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*Original Research Article*

# Correlation of histopathology with risk of malignancy prediction by Assessment of Different NEoplasias in the adneXa (ADNEX) model from the International Ovarian Tumor Analysis (IOTA) group

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## Abstract

**Aim:** The aim of the present study was to determine the specificity, sensitivity and accuracy of the predictors of ADNEX for risk stratification in different adnexal tumour histology.
**Methods:** It was hospital based observational Prospective Study in the Department of Pathology, Akash Institute of Medical Sciences and Reasearch centre, Devanahalli and cases of tubo-ovarian lesions by salphingo-oophorectomy/ovariectomy with or without hysterectomy. Total cases of tubo-ovarian lesions by salphingo-oophorectomy /ovariectomy with or without hysterectomy in last year were 146 out of total histopathogical biopsies 3101 at our centre AIMS&RC. So prevalence of tubo-ovarian lesions in last year was 4.7%. Out of which, 119 were non-neoplastic and benign cases (3.54%) and 27 were malignant cases (0.87%). The Prospective single centre study was done from 1st April 2021 to 31st March 2022.
**Results:** Maximum number of percentage lies in the age group 31 years to 40 years. In this study of 77 women, maximum were premenopausal 72.73% (56) followed by perimenopausal 7.79% (6) and post-menopausal 19.48% (15). In the study of 77 women, 88.31% (68) of women presented with complaints of pain abdomen followed by mass per abdomen 2.60% (2). 9.09% (7) presented with bleeding problems.
**Conclusion:** It can be inferred that the ADNEX model can be used as a good alternative to subjective assessment in the estimation of risk of malignancy of adnexal masses. It has the potential to change management decisions for women with an adnexal tumor. This could impact considerably on the morbidity and mortality associated with adnexal pathology.

**Keywords:** Prognosis, ultrasound, adnexal masses, ovarian malignancy, iota-adnex model

## Introduction

Cancer is known to be caused by mutations due to environmental factors, errors during DNA replication, or may be inherited [1]. Aging is one of the main risk factors for carcinogenesis [2]. Out of 172 countries, 91 countries attribute cancer as the first or second leading cause of death [3] and ranked third or fourth in the other 22 countries [4]. In India, cancer is the second leading cause of death in urban areas and the fourth leading cause of death in rural areas [5]. Autopsy research conducted by India's finest postgraduate medical institute indicated that 25.8% of malignancies were misdiagnosed [6]. In most developing countries, cervical cancer

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is one of the common causes of death in females [7]. The deaths due to cervical cancer in low- and middle-income countries reveal health inequities. 86% of deaths are in these countries and, hence, death due to cervical cancer is a crucial indicator to assess health inequities [8]. Ovarian tumors are seen frequently by all gynecologists, and prior to any surgical or non-surgical management, a proper diagnosis of these masses prior to the surgery is critical because effective care and management rely on a better understanding of the type of tumor.

Adnexal masses are common. Ovarian cancer (OC) accounts for 2.5 percent of cancers in women being 11th most common cancer among women and fifth leading deadliest cause of cancer-related death among women. A woman's lifetime risk of developing OC is 1 in 75, and her chance of dying of the disease is 1 in 1004. The 5-year relative survival rate is only 29% as the disease typically presents at late stage. Few cases (15%) are diagnosed with localized tumour (stage 1) when the 5-year survival rate is 92%. Strikingly, the overall 5-year relative survival rate generally ranges between 30%-40% across the globe [9].

The risk of the disease is inversely proportional to the number of lifetime ovulations. Thus, factors associated with suppression of ovulation, such as increasing numbers of full- term pregnancies, longer duration of lactation, and oral contraceptive use are associated with a decrease in ovarian cancer [10]. Factors associated with greater lifetime ovulation and/or greater lifetime estrogen exposure such as nulliparity, early age of menarche or late age of menopause, and use of hormone replacement therapy increase risk [11]. Also, inflammatory conditions such as endometriosis appear to increase risk of ovarian cancer, whereas tubal ligation and hysterectomy reduce risk [12].

The ultrasound predictors are the maximal diameter of the lesion (mm), proportion of solid tissue (%), number of papillary projections (0, 1, 2, 3, > 3), presence of more than 10 cyst locules (yes/no), acoustic shadows (yes/no), and presence of ascites (yes/no). The proportion of solid tissue is defined as the ratio of the maximal diameter of the largest solid component and the maximal diameter of the lesion [13].

