



HISTOPATHOLOGICAL STUDY OF OVARIAN TUMORS IN GMC-A 5 YEAR STUDY

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ABSTRACT Ovarian tumors encompass a diverse range of benign and malignant growths arising from the ovary. Given the incidence and prevalence of these tumors in the modern day world and in our country it would be unwise to neglect understanding them thoroughly. Ovarian neoplasms have a broad range of histological patterns, from epithelial tissues to specialized hormone-secreting germinal and embryonal cells. Accurate identification of these histologic patterns is pivotal for the diagnosis, treatment, and prognosis of ovarian tumors. Various factors like tumor stage, histologic type, grade, residual disease, presence of ascites, psammoma bodies, metastatic sites, age, race, ploidy, and presenting symptoms have been found to correlate with prognosis in patients with ovarian neoplasms. Although tumor indicators, and other diagnostic methods including fine-needle aspiration cytology (FNAC), ultrasonography, and clinical evaluation are useful adjuncts for early diagnosis, histopathological examination continues to be the most useful method for detecting ovarian cancers. Hence, understanding the gross and microscopic features of various ovarian tumors, their variants and subtypes is essential. The correct diagnosis of these tumors using the appropriate classification and categorisation has a huge impact on the treatment and prognosis of the patients.

KEYWORDS : Ovarian Tumors, Histopathological Examination, Neoplasms, Psammoma Bodies.

INTRODUCTION

While ovarian cancer accounts for about 4% of all female cancers and 25% of female genital tract malignant tumors, the majority of ovarian tumors are benign (1). Of all gynecological malignancies, ovarian cancer is the 2nd most frequent in India, after cervical cancer. Gynecological cancer is the 5th most deadly type of malignancy among women and the fifth most prevalent cancer overall (1). Despite comprising less than one-third of all gynecological cancers, ovarian cancer is responsible for more than two-thirds of deaths from such cancers (2). Globally, an estimated 300,000 women are diagnosed with ovarian cancer every year, with Asia, Europe, North America, and Africa having the highest prevalence, according to 2020 estimates from GLOBACon (3). The GLOBACon 2020 statistics report the mortality of 2,00,000 females from ovarian cancer worldwide. Thus, it contributes to 4.6% of global cancer deaths (3). Ovarian malignancies frequently have vague symptoms, which results in late-stage diagnosis and dismal prognoses—patients with advanced stages had an average 17% 5-year survival rate (2). Therefore, early detection and intervention are crucial.

In addition to advanced age, nulliparity or delayed childbirth, family history, familial cancer syndromes, BRCA gene mutations, postmenopausal hormone therapy, smoking, alcohol consumption, physical inactivity, poor diet, obesity, and diabetes are risk factors for ovarian cancer. The theory of incessant ovulation posits that a person's age at first ovulation and cumulative number of ovulatory cycles are indicators of ovarian cancer risk. Benign surface epithelial tumors are more frequent in women between the ages of 20 & 45, but about 80% of ovarian tumors are benign. Most ovarian malignancies develop between the ages of 45 and 65. (4). Germ cell tumors are predominantly observed in children. Thus, age, tumor stage, and laterality are important factors in assessing tumor behavior. Most ovarian neoplasms are surface epithelial tumors; 90% of ovarian malignancies are malignant variations of these tumors. Relatively less prevalent are germ cell and sex cord-stromal "tumors" (5).

Who Classification Of Ovarian Tumors 2020: (7)

1. Epithelial Tumors:

- Serous tumors –
Surface papilloma, serous cystadenoma, and adenofibroma
Serous borderline tumor
Low-grade serous carcinoma
High-grade serous carcinoma
- Mucinous tumors

