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RESEARCH ARTICLE
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PATTERN OF HISTOPATHOLOGICAL TYPES OF OVARIAN NEOPLASMS –A 5 YEAR STUDY IN A TERTIARY CARE HOSPITAL

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ABSTRACT

BACKGROUND: Ovarian cancer is one of the leading causes of cancer-related mortality among women and accounts for nearly 8% of all cancers in India. Accurate classification of ovarian neoplasms is essential for effective management and treatment.

AIM: To study the incidence and histopathological patterns in patients with ovarian neoplasms for a period of 5 years.

MATERIAL AND METHODS: This retrospective and prospective study was done for a period of 5 years (January 2020 to December 2024) in the Department of Pathology, SV medical college , Tirupati. . Based on the histopathological patterns, the ovarian neoplasms were classified into benign, borderline and malignant according to WHO classification of ovarian tumours 2020.

RESULTS: In this study, a total of 168 cases of ovarian neoplasms were analysed, with the highest incidence observed in 21-30 years of age in our study. Out of these 168 cases, 158 cases were benign, 06 cases were borderline and 05 cases were malignant. Among these168 cases of ovarian neoplasms, surface epithelial tumours (142) were commonest , second most common were germ cell tumours (21) followed by sex cord stromal tumours (5). Also reported a rare case of mixed tumour consisting of mature cystic teratoma with synchronous granulosa cell tumour.

CONCLUSION: The study concluded that most ovarian tumours were benign, followed by borderline and then malignant tumours. Surface epithelial tumours were the most frequently observed histopathological type.

INTRODUCTION:

Ovarian neoplasms (ONs) comprise 3% of all cancers, and among female genital tract-related malignancies, the incidence is 25%[1] . Ovarian cancer is the fifth most prevalent cancer overall and the second most common gynaecological cancer.[1,2] WHO classification of ovarian tumours is based on the tissue of origin of tumours which have been found to arise from one of the three ovarian

components : 1) The epithelium 2) The germ cells and 3) The stroma of the ovary. The most common are the epithelial carcinomas, in which the most prevalent is serous ovarian carcinoma.[2,3] Most of the ONs are benign and occur in young women between 20-45 years of age, while malignant tumours common in older women between ages of 40-70 years of age with poorer prognosis.[2,3] Ovarian tumours are an increasing cause for morbidity and mortality worldwide. This is mainly due to a fact that these ovarian neoplasias manifest at a very late stage and hence carry a poor prognosis. The histopathological type of ovarian tumour correlates with the prognosis as well. Hence the Histopathological diagnosis remains the mainstay in achieving an optimum treatment response.[3,4]
The present study is designed to determine the incidence of various histological variants of ovarian tumour and their age distribution.

AIM AND OBJECTIVES:

AIM: To study the incidence and histopathological patterns in patients with ovarian neoplasms for a period of 5 years.

OBJECTIVES:

- To describe different histopathological patterns of ovarian tumours according to the 2020 WHO classification.
- To evaluate their association with age distribution and laterality.
- To evaluate the changes in the incidence of ovarian neoplasms from January 2020 to December 2024.

MATERIAL AND METHODS:

This retrospective and prospective study was conducted in the department of pathology, SV medical college , Tirupati, for a period of 5 years from january 2020 to december 2024 in the department of pathology, SV medical college , Tirupati.

INCLUSION CRITERIA:

All Total abdominal hysterectomy, oophorectomy and cystectomy specimens with ovarian neoplasms received in 10% neutral buffered formalin to the department of Pathology and all age groups were included in the study.

EXCLUSION CRITERIA

Poorly fixed specimens and autolysed specimens.
All non neoplastic and inflammatory ovarian lesions were excluded.
All the clinical and histopathological data of patients with ovarian neoplasms were retrieved from the departmental data records and analysed.
The ovarian specimens were fixed in 10% neutral buffered formalin for proper fixation.
Gross findings like nature (solid /cystic/mixed) , it's locularity and type of cystic fluid, wall thickness, solid areas, papillary projections, haemorrhage and necrosis were recorded in the proforma. For microscopic examination, sections of the tissues were taken for routine paraffin embedding. After embedding in paraffin wax, sections of 4-5 micron thickness were cut with the microtome and stained with haematoxylin and eosin stain for histopathological examination. Based on the histopathological patterns, the ovarian neoplasms were classified into benign, borderline and malignant according to WHO classification of ovarian tumours 2020.
Immunohistochemistry (IHC) were done whereever necessary .

