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Histopathological study of ovarian lesions at a tertiary care hospital

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Abstract
Background: Ovary is the commonest site of neoplastic and non-neoplastic lesion, can present in childhood to postmenopausal age group and accounts for the most prevalent cause of hospital admissions.
Aims & Objectives: (1) To know about various histopathological types of ovarian lesions presented and diagnosed. (2) To study the incidence of ovarian lesions with respect to patient's age. (3) To study the frequency of ovarian lesions in terms of non-neoplastic or neoplastic, benign or malignant, unilateral or bilateral, etc.
Materials and Method: This is a descriptive study which was carried out at B.J. Medical College, Ahmedabad for a period of three years from 1st January 2018 to 31st December 2020. A Total of 225 cases of ovarian lesions were received and processed in the Pathology Department. Hematoxylin and Eosin stained slides were examined. We have included parameters like Age wise incidence, Nature of Lesion, Frequency & Laterality in this study.
Results: Out of 225 cases, 197 cases (87.56%) were unilateral and 28cases (12.44%) were bilateral, 98 cases (43.56%) were non neoplastic & 127 cases (56.44%) were neoplastic. Majority of cases 112(49.78%) belong to age group of 20-39 years. The most common non-neoplastic lesion seen was Follicular Cyst followed by simple and corpus luteal cyst. Among neoplastic lesions, 120 cases (94.49%) were benign & 1 case (0.78%) was borderline & 6 cases (4.73%) were malignant. In benign ovarian neoplasm, most commonly seen lesion were serous cyst adenoma followed by benign cystic teratoma and mucinous cyst adenoma. In malignant cases, maximum were of serous cyst adenocarcinoma and endometrioid carcinoma.
Conclusion: Ovarian Lesions both non-neoplastic and neoplastic include a variety of morphological features and show a particular age wise incidence. Role of histopathological evaluation remains always important in both diagnosis & management of such cases, particularly in cases of Malignant Lesions in order to save the patient's life.

Keywords: Non-neoplastic, benign, borderline, malignant, follicular cyst, serous cystadenoma

Introduction
Ovary is an important organ and is concerned with progeny production. The ovary consists of totipotent sex cells and multipotent mesenchymal cells [1]. Ovarian enlargements (lesions), cystic or solid, may occur at any age [2]. These enlargements may be Non-neoplastic or Neoplastic in nature.
Non-Neoplastic Enlargements include Simple Follicular Cysts, Corpus Luteal Cysts, Chocolate Cysts due to Endometriosis, Twisted Haemorrhagic Cysts, Polycystic Ovarian Disease (PCOD), Various Inflammatory Lesions, etc. To define a functional non-neoplastic cyst, its size or diameter must be at least 3 cm, but not more than 7 cm [2]. Non-Neoplastic Enlargements develop almost exclusively during the childbearing years. They may be asymptomatic or produce local discomfort, menstrual disturbances, infertility, or in rare cases cause acute symptoms due to complications like haemorrhage, rupture or torsion [2].
Neoplastic disorders or lesions of Ovary can arise from (1) Mullerian epithelium, (2) Germ cells or (3) Sex cord Stromal cells [3]. Classification of Ovarian Neoplasms given by WHO is completely based upon the tissue of origin. It includes a variety of entities like Surface Epithelial Tumors, Sex cord Stromal Tumors, Pure or Mixed Germ Cell Tumors, Gonadoblastoma, Soft Tissue Tumors, Metastatic Tumors, Unclassified Tumors, etc. Surface Epithelial Tumors are further categorized into benign, borderline and malignant [2, 4].

Ovarian neoplasms behave in diverse way and generally escape the detection until they attain a larger size. This is primarily due to the reason that either the symptoms are vague or most of these are asymptomatic therefore they manifest over a time period due to no definite screening program. Therefore, diagnosis of various histological patterns of ovarian tumors is very important in the treatment and prognosis [4].

