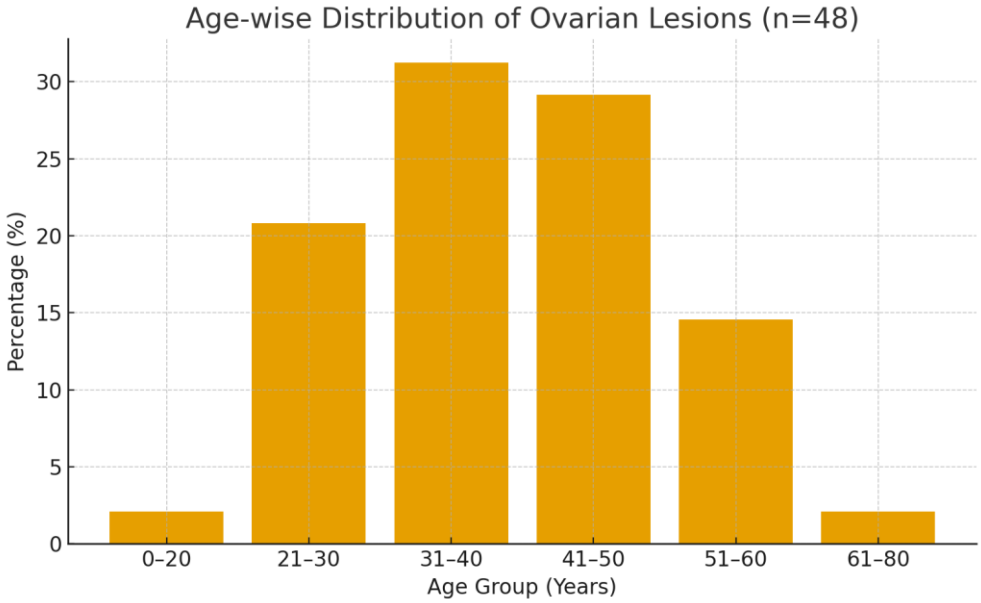
40x view shows tumour cells with angulated pale nuclei and nuclear grooves

Table 1: Type of Specimen Studied (n = 48)

Type of Specimen	**Number of Cases**	**Percentage (%)**
Total Abdominal Hysterectomy with Bilateral Salpingo-oophorectomy (TAH + BSO)	29	60.41
Salpingo-oophorectomy	9	18.75
Cystectomy	10	20.83
Total	**48**	**100.00**

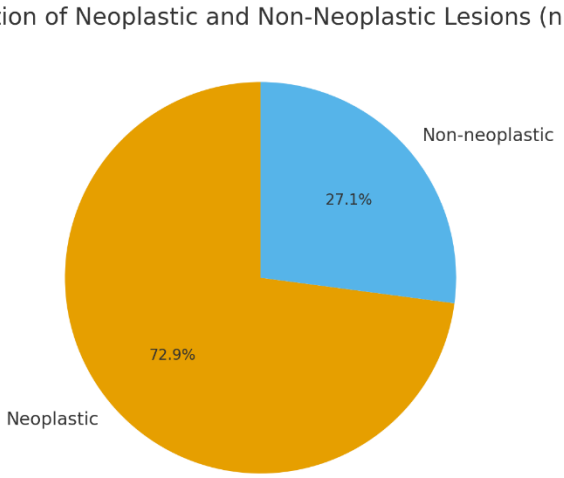
In the present study comprising 48 ovarian lesion cases, the majority of specimens were obtained through total abdominal hysterectomy with bilateral salpingo-oophorectomy (TAH + BSO), accounting for 29 cases (60.41%), reflecting that most patients were in the perimenopausal or postmenopausal age group where hysterectomy is the preferred surgical approach. This was followed by 10 cases (20.83%) of cystectomy, typically performed in younger women with localized cystic lesions, and 9 cases (18.75%) of salpingo-oophorectomy, indicating unilateral ovarian involvement. Thus, TAH + BSO constituted the predominant specimen type in this study.