RESULTS:

Total number of cases of ovarian neoplasms in our study from 2020-2024: 168 cases.

TABLE1 : AGEWISE DISTRIBUTION OF OVARIAN TUMOURS

Age incidence	Number of cases	percentage
<10 years	01	0.6%
11-20 years	08	4.76%
21-30 years	48	28.6%
31-40 years	40	23.80%
41-50 years	42	25%
51-60 years	18	10.71%
61-70 years	07	4.16%
71-80 years	04	2.38%

The minimum age of ovarian tumour observed in this study is 5 years. The incidence of ovarian tumours is highest at 21-30 years of age in our study.

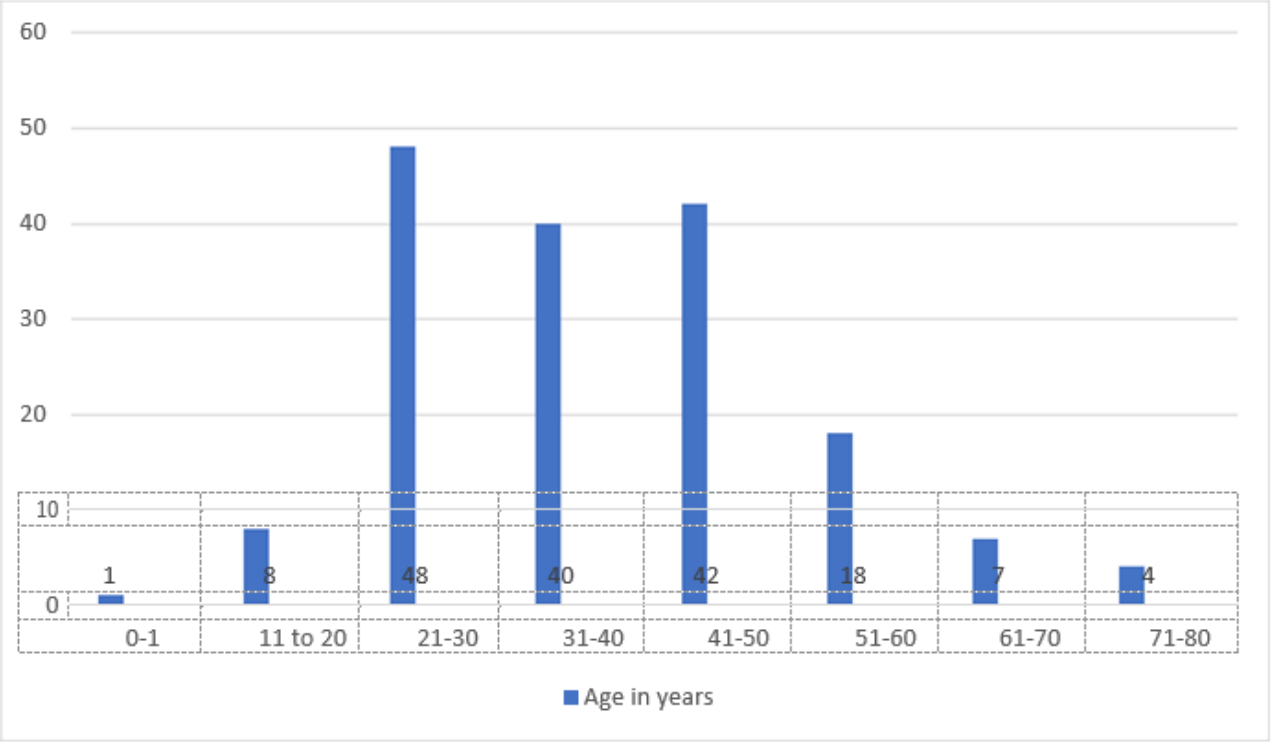

FIG 1 : Incidence of ovarian tumours

TABLE 2 : AGEWISE DISTRIBUTION OF BENIGN, BORDERLINE AND MALIGNANT OVARIAN TUMOURS:

Age incidence	Benign	Borderline	Malignant
<10 years	01	-	-
11-20 years	08	-	-
21-30 years	44	03	01
31-40 years	40	-	-
41-50 years	37	02	03
51-60 years	16	-	02
61-70 years	05	01	01
71-80 years	02	-	02

In this study, the benign and borderline tumours were common between 21 to 30 years of age group whereas malignant common in greater than 40 years of age.

