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Histopathological Spectrum of Ovarian Neoplasms: A Single-Center Study

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ABSTRACT

Background: The ovarian neoplasms range from neoplastic to non-neoplastic lesions that exhibit significant diversity in histopathological features and biological behavior. **Objective:** To establish the histopathological spectrum of ovarian tumors within the study population. **Study Design:** Retrospective cross-sectional study. **Settings:** Meezan Laboratory in Faisalabad, Pakistan. **Duration:** Five years, from June 2019 to May 2024. **Methods:** In this study, 366 ovarian tumor cases were seen, and the tumors were grouped based on their histopathological features according to the WHO classification. The study was analyzed using SPSS version 27, with frequencies, percentages, and laterality being highlighted. The p-value < 0.005 is considered significant. **Results:** Among 366 ovarian tumors, 180 (49.25%) were right-sided, and 132 (36.15%) were left-sided, with 53 (14.5%) being bilateral. The peak age incidence was between 21 and 30 years. The majority of surface epithelial tumors were benign. Serous cystadenoma was predominant, with 162 (44.3%) cases, followed by mucinous cystadenoma with 52 (14.2%) cases. The malignant form of surface epithelial tumors was dominated by serous carcinoma, with 22 (6.0%) cases, and mucinous carcinoma with 9 (2.5%) cases. Borderline mucinous tumors were less common, with 5 (1.4%) cases. In germ cell tumors, mature cystic teratoma was predominant, with 86 (23.5%) cases. **Conclusion:** This study found that benign ovarian tumors, with the most common being benign serous cystadenoma, predominance, which is slightly more prevalent on the right side. Malignant ovarian tumors were less common. Histopathological examination of the ovarian tumor is important for subcategorization and timely management planning.

Keywords: *Ovarian cancer, WHO, Surface epithelial tumors, Serous cystadenoma, Mature cystic teratoma.*

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INTRODUCTION

Ovarian cancer is the second most common female genital tract malignancy. It is responsible for nearly 3% of all cancers. Ovarian cancer is a diverse group of neoplastic and non-neoplastic disorders. The malignant ovarian tumors are the main cause of death among women across the world. Ovaries are the dynamic organs that are under the influence of hormones throughout the life of an individual. Benign tumors are common among the reproductive age group, whereas malignant tumors are common among the postmenopausal age group of 60-70 years. The presence of pluripotent cells results in a wide spectrum of morphological and histological neoplasms of various cell types, i.e., epithelial, germ cell, and sex cord-stromal cell types.[1,2]

The risk factors, clinical characteristics, and histopathological types of ovarian tumors vary worldwide and are related to a combination of genetic predilections, environmental influences, and socio-economic factors.[3] In low- and middle-income countries, deficiencies in diagnostic facilities, delayed onset of clinical manifestations, and the lack of effective screening programs often lead to late detection of malignant types of ovarian tumors.[4]

Studies have shown that benign epithelial tumors, especially serous and mucinous cystadenomas, are the most common ovarian tumors, followed by germ cell tumors such as mature cystic teratoma.[5,6,7,8] Although malignant ovarian tumors are less common, they present a major clinical challenge owing to their aggressive biological nature and poor survival rates. Histopathological examination of ovarian tumors is considered the gold standard.[9] The risk factors for ovarian tumors include nulliparity, high socioeconomic status, and environmental and genetic factors.[10]

Thus, diagnosis and histopathological examination become important for proper therapeutic and prognostic evaluation. It is important to periodically evaluate the histopathological trends of ovarian tumors in different populations. This study aims to evaluate the histopathological spectrum of ovarian tumors in our setup.

