ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 07 | July - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A PROSPECTIVE STUDY ON THE EVALUATION OF THE INTERNATIONAL OVARIAN TUMOR ANALYSIS (IOTA) SIMPLE ULTRASOUND RULES IN DIFFERENTIATING BENIGN AND MALIGNANT OVARIAN TUMORS IN A TERTIARY CARE CENTRE.

Obstetrics & Gynaecology

Dr Priya Bhaurao Rathod* Assistant professor department of obstetrics and gynecology *Corresponding Author

Dr Maya Arvikar Head of department department of obstetrics and gynecology

Dr Tejas Sanjaykumar Sonawane Junior resident department of obstetrics and gynecology

ABSTRACT

Background: Ovarian masses are a common gynecological problem and present a diagnostic challenge because of the wide spectrum of benign and malignant lesions. Early and accurate differentiation between benign and malignant ovarian tumors is essential for appropriate management and improved patient outcomes. The International Ovarian Tumor Analysis (IOTA) group developed simple ultrasound rules to aid in the preoperative classification of adnexal masses. **Objective:** To assess the diagnostic performance of IOTA simple ultrasound rules in distinguishing benign from malignant ovarian tumors and to correlate ultrasonographic findings with histopathological diagnosis. **Materials and Methods:** This prospective observational study was conducted in a tertiary care center on women presenting with ovarian masses. All patients underwent detailed clinical evaluation, ultrasonography using IOTA simple rules, and subsequent surgical management when indicated. Histopathological examination served as the gold standard for diagnosis. Ultrasound findings were compared with histopathological results to determine the efficacy of the IOTA rules. **Results:** The majority of ovarian masses were benign, with malignant lesions occurring more frequently among postmenopausal women. The IOTA simple rules demonstrated high diagnostic accuracy in differentiating benign from malignant ovarian tumors. There was a strong correlation between sonographic classification and histopathological diagnosis, with high sensitivity, specificity, positive predictive value, and negative predictive value. **Conclusion:** IOTA simple ultrasound rules are a reliable, non-invasive, and cost-effective tool for the preoperative evaluation of ovarian masses. They provide excellent diagnostic accuracy and can be effectively used in routine clinical practice to distinguish benign from malignant ovarian tumors, facilitating timely referral and appropriate management.

KEYWORDS

Ovarian Mass, IOTA Simple Rules, Ultrasonography, Histopathology, Ovarian Malignancy.

INTRODUCTION

Ovarian tumors constitute one of the most challenging conditions encountered in gynecological practice. Ovarian masses may arise from physiological cysts, benign neoplasms, or malignant tumors. Although most ovarian masses are benign, distinguishing benign from malignant lesions preoperatively remains crucial because ovarian cancer is associated with high mortality and poor prognosis when diagnosed at advanced stages. Early detection significantly improves survival rates, reaching up to 90% in localized disease.

Ultrasonography is the primary imaging modality used in the evaluation of adnexal masses because it is non-invasive, cost-effective, widely available, and free from ionizing radiation. However, considerable overlap exists between the sonographic appearances of benign and malignant ovarian tumors, making diagnosis difficult.

To overcome this challenge, the International Ovarian Tumor Analysis (IOTA) Group developed standardized ultrasound terminology and simple rules for the characterization of adnexal masses. These rules classify ovarian tumors based on specific benign (B) and malignant (M) ultrasound features. The IOTA Simple Rules have been validated in several international studies and have demonstrated high sensitivity and specificity in differentiating benign from malignant ovarian masses.

The present study was undertaken to evaluate the diagnostic performance of IOTA Simple Rules in women presenting with ovarian masses and to correlate ultrasound findings with histopathological examination, which remains the gold standard for diagnosis.

AIMS AND OBJECTIVES

Primary Objective :To assess the diagnostic performance of IOTA Simple Ultrasound Rules in differentiating benign and malignant ovarian tumors.

Secondary Objective : To correlate sonographic diagnosis based on IOTA Simple Rules with histopathological findings.

MATERIALS AND METHODS

Study Design :Prospective observational study.

Study Setting:Department of Obstetrics and Gynecology, tertiary care hospital.

Study Duration: one years.

Study Population : Women diagnosed with ovarian masses who were admitted for evaluation and surgical management.

Sample Size :40 patients with ovarian masses.

Inclusion Criteria: Women with adnexal/ovarian masses detected clinically or radiologically, Patients willing to participate in the study, Patients undergoing surgical treatment with histopathological confirmation.