TABLE 3: DISTRIBUTION OF OVARIAN TUMOURS ACCORDING TO HISTOPATHOLOGICAL TYPES:

Tumour	Benign	Borderline	Malignant	Total
Surface epithelial tumours	131	06	05	142 (84.5%)
Sex cord stromal tumours	01	-	04	05 (3%)
Germ cell tumours	21	-	-	21 (12.5%)
Total	153(91.1%)	06(3.6%)	09(5.3%)	168 (100%)

In present study, out of 168 cases of ovarian neoplasms, 158 cases were benign, 06 cases were borderline and 05 cases were malignant. Majority of cases were benign.
Out of 168 cases of ovarian neoplasms, surface epithelial tumours (142) were commonest , second most common were germ cell tumours (21) followed by sex cord stromal tumours (5).

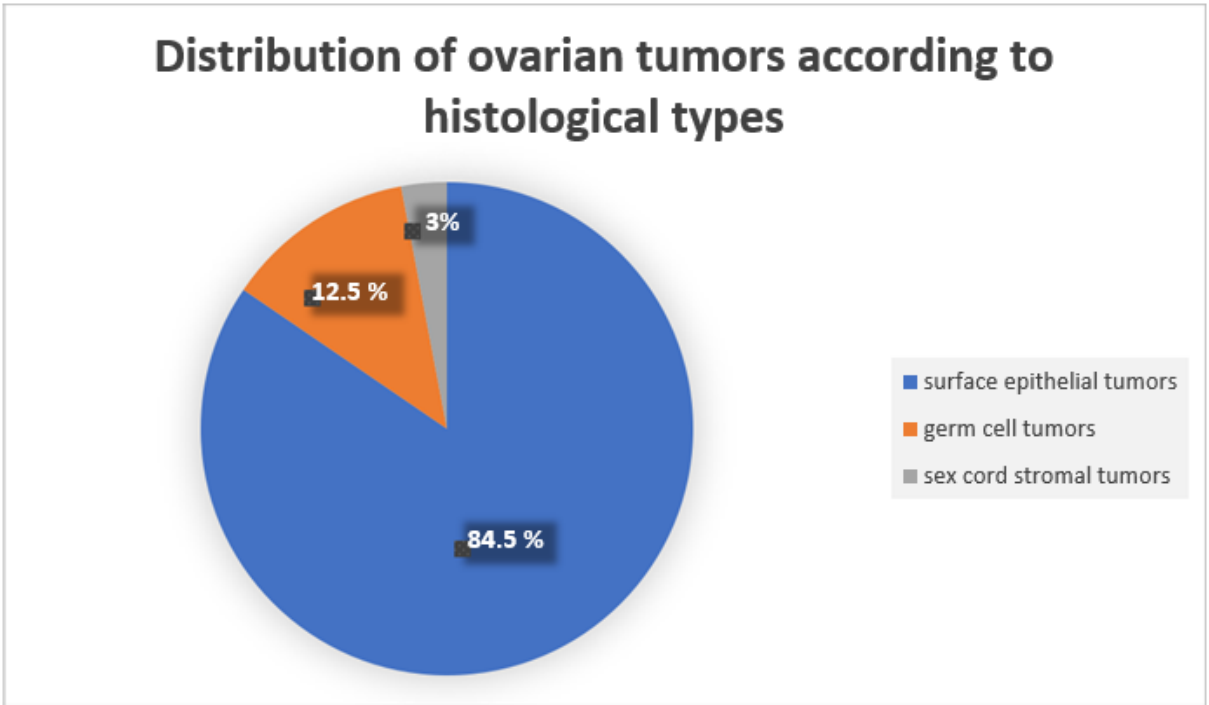

FIG 2 : Distribution of ovarian tumours

TABLE 4 : DISTRIBUTION OF SURFACE EPITHELIAL TUMOURS

Tumour	Benign	Borderline	Malignant	Total
Serous tumours	96	04	03	103 (72.5%)
Mucinous tumours	30	02	01	33 (23.2%)
Seromucinous tumours	04	00	00	04 (2.8%)
Brenner tumour	01	00	01	02 (1.4%)
Clear cell tumour	00	00	00	00
Endometrioid tumour	00	00	00	00
Others	00	00	00	00
Total	131(92.3%)	06(4.2%)	05 (3.5%)	142(100%)

Out of 142 cases of surface epithelial tumours , 92.3% of cases were benign, 4.2% of cases were borderline and 3.5% of cases were malignant. Majority of cases were benign.