- Mucinous cystadenoma and adenofibroma
Mucinous borderline tumor
Mucinous carcinoma
- Endometrioid tumors
Endometrioid" cystadenoma and adenofibroma
Endometrioid borderline tumor
Endometrioid carcinoma
- Clear cell tumors
Clear cell cystadenoma and adenofibroma
Clear cell borderline tumor
Clear cell carcinoma
- Seromucinous tumors
Seromucinous cystadenoma and adenofibroma
Seromucinous borderline tumor
- Brenner tumor
Brenner tumor
Borderline Brenner tumor
Malignant Brenner tumor
Other carcinomas:
Mesonephric-like adenocarcinoma
Undifferentiated and de-differentiated carcinoma
Carcinosarcoma
Mixed carcinoma

2. Mesenchymal Tumors:

- Endometrioid stromal sarcoma:
Low grade
High grade
- Smooth muscle tumors
Leiomyoma
Smooth muscle tumor of uncertain malignant potential
Leiomyosarcoma
- Ovarian myxoma

3. Mixed Epithelial and Mesenchymal Tumors:

- Adenosarcoma

4. Sex Cord-stromal Tumors:

- Pure stromal tumors :
Fibroma,
Thecoma
Sclerosing stromal tumors
Microcystic stromal tumors
Signet ring stromal tumors

- Leydig cell tumors
- Steroid cell tumor
- Fibrosarcoma
- b) Pure sex cord tumors
 - Adult granulosa cell tumor
 - Juvenile granulosa cell tumor
 - Sertoli cell tumor
 - Sex cord tumor with annular tubules
- c) Mixed-sex cord-stromal tumors
 - Sertoli-leydig cell tumor
 - well differentiated
 - moderately differentiated
 - poorly differentiated
 - Sex cord-stromal tumors, NOS
 - Gynandroblastoma
- 5. **Germ Cell Tumors :**
 - Teratoma -mature and immature
 - Dysgerminoma
 - Yolk sac tumor
 - Embryonal carcinoma
 - Choriocarcinoma
 - Mixed germ cell tumor
 - Monodermal teratomas and somatic-type tumors arising from a dermoid cyst
 - struma ovarii, NOS
 - struma ovarii,malignant
 - stromal carcinoid
 - teratoma with malignant transformation
 - cystic teratoma, NOS
 - Germ cell sex cord-stromal tumors
 - gonadoblastoma -dissecting gonadoblastoma and undifferentiated gonadal tissue
 - mixed germ cell sex cord-stromal tumors, unclassified
- 6. **Miscellaneous Tumors:**
 - Rete cystadenoma, adenoma and adenocarcinoma
 - Small cell carcinoma of the ovary, hypercalcemic type
 - Wilm's tumor
 - Solid pseudopapillary tumor
 - Wolffian tumor
- 7. **Metastatic Tumors From Non-ovarian Primary:**
 - Breast
 - Colonic
 - Gastric
 - Appendiceal
 - Pancreaticobiliary
- 8. **Tumor-like Lesions of the Ovary:**
 - Follicle cyst
 - Corpus luteum cyst
 - Large solitary luteinized follicle cyst
 - Hyper reactio-luteinalis
 - Pregnancy luteoma
 - Stromal hyperplasia and hyperthecosis
 - Fibromatosis and massive edema
 - Leydig cell hyperplasia

MATERIALS AND METHODS

- The present investigation used descriptive observational methods. It was a five-year study that was undertaken between June 2019 and June 2023, with a portion of it being retrospective and a portion being prospective.
- All surgical specimens of ovarian tumors obtained by the Pathology Department at Goa Medical College, Bambolim, were included in the study.
- All surgical specimens of ovarian tumors received in the Department of Pathology, regardless of the type of surgery performed or the clinical characteristics of the disease were eligible for inclusion.
- Non-neoplastic ovarian lesions including polycystic ovaries, tubo-ovarian masses, and simple ovarian cysts were excluded.
- Standard techniques had been used to process all received samples for paraffin sections, which were then stained with Hematoxylin & Eosin.
- Clinical data was collected from histopathology requisition forms and medical records department papers as necessary.
- Records from the pathology department were searched for

histopathology reports and slides.

- The data was tabulated and analyzed concerning variables such as incidence, age distribution, and classification according to WHO guidelines.
- The proportion of each tumor in different age groups was expressed as a percentage.
- Results were compared with findings in Indian and Western literature.

