

**A study of ovarian Tumors in patients presenting at RMC, Ajmer**

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**Abstract**

**Introduction:** Ovarian cancer is the second most common cancer of female reproductive system and is the fourth leading cause of death among cancer deaths in females and more predominantly after 3rd decade<sup>2</sup>. The current study was done to assess clinical profile of ovarian neoplasms, risks of malignancy, and the efficacy of various imaging modalities like USG, CT scan and MRI in the diagnosis.

**Methodology:** The present study is a prospective observational study conducted on 105 patients with an ovarian tumor, admitted in the Department of Obstetrics and Gynaecology, JLN Medical College, Ajmer from March 2020 to June 2021. All patients included in the study underwent CA-125 estimation, USG, CT scan/MRI followed by surgery and histopathological examination of the specimen. Risk of Malignancy Index was calculated in all cases. All the details were studied and compared with the final histopathological diagnosis.

**Results:** Out of the 105 patients included in the study, most of the patients (33.3%) were in the age group of 20-30 years. Benign tumors were more common (62.85%),

followed by malignant tumors (30.47%) and borderline tumors (6.67%). Most of the patients presented with the complaint of abdominal pain (82.85%); followed by abdominal lump in 40.95% patients. Epithelial tumors were most common (66.7%) followed by germ cell tumors (30.5%). Serous cystadenomas and mature cystic teratomas were most common tumors, and serous cystadenocarcinoma was the most common malignant tumor. The risk of malignancy increased with: Age>50 years, multiparity, earlier age at menarche, postmenopausal status, bilaterality of the tumors, and solid consistency of tumors. The diagnostic accuracy of MRI was the highest (96.7%) as compared to USG and CT scan. MRI also had the highest sensitivity and specificity.

**Conclusion:** Benign tumors were more common as compared to malignant tumors. USG is the initial imaging modality of choice but MRI is highly diagnostic for ovarian tumors. Age>50 years, postmenopausal age group, solid tumor morphology, presence of ascites, bilaterality of tumors significantly increased the risk of

malignancy. Thus, these parameters can be used to predict the risk of malignancy.

**Keywords:** Ovarian neoplasms, benign tumors, epithelial tumors, malignant tumors, abdominal mass.

### Introduction

Ovaries are paired intrapelvic organs of female reproductive system. Ovarian neoplasm is most fascinating tumor in terms of histogenesis and malignant potential and has extensive heterogeneity within and between histologic subtypes<sup>1</sup>. It is the second most common cancer of female reproductive system and is the fourth leading cause of death among cancer deaths in females and more predominantly after 3rd decade<sup>2</sup>. Ten year survival for all ovarian cancers is approximately 30%–40%<sup>3,4</sup>.

In 2020, 2,07,252 deaths occurred due to ovarian cancer, accounting for 4.6% of the entire cancer related mortality among women<sup>5</sup>. The highest mortality rate in Asia is seen in India<sup>6</sup>. Two-thirds of ovarian cancer mortality is attributable to high-grade serous carcinoma<sup>7</sup>. It is predicted that, by the year 2040, the mortality rate of this cancer will rise significantly<sup>8</sup>. Age-adjusted rates of new ovarian cancer cases are on a reducing trend based on statistical models of analysis<sup>9</sup>.

Ninety percent of ovarian cancers are epithelial, with the serous subtype being the most common. Increased incidence of this cancer is more pronounced in women over 65 years of age<sup>10</sup>. According to previous studies, median age at diagnosis is 50–79 years<sup>11,12,13</sup>. Ovarian cancer easily undergoes necrosis, hemorrhage and other severe complications, endangering the lives of patients<sup>[14,15]</sup>. Around 70% of patients with ovarian tumors are diagnosed only at advanced stages due to unavailability of effective screening method and lack of specific clinical presentations at early stage of the disease. Studies

indicate that some women experience persistent, nonspecific symptoms in the months before diagnosis, including back pain, abdominal distension, pelvic or abdominal pain, difficulty eating or feeling full quickly, vomiting, indigestion, altered bowel habits, or urinary urgency or frequency, which is easily overlooked on clinical examinations. Therefore, most diagnosed patients with ovarian cancer are in an advanced disease stage, and the prognosis and life quality of patients are seriously affected<sup>[16]</sup>.

Introduction of high frequency transvaginal probe (more than 5 MHz) has greatly improved the ultrasound capability in characterization of adnexal masses. Though ultrasound is an important tool in evaluating nature of the tumor, it cannot assess tumor spread. CT and MRI imaging modalities score over ultrasound in this aspect. Also, lymph node metastasis (smaller than 1 cm) are easily picked by CT and even better by MRI.