On further subclassifying the surface epithelial tumours, 72.5% of cases were serous tumours, 23.2% of cases were mucinous tumours, 2.8% of cases were seromucinous tumours and 1.4% of cases were brenner tumour. The most common were serous tumours followed by mucinous tumours.

TABLE 5: DISTRIBUTION OF SEX CORD STROMAL TUMOURS:

Tumor	**Benign**	**Malignant**	**Total**
Fibroma	01	-	01 (20%)
Thecoma	-	-	-
Juvenile granulosa cell tumour	-	-	-
Adult granulosa cell tumour	-	04	04 (80%)
Sertoli-leydig cell tumour	-	-	-
Total	01(20%)	04 (80%)	05 (100%)

Out of 5 cases of sex-cord stromal tumours, 80% of the cases were granulosa cell tumour and 20% were fibroma.

TABLE 6: DISTRIBUTION OF GERM CELL TUMOURS:

Tumour	Number of cases
Mature teratoma	21
Immature teratoma	-
Dysgerminoma	-
Yolksac tumour	-
Embryonal carcinoma	-
Mixed germ cell tumour	-
Total	21 (100%)

Out of 21 cases of germ cell tumours, 100% of cases were mature cystic teratoma.

In our study, there is one rare case of mixed tumor with a combination of granulosa cell tumor and mature cystic teratoma.

TABLE 7: LATERALITY OF TUMOURS:

UNILATERAL	BILATERAL
160 (95.2%)	08 (4.8%)

Among 168 cases of ovarian tumours, 95.2% cases were unilateral and only 4.8% cases were bilateral.

TABLE 8: DISTRIBUTION OF BILATERAL TUMOURS:

RIGHT	LEFT
Serous cystadenoma	Serous cystadenoma
Serous cystadenoma	Serous cystadenoma
Mucinous cystadenoma	Mucinous cystadenoma
Mucinous cystadenoma	Mucinous cystadenoma
Seromucinous cystadenoma	Seromucinous cystadenoma
Mature cystic teratoma	Mature cystic teratoma
Mature cystic teratoma with granulosa cell tumor	Mature cystic teratoma

TABLE 9 : INCIDENCE OF OVARIAN NEOPLAMS FROM JANUARY 2020 TO DECEMBER 2024:

Year	Benign	Borderline	Malignant	Total
2020	21	00	01	22 (13.09%)
2021	24	03	01	28(16.66%)
2022	33	01	02	36 (21.4%)
2023	38	01	03	42 (25%)
2024	37	01	02	40 (23.8%)
Total	153 (91.1%)	06(3.6%)	09 (5.3%)	168 (100%)