Aims & Objectives

1. To know about various histopathological types of ovarian lesions presented and diagnosed.
2. To study the incidence of ovarian lesions with respect to patient's age.
3. To study the frequency of ovarian lesions in terms of non-neoplastic or neoplastic, benign or malignant, unilateral or bilateral, etc.

Materials and Method

This descriptive study was done in the Department of Pathology, B.J.M.C, and Ahmedabad over a period of three years from 1st January 2018 to 31st December 2020. Cases of ovarian lesions which underwent oophorectomy or hysterectomy with bilateral/ unilateral salpingectomy were included in the study.

Information regarding the age, clinical history, digital rectal examination, and clinical diagnosis was obtained. All specimens sent for histology were fixed in 10% formalin solution, processed with automated tissue processor, paraffin embedded, and sectioned at 3-5 microns using the microtome machine before staining with Hematoxylin and Eosin. The results obtained were analysed Special stains Reticulin and Periodic acid-Schiff stains were used where necessary.

Results

A total of 225 specimens of ovarian lesions have been received for histopathological evaluation at our department & out of them, 197 cases (87.56%) were unilateral and 28cases (12.44%) were bilateral, 98 cases (43.56%) were non neoplastic & 127 cases (56.44%) were neoplastic.

Among neoplastic lesions 120 cases (94.49%) were benign & 1 case (0.78%) was borderline & 6 cases (4.73%) were malignant.

Patients in the age group of 20-39 years constituted the majority of patients (112 out of 225; 49.78%) followed by age group of 40-59 years (82 out of 225, 36.44%).

The youngest age of presentation was 3 month and oldest was 85 years.

On gross examination, majority of cases, 118(52.44%) were of mixed consistency showing both solid and cystic areas. Among the rest case 97 (43.11%) were cystic and 10 (4.45%) were solid.

Histopathological Categorization of Various Ovarian Lesions were given below in Table no.1 and their Age-wise incidence was given below in Table no.2.

Simple Follicular Cyst was the commonest among all Non-neoplastic Cystic Lesions and often bilateral. Next common non neoplastic cystic lesion was simple cyst followed by corpus luteal cyst. Non-neoplastic Cysts were seen in comparatively younger females belonging to age group of 20-39 years and quite rare after menopause because of complete cessation of normal & regular menstrual cycles.

Among various benign neoplasms, Serous Cyst adenoma was the commonest & often bilateral. Next common benign neoplasm was Mature Cystic Teratoma or Dermoid Cyst of Ovary that was often unilateral. Both of these benign tumors can occur at any age but commonly seen before 40 years of age during reproductive period of life.

Other benign neoplasms like Mucinous Cyst adenoma, Benign Endometrioid tumor and Serous Cystadenofibroma were also seen in younger females. Brenner's Tumor was an uncommon subtype of the surface epithelial tumors of ovary and Majority of the cases were benign in nature. This tumor was particularly seen between 40-60 years of age.

Our present study includes total 1 cases of Borderline & 6 cases of Malignant Neoplasms.

Borderline neoplasm include

- 1 case of Borderline Mucinous Tumor (48 years old).

Malignant neoplasm includes

- 2 cases of Serous Cyst adenocarcinoma (58 year old &65 years old),
- 2 cases of Endometrioid carcinoma (38 year old &56 years old),
- 1 case of Granulosa Cell Tumor of Adult Type (45years old) &
- 1 case of metastatic adenocarcinoma (85 year old).

Based on Histomorphological features Surface Epithelial Tumors (97 cases out of 127, 76.37%) were most common followed by germ cell tumors (25 cases out 127, 19.68%) and sex cord stromal tumors (4 cases out of 127, 3.15%).

