

ORIGINAL RESEARCH

## A STUDY ON HISTOMORPHOLOGICAL FEATURES OF OVARIAN TUMOURS

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### ABSTRACT

**Background:**Ovaries are one of the commonest sites of neoplastic lesions. Ovary is complex in its embryology, histology, steroidogenesis and potential for malignancy and presents wide variation in the clinical and morphological features The clinical stage of the neoplasm per se is inadequate to evaluate the optimum mode of therapy and to compare the therapeutic results. Histological classification of ovarian tumors forms an integral part of this evaluation Determination of various histopathologic patterns of ovarian tumors is very important in diagnosis as well as prognosis of ovarian tumors.**Aims and Objectives:** To classify and to study the histomorphology of various types of benign, borderline and malignant ovarian tumors and their relation to age and distribution of ovarian neoplasm.

**Materials and Methods:** During the period of three years from June 2019 to May 2022, 150 ovarian tumors were studied in the department of Pathology ACSR Govt Medical College, Nellore, AP, India.

**Results:** The overall incidence of ovarian tumors was 14.83% of total hysterectomy and oophorectomy specimens. The surface epithelial tumor formed the commonest tumor type accounting for 92 (66.67%) of ovarian tumors followed by germ cell tumors with 39 (28.26%) cases. The most frequent presentation of ovarian tumors was in the age group of 21-30 year in both benign and malignant tumours. Majority, 122 (88.4%) were benign and 16 (11.59%) were malignant. 94.93%of the tumors were unilateral, of which majority (85.51%) were benign. Majority of benign tumors 84.06%cases had cystic consistency,majority of malignant tumors 7.97%had mixed consistency.Other rare tumours Transitional cell carcinoma, undifferentiated carcinoma, immatureteratoma Haemangioma and lymphangioma were encountered.

**Conclusion:** A proper histological diagnosis and categorization of ovarian neoplasms in conjunction with clinical findings and recent diagnostic modalities assist in making accurate diagnosis which helps in the proper management.

**Keywords:** Ovary; WHO; Histomorphology.

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### INTRODUCTION

Ovaries are one of the commonest sites of neoplastic lesions and ovarian cancer is the sixth most common cancer and the seventh leading cause of deaths among women worldwide.<sup>[1]</sup> As per the surveillance epidemiology and end results cancer statistics (SEER) based on the rates from 2007-2009 about 1 in every 72 women have a lifetime risk of developing ovarian cancer.<sup>[2]</sup>

Ovary is complex in its embryology, histology, steroidogenesis and potential for malignancy. It is made up of germ cells, follicular cells and mesenchymal tissues, each with its own potential to form tumor.<sup>[3]</sup>

The complex anatomy of the ovary and its peculiar physiology with the constant cyclical changes from puberty to menopause gives rise to a number of cell types, each of which is capable of giving rise to tumours.<sup>[4]</sup>

Ovarian cancer is the greatest challenge of gynecologic oncology, the vast majority of ovarian cancers are diagnosed in an advanced stage, which accounts for the fact that this disease is the most lethal gynecologic malignancy. At the time for diagnosis, more than 60% of ovarian cancers present at an advanced stage, and the prognosis is poor with an expected 5-year survival rate in the range of 10-20%.<sup>[5]</sup>

Despite aggressive surgical intervention and new chemotherapeutic regimens, the overall five-year survival rate for women with advanced stage epithelial ovarian cancer (stage III and stage IV) remains poor (<30%) however, if early ovarian cancer is detected when confined to the ovary (stage I), the 5-year survival is more than 90%; clearly detection of early stage ovarian cancer is the best way to improve survival.<sup>[6,7]</sup>

Ovarian tumors present wide variation in the clinical and morphological features, the origins of many tumors are interrelated moreover, one can never be sure of the benign nature unless histopathology is determined. Determination of various histopathologic patterns of ovarian tumors is very important in diagnosis as well as prognosis of ovarian tumors.<sup>[8,9]</sup>

The clinical stage of the neoplasm per se is inadequate to evaluate the optimum mode of therapy, and to compare the various therapeutic results. Histological classification of ovarian tumours forms an integral part of this evaluation.<sup>[10]</sup>

The complex nature, unpredictable behavior and prognosis and controversial management make ovarian neoplasm a difficult problem for gynecologists.

The present study was undertaken to review and study the common morphological and histological types of ovarian neoplasms, their age, frequency and distribution.

### **Aim & Objectives:**

- To classify different types of tumors of ovary as benign, borderline and malignant.
- To study the histomorphology of various types of benign, borderline and malignant ovarian neoplasms.
- To study the age and distribution of ovarian neoplasm.