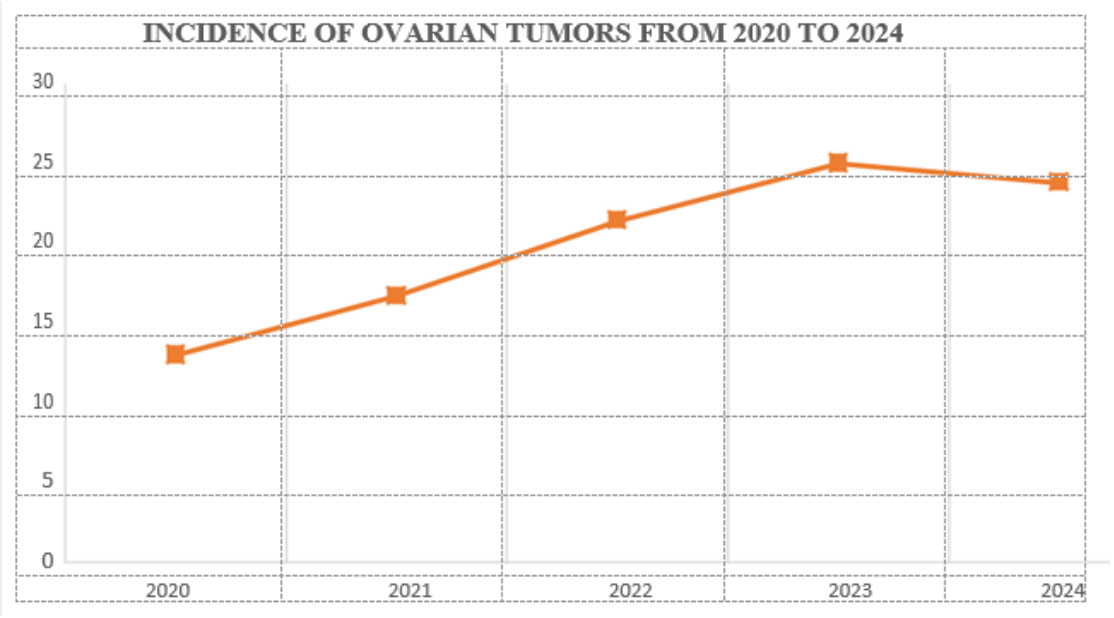

FIG 3 : Incidence of ovarian tumors.

TABLE 10: YEARWISE DISTRIBUTION OF HISTOPATHOLOGICAL TYPES OF OVARIAN NEOPLASMS:

YEAR	Surface epithelial tumors	Germ cell tumors	Sex cord stromal tumors
2020	21	00	01
2021	24	04	00
2022	30	05	01
2023	37	04	01
2024	30	08	02
Total	142 (84.5%)	21 (12.5%)	05 (3%)

The incidence of ovarian tumors were increasing from 2020 to 2024 , where the year 2023 shows higher incidence of ovarian tumors. In all the years, the incidence of benign tumors are more common than malignant tumors. Among the ovarian tumors, surface epithelial tumors are more common.

DISCUSSION:

In present study there were 168 cases. Out of 168 neoplasms, majority of the cases were observed in third decade of life which is in concordance with Batool et al[1] study but this is in discordance with Poonam et al, sampurna et al[6] and Thakkar N et al[8].

TABLE 11 : COMPARISION OF INCIDENCE OF OVARIAN TUMORS IN VARIOUS STUDIES:

Authors	Benign tumors	Borderline tumors	Malignant tumors
Batool et al[1]	80.2%	2.82%	14.61%
Mehra et al[2]	69%	5.4%	24.5%
Amita S Patel et al[5]	93.2%	0.6%	6.2%
Poonam sharma et al[7]	89.6%	3.6%	9.8%
Sampurna et al[6]	66%	3.5%	30.5%
Thakkar N et al[8]	84.5%	2.3%	13.2%
Sawant A et al[9]	75.7%	6.6%	18.2%
Singh S et al[10]	80.8%	1.6%	20%
Hathila et al[11]	62.3%	4.4%	33.3%
Maheshwari V et al[12]	71.7%	4.4%	23.7%
Gupta N et al[13]	72.9%	22.9%	4.2%
Pilli GS et al[14]	76%	2.8%	21%
Badge A et al[15]	74%	5%	21%
Present study	91.1%	3.6%	5.3%

Out of 168 cases, majority were benign tumors (91.1%) followed by borderline(3.6%) and malignant tumors(5.3%). This is in concordance with Amita S Patel et al[5] and Poonam Sharma et al[7] studies.

TABLE 12 : COMPARISION OF DIFFERENT HISTOPATHOLOGICAL TYPES OF OVARIAN TUMORS:

Authors	Surface epithelial tumors	Germ cell tumors	Sex cord stromal tumors
Batool et al[1]	63%	29%	6%
Mehra et al[2]	70%	20.9%	2.7%
Amita S Patel et al[5]	77.7%	18.5%	3.8%
Poonam sharma et al[7]	69.6%	25.8%	4.1%
Sawant A et al[9]	84.8%	9.1%	6.1%
Singh S et al[10]	69.1%	25.8%	4.1%
Hathila et al[11]	76.7%	13.03%	10%
Gupta N et al[13]	65.6%	23.9%	8.3%
Pilli GS et al[14]	71%	21%	7%
Present study	83.9%	12.5%	3%

In this study, out of 168 ovarian neoplasms, majority were surface epithelial tumours comprising 84.5% followed by germ cell tumors (12.5%) and sex cord stromal tumors (3%).

Out of 142 cases of surface epithelial tumours , 92.3% of cases were benign, 4.2% of cases were borderline and 3.5% of cases were malignant. This is in concordance with Amita S patel et al [5] and poonam sharma et al[7] studies.