Table 1: Histopathological Categorization of various Ovarian Lesions

S. No		Histopathological Diagnosis or Category	Unilateral Cases	Bilateral Cases	Total
Non – Neoplastic Lesion					
1		Follicular Cyst	32	05	38(16.88%)
2		Simple Cyst	30	02	32(14.22%)
3		Corpus Luteal Cysts	15	-	15(6.67%)
4		Hemorrhagic cyst	07	02	09(4%)
5		Infected Ovary	02	02	04(1.78%)
Total					
Benign Neoplastic Lesion					
1		Serous Cyst Adenoma	40	08	48(21.33%)
2		Mucinous Cyst Adenoma	17	04	21(9.32%)
3		Serous Cyst Adenofibroma	07	-	07(3.11%)
4	Surface Epithelial Tumor	Seromucinous Cystadenoma	02	-	02(0.89%)
5		Benign Endometrioid tumor	12	-	12(5.32%)
6		Benign Brenner Tumor	02	-	02(0.89%)
7	Germ Cell tumor	Mature Teratoma	21	04	25(11.12%)

8	Sex Cord Stromal Tumor	Fibroma	02	-	02(0.89%)
9		Well differentiated sertoli-leydig cell tumor	01	-	01(0.45%)
	Total				
Borderline Neoplastic Lesion					
1	Surface Epithelial Tumor	Borderline Mucinous Tumor	01	-	01(0.45%)
	Total				
Malignant Neoplastic Lesion					
1	Surface Epithelial Tumor	Serous cyst adenocarcinoma	02	-	02(0.89%)
2		Endometrioid Carcinoma	02	-	02(0.89%)
3	Sex Cord Stromal Tumor	Adult Granulosa cell Tumor	01	-	01(0.45%)
4		Metastatic Adenocarcinoma	01		01(0.45%)
	Total		197 (87.56%)	28 (12.44%)	225 (100%)

Table 2: Age-wise Incidence of various Ovarian Lesions

S. No		Histopathological Diagnosis or Category	≤19 Years	20-39 Years	40-59 Years	≥60 Years	Total
Non – Neoplastic Lesion							
1		Follicular Cyst	01	21	16	-	38
2		Simple Cyst	04	16	12	-	32
3		Corpus Luteal Cysts	-	03	12	-	15
4		Hemorrhagic cyst	02	07	-	-	09
5		Infected Ovary	01	03	-	-	04
Total							
Benign Neoplastic Lesion							
1	Surface Epithelial Tumor	Serous Cyst Adenoma	04	24	13	07	48
2		Mucinous Cyst Adenoma	-	13	05	03	21
3		Serous Cyst Adenofibroma	02	04	01	-	07
4		Seromucinous Cystadenoma	-	-	02	-	02
5		Benign Endometrioid tumor	-	07	05	-	12
6		Benign Brenner Tumor	-	-	02	-	02
7	Germ Cell tumor	Mature Teratoma	04	12	09	-	25
8	Sex Cord Stromal Tumor	Fibroma	-	01	01	-	02
9		Well differentiated sertoli-leydig cell tumor	01	-	-	-	01
	Total						
Borderline Neoplastic Lesion							
1	Surface Epithelial Tumor	Borderline Mucinous Tumor	-	-	01	-	01
	Total						
Malignant Neoplastic Lesion							
1	Surface Epithelial Tumor	Serous cyst adenocarcinoma	-	-	01	01	02
2		Endometrioid Carcinoma	-	01	01	-	02
3	Sex Cord Stromal Tumor	Adult Granulosa cell Tumor	-	-	01	-	01
4		Metastatic Adenocarcinoma	-	-	-	01	01
	Total		19 (8.45%)	112 (49.78%)	82 (36.44%)	12 (5.33%)	225 (100%)

Discussion

Ovarian cancer is the second leading cause of mortality among all gynecological cancers [5]. Due to similar clinical presentations there is confusion in the diagnosis of non-neoplastic and neoplastic lesions of ovary although it is diagnosed as a mass or cystic lesion on ultrasonography and hence removed prophylactically in routine oophorectomies and hysterectomies [6].