### **MATERIALS & METHODS**

The present study consists of a total of 138 cases of ovarian neoplasms received at the department of pathology, ACSR Govt Medical College, Nellore, AP over a period of 3 years, which included 2 years retrospective period (April 2020 to March 2022) and one year prospective period (June 2020 to May 2021).

All the specimens were received at the histopathology laboratory in department of pathology. Clinical details were taken from the medical records of patients. The specimens were received in the form of oophorectomy/salpingo oophorectomy/panhysterectomy. All details of the case consisting of clinical history, external examination, gross features, microscopic features and final diagnosis were filled in a proforma (Annexure 1), for the retrospective cases, details were obtained from hospital and departmental records. The histopathology slides were reviewed for retrospective cases.

The gross examination was done carefully noting the size, shape, extent and configuration, nodularity, consistency and presence of torsion. For morphologic study photos have been taken. A minimum of 4-5 bits were selected from the representative areas of tumor. The tissue was fixed in 10% neutral buffered formalin for 24 hours and processed in

automatic tissue processor and embedded in paraffin. The sections 3-5 microns thick were cut and stained by haematoxylin and eosin, in all cases and special stains like PAS, Reticulin (Annexure-II) were done wherever feasible.

The lesions were classified and studied as per WHO classification of tumors of ovary 2003.

## RESULTS

The present study included the 'study of histomorphological features of ovarian tumours' over a period of 3 years with two years retrospective study.

This study was undertaken in the department of pathology Govt Medical College, Nellore, Andhra Pradesh. A total of 150 ovarian neoplasms were evaluated.

All surgical specimens of oophorectomy and pan-hysterectomy from all age groups were included in this study.

The normal ovaries and ovaries with nonspecific finding like follicular cyst, cystic follicles, surface inclusion cysts, hemorrhagic inclusion cysts, endometriosis, all extra ovarian tumors, tumor like lesions such as luteoma of pregnancy, stromal hyperthecosis, stromal hyperplasia, fibromatosis, massive oedema of ovary were excluded from the study.

The total number of histopathology specimens submitted during the 3 years was 6959 among which the total number of hysterectomy and oophorectomy specimens were 930, The incidence of ovarian neoplasms was 1.98% of the total number of histopathology specimens and 14.83% of the panhysterectomy and oophorectomy specimens.

**Table 1: Year wise distribution of ovarian neoplasms**

Year	Number of cases	Percentage
2016 (June-Dec)	30	18.57
2017	40	26.31
2018	50	36.55
2019 (Jan-May)	30	18.57
Total	150	100

In the present study, the highest number of cases were in 2018, 50 (36.55%).

## Clinical Presentation:

**Table 2: Distribution of clinical presentation in ovarian neoplasms in the Present study**

Clinical Presentation	Number of Cases	Percentage
Mass per abdomen	61	40.60
MPA+Pain Abdomen	40	26.60
MPA+Pressure symptoms	10	6.56
Pain abdomen	17	11.32
MPA+Ascites	16	10.26
Menstrual irregularities	7	4.66
Total	150	100

In the present study, the most common symptom with which the patients presented was mass per abdomen 61 (40.60%) followed by 40 (26.60%) with mass pain abdomen and pain abdomen and 17 (11.32%) and 16 (10.26%) with mass pain abdomen and ascites.

**Table 3: Benign, borderline, malignant tumours of ovary in the present study**

Nature	Number of cases	Percentage
Benign	130	86.61
Borderline	-	-
Malignant	20	13.39
Total	150	100

In the present study, majority of the ovarian tumors were benign accounting for 130(86.61%) tumors, followed by 20(13.39%) malignant tumors, there were no borderline tumors encountered in present study.

#### Operative procedures:

**Table 4: Various operative procedures adopted in the present study**

Operative procedures	Benign	Borderline	Malignant	Total	Percentage
Cystectomy	10	-	-	10	6.61
Unilateraloophorectomy	51	-	-	51	34.65
TAH with USO	16	-	-	16	10.66
TAH with BSO	24	-	5	29	19.01
BSO	7	-	3	10	6.66
USO	21	-	4	26	17.53
Radical surgery	3	-	4	7	4.19
Exploratorylaparotomy	-	-	1	1	0.69
Total	133	-	17	150	100

P<0.05 (S)

In the present study, unilateral oophorectomy was the most common procedure done in 51(34.65%) followed by, TAH with BSO in 29 (19.01%).

Specimens obtained by cystectomy, unilateral oophorectomy and USO were predominantly benign tumors while specimens from the TAH and BSO were malignant. The association between surgical procedure and nature of tumor was found to be statistically significant.