Of these 142 cases, 72.5% of cases were serous tumours, 23.2% of cases were mucinous tumours, 2.8% of cases were seromucinous tumours and 1.4% of cases were brenner tumour. The most common were serous tumours followed by mucinous tumours. This is in concordance with Nandhitha navaneethakrishnan et al study.

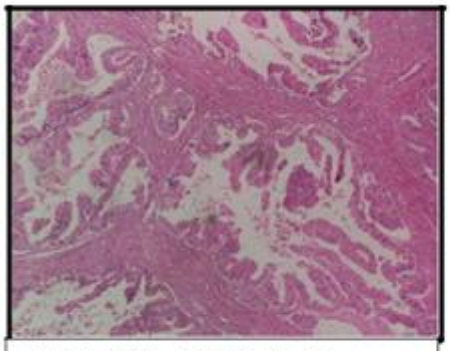

FIG 4: 100x, H&E Stain -Serous cystadenocarcinoma

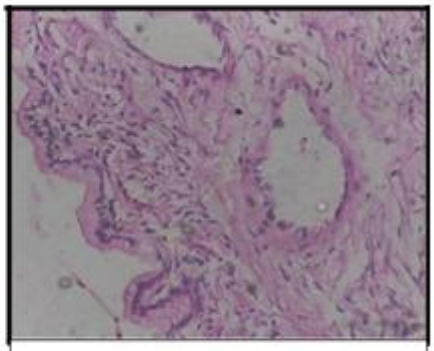

FIG 4: 100x, H&E Stain - Mucinous cystadenocarcinoma

Out of 5 cases of sex cord stromal tumors, 4 cases were granulosa cell tumor and 1 case were fibroma. This is about 3% of ovarian tumors in our study. This is closely related with mehra et al[2] and Amita S Patel et al[5] which is about 2.7% and 3.8% respectively.

Out of 21 cases (12.5%) of germ cell tumors, all were mature cystic teratoma, this is in concordance with Hathila et al[11] (13%). Among them, we received one case of Struma ovarii. Struma ovarii accounts for approximately 1% of all ovarian tumors. It occurs commonly in individuals aged 31- 50 years. The most common carcinoma arising in the background of struma ovarii is papillary thyroid carcinoma followed by follicular thyroid carcinoma.[19]

In our study we received a rare case of mixed tumor consisting of mature cystic teratoma with synchronous granulosa cell tumour in the same ovary. IHC was done for this case which showed diffuse cytoplasmic positivity for inhibin A.Granulosa cell tumor and mature cystic teratoma are independent tumor arising from sexcord stromal cells and germ cells respectively.[16]

This rare malignancy responds well to surgery and postoperative chemotherapy. Recurrences can occur many years after removal of primary tumour, therefore patients needs regular and long term follow up.[17] Ocassionally granulosa cell tumour presents as a small lesion in cystic teratoma which could easily missed through inadequate sections, so ovaries with mature cystic teratoma should be examined thoroughly for small foci of granulosa cell tumour.

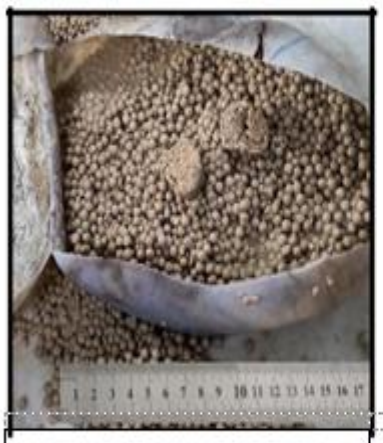

FIG 6 : Mature cystic teratoma – Sac of marbles appearance

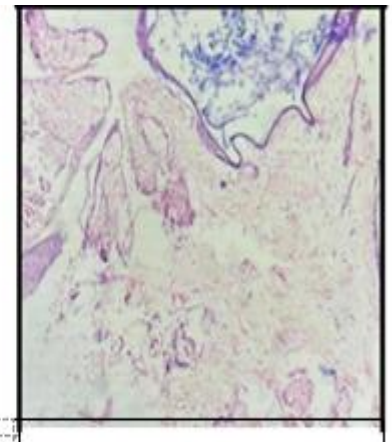

FIG 7 : 100x, H&E Stain – Mature cystic teratoma

FIG 8 : Gross picture of mature cystic teratoma with adult granulosa cell tumour showing mucin, hair and grey white areas.