OBSERVATIONS AND RESULTS

This study represents a histopathological analysis of ovarian tumours received in the department of pathology , Goa Medical College , over a period of 5 yrs from January 2019 to December 2023.

Table 1 : Year Wise Distribution of Ovarian Tumours Out of the Total No. of Histopathological Specimens Received

Year	Total no. of Histopathological specimens received	Total no. of ovarian tumours	Proportion (%)
2019	9275	63	0.67
2020	8637	60	0.69
2021	5026	55	1.09
2022	6507	86	1.32
2023	7529	63	0.83

Table 2: Percentage Distribution of Ovarian Tumors in Present Study

Type of tumor	Number	Percentage
Benign tumors	283	86.54%
Borderline tumors	11	3.36%
Malignant tumors	28	8.56%
Metastatic tumors	5	1.54%

Table 3: Percentage Distribution of Ovarian Tumors According to Histologic Type

Type of tumor	Number	Percentage
Surface epithelial tumors	248	75.84%
Sex cord stromal tumors	8	2.44%
Germ cell tumors	66	20.18%
Metastatic tumors	5	1.54%
Total	327	

Table 4: Age Wise Distribution of Ovarian Tumors :

Age group (years)	No. of cases	Percentage of cases
0-10	3	0.95%
11-20	28	8.56%
21-30	80	24.46%
31-40	59	18.04%
41-50	84	25.68%
51-60	36	11%
61-70	28	8.56%
71-80	9	2.75%

Table 5: Comparative Analysis of Consistency of Ovarian Tumors on Gross Examination :

Ovarian tumors	Number	Percentage
Solid	75	22.93%
Cystic	191	58.40%
Mixed	61	18.67%
Total	327	

Table 6: Comparison of Histological Types of Ovarian Tumours

Type of ovarian tumors	Percentage (%) in present GMC study	Past GMC study (%)	Namrata Aggarwal et al (2021) (%)	Ritu Sharma et al (2020)(1) (%)
1.Surface epithelial tumors	75.84	77.21	60	64.12
a. Serous tumors	51.37	50.92	31.25	52.81
Benign	43.42	38.02	20	33.95
Borderline	2.44	1.64	3.75	1.88
Malignant	5.50	11.26	7.5	16.98
b. Mucinous tumors	23.24	22.53	22.5	7.54
Benign	19.87	19.71	15	5.66
Borderline	0.91	1.17	2.5	0
Malignant	2.44	1.64	5	1.88
c. Endometrioid carcinoma	0.61	0.48	1.25	3.77
d. Brenner	0.61	1.88	3.75	0

e. Clear cell	0	0.24	1.25	0
f. Mixed SET	0	1.17	0	0
2. Sex cord stromal tumors	2.44	2.59	11.25	7.54
a. Granulosa cell tumor	1.22	0.94	6.25	3.77
b. Fibroma	0.91	1.41	2.5	3.77
c. Leydig cell tumor	0	0	1.25	0
d. Sertoli cell tumor	0	0	1.25	0
a. Sertoli -Leydig cell tumor	0	0	1.25	0
f. Steroid cell tumor	0.3	0.24	0	0
b. Sclerosing stromal tumors	0	0	0	0
c. Gynandroblastoma	0	0	0	0

3. Germ cell tumors	20.18	18.55	22.5	28.30
a. Dysgerminoma	0.91	0.24	2.5	1.88
b. Yolk sac tumor	0	0.47	1.25	0
c. Teratoma	19.26	15.72	18.75	24.54
Mature teratoma	18.65	15.25	15	18.86
Immature teratoma	0.30	0.47	2.5	5.68
Struma ovarii	0.30	0	1.25	0
d. Choriocarcinoma	0	0	0	0
e. Embryonal carcinoma	0	0	0	0
f. Gonadoblastoma	0	0	0	0
g. Mixed germ cell tumor	0	2.12	0	1.88
4. Metastatic tumors	1.54	1.64	6.25	0
5. Total	n=327	n=426	n=80	n=150