### Objective

To study the distribution of ovarian tumors, to evaluate the association between various parameters of ovarian tumors and risk of malignancy and the efficacy of various imaging modalities in the diagnosis.

### Methodology

The present study is a prospective observational study conducted on 105 patients with ovarian tumors, admitted in the Department of Obstetrics and Gynaecology, JLN Medical College, Ajmer from March 2020 to June 2021.

### Inclusion Criteria

- Patients with an ovarian tumor confirmed by transabdominal ultrasound examination.
- Patients who gave consent.

### Exclusion Criteria

- Non-neoplastic ovarian lesions like simple ovarian cyst, tubo-ovarian mass and polycystic ovaries were

excluded. Demographic profile including age, parity and socioeconomic status were noted. A detail of symptoms was asked from the patients. Routine investigations like complete blood count, biochemical (renal function tests and liver function tests) and common tumor marker like CA -125 was done for all patients. Further investigations like USG (Alok propound i4machine), CT scan (16 slice MDCT scanner - Philips MX-16 Medical system) / MRI (Philips Intera Acheiva 1.5 Tesla - Medical system) were done for all patients and Risk of Malignancy Index (RMI) was calculated as:

$$RMI = U \times M \times CA-125$$

Where; a total ultrasound score of 0 or 1 made U=1, and a score of  $\geq 2$  made U=3; premenopausal status made M=1 and postmenopausal M=3. The score for CA 125 remains unchanged (corresponds to actual level of serum concentration in units/mL). Ultrasound features (one point for each finding) suggesting malignancy were multilocular cyst, solid areas, bilateral lesions, ascites, intra-abdominal metastases. RMI score of more than 200 was considered to represent malignancy.

All the patients underwent surgery, and the ovarian specimen was sent to the Department of Pathology for histopathological examination (which is the gold standard for diagnosis).

The incidence of benign as well as malignant tumors was noted, and also the various histopathological types were then evaluated and compared with variables like age, parity, menopausal status etc.

### Statistical analysis

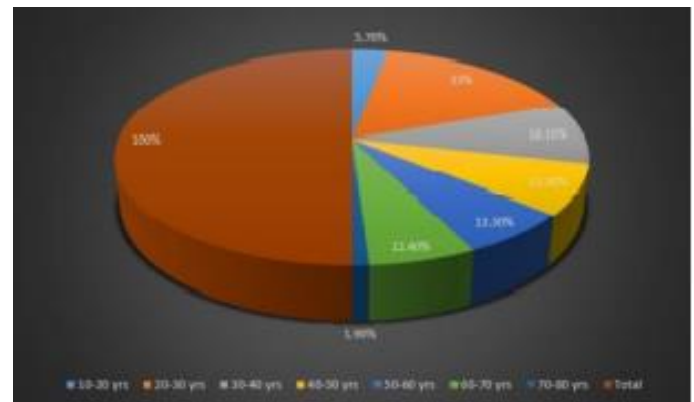
Data analysis was done with the help of computer using SPSS ver. 20 software.

## Results

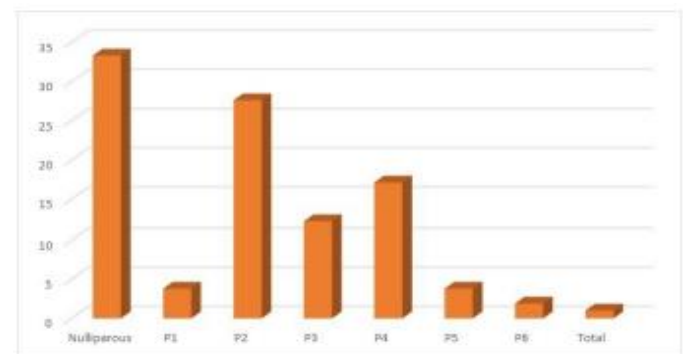
### Demography

Out of the 105 patients included in the study, most of the patients (33.3%) were in the age group of 20-30 years; followed by 30-40 years (18.1%). 6 patients (5.7%) were in the age group of 10-20 years, while 2 (1.9%) of them were between 70-80 years. (Graph 1).

Most of the patients (66.7%) were parous; out of which para 2 were most common (27.6%). 33.3% patients were nulliparous (Graph 2)



Graph 1: age distribution of patients enrolled in the study.