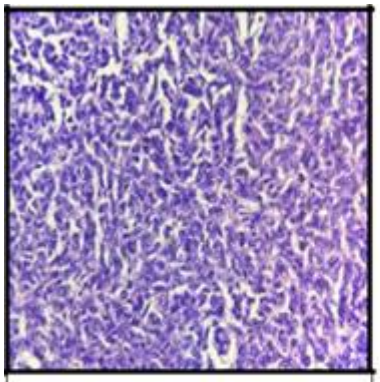

FIG 11 : 100x, H&E Stain – Diffuse pattern in Granulosa cell tumor

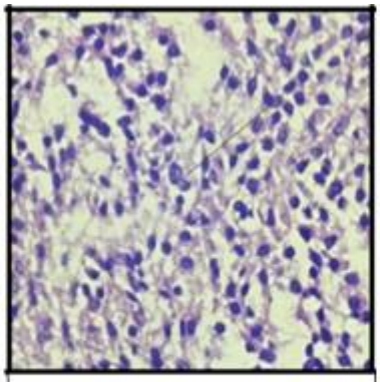

FIG 10: 400x,H&E Stain- Nuclear grooves in GCT

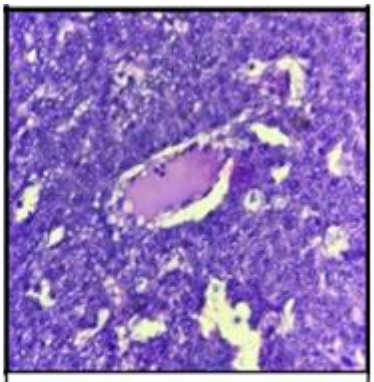

FIG 9 : 100x, H&E Stain – Call Exner bodies in GCT

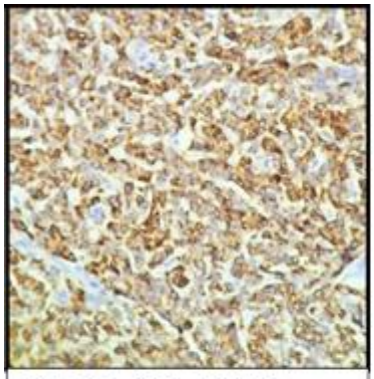

FIG 12 : 400x, IHC shows diffuse cytoplasmic positivity for Inhibin A

FIG 13 : Gross picture of struma ovarii

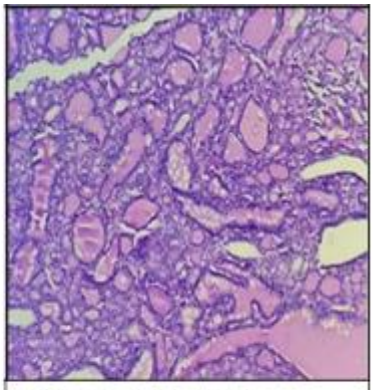

FIG 14: 100x, H&E – struma ovarii

In our study, other case of an adult granulosa cell tumour presented in younger age women (25 years) which is rare in this age. This may be due to mutation in FOXL2 gene (regardless of patient age) and hyperestrogenic states like early menarche, obesity , exogenous hormonal therapy, infertility etc.,[18]

CONCLUSION:

To conclude most of the ovarian tumours are benign than malignant ones in all the age groups. Surface epithelial tumors were the commonest histopathological type among ovarian tumors, followed by

germ cell tumors. Among the surface epithelial tumors, serous cystadenoma were the most common subtype followed by mucinous cystadenoma. Mature cystic teratoma is the most common tumor among germ cell tumors.

The incidence of ovarian neoplasms were increasing from the year 2020 to year 2024 in our population, the highest number of cases were seen in the year 2023.

Thus the present study helps to determine the prevalence of various histopathological patterns of ovarian tumours in our population.

Ovarian cancer rates tend to increase with age, with the median age at diagnosis being around 63 years and the median age at death approximately 70 years.

Thus early screening plays a crucial role in detecting the disease at an earlier stage, allowing for timely intervention and improved treatment outcomes.

LIMITATION:

The limitation of the study was the smaller sample size and it was a record based retrospective study confined to a single tertiary care centre. Therefore, the data may not be generalisable to a community setting.

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