METHODS

This cross-sectional retrospective study aims to analyze 366 ovarian tumor samples over a period of five years, i.e., from June 2019 to May 2024, in the Meezan Lab in Faisalabad, Pakistan. Ethical approval (Ref# ML/EA/06-23, dated 23-06-2024) for this research was obtained from the ethical review committee of the institution. The sampling technique was non-probability purposive sampling. The sample size was calculated using the formula $n = Z^2p(1-p)/d2$, assuming a 95% confidence level ($Z = 1.96$), anticipated prevalence of surface epithelial ovarian tumors as 70% based on previous literature (2), and a margin of error of 5%. The minimum required sample size was calculated to be 323 cases. As this was a retrospective study, all cases fulfilling the inclusion and exclusion criteria over five years were included, resulting in a final sample size of 366 cases, which exceeded the minimum requirement and ensured adequate statistical precision. [2]Tumour samples included oophorectomy, salpingo-oophorectomy, and hysterectomy with bilateral salpingo-oophorectomy. All slides for the hematoxylin and eosin stain were obtained. Opinions from two qualified histopathologists were obtained to avoid observer bias. Tumors were further sub-classified according to the WHO classification of tumors of the female genital system, considering both histogenesis type and morphology. Clinical and pathological data, such as patient age and laterality, were obtained from laboratory records and requisition forms. Statistical analysis of the data was performed using SPSS Statistics 27. Statistically significant data is considered when $p < 0.05$. Inclusion criteria: All primary ovarian tumors with histopathological diagnosis, considering all ages. Exclusion criteria: Recurrent tumors, post-chemotherapy tumor samples, metastatic ovarian tumors with incomplete clinical information, and tumor samples with incomplete histopathological slides or reports.

RESULTS

The total cases were 366, with 180 cases (49.2%) on the right side, 132 cases (36.1%) on the left side, and 53 cases (14.5%) were bilateral, as shown in Table 1.

The commonest tumor was serous cystadenoma, accounting for 44.3% of all tumors (162 cases). Mature cystic teratoma was the second most common tumor, accounting for 23.5% (86 cases). Mucinous cystadenoma was the third most common tumor, accounting for 14.2% (52 cases). Sero-mucinous cysts were present in 2 cases. Serous carcinoma was present in 6% of cases (22 cases). Among these, high-grade serous carcinoma was present in 3.3%, and low-grade serous carcinoma was present in 2.7%. Mucinous carcinoma was present in 2.5% (9 cases). In germ cell tumors, mature cystic teratoma was predominant, with 86 (23.5%) cases. Among malignant germ cell tumors, yolk sac tumor was present in 1.4% (5 cases). Mixed germ cell tumor was present in 4 cases (1.1%). Choriocarcinoma and immature teratoma were present in less than 1%, as shown in Table 2.

Table 1: Frequency of laterality

Side	Frequency	Percent %
Right	180	49.2%
Left	132	36.1%
Bilateral	53	14.5%
Total	366	100.0%

Table 2: Frequency of ovarian neoplasm cases

Ovarian Tumor	Frequency	Percent
Choriocarcinoma	2	0.5%
Mucinous cystadenoma	52	14.2%
Sero mucinous cyst	2	0.5%
Borderline mucinous tumor	5	1.4%
Immature teratoma	1	0.3%
Hemorrhagic corpus luteal cyst	11	3.0%
High-grade serous carcinoma	12	3.3%
Low-grade serous carcinoma	10	2.7%
Mucinous carcinoma	9	2.5%
Dysgerminoma	4	1.1%
Yolk sac tumor	5	1.4%
Mixed germ cell tumor	4	1.1%
Mature cystic teratoma	86	23.5%
Serous cystadenoma	162	44.3%
Total	366	100.0%