Graph 2: parity of the patients Presenting complaint

Most of the patients presented with the complaint of abdominal pain (82.85%); followed by abdominal lump in 40.95% patients. Menstrual irregularities were seen in 23.8 % patients; GI and urinary symptoms occurred in 12.38% and 5.71 % patients respectively.

| Complaints               | Frequency | Percentage |
|--------------------------|-----------|------------|
| Pain Abdomen             | 87        | 82.85      |
| Abdominal lump           | 43        | 40.95      |
| Menstrual Irregularities | 25        | 23.80      |
| GI Symptoms              | 13        | 12.38      |
| Urinary Symptoms         | 6         | 5.71       |
| Ascites                  | 14        | 13.33      |
| Total                    | 105       | 100%       |

Table 1: presenting complaints of patients ca-125 levels CA-125 levels were done in all 105 patients. They were found to be raised (i.e., >35U/ml) in only 27.61%.

Risk of Malignancy Index (RMI) was calculated for all patients and 24.76 % patients had an RMI > 200

| RMI   | Number | %     |
|-------|--------|-------|
| <200  | 79     | 75.23 |
| >200  | 26     | 24.76 |
| Total | 105    | 100%  |

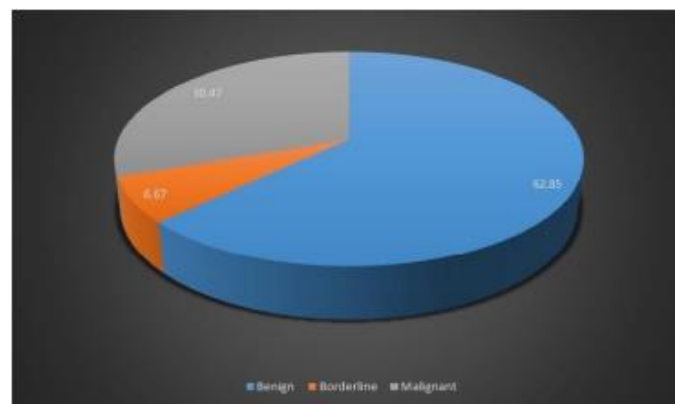
Table 2: risk of malignancy index in the patients

**Types of tumors:** After the histopathological report of the operated tumors, most of them were diagnosed as benign (62.85 %). 30.47% were malignant and 6.67 % were borderline ovarian tumors (Graph 2).

Epithelial tumors (66.7%) were found to be the commonest and 30.5% had germ cell tumor. 1 tumor was metastatic and 2 (1.9%) were sex cord stromal tumors. (Table 3).

Most of the tumors (21.9%) were histopathologic ally diagnosed as serous cystadenoma or mature cystic teratoma (21 %). This was followed by mucinous cystadenoma in 14.3% patients, serous cystadeno carcinoma in 8.6%, mucinous cystadenocarcinoma in 4.8%. 4 patients had yolk sac tumor (3.8%), 3 had dysgerminoma (2.9%). 2 cases each were seen of

immature teratoma (1.9%) and fibroma (1.9%). 1 patient had metastatic tumor (1%). (Table 4).



Graph 3: Distribution of the ovarian tumors.

|                          | Frequency | Percent |
|--------------------------|-----------|---------|
| Epithelial Tumor         | 70        | 66.7    |
| Germ Cell Tumor          | 32        | 30.5    |
| Metastatic Tumor         | 1         | 1.0     |
| Sex cord - stromal tumor | 2         | 1.9     |
| Total                    | 105       | 100.0   |

Table 3: Types of ovarian tumors

| Tumor type                      | Frequency | Percentage |
|---------------------------------|-----------|------------|
| Serous cystadenoma              | 23        | 21.9%      |
| Mucinous cystadenoma            | 15        | 14.3%      |
| Serous Borderline tumor         | 2         | 1.9%       |
| Mucinous Borderline Tumor       | 5         | 4.8%       |
| Serous Cystadenocarcinoma       | 9         | 8.6%       |
| Mucinous Cystadenocarcinoma     | 5         | 4.8%       |
| Mucinous Cystadenofibroma       | 1         | 1%         |
| Mature Cystic Teratoma          | 22        | 21%        |
| Yolk Sac Tumor                  | 4         | 3.8%       |
| Dysgerminoma                    | 3         | 2.9%       |
| Embryonal carcinoma             | 1         | 1%         |
| Immature Teratoma               | 2         | 1.9%       |
| Fibroma                         | 2         | 1.9%       |
| Endometrioid Cystadenocarcinoma | 1         | 1%         |
| Metastatic                      | 1         | 1%         |
| Total                           | 105       | 100%       |