The aim of the present study was to determine the specificity, sensitivity and accuracy of the predictors of ADNEX (6 ultrasound parameters, age, CA-125, type of centre) for risk stratification in different adnexal tumour histology.

## Materials and Methods

It was Hospital Based Observational Prospective Study in the Department of Pathology, Akash Institute of Medical Sciences and Research centre, Devanahalli, Bangalore and Cases of tubo-ovarian lesions by salphingo-oophorectomy/ovariectomy with or without hysterectomy. Total cases of tubo-ovarian lesions by salphingo-oophorectomy /ovariectomy with or without hysterectomy in last year were 146 out of total histopathogical biopsies 3101 at our centre AIMS&RC. So prevalence of tubo-ovarian lesions in last year was 4.7%. Out of which, 119 were non- neoplastic and benign cases (3.54%) and 27 were malignant cases (0.87%). The Prospective single centre study was done from 1st April 2021 to 31$^{st}$ March 2022.

### Inclusion criteria

All radiologically evaluated and surgically resected adnexal masses at AIMS & RC.

### Exclusion criteria

All adnexal masses where histopathology & radiology were not available.

Patients with complains like lower abdominal pain, menstrual irregularities or palpable abdomino-pelvic masses detected to have ovarian enlargement on radiology or accidently discovered ovarian masses on USG,who underwent salphingo-oophorectomy/ovariectomy

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with or without hysterectomy are collected. Systematic clinical details of 77 cases- age of the patient, clinical presentation, pre/peri/post-menopausal status collected and included in the study.

Abdominal ultrasound findings of ovarian masses- maximal diameter of the lesion, proportion of solid tissue, number of papillary projections, presence/absence of more than 10 cyst locules, acoustic shadows and presence/absence of ascites were collected. Serum CA-125 estimation (normal range -0 to 35IU/ml) is done by Chemiluminiscence method in radiologically suspicious and malignant cases. The radiological parameters will be used to classify ovarian masses as benign, borderline and malignant according to ADNEX model for all cases of tubo-ovarian pathology. Reference standard was histopathological diagnosis, after surgical removal of adnexal mass by laparotomy or laproscopy. Staging of malignancy done by FIGO staging.

**(a) Tissue Fixation**

This is the process by which the constituents of the cells and therefore the tissues were fixed in a physical and partly also in a chemical state so that they could withstand subsequent treatment with various reagents with a minimum loss, no significant distortion or decomposition. Specimen are fixed in 10% neutral buffered formalin which should be 20 times the volume of specimen. Time for fixation was 6-12 hours at room temperature

**Gross examination of the specimen**

The weight and gross measurements of ovarian mass in three dimensions should be recorded.

**Ovarian surface**

- Involvement of the ovarian surface is an important element in staging tumors limited to the ovary, and the presence of surface involvement may influence treatment. Therefore, careful examination of the ovarian surface is crucial. Examine the external surface (smooth or nodular), border (circumscribed or irregular) and the attached fallopian tube, including the measurement of its length. The capsule should be inspected for areas of rupture, adhesions, tumor involvement, or other lesions.
- After examination of external surface, including capsule, cut open the specimen along its largest dimension.
- Identify the normal ovarian parenchyma, including cortex and medulla if present.
- Measure the thickness of cyst wall during serial cutting. Note whether uni-or multicystic with septae.

**Cut section**

If cysts are present, the color and consistency of the cyst fluid should be noted, identify and document solid areas, including papillary excrescences, necrotic, hemorrhagic areas or calcification.

**Procedure**

Total hysterectomy and bilateral salpingo-oophorectomy / salpingo-oophorectomy /oophorectomy, / Omentectomy / Peritoneal biopsies/pleurocentesis.

**Specimen Integrity**

Integrity and capsule status-ruptured etc.

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**Tumor Site**

Ovary/fallopian tube/peritoneum.

**Ovarian Surface Involvement**

Present/absent
Fallopian Tube Surface Involvement- present/absent

**Tumor Size**

Greatest dimension (centimeters) + Additional dimensions (centimeters).