**Table 5: Age distribution**

Age	Number of cases	Percentage
5-15	1	0.66%
16-25	9	6%
26-35	61	40.66%
36-45	42	28.36%
46-55	21	14.07%
56-65	10	6.25%
66-75	6	4%
Total	150	100%

In the present study, majority of the cases were in the age group of 26-35 yrs and 36-45 yrs accounting for 61 (40.66%) and 42 (28.36%) respectively, All of these cases were during active reproductive life. The youngest case was a 15 yr old and the oldest age was 75 yrs.

**Table 6: Relationship between the age and nature of ovarian neoplasm**

Age	Benign	Percentage	Borderline	Malignant	Percentage	Total No	Percentage Of total no
5-15	1	0.66%	-		0	1	0.66%
16-25	8	5.33%	-	1	0.66	9	6%
26-35	52	34.66	-	9	6	61	40.66%
36-45	39	26	-	3	2	36	28.36%
46-55	19	12.66	-	2	1.33	19	14.07%
56-65	9	6	-	1	0.66	10	6.25%
66-75	5	3.33	-	1	0.66	6	4%
Total	133	88.64	-	17	11.36	150	100

In the present study, majority of the benign tumors, 52 (34.66%) were in the age group of 26-35 years followed by 39 (26%) in the age group 36-45 yrs. Majority of malignant tumors 9 (6%) were in the age group 26-35 years followed by 3 (2%) in the age group 36-45 yrs. No borderline tumors were encountered in present study. The association between the age range and the nature of the neoplasm was found to be statistically significant.

**Table 7: Size range of the ovarian neoplasm in the present study**

Size(cm)	Number of cases	Percentage
≤4	29	19.33%
5-15	64	42.66%
16-25	46	30.66%
≥26	11	7.33%
Total	150	100

There was a wide size range in ovarian neoplasms in the present study. It ranged from 1.5x1.5cm to 30x18cm. Majority of them, 64 (42.66%) were in the size range of 5-15cm, followed by, 46 (30.66%) tumors in the size range of 16-25 cm as shown in table-7. Benign tumors were smaller, predominantly in the range of 5-15 cm while malignant tumors were predominantly more than 15 cm in size.

**Table 8: Gross findings in the benign, borderline and, malignant neoplasms of ovary in the present study**

Gross finding	Benign	Borderline	Malignant	Total	Percentage
Cystic	121	-	-	121	80.66%
Solid	4	-	11	15	10%
Mixed	8	-	6	14	9.33%
Total	133	-	17	150	100

In the present study, majority 121 (80.66%) of ovarian neoplasms were cystic consistency. all of them were benign tumors, 15 (10.%) had mixed consistency i.e. both solid and cystic, among which majority 11 (73.33.%) were malignant tumors. 4 (26.66%) had solid consistency The association between gross findings and nature of neoplasm were found to be statistically highly significant.

**Laterality:****Table 9: Laterality of the ovarian neoplasm in the present study**

Laterality	Benign	Borderline	Malignant	Total	Percentage
Unilateral	129	-	9	138	92%
Bilateral	7	-	5	12	8%
Total	136	-	14	150	100

In the present study, majority 138 (92%) were unilateral tumors among which majority 129 (93.07 %) were benign tumors and 9 (6.52%) were malignant tumors.

12 (8%) were bilateral, of which majority 7 (58.33%) were benign tumors and 5 (41.66%) were malignant as shown in table. Association between Laterality and the nature of neoplasm was found to be statistically highly significant.

**Table 10: Showing the spectrum of ovarian neoplasms in the present study**

Histological type	Number of cases	Percentage
Surface epithelial tumors	104	69.33%
Sex cord stromal tumors	8	5.33%
Germ cell tumors	18	12%
Secondaries	9	6%
Miscellaneous tumors	11	7.33%
Total	150	100

In the present study, spectrum of ovarian neoplasms encountered ranged from surface epithelial tumors to secondary deposits. Majority of these were Surface epithelial tumors accounting for 104 (69.33%), followed by 18 (12%) germ cell tumors. sex cord stromal tumors accounted for 8 (5.33%), 9 (6%) were secondary deposits. and miscellaneous tumors (with lymphangioma and haemangioma) accounted for 11 (7.33%).