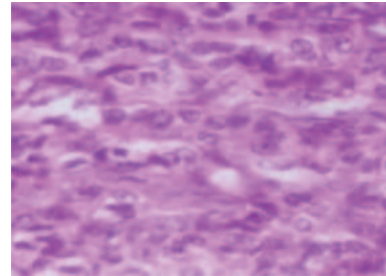
Table 7: Comparison of Benign, borderline, malignant and Metastatic Ovarian Tumours in Various Indian Studies

	Present study	Past GMC study (2013)	GMC Kota Ritu Sharma et al 2020 (1)	SMS Jaipur Namrata Aggarwal et al 2021 (29)	KEM Mumbai Dhende et al 2014-2017 (30)	HCG Cancer centre Bangalore Soumya B U et al 2016 (31)	KMC manipal Anugnya et al 2015-2017 (32)	GMC Gujarat Hathila et al 2019-2020 (33)	G Sudhakar M.D et al 2010-2015 (34)
Benign	86.54%	79.81%	61.53%	60%	79.3%	22.64%	68.12%	87.25%	62.3%
Borderline	3.36%	2.82%	1.92%	3.75%	6%	5.66%	8.7%	6.04%	4.4%
Malignant	8.56%	17.37%	36.53%	30%	14.6%	71.70%	22.5%	6.71%	33.3%
Metastatic	1.54%			6.25%					

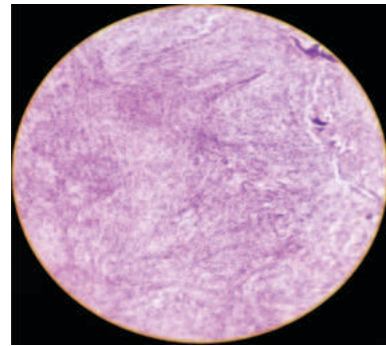
Table 8: Laterality of Ovarian Tumors

Total no. of cases	327	Percentage
Bilateral	28	8.56%
Unilateral	299	91.44%
Right	159	48.62%
Left	140	42.82%

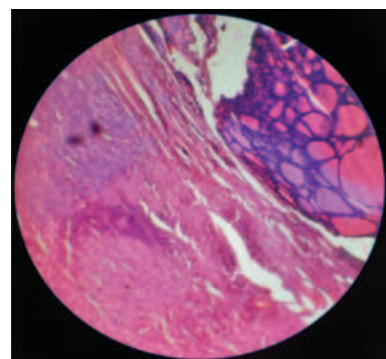
Photomicrograph H&E (40X): Microscopy of Papillary Serous Cystadenocarcinoma of Ovary Show Hyperchromatic Malignant Serous Cells Lining A Fibrovascular Core.



Photomicrograph H&E (100X): Microscopy of Granulosa Cell Tumor of Ovary – Showing Sheets and Cords of Cells with Grooved Nuclei.



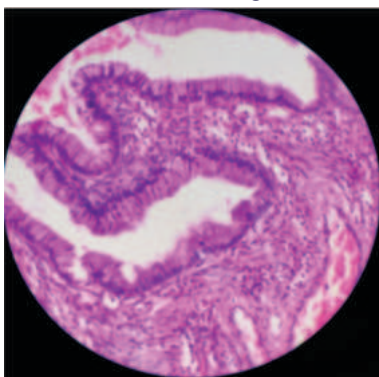
Photomicrograph H&E (100X): Microscopy of Fibroma of Ovary-Showing Intersecting Bundles of Spindle Cells Which Have Pointed Ends, Scanty Eosinophilic Cytoplasm and Bland Oval Nuclei.