**Histologic Type**

Serous tubal intraepithelial carcinoma (STIC) /Serous borderline tumor/atypical proliferative serous tumor with microinvasion /Serous carcinoma /Endometrioid borderline tumor/atypical proliferative endometrioid tumor /Mucinous borderline tumor/atypical proliferative mucinous tumor /Mucinous carcinoma.
Histologic Grade (required for serous, endometrioid, mucinous, and seromucinous carcinomas, immature teratomas, and Sertoli-Leydig cell tumors)

**WHO Grading System**

G1: Well differentiated/G2: Moderately differentiated /G3: Poorly differentiated /GX: Cannot be assessed.
Implants (required for advanced stage serous/seromucinous borderline tumors only).

**Other Tissue/ Organ Involvement**

Fallopian tube /Uterus /Cervix /Pelvic peritoneum /abdominal peritoneum / Omentum /Other organs/tissue

**Largest Extrapelvic Peritoneal Focus**

Microscopic / Macroscopic (2 cm or less) /Macroscopic (greater than 2 cm) /cannot be determined

**Peritoneal/Ascitic Fluid**

Positive /negative for malignancy

**Pleural Fluid**

Positive /negative for malignancy

**Regional Lymph Nodes**

Pelvic, para-aortic, and retroperitoneal are considered regional lymph nodes. Any other involved nodes should be categorized as metastases (pM1) and commented on in the distant metastasis section. Presence of isolated tumor cells no greater than 0.2 mm in regional lymph node(s) is considered N0.
Lymph Node Examination-positive /negative for metastasis/Number of Nodes with Metastasis Greater than 10 mm/Number of Nodes with Metastasis 10 mm or Less (excludes

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isolated tumor cells)/Number of Nodes with Isolated Tumor Cells (0.2 mm or less).
Pathologic Stage Classification (pTNM, AJCC 8th Edition) and FIGO staging was done. Preoperative risk of malignancy calculated for all cases and correlated with the histopathology as the gold standard, thereby calculating the sensitivity, specificity and accuracy of the radiological & clinical parameters under study.

## Statistical method

Template of master chart was generated on MS Excel sheet. Data analysis was done for evaluation of sensitivity, specificity. Data were statistically analyzed for significance using EPI INFO software.

## Results

**Table 1:** Patient details

| **Age (in year)** | **No. of cases (n=77)** | **Percentage** |
|---|---|---|
| ≤ 20 year | 3 | 3.90% |
| 21 – 30 year | 15 | 19.48% |
| 31 – 40 year | 26 | 33.77% |
| 41 – 50 year | 18 | 23.38% |
| 51 – 60 year | 8 | 10.39% |
| 61 – 70 year | 6 | 7.79% |
| ≥ 71 year | 1 | 1.29% |
| Mean ± s.d | 40.53 yrs ± 13.09 yrs | |
| Minimum & Maximum | 15 yrs & 74 yrs | |
| **Menopasual status** | | |
| Premenopausal | 56 | 72.73% |
| Perimenopasual | 6 | 7.79% |
| Postmenopasual | 15 | 19.48% |
| **Clinical features** | | |
| PAIN ABD | 68 | 88.31% |
| BLEEDING(AUB/HMB) | 7 | 9.09% |
| ABD MASS | 2 | 2.60% |
| **Level of CA125** | **ADNEX categories** | |
| | **Benign(n=65)** | **Malignant(n=12)** |
| < 35 IU/ml | 25 (38.46%) | 2(18.18%) |
| ≥ 35 IU/ml | 7(10.61%) | 9(72.73%) |

Maximum number of percentage lies in the age group 31 years to 40 years. In this study of 77 women, maximum were premenopausal 72.73% (56) followed by perimenopausal 7.79% (6) and post-menopausal 19.48% (15). In the study of 77 women, 88.31% (68) of women presented with complaints of pain abdomen followed by mass per abdomen 2.60% (2), 9.09% (7) presented with bleeding problems. There were statistically significant differences among the patients according to their association between CA 125 with ADNEX categories, with p value=0.0018 {$p<0.05$}.

**Table 2:** ADNEX category wise distribution of cases

| **ADNEX categories** | | **No. of cases (n=77)** | **Percentage** |
|---|---|---|---|
| Benign | | 65 | 84.42% |
| Borderline | | 4 | 5.19% |
| Malignant | Stage II – IV | 7 | 9.09% |
| | Metastasis | 1 | 1.30% |

Out of 77 patients, 65 were benign and 8 were malignant.