**Table 11: Showing the distribution of the surface epithelial tumors in the present study**

Histological type	Benign	Boderline	Malignant	Total	Percentage
Serous tumors	59	-	5	64	61.53
Mucinous Tumours	26	-	4	30	28.84
Endometrioid tumors	-	-	-	-	-
Clear cell tumors	-	-	-	-	-
Transitional cell tumors	6	-	1	7	6.73
Mixed epithelial tumors	-	-	-	-	-
Undifferentiated tumor	-	-	3	3	2.88
Total	91	-	13	104	100

Among the 150 ovarian neoplasms studied, majority were surface epithelial tumors 104 (69.33%) Among these surface epithelial tumors majority, 64 (61.53%) were serous tumors, followed by mucinous tumors 30 (28.84%) and 7 (6.73%) of transitional cell tumors. There was only 3 (2.88%) case of undifferentiated carcinoma.

91 (87.5%) were benign surface epithelial tumors and 13 (12.5%) were malignant. No borderline surface epithelial tumors were encountered in the present study as shown in [Table 11]. The association of histological type of surface epithelial tumors and its nature is found to be statistically highly significant.

In the present study serous tumors formed the major group of surface epithelial tumors accounting for 64 (61.53%) tumors, of which 59 (92.18%) were benign and 5 (7.81%) were malignant.

Among the 59 (92.18%) benign serous tumors 42 (71.18%) were serous cystadenomas and 17 (28.81%) were serous papillary cystadenomas. Majority 59 (73.8%) of the cystadenomas were in the age group 26-35 years followed by 11 (26.19%) in the age group of 36-45 years.

Majority 26 (73.8%) cystadenomas were in the size range of 5-15 cm, followed by 11 (26.19%) in size range of 16-25 cms. The association of histological type, age, and size are found to be statistically significant.

Grossly all the cystadenomas were cystic, uniloculated with majority having smooth surface with serous fluid. The papillary cystadenomas showed tiny papillary structures within the cyst.

Microscopy revealed ciliated cuboidal cells with round uniform nucleus and abundant pale cytoplasm.

The malignant serous tumors constituted 5 (7.81%) of the serous tumors. Majority of them 4 (80%) were in the age group of 56-65 years and 1(25%) case each were in the age range 26-35yrs and 46-55yrs.

3 (50%) malignant tumors were in the size range of 5-15 cm and one case was more than 20cms size. Gross of the papillary cystadenocarcinomas revealed cyst with multiple papillary structures with areas of necrosis and haemorrhage.

Microscopy revealed pleomorphic cells arranged in papillae and sheets with vesicular nucleus and prominent nucleoli and moderate amount of pale cytoplasm. neoplastic cells were seen invading the stroma. Necrosis and haemorrhagic areas also seen. Omental deposits of the tumor were seen in one case.

#### **Mucinous tumors:**

Mucinous tumors formed the 2nd major group of surface epithelial tumors constituting 30 (28.84%) cases, of which 26(91.30%) cases were mucinous cystadenomas and 4 (8.70%) cases were mucinous cystadenocarcinomas.

Majority of the cases, 11 (44.47%) were in the age group 26-35 years followed by 7 (28.08%) were in the age range of 36-45years. These tumors were large, majority, 21 (82.17%) were 15 – 25 cm in size.

Grossly mucinous cystadenomas were multiloculated and filled with mucin. Histologically the cysts were lined by columnar cells with basally situated nucleus and abundant cytoplasm.

#### **Transitional Cell tumors:**

There were two benign and one malignant tumor. The age of the patient with benign Brenner tumor was 55 years with the size of 10x10x6 cm, it was unilateral. Consistency was solid; other case was in a 30 yr old lady with size of 18x12x4.

Histologically, it was composed of nests and islands of transitional cells separated by dense fibrocollagenous tissue with abundant clear cytoplasm and uniform bland nucleus with nuclear grooves.

The malignant transitional tumor was non Brenner type, primary transitional carcinoma in a 66 year old lady. The tumor measured 10x9 cm size grossly the tumor was solid grey white, with necrotic areas.

#### **Undifferentiated tumor**

The undifferentiated tumor was seen in a 48 years old lady with metastasis to uterus, contralateral ovary, fallopian tube and omentum. The tumor measured 11x7x6 cm, it was grey white with solid and cystic areas. Histologically, highly pleomorphic cells with vesicular nucleus and prominent nucleoli with scant cytoplasm arranged in nests, sheets and complex papillary pattern were noted, few large bizarre nuclei were seen numerous mitotic figures were noted. Large areas of Necrosis were also seen.

#### **Sex cord stromal tumors**

In the present study, sex cord stromal tumors constituted 3 (2.05%) of all ovarian neoplasms, both of these cases were granulosa cell tumors, which is a potentially malignant tumor. The two cases were of age 35yrs and 60yrs and size of the tumor in one case was 7x6x3cm and

other was 11x6x5 cms. Both the tumors were unilateral and had mixed consistency. Gross specimen showed cystic and solid areas with necrosis and haemorrhage.