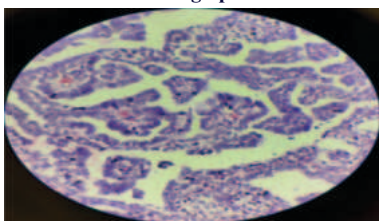
Photomicrographs of Histopathological Findings :



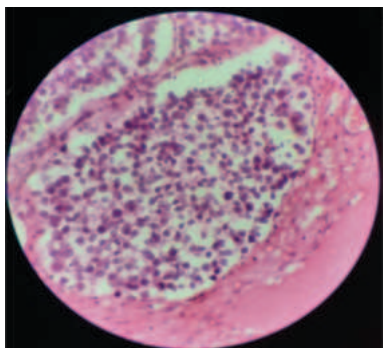
Specimen of Serous Cystadenoma of Ovary: Ovary is Replaced by the Tumor and Shows Smooth Glistening Outer Surface.



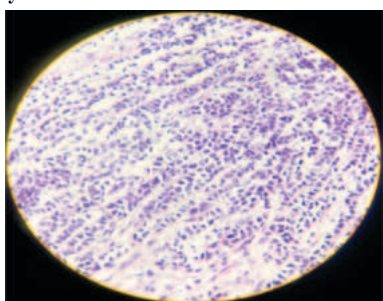
Photomicrograph H&E (100X): Microscopy of Mucinous Cystadenoma of Ovary – Showing Mucin Filled Glands Lined by Bland Columnar Mucin Secreting Epithelium.



Photomicrograph H&E (100X): Microscopy of Struma Ovarii : Colloid Filled Follicles (resembling Thyroid Gland) Seen within the Ovarian Stroma.



Photomicrograph H&E (40x): Microscopy of Dysgerminoma : Nests of Cells with Round Nuclei and Prominent Nucleoli Seen Separated by Fibrous Strands.



Photomicrograph H&E (100X): Microscopy of Metastatic Carcinoma of Ovary- Showing Single File Arrangement of Hyperchromatic Cells Signifying Metastasis from Invasive Lobular Carcinoma Of Breast.

DISCUSSION

- In the current investigation, which was conducted in the pathology department at Goa Medical College, 36,974 histopathological specimens were obtained throughout the course of five years, from January 2019 to December 2023, of which 327 cases of ovarian tumors were detected. We examined the incidence, age distribution, type, and pattern of each of these cases. The outcomes have been contrasted with those of related research conducted abroad and in India.
- In the current investigation, the percentages of benign, borderline, malignant, and metastatic ovarian cancers in GMC were 86.54%, 3.36%, 8.56%, and 1.54%, respectively. This was consistent with the research conducted by Hathila et al. (33).
- Laterality of the tumors – 28 cases (8.56%) were found to be bilateral while 299 cases (91.44%) were unilateral.
- Among unilateral ovarian tumors majority of tumors were Right sided (48.62%) and rest left sided (42.82%).
- Distribution of bilateral tumors:
- 28 cases of ovarian tumors (8.56%) (19 benign and 9 malignant) were bilateral. 14 of the 28 cases of bilateral tumors were surface epithelial type. Out of which 6 cases were of serous carcinoma, 5 cases of benign serous tumors and 3 cases were of benign mucinous tumor.
- 10 of the 28 cases were of germ cell origin (all mature cystic teratoma) and 4 of the 28 cases were of metastases to ovary.
- While 30% of malignant tumors were bilateral only 6.57% of benign tumors were found to be bilateral.
- In a study conducted by Kouki INAI et al (35) among atomic-bomb survivors in Japan from 1950-1988, out of the 723 ovarian tumors, 36% (260) were malignant and 64% (463) were benign. The most frequent form of ovarian cancer found was epithelial tumors (serous carcinoma), which was followed by germ cell tumors (mature cystic teratoma) as well as sex-cord stromal tumors (fibroma).
- In a study conducted at Hawassa University in Southern Ethiopia from 2017 to 2021, (36) 187 cases of ovarian tumors were identified out of which 143 (76.5%) were benign, 9 (4.8%) were borderline and 35 (18.7%) were malignant.
- The study conducted at Homi Bhabha Cancer Hospital Sangrur, Punjab from 2017-2018 found most patients with malignant

ovarian tumors to be in the age group of 45-65 years (27).