Fig 1- Age-wise Distribution of Ovarian Lesions (n=48)



In the present study, ovarian lesions were observed across a wide age range of 19 to 80 years, with the highest incidence seen in the 31–40 years age group, accounting for 31.25% of cases, followed closely by the 41–50 years group with 29.16%. The 21–30 years age group constituted 20.83% of cases, while lesions were less frequent in women above 50 years, comprising 14.58% in the 51–60 years group and only 2.08% in those aged 61–80 years. Similarly, the incidence among adolescents (0–20 years) was minimal at 2.08%. This distribution highlights that ovarian lesions are most common during the reproductive and perimenopausal periods, emphasizing the role of hormonal influences and active ovarian physiology in the pathogenesis of these conditions.

Fig 2: Distribution of Neoplastic and Non-Neoplastic Lesions



In the present study, out of 48 ovarian lesion cases, the majority were neoplastic lesions, constituting 35 cases (72.91%), while non-neoplastic lesions accounted for 13 cases (27.08%). This finding indicates that tumor-related lesions of the ovary were more common than functional or inflammatory cystic changes. The predominance of neoplastic lesions reflects the high frequency of benign surface epithelial and germ cell tumors in women of reproductive and perimenopausal age groups, emphasizing the importance of histopathological evaluation for accurate diagnosis and management.

Table 2: Spectrum of Non-Neoplastic Lesions (n = 13)

Type of Non-Neoplastic Lesion	Number of Cases	Percentage (%)
Cystic follicles	5	38.46
Follicular cysts	3	23.07
Simple serous cyst	2	15.38
Corpus luteal cyst	2	15.38
Endometriotic cyst	1	7.69
Total	**13**	**100.00**

Among the 13 non-neoplastic ovarian lesions studied, cystic follicles were the most frequent, accounting for 5 cases (38.46%), followed by follicular cysts in 3 cases (23.07%). Simple serous cysts and corpus luteal cysts were observed in 2 cases each (15.38%), while endometriotic cyst was noted in 1 case (7.69%). These findings indicate that the majority of non-neoplastic lesions were functional cysts related to normal physiological ovarian activity. Such cysts often arise due to disturbances in follicular development or corpus luteum formation and are generally benign and self-limiting, although they may occasionally mimic neoplastic processes clinically or radiologically, underscoring the importance of histopathological confirmation.

Table 3: Spectrum of Neoplastic Ovarian Tumors (n = 35)

Histological Type	Number of Cases	Percentage (%)
Benign Lesions (n = 31; 88.57%)		
- Serous cystadenoma	18	51.42
- Mucinous cystadenoma	7	20.00
- Benign cystic teratoma	6	17.14
Borderline Lesion (n = 1; 2.85%)		
- Borderline mucinous cystadenoma	1	2.85
Malignant Lesions (n = 3; 8.57%)		
- Dysgerminoma	1	2.85
- Granulosa cell tumor	1	2.85
- Small round blue cell tumor	1	2.85
Total	**35**	**100.00**

In the present study comprising 35 neoplastic ovarian lesions, benign tumors formed the majority with 31 cases (88.57%), followed by 3 malignant tumors (8.57%) and 1 borderline tumor (2.85%). Among the benign lesions, serous cystadenoma was the most common histological type, observed in 18 cases (51.42%), followed by mucinous cystadenoma in 7 cases (20%) and benign cystic teratoma in 6 cases (17.14%). The single borderline lesion encountered was a borderline mucinous cystadenoma (2.85%). Among the malignant tumors, one case each of dysgerminoma, granulosa cell tumor, and small round blue cell tumor was identified, each constituting 2.85%. These findings demonstrate that benign surface epithelial tumors, particularly serous cystadenoma, are the most frequent ovarian neoplasms, while malignant and borderline tumors are relatively uncommon, aligning with patterns reported in similar institutional studies.

Table 4: Association Between Age Group and Behavior of Neoplastic Lesions (n = 35)

Age Group (years)	Benign (n = 31)	Borderline (n = 1)	Malignant (n = 3)	Total	Percentage (%)
0 – 20	0	0	1	1	2.86
21 – 30	7	0	0	7	20.00

Age Group (years)	Benign (n = 31)	Borderline (n = 1)	Malignant (n = 3)	Total	Percentage (%)
31 – 40	11	0	0	11	31.43
41 – 50	9	1	1	11	31.43
51 – 60	4	0	1	5	14.28
61 – 80	0	0	0	0	0
Total	**31 (88.57%)**	**1 (2.85%)**	**3 (8.57%)**	**35**	**100.00**