Histologically, the tumor cells were uniform, small and polyhedral with granular scanty cytoplasm and central vesicular nucleus with nuclear grooves. Microfollicular and trabecular pattern were frequent, Call-Exner bodies were also seen.

Reticulin stain revealed, reticulin fibers staining black and surrounding groups of malignant cells.

In the present study, 18 (12.%) cases were diagnosed as germ cell tumors among the total of 150 ovarian neoplasms, forming the 2nd largest group of tumors.

Benign cystic teratoma was the commonest germ cell tumor with 12 (91.18%) cases, followed by dysgerminoma.

### **Teratomas**

In the present study, the youngest case of benign cystic teratoma was a 10 yearold girl.

Majority, 14 (48.23%) were in the age group of 26-35 years followed by 11 (30.01%) in the age range of 36-45 years. Majority of these tumors, 18 (62.94%) were in the size range of 5- 15 cm followed by, 12 (36.47%) in size range of <4cm.

Grossly these tumors were unilocular cysts with pultaceous material, hair, and fat. Histologically revealed mature tissue elements derived from all 3 germinal layers.

Struma ovarii, which is monophasic germ cell tumor, was seen in a 30 years old lady. It measured 8x7x6 cm and was unilateral in one case.

This tumor had solid and cystic areas filled with colloid material. Histologically, mature, colloid filled follicles lined by flattened cuboidal epithelium was seen.

### **Malignant germ cell tumor**

Dysgerminoma was seen in young women of age 24yrs and 21 yrs that measured 13x12x9cms and 25x22x18 cms respectively was unilateral in both cases.

Grossly it had solid grey white lobulated areas with areas of haemorrhage. Histologically, the cells were arranged in nests and sheets of ovoid to polyhedral cells separated by connective tissue septae, infiltrated by lymphocytes. The cells had rounded vesicular, centrally placed nuclei, also noted were large areas of haemorrhage, necrosis and plenty of syncytiotrophoblastic giant cells.

Immature teratoma was seen in 30yr female, that measured 22x11x8cm, and was unilateral, grossly it had mixed consistency with cut surface showing solid and cystic areas, and areas of haemorrhage were noted. Histologically composed of variable amounts of immature embryonal-type tissues mostly neuroectodermal rosettes and tubules admixed with mature tissue

### **Miscellaneous tumors**

One case each of haemangioma and lymphangioma were encountered in 19 years and 54 years female respectively. The size range was <4cm and 5-15 cms, both were unilateral.

Histologically both the cases revealed cavernous and capillary spaces lined by endothelial cells filled with blood in case of haemangioma and in case of lymphangioma vascular spaces were filled with pale eosinophilic fluid with few showing lymphocytes.

**Table 19: The distribution of malignant ovarian tumors in the present study**

<b>Histological type</b>	<b>Number of cases</b>	<b>Percentage</b>
Primary	36	81.25
Secondary	16	18.75
Total	16	100

In the present study, 20 (21.59%) cases of malignant ovarian tumors were encountered among the 138 ovarian neoplasms. 18 (81.25%) were primary ovarian malignancies while 2 (28.75%) were secondary malignancies.

**Table 20: The laterality of malignant ovarian tumors in the present study**

Histological type	Unilateral	Bilateral	Total
Primary	19	11	30
Secondary	9	8	20
Total (%)	28 (91.27)	19 (28.33%)	50(100)

P<0.001 (HS)

In the present study, majority, 19 (89.27%) of the malignant tumors were unilateral and 11 (28.23%) were bilateral. The association between the type of malignancy and laterality is found to be statistically highly significant.

### Secondary Tumors

The sources of metastatic tumors to the ovary were traced. The primary was detected in 2 cases and it was unknown in 1 case.

There was 1 case of Krukenberg tumour and 2 cases of, adenocarcinoma.

### Krukenberg tumors:

It was found in a 28 year old girl primary was from colon grossly, the tumor was large, bosselated with solid grey white and cystic areas. Histologically, tumors were composed of plump, rounded cells with signet ring appearance and were surrounded by dense fibrous stroma. These cells were arranged in singles and nests mucin pools were also noted.

## DISCUSSION

In the present study 150 ovarian neoplasms were evaluated and classified based on the histological classification of the ovary by WHO (2003).

### Incidence:

In the present study, the overall incidence of the ovarian neoplasms was 1.98% of the total number of histopathology specimens and 14.83% of the total hysterectomy and oophorectomy specimens submitted to our department during the study period of three years. Similar study done by Sarkar R,<sup>[11]</sup> in this area revealed almost similar data, with the ovarian neoplasms comprising of 2.17% of the total specimens and 11.43% of hysterectomy specimens.