Our present study includes total 225 cases of Ovarian Lesions diagnosed finally on histopathological basis. Out of them, 197 cases (87.6%) show unilateral lesion and 28 cases (12.44%) show bilateral lesions. Maru A *et al.* found similar observation in his study with 89% unilateral % 11 % bilateral lesions [7]. Prakash *et al.* with 90.9% unilateral & 9.2% bilateral lesions [8], Thakkar and shah *et al.* 88.4 % unilateral & 11.6 % bilateral lesions [9], Gurung P *et al.* with 88.15% unilateral & 11.85% bilateral lesions [10], Couto F *et al.* with 91.2% unilateral & 8.7% bilateral lesions [11], Misra *et al.* with 95.5% unilateral & 4.5% bilateral lesions [12] and by Prabhakar BR& Kalyani M [13] having 90.9% unilateral & 9.1% bilateral ovarian lesions.So we can say that unilateral lesions are more frequent than bilateral ones and all the studies show comparable outcomes [7-13].

Laterality of ovarian neoplastic lesions in various studies in comparison with present study is illustrated in Table 3.

Table 3: Laterality of ovarian neoplastic lesions in various studies in comparison with present study.

Authors	Laterality	
	Unilateral	Bi lateral
Maru A *et al.* (2019) [7]	89%	11%
Prakash *et al.* (2017) [8]	90.8%	9.2%
Thakkar and shah *et al.* (2015) [9]	88.4%	11.6%
Gurung P *et al.* (2013) [10]	88.15%	11.85%
Couto F *et al.* (1993) [11]	91.2%	8.7%
Misra *et al.* (1990) [12]	95.5%	4.5%
Prabhakar BR& Kalyani M (1989) [13]	90.9%	9.1%
Present study	87.56%	12.44%

The percentage distribution of patients in various age groups in comparison with other studies is illustrated in Table 4. The majority of our patients were in the age group 20-39 years (112 patients, 49.78% of patients) while those in the age group 40-59 years were the second largest group of patients (82 patients, 36.44% of patients). This is in concordance with the studies of Maru A. *et al.* [7] (20-39

years – 58%; 40-59 years – 32%), Prakash *et al.* [8] (20-39 years – 53.4%; 40-59 years – 36.6%), Pilli *et al.* [14] (20-39 years -58.0%; 40-59 years-30%) and Ramachandran *et al.* (20-39 years -53.0%; 40-59 years -30% of patients) [15]. However, Thakkar and Shah [9] found only 25.6% of their patients in the age group 20-39 years and 53.5% in the age group 40 - 59 years. Kar *et al.* [16] reported 46.25% of patients in the age group 40-59 years.

Table 4: Percentage distribution of cases in various age groups in comparison with present study

Authors	0-19 age group	20-39 age group	40-59 age group	≥60 age group
Maru A *et al.* (2019) [7]	-	58%	32%	10%
Prakash *et al.* (2017) [8]	5.7%	53.4%	36.6%	4.3%
Kar *et al.* (2005) [16]	7.4%	41.7%	46.2%	4.4%
Pilli *et al.* (2002) [14]	7%	58%	30%	5%
Ramchandra *et al.* (1972) [15]	7.9%	53%	30%	9.1%
Present study	8.45%	49.78%	36.44%	5.33%

Broad categorization of these lesions includes non-neoplastic cysts, Benign Neoplasms and Borderline-Malignant Neoplasms. Our present study shows 98 cases (43.55%) of Non-neoplastic Cysts, 120 cases (53.34%) of benign neoplastic lesions, 1 case (0.45%) of Borderline neoplastic lesions and 6 cases (2.66%) of malignant neoplastic lesions of ovary. This is in concordance with the studies of Maru A. *et al.* [7] and Prakash *et al.* [8] while Amod *et al.* [17] show 76.92% non-neoplastic lesions, 17.48 % Benign neoplastic, 1.39% borderline neoplastic and 4.19% malignant neoplastic lesion of ovary which was not comparable with that of our present study. Comparative incidence of non-neoplastic and neoplastic lesions of ovary illustrated in Table 5.