Table 4: Histopathological pattern of ovarian tumors legible, approximately 8-to-12-point type. Variables related to the risk of malignancy

In our present study, it was observed that the risk of malignancy increased with

- Age>50 years,
- Multiparity,

- Earlier age at menarche,
- Postmenopausal status,
- Bilaterality of the tumors, and
- Solid consistency.

| S. No | Variable          | Total                  | Malignant | %  | P value |           |
|-------|-------------------|------------------------|-----------|----|---------|-----------|
| 1.    | Age               | ≤50 years              | 76        | 14 | 18.4    | 0.001 (S) |
|       |                   | >50 years              | 29        | 16 | 55.2    |           |
| 2.    | Parity            | ≤1                     | 39        | 7  | 17.9    | 0.008 (S) |
|       |                   | >1                     | 66        | 23 | 34.8    |           |
| 3.    | Menopausal status | Attained menopause     | 36        | 19 | 52.7    | 0.008 (S) |
|       |                   | Menopause not attained | 69        | 12 | 17.3    |           |
| 4.    | Tumor morphology  | Cystic                 | 66        | 3  | 4.5     | 0.001 (S) |
|       |                   | Solid                  | 23        | 17 | 73.9    |           |
|       |                   | Solid + cystic         | 16        | 10 | 62.5    |           |
| 5.    | Laterality:       | U/L                    | 92        | 21 | 22.8    | 0.002 (S) |
|       |                   | B/L                    | 13        | 9  | 69.2    |           |
| 6.    | Age at menarche:  | ≤12 years              | 51        | 22 | 43.1    | 0.002 (S) |
|       |                   | >12 years              | 52        | 6  | 11.5    |           |
|       |                   | Not attained           | 2         | 2  | 100     |           |

Table 5: variables related to the risk of malignancy in ovarian tumors.

**Comparative value of USG, CT scan and MRI in the diagnosis**

The histopathological analysis of surgical resected specimens was considered as gold standard for comparison of diagnostic values of various investigative modalities. Diagnostic comparison was done (Table 6,7) for different modes of evaluation using sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and accuracy.

It was found that both false positive and false negative rate was high with ultrasound. CT Scan had a false positive rate of 9.7 % whereas MRI had the least false positive rate of 4.76%. In addition, the accuracy of diagnosing ovarian lesions was highest with MRI (96.7 %) as compared to USG and CT scan. The sensitivity (89%) and specificity (100%) of MRI was the highest.

USG had a sensitivity of 55 % and specificity of 92.56 %. CT Scan had a sensitivity of 70.45% and specificity of 100%.

|         | False positive % | False negative % |
|---------|------------------|------------------|
| USG     | 16 (15.3%)       | 6 (5.7%)         |
| CT SCAN | 4 (9.7%)         | 0                |
| MRI     | 3 (4.76%)        | 0                |

Table 6: Comparison of USG, CT scan and MRI

|                           | USG   | CT SCAN | MRI  |
|---------------------------|-------|---------|------|
| Sensitivity               | 55    | 70.45   | 89   |
| Specificity               | 92.56 | 100     | 100  |
| Positive predictive value | 78.5  | 100     | 100  |
| Negative predictive value | 85.36 | 78.6    | 94.5 |
| Accuracy                  | 80.1  | 85.8    | 96.7 |

Table 7: Diagnostic comparison of USG, CT scan and MRI

**Discussion**

Ovarian tumors are the biggest diagnostic challenge in the field of Gynaecological oncology. These tumors remain silent clinically for long periods of time and pose many problems due to their high complication rate.

In the current study, clinical profile of 105 patients with ovarian neoplasms were evaluated.

The age group distribution of patients in the present study ranged from 12 – 74 years. The youngest patient in this study was a 12-year-old girl with yolk sac tumor. The oldest patient was a 74-year-old lady with bilateral serous adenocarcinoma who presented with abdominal pain and ascites. most of the patients (33.3%) were in the age group of 20-30 years; followed by 30-40 years (18.1%). 14.3% of ovarian tumors were found in women aged above 60 years.

In the study of Archana Kumari. et al. (2020)17, out of 68 tumors evaluated, overall highest incidence of ovarian tumor was found in age group of 31-40 years followed by 41-50 years. Only 1.4% had tumors in women aged above 60 years.