Exclusion Criteria: Functional ovarian cysts resolving spontaneously, Pregnancy-related ovarian masses, Patients unwilling for surgery, Inadequate histopathological data.

Methodology

All patients underwent:
1. Detailed clinical history.
2. General and systemic examination.
3. Pelvic examination.
4. Transabdominal and transvaginal ultrasonography.
5. Classification according to IOTA Simple Rules.
6. Surgical intervention.
7. Histopathological examination.

IOTA Simple Rules
Benign Features (B-Rules)
B1: Unilocular cyst
B2: Solid component <7 mm
B3: Acoustic shadows
B4: Smooth multilocular cyst <10 cm
B5: No blood flow

Malignant Features (M-Rules)
M1: Irregular solid tumor
M2: Ascites

M3: ≥4 papillary projections
M4: Irregular multilocular solid tumor ≥10 cm
M5: Very strong blood flow

Statistical Analysis
Data were analyzed using SPSS software. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy were calculated using histopathology as the reference standard.

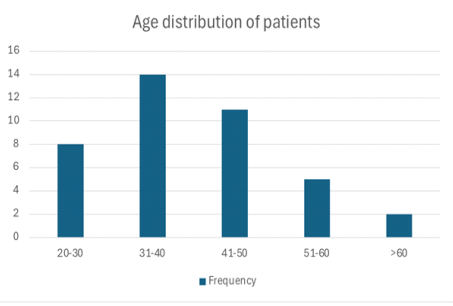
RESULTS

1)Age Distribution

Table1: Distribution of ovarian tumor cases according to age group.

Age group in year	Frequency	Percentage
20-30	8	20
31-40	14	36
41-50	11	28
51-60	5	12
>60	2	4
Total	40	100

Graph2: Distribution of ovarian tumor cases according to age group.



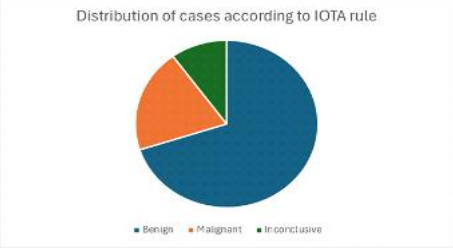
The majority of participants belonged to the 31–40 years age group (36%), followed by the 41–50 years age group (28%). Participants aged >60 years constituted the smallest proportion (4%) of the study population.

2) Classification According to IOTA Rule:

Table 2 : IOTA Classification distribution of cases according to iota rule

Classification	Cases	Percentage
Benign	28	70
Malignant	8	20
Inconclusive	4	10

Graph2 : distribution of cases according to iota rule



Among them, 28 cases (70%) were classified as benign, indicating that the majority of lesions were non-cancerous. Malignant lesions accounted for 8 cases (20%), suggesting that one-fifth of the studied cases were cancerous. Inconclusive findings were observed in 4cases (10%).

Histopathological Findings:

Table3: cases on Histopathological examination

Histopathology	Cases
Benign	30
Malignant	10

Among the 40 patients studied, 30 (75%) had benign ovarian tumors, while 10 (25%) had malignant tumors on histopathological examination. Benign lesions were more common than malignant lesions in the study population.

Common Benign Lesions: Serous cystadenoma , Mucinous cystadenoma ,Dermoid cyst ,Endometrioma, Hemorrhagic cyst

Common Malignant Lesions : Serous cystadenocarcinoma, Mucinous cystadenocarcinoma ,Sex cord stromal tumors

Correlation of IOTA with Histopathology

Table4: correlation of IOTA with Histopathology

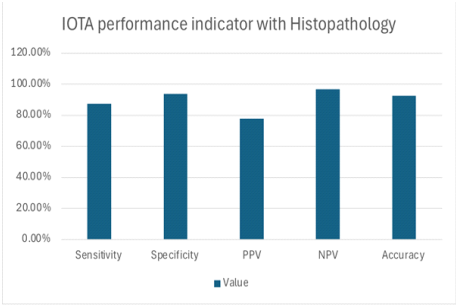
IOTA Diagnosis	Histopathology benign	Histopathology malignant
benign	30	1
Malignant	2	7

Diagnostic Performance

Table5: diagnostic performance

Parameter	Value
Sensitivity	87.5%
Specificity	93.75%
PPV	77.8%
NPV	96.8%
Accuracy	92.5%

Graph3 : IOTA performance indicator with Histopathology



The IOTA classification showed high diagnostic accuracy (92.5%) in differentiating benign from malignant ovarian tumors, with sensitivity of 87.5% and specificity of 93.75%. This indicates excellent agreement with histopathological diagnosis.