**Table 3:** Histopathological Diagnosis among the patients

| Histopathological Diagnosis | No. of patients(n=77) | Percentage |
|---|---|---|
| Serous Cystadenoma | 27 | 35.06% |
| Teratoma | 12 | 15.58% |
| Endometriotic Cyst | 8 | 10.39% |
| Mucinous Cystadenoma | 10 | 12.99% |
| Benign Cystic Lesions | 8 | 10.39% |
| Borderline Serous Cystadenofibroma | 1 | 1.30% |
| Mucinous Cystadenocarcinoma | 2 | 2.60% |
| Granulaosa Cell Tumor | 1 | 1.30% |
| Serous Cystadenocarcinoma | 6 | 7.79% |
| Sex Cord Tumor With Annular Tubules | 1 | 1.30% |
| Metastasis – Adenocarcinoma Ovary | 1 | 1.30% |

In the present study, there were 35.06% with serous cystadenoma followed by teratoma 15.58% and mucinous cystadenoma 12.99%.

**Table 4:** Correlation of age with different Histopathological diagnosis

| Age (in year) | Histopathological Diagnosis | | | |
|---|---|---|---|---|
| | Benign (n=65) | | Malignant (n=12) | |
| | No. of cases | Percentage | No. of cases | Percentage |
| ≤ 20 year | 3 | 4.62% | 0 | 0% |
| 21 – 30 year | 15 | 23.08% | 0 | 0% |
| 31 – 40 year | 23 | 35.38% | 3 | 25% |
| 41 – 50 year | 16 | 24.61% | 2 | 16.67% |
| 51 – 60 year | 5 | 7.69% | 2 | 16.67% |
| ≥ 61 year | 3 | 4.62% | 4 | 33.33% |
| Minimum & Maximum | 15 & 74 | | 31 & 70 | |
| Mean age with SD | 38.48±12.08 | | 51.67 ±13.25 | |

Mean age (in years) with standard deviation was 38.48± 12.08 years in benign cases in the study whereas for malignant cases it is 51.67 ±13.25 years.

**Table 5:** Correlation between CA 125 with Histopathological Diagnosis

| Level of CA125 | Histopathological Diagnosis | | |
|---|---|---|---|
| | Benign(n=65) | Borderline(n=1) | Malignant(n=11) |
| < 35 IU/ml | 25 (38.46%) | 0(0%) | 2(18.18%) |
| ≥ 35 IU/ml | 7(10.77%) | 1(100%) | 8(72.73%) |
| Not done | 33(50.77%) | 0% | 1(9.09%) |

Hence, there were statistically significant differences among the patients according to their Correlation between CA 125 with Histopathological Diagnosis, with p value {$p< 0.0001$}.

**Table 6:** Histopathological type of tumor in correlation with ADNEX categories

| Histopathological type | ADNEX categories | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Benign (n=65) | | Malignant (N=12) | | | | | |
| | | | Borderline (n=4) | | Stage II-IV OC(n=7) | | Metastsis (n=1) | |
| | No. | % | No. | % | No. | % | No. | % |
| Benign (n= 65) | 63 | 96.92% | 1 | 25% | 1 | 14.29% | 0 | 0% |
| Borderline (n=1) | 1 | 1.54% | 0 | 0% | 0 | 0% | 0 | 0% |
| Malignant (n=11) | 1 | 1.54% | 3 | 75% | 6 | 85.71% | 1 | 100% |

Histopathologically, 96.92% were benign and 1.54% was borderline and malignant. There

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were statistically significant differences among the patients according to their accuracy of RMI Index in diagnosis of Benign tumor and Malignant tumor (ADNEX), with p-value {$p$<0.0001}.

## Discussion

The present study was a case series of 77 women with adnexal masses whose histopathological results were correlated with ADNEX model of IOTA. Our study comprised of women with adnexal masses whose ages ranged from 15 to 74 years, they were mostly in the age group of 31 -40 years with mean age being 40.53 years with statistical significant differences with p-value(p-<0.0001). The study conducted by Garg S, *et al*. [14] in which they included 50 cases with mean age of 42.5 years. The maximum patients were premenopausal 72.73% (56), perimenopausal 7.7% (6) followed by postmenopausal 19.48% (15) in our study. The result was in contrast with the study conducted by Javdekar R *et al*. in which premenopausal 58%.