### Clinical presentation

Most of the ovarian tumors do not give rise to any specific symptoms. They are associated with mild symptoms like abdominal distention, pain and urinary or gastrointestinal symptoms.<sup>[12]</sup>

In the present study, majority 61(40.60%) cases presented with mass per abdomen and 40 (26.60%) presented with mass per abdomen associated with pain. Similar studies by Jagadeshwari et al (1971) also encountered mass per abdomen as the common symptom with 154 (58.11%).

Similar studies by Couto F et al (1993) revealed mass per abdomen as the common symptom in 90.4% cases, while ascites was found along with mass per abdomen in 4.91% case with malignant tumors.<sup>[13]</sup>

In the present study unilateral oophorectomy was done in 49(35.51%) cases was the most common procedure opted followed by TAH with BSO in 29(21.01%) cases.

But in studies conducted by Sarkar R (1980),<sup>[14]</sup> TAH with BSO done in 67 (58.26%) cases and unilateral oophorectomy in 28 (24.35%) cases were the common procedures opted.

Histologically the malignant cells were arranged in papillae, and nests with pleomorphic nuclei and scant eosinophilic cytoplasm. Many atypical mitosis were also noted.

In the present study, 130 (86.61%) were benign followed by, 20 (13.39%) malignant cases. There were no borderline cases. This is similar to the study conducted by Lim FK et al (1991),<sup>[15]</sup> where 370 (79.7%) tumors were benign and 94 (20.3%) tumors were malignant. However the study by Battacharya M et al (1980) showed that incidence of benign tumors as 173 (64%) tumors was comparatively lower than the present study, while malignant tumors, 77 (28.5%) were higher as shown.<sup>[16]</sup>

In the present study, majority, 53 (38.40%) cases were in the age range 26-35 years, followed by 36 (26.09%) in 36-45 years of age. Similar observation was made by Saxena et al (1980) with majority 111 (31.2%) in age range of 21-30 years followed by 98 (27.4%) cases in 31-40 years of age. The study by Bhavikatti.B revealed the incidence of majority 56(31.1%) cases in the age group of 21-30, followed by 48(26.7%) in the age group of 31-40 years as shown.

Age wise distribution of benign and malignant lesions

About two thirds of ovarian tumors occur in women of reproductive age and 80-90% of them between the ages of 20-65 years; less than 5% develop in children. Nowak et al reviewed 326 patients, defining the reproductive age group as between 18-39 years. A total of 93% were benign epithelial tumors and only 4.6% were malignant in this age group.

In the present study majority, 47(38.52%) of the benign ovarian tumors occurred in the age group 21-30 years followed by 34(27.86%) cases in the age group of 31-40 years. This is similar to the studies conducted by Nadkarni NS et al (1971),<sup>[16]</sup> and Verma and Bhatia (1981) as shown.

The incidence of benign ovarian neoplasms decreased with increasing age in the present study. Rebello et al (1989)<sup>17</sup> also reported the highest (94%), benign ovarian tumors in 3rd decade which became less common with increasing age and the least benign tumors were seen in the 7<sup>th</sup> decade.

In the present study majority 6(37.50%) of the malignant ovarian tumors occurred in 21-30 years, while in the other studies by Jagadeshwari et al (1971) and Verma and Bhatia (1981), malignant tumors occurred in the age range 31-40 years with 28 (29.47%) and 36(27.07%) cases respectively.

The overall risk that an ovarian neoplasm was malignant was 13% in premenopausal women, and 45% in post menopausal women.

In the present study, 69(50%) tumors were in the size range 5-10cm, followed by 37(26.81%) in the size range of 11-19 cm. Similarly, study by Okugawa et al also showed 658 (39.93%) cases in 5-10cm range as shown in table.

In the present study majority of the benign tumors especially serous cyst adenomas were 5-10cm. Malignant tumors were > 10 cm in size.

Bhuvanesh and Logambal (1978) also showed that 57.9% of benign tumors were small while 13.2% were large.

In the present study majority, 116(84.06%) of the ovarian tumors showed cystic consistency which is higher than the studies by Madan et al(1978) and Bhuvanesh and Logambal (1978) who observed cystic consistency in 77 (64.1%) and 52 (74.3%) cases respectively. This was followed by mixed consistency in 16(11.59%) which is similar to study by Madan et al (1978) with 23 (19.2%) cases as shown.