Table 3: Age and ovarian tumor crosstabulation

Ovarian Tumor	Age							Total
	10-20	21-30	31-40	41-50	51-60	61-70	71-80	
Choriocarcinoma	1	1	0	0	0	0	0	2
Mucinous cystadenoma	1	16	17	8	6	3	1	52
Seromucinous cyst	0	0	1	0	1	0	0	2
Borderline mucinous tumor	0	0	0	3	0	0	2	5
Immature teratoma	0	1	0	0	0	0	0	1
Hemorrhagic corpus luteal cyst	0	4	4	2	1	0	0	11
High-grade serous carcinoma	0	0	1	4	3	3	1	12
Low-grade serous carcinoma	0	0	0	6	1	3	0	10
Mucinous carcinoma	0	2	2	4	0	0	1	9
Dysgerminoma	0	3	1	0	0	0	0	4
Yolk sac tumor	3	1	1	0	0	0	0	5
Mixed germ cell tumor	1	3	0	0	0	0	0	4
Mature cystic teratoma	5	34	25	15	4	2	1	86
Serous cystadenoma	11	55	50	32	9	3	2	162
Total	22	120	102	74	25	14	8	366

Figure 1: Serous cystadenoma with cuboidal epithelium (H&E 400 x)

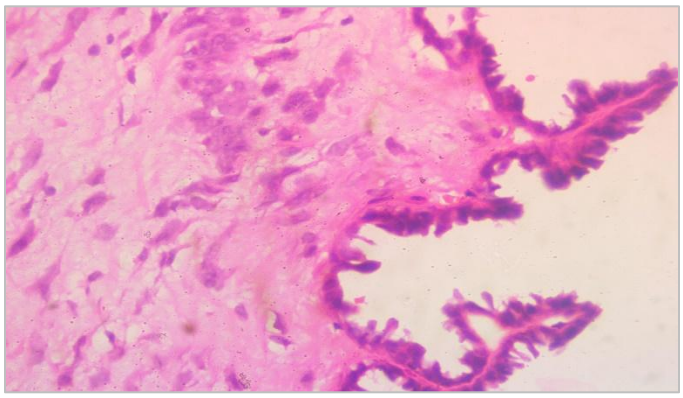


Figure 2: Mucinous cystadenoma with columnar epithelium with apical mucin (H&E 400 x)

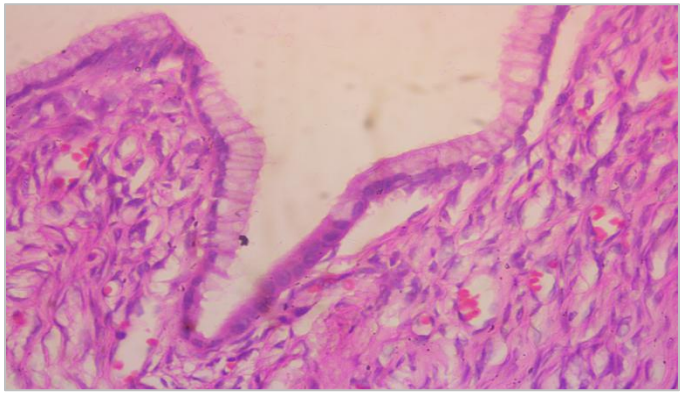
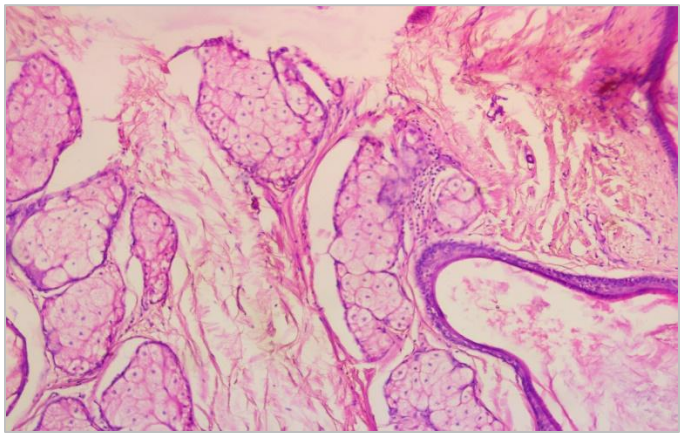


Figure 3: Mature cystic teratoma showing sebaceous glands and keratinous cyst (H&E 400x)



H&E: hematoxylin and eosin.