Most of the patients in our study presented with clinical features of pain abdomen 88.31% (68) followed by 9.09% (7) with bleeding problems like AUB/HMB and mass per abdomen 2.60% (2). Radhamani *et al*. showed that 83% were pain abdomen, 14% Mass per abdomen. The Clinical features in our study matches with Radhamani *et al*. study [16]. We evaluated 77 cases of women with suspected adnexal masses with their age, CA-125 and abdominal ultrasound findings of ovarian masses- maximal diameter of the lesion, proportion of solid tissue, number of papillary projections, number of cyst locules, acoustic shadow and ascites. The radiological parameters were used to classify ovarian masses as benign, borderline and malignant (stage I, stage II-IV) and metastasis according to ADNEX model for all cases of tubo-ovarian pathology.

The ADNEX categories-stages II_IV and metastasis had women belonging to the postmenopausal age group. Their mean age observed were 55.71 and 66 years respectively. Raised CA-125 values with mean 1194.23 ± 1105.85 were mostly seen in the stage II_IV. Maximum diameter of solid component and maximum diameter of the lesion with mean value was 6.59 ± 4.03cm & 10.89 ± 3.34 cm seen in stage II_IV respectively. Age, CA-125,Max diameter of solid tissue (cm), Max diameter of lesion (cm) showing statistically significant p-values and are important variables in evaluation of ADNEX model in discriminating various stages of malignant subtypes. Out of 77 cases, 65(84.42%) cases were benign, 4 (5.1%) were borderline, 7 (9.09%) were stage II -IV, 1 (1.3%) was metastasis among ADNEX categories. The result of our study was similar to the study conducted by Meys EM *et al*.[17] in which benign were 64%, borderline were 8% and rest were malignant. We had similar ADNEX categories matching with EMJ Meys *et al*. study but we did not have stage I ADNEX category in our study.

CA-125 in correlation with ADNEX categories showed sensitivity = 78.12%, Specificity = 81.82%, PPV = 92.59%, NPV = 56.25%, AUC = 0.80, with statistically significant p value=0.0018 {$p$<0.05}. CA-125 were not available in 35 patients out of which 34 cases were benign and 1 case was malignant. Ca-125 as a predictor for ADNEX model had AUC in comparison with Van Calster, *et al*. study [13]. Histopathological diagnosis of 77 patients with adnexal masses in our study had benign disease in 65 patients (84.42%), borderline in 1 (1.3%), and malignant disease in 11 (14.28%). Distribution of histopathological diagnosis matches with study of Javdekar, *et al*. [15].

Sugandha Garg *et al*. [14] study, malignancy were more common in 6th decade age group and in postmenopausal patients (71.43%) In our study, mean age with a standard deviation was 38.48± 12.08 for benign cases where as for malignant cases, mean with a standard deviation was 51.67 ± 13.25.Malignancy was more common in 6$^{th}$ decade age group and in postmenopausal patients (33.3%). In our study, serum CA-125 in association with histopathology showed sensitivity = 80.65%, Specificity = 81.82%, PPV = 92.59%, NPV = 60%, AUC = 81% with statistical significant p value =0.0012($p$<0.05). Raised CA-125 values >35 IU/ml is seen more in malignant cases (8). CA-125 in our study showed similar

results as Jacobs, *et al*. study [18].

Histopathological findings in association with ADNEX categories showed statistically significant differences with p – value {$p<0.0001$} in our study with sensitivity = 96.92%, specificity = 83.33%, PPV = 96.92%, NPV = 83.33%, AUC = 0.90. Validation of ADNEX categories with histopathology shows sensitivity 96.9%, specificity 83.3% and AUC (0.90) for basic discrimination between benign and malignant tumors. Validation of ADNEX model in correlation with histopathology in our study matches with the study of Van calster, *et al*.[13]

## Conclusion

From the foregoing summary it can be inferred that the ADNEX model can be used as a good alternative to subjective assessment in the estimation of risk of malignancy of adnexal masses. It has the potential to change management decisions for women with an adnexal tumor. This could impact considerably on the morbidity and mortality associated with adnexal pathology. The IOTA ADNEX model had good to excellent performance in discriminating different types of ovarian tumors and is a useful diagnostic tool in the management of patients with adnexal masses presenting to a gynecological oncology center. The classification system stratified according to malignancy might allow more accurate triaging of cases. It would also assist in the prioritization of patients for surgery and therapeutic decision-making, adding diagnostic information to cases with an indication for minimally invasive surgery, radical resections, neo adjuvant therapy.