Among all non-neoplastic cystic enlargements, Simple Follicular Cyst, unilateral or bilateral is the commonest one followed by simple and Corpus Luteal Cyst. All of them are frequently seen among women of reproductive age and perimenopausal age.

Our present study shows 16.88% of Follicular Cysts, 14.22% simple cyst & 8.44 % of Corpus Luteal Cysts respectively. Study done by Maru *et al.* [7] shows 20% of Follicular Cysts & 14% of Corpus Luteal Cysts, Prakash A *et al.* [8] shows 20.1% of Follicular Cysts & 10.9% of Corpus Luteal Cysts which is comparable with our study. Gurung P *et al.* [5] reported 10.4% of Simple Follicular Cyst and 9.6% of Corpus Luteal Cyst and this result or outcome was not comparable with that of our present study. Comparative incidence of most common non – neoplastic lesions of ovary were illustrated in table no. -6.

Table 5: Comparative incidence of non-neoplastic and neoplastic lesions of ovary

Author	Non–neoplastic lesions	Neoplastic lesions		
		Benign	Borderline	Malignant
Maru A *et al.* (2019) [7]	44%	52%	1%	3%
Prakash *et al.* (2017) [8]	44.10%	54.14%	-	1.78%
Amod *et al.* (2017) [17]	76.92%	17.48%	1.39%	4.19%
Present study	43.55%	53.34%	0.45%	2.66%

Table 6: Comparative incidence of most common non-neoplastic lesions of ovary

Author	Follicular cyst	Simple cyst	Corpus luteal cyst
Maru A *et al.* (2019) [7]	20%	-	14%
Prakash *et al.* (2017) [8]	20.1%	-	10.9%
Gurung P *et al.* (2013) [5]	10.4%	-	9.62%
Present study	16.88%	14.22%	6.68%

Among benign neoplasms, Serous Cyst adenoma was the commonest one followed by Mature Cystic Teratoma (Dermoid Cyst) and Mucinous Cyst adenoma.

Our present study shows 21.33% cases of Serous Cyst adenoma, 11.12% cases of Mature Cystic Teratoma and 9.32% cases of Mucinous Cyst adenoma respectively. Maru A *et al.* [7] shows 28% cases of Serous Cyst adenoma, 13% cases of Mature Cystic Teratoma and 6% cases of Mucinous Cyst adenoma. Amod *et al.* [17] shows 12.58% cases of Serous Cyst adenoma, 2.09 % cases of Mature Cystic Teratoma and 1.39 % cases of Mucinous Cyst adenoma, Yogambal M *et al.* [19] has reported 21.4% cases of Serous Cystadenoma and 19.9% cases of Mature Cystic Teratoma. Mondal *et al.* [18] has reported 29.9% cases of Serous Cyst adenoma, 15.9% cases of Mature Cystic Teratoma and 11.1% cases of mucinous cyst adenoma, Yasmin *et al.* [20] has reported 24% cases of Serous Cyst adenoma followed by 18% cases of Mature Cystic Teratoma. Sowe can say that outcome of all these similar studies are comparable with that of our present study. Comparative incidence of most common benign neoplastic lesions of ovary were illustrated in table no. -7.

Table 7: Comparative incidence of most common benign neoplastic lesions of ovary

Author	Serous cyst adenoma	Mature teratoma	Mucinous cyst adenoma
Maru A *et al.* (2019) [7]	28%	13%	6%
Amod *et al.* (2017) [17]	12.58%	2.09%	1.39%
Yogambal M *et al.* (2014) [19]	21.4%	19.9%	-
Mondal *et al.* (2011) [18]	29.9%	15.9%	11.1%
Yasmin *et al.* (2008) [20]	24%	18%	-
Present study	21.33%	11.12%	9.32%