$\chi^2 = 10.8$; $p = 0.046$ *

In the present study, an analysis of the association between age group and behavior of neoplastic ovarian lesions revealed a statistically significant correlation ($\chi^2 = 10.8$; $p = 0.046$). The majority of benign tumors (88.57%) occurred in women aged 21–50 years, with the highest incidence in the 31–40 years (31.43%) and 41–50 years (31.43%) age groups. The single borderline tumor (2.85%) was also observed in a woman aged 41–50 years, while malignant tumors (8.57%) were more frequently seen in women above 40 years, particularly in the 41–60 years age range. These findings indicate that benign ovarian neoplasms are more common during the reproductive period, whereas the likelihood of malignancy increases with advancing age, a trend consistent with previous studies emphasizing the influence of hormonal and physiological changes in ovarian tumor behavior.

Discussion

Ovarian lesions comprise a wide spectrum ranging from physiological cysts to malignant neoplasms, and their diagnosis is often delayed due to vague or absent symptoms until an advanced stage [14]. In the present prospective study of 48 cases conducted at MIMS, Nellimarla, the histopathological spectrum of ovarian lesions was evaluated and compared with previously published data.

The highest incidence of ovarian lesions was found in the 31–40 years (31.25%) and 41–50 years (29.16%) age groups, indicating a predominance during the reproductive and perimenopausal years. Similar findings were reported by Inamdar et al. (2015) and Abdul Kareem Younis et al. (2019), who observed that hormonal activity during reproductive life predisposes the ovary to various pathological changes [15,16].

In the present study, neoplastic lesions (72.91%) outnumbered non-neoplastic lesions (27.08%), which corresponds with the findings of Phukan et al. (2018) and Sofi et al. (2018) [17,18]. However, a few reports, such as those by Gaikwad et al. (2020), showed a greater proportion of non-neoplastic lesions, possibly due to inclusion of incidental physiological cysts [19]. Among non-neoplastic lesions, cystic follicles and follicular cysts were predominant, aligning with studies by Dhakal et al. (2016), which identified these as common functional cysts formed due to failed follicular rupture [20].

Among neoplastic lesions, benign tumors constituted the majority (88.57%), followed by malignant (8.57%) and borderline (2.85%) lesions. This distribution is consistent with other studies, including Patel et al. (2020), which also reported a predominance of benign tumors [21]. Surface epithelial tumors were the most frequent category, particularly serous cystadenomas (51.42%), followed by mucinous cystadenomas (20%) and benign cystic teratomas (17.14%). These results are in agreement with Scully (1977), who established surface epithelial tumors as the most common ovarian neoplasms [22].

A statistically significant association ($\chi^2 = 10.8$; $p = 0.046$) between age and tumor behavior was observed, indicating that malignant tumors were more common in women above 40 years, whereas benign tumors predominated in younger age groups. This trend reinforces that increasing age and hormonal exposure play a critical role in the pathogenesis of ovarian malignancy.

Overall, the study findings highlight that benign surface epithelial tumors are the most prevalent ovarian neoplasms, while malignant tumors are relatively infrequent. The histopathological spectrum observed closely corresponds with national and international data, reaffirming that

microscopic evaluation remains the gold standard for accurate diagnosis and classification, which is crucial for appropriate clinical management and prognostication.

Conclusion

The present study highlights the diverse histopathological spectrum of ovarian lesions encountered in a tertiary care center. The majority of cases were neoplastic lesions, predominantly benign surface epithelial tumors, with serous cystadenoma being the most common subtype. Non-neoplastic lesions such as cystic and follicular cysts formed a smaller yet significant proportion, reflecting the physiological activity of the ovary during the reproductive period. The occurrence of lesions peaked in the 31–50 years age group, indicating a strong association with hormonal influences and active ovarian function.

A statistically significant correlation between age and tumor behavior was observed, showing that the risk of malignancy increased with advancing age. These findings correspond well with previous studies and reaffirm that histopathological examination remains the cornerstone for definitive diagnosis, classification, and prognostic assessment of ovarian masses. Early detection, accurate tissue diagnosis, and timely management are crucial for improving clinical outcomes, especially in malignant cases.

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