- In a different ICMR-NCDIR analysis, the majority of the 17,887 ovarian cancer cases reported under NCRP between 2012 and 2019 were in the 40–70-year age range (28).
- According to a 1993–2013 study (37) carried out at the University of Copenhagen in Denmark; epithelial-serious carcinoma was the most prevalent kind of ovarian cancer. “The age-standardized incidence rate of ovarian cancer decreased from 15.9 per 1 lakh person-years in 2003–2004 to 14.1 in 2011–2013, according to the investigation. Throughout the course of the investigation, the incidence of serous tumors remained stable” while that of other epithelial tumors declined. Throughout the course of the investigation, the incidence of the remaining histological types remained constant.
- In a register-based prospective investigation conducted for 35 years from 1981 to 2015 by A Irodi et al (38) in southeast Scotland, the association between patterns of clinicopathological features and outcomes in epithelial ovarian cancer was demonstrated. The most prevalent epithelial ovarian cancer found was high-grade serous carcinoma.
- The CONCORD program, a population-based study of cancer trends (1995–2009) across 51 countries, revealed the following findings (39): between 1995 and 2009, the percentage of type 2 ovarian epithelial tumors increased from 68.6 percent to 71.1 percent, while the percentage of type 1 epithelial tumors decreased from 23.8% to 21.1%. Type 2 epithelial cancers were the most prevalent from 2005 to 2009. Compared to Central and South America and Asia, the proportion was larger in Oceania, North America, and Europe. Asia had a higher incidence of type 1 epithelial cancers than North America. All around the world, germ cell cancers were discovered to be rare; in Asia, the proportion was three times higher than in Europe. Compared to GCTs, sex cord-stromal tumors were less prevalent.

SUMMARY AND CONCLUSIONS

- A total of 36,974 surgical pathology specimens were received by the department of pathology GMC from January 2019 to December 2023, out of which 327 were ovarian tumours resulting in a mean annual proportion of 0.88 %.
- Year wise study showed a fairly constant pattern of incidence ranging from 0.67 to 1.32%.
- Among the tumours, majority was constituted by surface epithelial tumors (76.14%), followed by germ cell tumors (20.18%) and sex cord stromal tumors (2.14%) and the least was by metastatic tumors (1.52%). This was in concordance with the studies done by Hathila et al (38) and Mehra et al (4).
- The majority of epithelial tumors were serous tumors accounting for 51.68% then followed by mucinous tumors accounting for 23.24% cases. The results were similar to studies done by Hathila et al (38) and Mehra et al (4).
- Serous cystadenocarcinoma was the most common malignant surface epithelial tumor which was in concordance with the results of Hathila et al (38) and Mehra et al (4).
- According to the current study, fibromas (42.86%) and granulosa cell tumors (57.14%) were the most prevalent sex cord-stromal tumors. This was consistent with research conducted by Hathila et al (38).
- Among the germ cell tumors, the majority were mature cystic teratoma (92.42%) followed by dysgerminoma (4.54%). This correlates with the investigation performed by Mehra et al (4) and Hathila et al (38).
- 327 ovarian tumors were found to be malignant (86.54%), 3.36% borderline, 8.56% benign, and 1.54% metastatic. This aligns with the research conducted by Hathila and colleagues (38).
- The age range of 20–50 years old was the most common for ovarian tumors. According to Anugnya Ranjoalkar et al. (37) and Sowmya BU et al. (36), this was in line with their research. Malignant tumors were more frequently observed in the 51–60-year age range, while benign tumors were more frequently observed in the 21–30-year age group.
- Of the 327 ovarian tumours, majority (91.44%) were unilateral out of which 48.62% were right sided and 42.82% were left sided. Only 8.56% ovarian tumors were found to be bilateral. This was in concordance with the study done by Tibebe Amare Abena et al (41).
- Majority (59.02%) of the tumors were cystic on gross examination followed by solid (22.93%) and mixed (18.65%). This was consistent with the study done by Tibebe Amare Abena et al.

- In summary, the histological spectrum of ovarian tumors at our institution is comparable to studies conducted in different regions of our nation as well as in other nations.

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