DISCUSSION

The present study evaluated the utility of IOTA Simple Rules in differentiating benign and malignant ovarian masses and compared sonographic findings with histopathology.

Most patients belonged to the reproductive age group, similar to studies by Timmerman et al. and Sayasneh et al., which reported higher frequencies of benign ovarian tumors among younger women. Postmenopausal women demonstrated a higher likelihood of malignant pathology.

In the current study, the majority of lesions were benign. Serous cystadenoma and mucinous cystadenoma were the most common benign tumors, whereas serous cystadenocarcinoma represented the predominant malignant lesion. These findings are consistent with published literature.

The IOTA Simple Rules classified most masses accurately. Benign features such as unilocular cysts, acoustic shadows, and absence of blood flow were strongly associated with benign pathology. Conversely, malignant features including irregular solid areas, papillary projections, ascites, and marked vascularity were significantly associated with malignancy.

The diagnostic accuracy observed in this study is comparable with international studies. Timmerman et al. reported sensitivity of 92% and specificity of 96%, while Kaijser et al. demonstrated sensitivity of 93% and specificity of 90%.

One important advantage of the IOTA system is its simplicity. Unlike complex mathematical models, it can be easily applied in routine gynecological practice. The standardized terminology improves communication between radiologists, sonologists, and gynecologists.
A small proportion of tumors remained inconclusive because both benign and malignant features coexisted or no defining features were identified. Such cases may require expert ultrasound examination, MRI, or additional tumor markers such as CA-125.

The findings of the present study confirm that IOTA Simple Rules provide a reliable and practical approach for preoperative evaluation of ovarian masses and can significantly improve referral decisions and surgical planning.

CONCLUSION

The present study demonstrates that IOTA Simple Ultrasound Rules are a valuable diagnostic tool for differentiating benign from malignant ovarian tumors.

Key findings include:

1. Most ovarian masses were benign.
2. Reproductive-age women constituted the majority of cases.
3. IOTA Simple Rules showed high sensitivity and specificity.
4. Histopathological findings strongly correlated with IOTA classification.
5. The method is simple, cost-effective, reproducible, and suitable for routine clinical use.
6. IOTA Rules can facilitate early diagnosis of ovarian malignancy and improve patient outcomes.

Therefore, IOTA Simple Rules should be incorporated into the routine assessment of adnexal masses in tertiary care centers.

REFERENCES (VANCOUVER STYLE)

1. Timmerman D, Testa AC, Bourne T, et al. Simple ultrasound rules to distinguish between benign and malignant adnexal masses. Ultrasound Obstet Gynecol. 2008;31(6):681-690.
2. Kaijser J, Sayasneh A, Van Hoorde K, et al. Presurgical diagnosis of adnexal tumors using IOTA models. BMJ. 2014;349:g5920.
3. Valentin L. Pattern recognition of pelvic masses by ultrasound imaging. Best Pract Res Clin Obstet Gynaecol. 2004;18(1):71-89.
4. Timmerman D, Valentin L, Bourne TH, et al. Terms, definitions and measurements to describe sonographic features of adnexal tumors. Ultrasound Obstet Gynecol. 2000;16(5):500-505.
5. Sayasneh A, Wynants L, Preisler J, et al. Multicenter external validation of IOTA prediction models. Ultrasound Obstet Gynecol. 2013;42(4):467-471.
6. American College of Obstetricians and Gynecologists. Management of Adnexal Masses. Obstet Gynecol. 2016;128:e210-e226.
7. Jacobs I, Oram D, Fairbanks J, et al. Risk of malignancy index in ovarian cancer. Br J Obstet Gynaecol. 1990;97(10):922-929.
8. Timmerman D, Bourne T, Tailor A, et al. A comparison of methods for ovarian cancer prediction. Ultrasound Obstet Gynecol. 2007;30(3):340-345.
9. Valentin L, Ameye L, Franchi D, et al. Risk assessment of adnexal masses. Ultrasound Obstet Gynecol. 2011;38(1):48-56.
10. Kaijser J, Van Gorp T, Sayasneh A, et al. Diagnostic accuracy of IOTA models. Gynecol Oncol. 2013;128(2):224-229.