In the current study, tumors in nullipara and women with low parity (two children) contributed to 64.7 % of all



tumors which was consistent with the findings of study done by Kayastha et al.<sup>18</sup>

The presenting complaint of most of the patients was abdominal pain (82.85%); followed by abdominal lump in 40.95%. This was consistent with the study of Archana et al.<sup>17</sup>, in which the most common symptom was abdominal pain observed in 70%. Similar findings were seen in the study by Krishnaswamy P et al.<sup>19</sup>, in which most common presenting symptom was abdominal pain (69.8%) followed by abdominal mass/distension (51.8%). In our study, out of the 105 ovarian tumors, most of them were diagnosed as benign (62.85 %). 30.47% were malignant and 6.67 % were borderline ovarian tumors. These findings were consistent with the study of Archana Kumari et al [17] (2020), in which 73.52% tumors were benign and 26% were malignant.

Ovarian tumors display histological heterogeneity. In our study, epithelial tumors (66.7%) were found to be the commonest and 30.5% had germ cell tumor. 1 tumor was metastatic and 2 (1.9%) were sex cord stromal tumors.

In the study of Chakrabarti, et al [20], Epithelial tumors (69.2%) accounted for the highest number of tumors, whereas germ cell tumors (26.18%) were the second most reported case.

In the present study, most of the tumors (21.9%) were diagnosed as serous cystadenoma or mature cystic teratoma (21 %). This was followed by Mucinous cystadenoma in 14.3% patients. Serous cystadenocarcinoma was the most common malignant tumor seen in 8.6%, followed by mucinous cystadenocarcinoma in 4.8%. 1 patient had metastatic tumor (1%) in the current study.

In the study of Archana et al [17]., the most common benign tumor was mucinous cystadenomas seen in 35.9% followed by serous cystadenomas seen in 23.4%. Mature

teratomas/dermoid cysts were seen in 15.6% cases and one case of granulosa cell tumor was seen. Serous cystadenocarcinoma was the most common malignant tumor seen in 15.6% cases, followed by mucinous cystadenocarcinoma seen in 6.2% cases and one case of Krukenberg tumor was seen.

Epithelial ovarian neoplasms and tumors of mesothelial origin express cancer antigen – 125 which is a high molecular-weight glycoprotein. In our present study, CA-125 levels were found to be raised (i.e., >35U/ml) in only 27.61%. After the histopathological diagnosis, it was found that malignant tumors were most commonly associated with raised CA-125 levels (76.67%).

Regarding the role of ultrasound in evaluation of adnexal lesion, our aim was not to evaluate its role for routine screening for malignancy, but to study the indicators of malignancy. It was observed that ultrasound features differed in the benign and malignant tumors. In our study, malignant tumors were associated with the following USG findings: bilaterality, wall thickness >3mm, thick septae, solid consistency, ascites, increased vascularity and presence of metastasis.

The study by Pourissa et al. [21] showed that abdominal sonography had a sensitivity of 70% and a specificity of 98.55% for predicting ovarian cancer.

Similar findings were observed in our study with sensitivity of 55% and specificity of 92.56%.

In our study, it was observed that the accuracy of diagnosing ovarian lesions was highest with MRI (96.7 %) as compared to USG and CT-Scan.

The sensitivity (89%) and specificity (100%) of MRI was the highest. CT Scan had a sensitivity of 70.45% and specificity of 100%.

In the study of Veena R. et al. (2010) <sup>[22]</sup>, the sensitivity and specificity of CT scan was 81% and 87% in

identifying ovarian tumors. The sensitivity and specificity of MRI scan was 81% and 98% in identifying ovarian tumors. This study proved that MRI is better than CT in diagnosing ovarian tumors, similar to the current study.

### Conclusion

Ovary is a frequent site of primary and metastatic tumors. Due to its complex structure, primary ovarian neoplasms are of diverse histological types. Our observations and results proved to be valuable baseline information regarding patterns of ovarian tumors in our population.

Age more than 50 years, post-menopausal age group, solid and complex tumor morphology, presence of ascites and bilaterality of tumors significantly increased the incidence of malignancy and thus, these parameters can be used to predict the risk of malignancy in ovarian tumors.

In spite of advanced chemotherapy regimens and improved surgical approaches, ovarian carcinomas continue to be one of the leading causes of death among Gynaecological malignancies. For the treatment of adnexal mass lesion, stratification of risk based on appearance of the mass on imaging is needed.

In our study USG was used as the initial imaging modality of choice for evaluation of adnexal mass lesions. But evaluation with MRI is highly accurate for identifying the origin of a mass, tissue characteristic with its content, staging and preoperative planning.

Since malignant ovarian tumors are known for high mortality and worse prognosis, proper categorization into exact histological types will help the clinician to plan timely management of these patients.

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