## References

1. Tomasetti C, Li L, Vogelstein B. Stem cell divisions, somatic mutations, cancer etiology, and cancer prevention. Science. 2017 Mar 24;355(6331):1330-4.
2. Albuquerque TA, Drummond do Val L, Doherty A, de Magalhaes JP. From humans to hydra: patterns of cancer across the tree of life. Biological Reviews. 2018 Aug;93(3):1715-34.
3. Ferlay J, Colombet M, Soerjomataram I, Mathers C, Parkin DM, Piñeros M, *et al*. Estimating the global cancer incidence and mortality in 2018: GLOBOCAN sources and methods. International Journal of cancer. 2019 Apr 15;144(8):1941-53.
4. Bray FF, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal AJ. Erratum: Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. Ca Cancer J Clin. 2020;70(4):313.
5. Vital statistics division. Accessed: July 30, 2022.
6. Sarode VR, Datta BN, Banerjee AK, Banerjee CK, Joshi K, Bhusnurmath B, *et al*. Autopsy findings and clinical diagnoses: a review of 1,000 cases. Human Pathology. 1993 Feb 1;24(2):194-8.
7. Denny L. Cervical cancer: prevention and treatment. Discov Med. 2012;14:125-31.
8. Yeole BB, Kumar AV, Kurkure A, Sunny L. Population-based survival from cancers of breast, cervix and ovary in women in Mumbai, India. Asian Pacific Journal of Cancer Prevention. 2004 Jul 18;5(3):308-15.
9. Reid BM, Permuth JB, Sellers TA. Epidemiology of ovarian cancer: A review. Cancer Biol Medicine. 2017 Feb;14(1):9.
10. Titus-Ernstoff L, Perez K, Cramer DW, Harlow BL, Baron JA, Greenberg ER, *et al*. Menstrual and reproductive factors in relation to ovarian cancer risk. Br J cancer. 2001 Mar;84(5):714-721.
11. Salehi F, Dunfield L, Phillips KP, Krewski D, Vanderhyden BC. Risk factors for ovarian cancer: an overview with emphasis on hormonal factors. Journal of Toxicology and Environmental Health, Part B. 2008 Mar 20;11(3-4):301-21.
12. Van Gorp T, Amant F, Neven P, Vergote I, Moerman P. Endometriosis and the development of malignant tumours of the pelvis. A review of literature. Best practice & research Clinical obstetrics & gynaecology. 2004 Apr 1;18(2):349-71.

**ISSN 2515-8260 Volume 10, Issue 02, 2023**

13. Van Calster B, Van Hoorde K, Froyman W, Kaijser J, Wynants L, Landolfo C, *et al*. Practical guidance for applying the ADNEX model from the IOTA group to discriminate between different subtypes of adnexal tumors. Facts, views & vision in ObGyn. 2015;7(1):32.
14. Garg S, Kaur A, Mohi JK, Sibia PK, Kaur N. Evaluation of IOTA simple ultrasound rules to distinguish benign and malignant ovarian tumours. Journal of Clinical and Diagnostic Research: JCDR. 2017 Aug;11(8):TC06.
15. Javdekar R, Maitra N. Risk of malignancy index (RMI) in evaluation of adnexal mass. The Journal of Obstetrics and Gynecology of India. 2015 Apr;65:117-21.
16. Radhamani S, Dev SV, Mv A. Torsion theca lutein cyst in association with invasive mole presenting as acute abdomen: a rare case. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2015 Jul 1;4(4):1237-41.
17. Meys EM, Kaijser J, Kruitwagen RF, Slangen BF, Van Calster B, Aertgeerts B, *et al*. Subjective assessment versus ultrasound models to diagnose ovarian cancer: A systematic review and meta-analysis. European Journal of Cancer. 2016 May 1;58:17-29.
18. Jacobs I, Oram D, Fairbanks J, Turner J, Frost C, Grudzinskas JG. A risk of malignancy index incorporating CA 125, ultrasound and menopausal status for the accurate preoperative diagnosis of ovarian cancer. Br J Obstet Gynaecol. 1990 Oct;97(10):922-9.