Solid consistency was observed in 6(4.35%) ovarian tumors which was much less as compared to 20 (16.7%), 18 (25.7%) observed by Madan et al (1978), Bhuvanesh and Logambal (1978) respectively.

Ramachandran G et al,<sup>[18]</sup> observed that cystic or partly cystic consistency was more commonly seen in benign tumors in 91.4% cases, where as among malignant tumors, 52.5% were solid in a study of 190 ovarian neoplasms.

In previous studies it has been shown that completely cystic tumors were benign in 96% of instances; in contrast, solid and cystic tumors were malignant in 68%.

### **Laterality**

Most of the primary ovarian tumors are unilateral, Over 66% of metastatic tumors are bilateral.

In the present study 131(94.93%) cases were unilateral, and 7(5.07%) cases were bilateral. This was similar to the studies by Saxena et al (1980), Prabhakar and Maingi (1989) with majority 298 (83.7%), 585 (91.2%) cases of unilateral ovarian tumors respectively.

Similar study by Couto F et al showed that majority of the primary ovarian tumors 313 (91.25%) were unilateral and 30 (8.75%) were bilateral.

In the present study surface epithelial tumors were the commonest,92(66.67%)This is similar to the other studies carried out by Verma and Bhatia (1981), Sarkar R (1996) were 262 (65%), 127 (66.8%) respectively.

The second most common tumor was germ cell tumor with 39(28.26%)cases which is similar to the above studies as 85 (21.1%),and 52 (27.4%) cases respectively as shown in Table-.

Serous tumors accounting to 65(70.65%) ovarian tumors were the most frequently encountered surface epithelial tumors in the present study.Similar observation were made in the studies by Misra RK et al (1991), and Verma and Bhatia with 259 (55.81%), and 126(48.1%)cases respectively.

The second most common surface epithelial tumor observed was mucinous tumors in 23(25%)cases, which is also similar to observations by Misra RK et al (1991), and verma and Bhatia with 87 (18.74%), and 110(41.9%)respectively.

Endometrioid, clear cell tumors, mixed epithelial tumors were not encountered in the present study.

### **Serous Tumors**

In the present study, majority of the surface epithelial tumors were serous tumors comprising of 65(70.65%) cases, of which 61(93.84%)were benign and 4(6.15%)were malignant.

In the present study it was observed that the benign serous cyst adenomas occurred predominantly in age group of 21-50years with a maximum incidence in the 3rd decade. The size range was 5-10cm in 37(60.66%) tumors. Majority of the benign serous cystadenomas were unilateral 59(96.72%) and were uniloculated cysts with serous content.

Couto F et al observed, serous cyst adenomas as the commonest surface epithelial tumors, with an incidence of 30.3% of all ovarian tumors which was lower than the present study.

In the present study malignant serous cystadenocarcinomas was the most common malignancy of surface epithelial tumors in 4(4.34%) cases. This was comparable with Ramchandran et al (1972), in whose study also; serouscystadenocarcinomas were the common malignant surface epithelial tumor accounting to 7.09% cases.

### **Mucinous tumors**

In the present study this is the 2nd common surface epithelial tumor constituting 23(25%) cases. The age range was 20-60 years with majority 10(43.48%) occurring between 21-30 years.

These observations were comparable with the studies by Madan A et al (1978) and Couto F et al (1993) with 25 (30.12%) and 83 (33.8%) cases respectively.<sup>[19]</sup>

The mucinous tumors in the present study ranged from <4cms to >20cms in size and majority 12(52.17%)being in the range of 11-19cm. The mucinous tumors were larger in size than the serous tumors. 22(95.65%)tumors were unilateral and 1(4.34%)case was bilateral.

These observations were comparable with Madan A et al (1978) and Couto F et al (1993) they also observed that mucinous tumors were larger than serous. In study by Couto F et al to 82 (98.8%) were unilateral which is similar to the present study.

There were 2cases of mucinous cystadenocarcinomas encountered in the present study.

### **Transitional Cell Tumors**

In the present study, 3(3.26%) tumors were in the transitional cell tumors category. 2(2.17%) cases were benign Brenner tumor and 1(1.08%) was primary transitional cell carcinoma (non Brenner).

The incidence of benign Brenner was comparable with Verma and Bhatia (1981)10 reported 2 (0.5%) cases of benign Brenner.

Primary transitional cell carcinomas are very rare tumor which was observed in a 61 year old lady in the present study measured 10x7cm. It was unilateral and had mixed consistency with areas of necrosis.

Parihar M et al (2005),<sup>[20]</sup> studied 13 cases of primary TCC ovary. The tumor size ranged from 3-30 cm and were solid to cystic in consistency. Microscopy revealed a predominant transitional pattern similar to the present study.