DISCUSSION

This study examined 366 cases of ovarian neoplasm, and the majority of cases, i.e., 120 (32.8%), were in the 21-30 years of age group. This result is in concurrence with the study done by Batool *et al*.[1] Other studies showed that the most common age group affected by ovarian neoplasm, i.e., 31-40 years of age, in various studies.[2,3,5,10,12,13,15] Epithelial malignant tumors were common in the 41-50 years of age group, which included high and low-grade serous tumors. Surface epithelial tumors were common in the 31-40 years of age group, and germ cell tumors were common in the 21-30 years of age group, as was seen in previous studies.[13,14,16]

Among surface epithelial tumors, benign serous cystadenoma was predominant, 162 (44.3%), followed by mucinous cystadenoma, 14.2%. This is shown in Figures 1 and 2. This is similar to the findings reported by Batool *et al*. They studied 390 cases, and 320 (82.05%) were benign. Also, benign serous cystadenoma was (30.2%). Similar findings were reported by other studies.[1,5,6,7,9,11] The most common germ cell tumor was a mature cystic teratoma, as shown in Figure 3. 86 (23.5%) of cases. This is similar to what was reported by Subramaniyan *et al*. They studied 200 ovarian tumors, and 132 were benign. Also, surface epithelial tumors were 159 cases (79.5%), and germ cell tumors were 27 cases (13.5%).[6,12,13] The other germ cell tumors, such as choriocarcinoma 2.0 (0.5%), yolk sac tumors 5.0 (1.4%), mixed germ cell tumor 4.0 (1.1%), dysgerminoma 4.0(1.1%), and immature teratoma 1%, were found to be very rare, similar to global findings.[4,16,19,21]

The malignant surface epithelial tumors included serous carcinoma (6.0%) and mucinous carcinoma (2.5%). These findings are in concordance with the findings of Mehra *et al*., 9% cases of high-grade serous carcinoma. These findings are in concurrence with the findings of Paswan *et al*., where (5.7%) cases.[2,11]

The borderline lesions in our study were few; only 5.0(1.4%) cases of borderline mucinous tumor were noted, and these findings are in concurrence with the other authors.[2,3,4,5]

A greater incidence of right-sided ovarian tumors was observed, i.e., 49.2%, compared to left-sided involvement, which was 36.1%, while in 14.5% of the cases, there was bilateral involvement. This slight preponderance of right-sided involvement concurs with other studies.[8,12] Patel *et al*. observed that the majority of ovarian tumors presented with left-sided involvement, amounting to 89.5%, while 49.4% of the total ovarian tumors showed left-sided involvement.[19] In another study by Malika *et al*., 90.8% of ovarian tumors were unilateral, and (80.8%) showed unilateral involvement in the study done by Ahuja S *et al*.[20,21]

The preponderance of benign ovarian lesions in the current study suggests that a significant number of lesions can be effectively treated by early surgical intervention. Early detection of malignant lesions in the current study suggests the importance of continued histopathological evaluation. In view of the fact that malignant ovarian lesions often present at an advanced stage with nonspecific clinical features, improved awareness among the general population and effective reporting systems are essential.[15]

CONCLUSION

This study further reinforces that benign epithelial neoplasms, especially serous cystadenoma, are the most common ovarian tumors, followed by mature cystic teratomas. Although malignant tumors are less common, they are still significant in clinical practice. Among these, serous carcinomas are the most common. It has been noted that there is a predominance of right-

sided tumors, along with the most common age group being 21-30 years. Regional surveillance, along with application of updated WHO classification systems, remains vital in further refining the accuracy of diagnosis and prognosis.

LIMITATIONS

This is a retrospective study from a single institution. Therefore, the results cannot be generalized to the general population.

SUGGESTIONS / RECOMMENDATIONS

Future studies would be beneficial by providing clinical, imaging, and immunohistochemical correlations.

CONFLICT OF INTEREST / DISCLOSURE

All authors declared that there is no conflict of interest.

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