Our present study includes total 1 cases of Borderline & 6 cases of Malignant Neoplasms. All of them are Unilateral and show different age wise incidences. Borderline Mucinous Tumor was seen at the age of 48 years, Maru A *et al.* [7] reported one case of Borderline Mucinous Tumor with age of 48 years and Prakash A *et al.* [8] has also reported one case of Borderline Mucinous Tumor with age of 35 years. We have reported two case of Serous Cyst adenocarcinoma in 58 & 65 years old female patient. Maru A *et al.* [7] has also reported one similar case with age of 65, Prakash A *et al*[8] has also reported one similar case with age of 56 years. Gurung P *et al.* [5] has reported five such cases with age range of 38 to 66 years. Our present study also includes two case of endometrioid carcinoma in 38 % 56 years old females. Amod *et al.* [17] reported two similar cases.

Our present study also includes one case of Adult type Granulosa Cell Tumor who is 45 years old. Modi D *et al.* [21] has reported three such cases out of which, two belongs to age group of 31-40 years and one belongs to age group of 41-50 years. Maru A *et al.* [7] and Hatwal D *et al.* [22] has reported one case of Granulosa Cell Tumor of Adult type who was 45 years old. So we can say that age wise incidence of Borderline & Malignant Neoplasms of our present study also correlate with that of other similar studies. Borderline tumors and Granulosa cell tumor of Adult type are commonly seen during middle age or perimenopausal age. Serous Cyst adenocarcinoma occurs at comparatively older age, usually beyond 60 years.

Based on Histomorphological features Surface Epithelial Tumors (97 cases out of 127, 76.37%) were most common followed by germ cell tumors (25 cases out 127, 19.68%) and sex cord stromal tumors (4 cases out of 127, 3.15%). Similar observations were seen in other studies like Amod A *et al* [17], Maru A *et al* [7], pilli *et al.* [14], Gupta *et al* [23] Comparative incidence of overall (benign and malignant) ovarian tumours were illustrated in table no.-8.

Table 8: Comparative incidence of overall (benign and malignant) ovarian tumours

Author	Surface epithelial tumor	Germ cell tumor	Sex cord stromal tumors
Maru A *et al* (2019)[7]	73.33%	23.3%	3.33%
Amod *et al* (2017)[17]	84.8%	9.1%	6.1%
Pilli *et al*(2002)[14]	70.9%	21.2%	6.7%
Gupta *et al* (2007)[23]	65.6%	23.9%	8.3%
Present study	76.37%	19.68%	3.15%

Our study reveals that the presentation of ovarian tumours was variable. Some of the ovarian tumours were incidentally diagnosed on ultrasound whereas others may be symptomatic like lump/pain in abdomen.

In Benign and malignant ovarian neoplasm, lump in abdomen was the most common complaint, followed pain in abdomen. These findings were in accordance with other studies [14].

Ovarian cancers are called as “silent killer” as in most of the primary ovarian tumour they remain asymptomatic until the advanced stage. However, histomorphological study of tumour is still today a gold standard method, these observations and results proved to be valuable base line information regarding frequency and pattern of ovarian tumours.

Conclusion

Ovarian Lesions or Enlargements, both non-neoplastic and neoplastic include a variety of morphological features and show a particular age wise incidence. Among non-neoplastic lesions, simple follicular cyst was common while among benign tumors, serous cystadenoma was common. Both are frequently bilateral. Malignant Neoplasms of Ovary are rare as compared to Benign Neoplasms and Non-neoplastic Lesions, but require a specific attention during diagnosis on both clinical and pathological basis in order to save the patient’s life.

Role of histopathological evaluation: remains always important in diagnosis and management of such cases along with clinical and radiological evaluations. Histopathological study is useful to predict nature and course of ovarian lesions so that future worse outcome can be prevented with early intervention and marker study.

Ethical Clearance: All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standard

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Declaration of Conflicts of Interest: The authors declare that they have no conflicts of interest.

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