### **Undifferentiated carcinomas**

1(1.09%)case of undifferentiated carcinoma was encountered in a 47 years women infiltration into the adjacent tube, uterus, contralateral ovary and omentum was noted.

The incidence of this tumor is comparable to other studies by Couto F et al (1993) and Verma and Bhatia (1981) with 4 (1.6%) and 6 (2.3%) cases respectively.

### **Sex-Cord Stromal tumors**

Sex cord stromal tumors account for 8% of ovarian tumors, they are the most common functioning ovarian tumors associated with endocrine manifestations.

In the present study, sex cord stromal tumors accounted for 2(1.45%)of all the ovarian tumors. This incidence is much lower than the studies by Verma and Bhatia (1981) with 29 (7.2%) cases, and Couto F et al (1993) with 14 (4.09%) cases.

In the present study, germ cell tumors were the second most common ovarian neoplasms accounting for 39(28.26%)of all ovarian tumors.

This incidence was comparable to the studies conducted by Verma and Bhatia (1981) and Couto F et al (1993) with 85 (21.1%) and 70 (20.39%) respectively.

Koonings et al (1989) encountered germ cell tumors as the most common group of benign ovarian neoplasms accounting for 380 (42.65%) cases in a study of 891 ovarian neoplasms.

Incidence of benign germ cell tumors in the present study was 36(26.08%)of all ovarian tumors which is similar to study by Verma and Bhatia (1981) with 70 (17.3%) cases, but was higher than study by Couto F et al (1993) with 54 (15.74%) cases. Malignant germ cell tumors were lower 3(2.17%) compared to Verma and Bhatia (1981) and Couto F et al (1993) with 15 (3.8%) and 16 (4.65%) respectively.

In the present study, mature cystic teratomas were second most commonly occurring benign cystic neoplasm; accounting to 34(24.63%)of all ovarian tumors. The age range was 10-66years. All 34 (100%) were cystic and 33(97.06%)were unilateral while 1(2.94%) was bilateral.

The incidence of teratomas were almost similar to studies by Couto F et al (1993) and Misra RK et al (1991) with 53 (15.45%) and 63 (13.57%) cases respectively.

The consistency of the teratomas varied in different studies. All 53 (100%) tumors encountered in study by Couto F et al (1993) had solid to cystic consistency while Misra RK et al (1991) encountered 56 (88.9%) tumors of cystic consistency and 6 (9.52%) tumors of solid to cystic consistency.

Laterality was similar to other studies, Misra RK encountered 59 (93.65%) unilateral and 4 (6.35%) bilateral tumors. However Couto et al encountered lower 48 (90.6%) unilateral tumors, but more 5 (9.4%) bilateral tumors, compared to the present study.

### **Miscellaneous Tumors:**

In the present study one case each of hemangioma and lymphangioma were encountered in a 19 years and 54 years lady. They ranged 5-10 cm in size.

Gehring PA et al (2000),<sup>[21]</sup> studied one case of capillary hemangioma which presented as adnexal mass and had an elevated serum CA-125 and was associated with massive ascites. The tumor measured 11.5 cm in diameter.

One of the most important morphologic features suggesting metastatic mucinous carcinoma is the presence of signet ring cells. These are considered rare in primary ovarian mucinous tumor.<sup>[22]</sup>

### **CONCLUSION**

Ovarian tumors are one of the most researched topics in gynaecological pathology.

During the present study of Histomorphological evaluation of 138 cases of ovarian neoplasm, it was found that the incidence of these neoplasms was almost the same in this region when compared with the previous data.

Surface epithelial tumors accounted for 66.67% of all ovarian tumors. Serous cystadenomas, mature cystic teratomas and mucinous cyadenomas were the common benign tumors while serous cystadenocarcinomas was the commonest primary malignant tumors.

No age was exempt from these tumors. They occurred in a wide range of 10- 70 years, with majority of the cases occurring in the 3rd decade. Benign tumors were common in 21-30 years of age accounting for 38.52% of cases and malignant tumors were also common in 21-30 years of age accounting for 37.5% cases. No borderline tumors were encountered in the present study.

Primary ovarian malignancies were common than secondary tumors certain rare tumor TCC, undifferentiated carcinoma, immature teratoma lymphangioma and haemangioma were diagnosed. Histological diagnosis of such tumors is of prime importance in view of their clinical correlations and proper management.

Thus with proper histological diagnosis and categorization of ovarian neoplasms in conjunction with recent diagnostic modalities a more accurate diagnosis can be made which helps in the proper management of the cases.

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