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Assessment of Diagnostic Accuracy of the Risk of Malignancy Index in Ovarian Masses with Histopathology as the Gold Standard

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ABSTRACT

Objective — *To ascertain the diagnostic accuracy of Risk of Malignancy Index (RMI) for diagnosing malignant ovarian masses taking histopathology findings as gold standard.*

Study design — *Cross sectional validation study.*

Place & Duration of study — *Department of Obstetrics & Gynecology, Jinnah Postgraduate Medical Centre (JPMC) Karachi, from May 2022 to November 2022.*

Methods — *Women between 20-years to 60-years of age with ovarian masses were enrolled by non-probability consecutive sampling methods. Demographic data like age, duration of the lesion, size of the mass were noted. Risk of malignancy index was calculated in each patient and malignant ovarian mass were identified. Surgery was then performed and specimen sent for histopathology to document the nature of the ovarian mass. RMI results were compared with histopathology findings.*

Results — *A total of 141 women were included. The mean age of the patients was 43.22±8.39 years and mean duration of the disease 6.55±1.48 months. Majority of the women (n=71-51.06%) presented with < 6-months duration of disease. In 91 (64.54%) women size of the lesion was < 3 cm. The overall sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of RMI for diagnosing malignant ovarian masses taking histopathology findings as gold standard were 88.10%, 91.23%, 93.67%, 83.87% and 89.36% respectively.*

Conclusion — *The diagnostic accuracy of RMI was high and helped in making preoperative diagnosis for planning treatment and counseling of the patients.*

Key words — *Ovarian tumor, Risk of malignancy index, Diagnostic accuracy, Malignant tumors.*

INTRODUCTION:

More than 2,50,000 new cases of ovarian masses are reported ever year. Ovarian malignancy is the fourth commonest cause of death related to gynecological malignancies.[1] The risk of ovarian malignancies is on rise in the developing countries.[2] The exact etiology of ovarian cancers remains unknown. However, various risk and precipitating factors, both genetic and reproductive, have been incriminated.

The diagnostic tools used for ovarian masses include imaging studies like ultrasound, CT scan, MRI, and tumor markers.[3,4] Sonography is considered the most important investigation for the evaluation of ovarian masses due to its wide spread availability, high sensitivity and relatively low cost.[5] Nevertheless because of its less specificity approximately 20% of the adnexal masses are missed.[6,7] RMI, which is

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based upon CA-125 level, sonographic score is used in a simplified regression equation to predict the presence of malignancy.[8] The cutoff value of RMI of 250 is considered as a predictor.[9]

In a study the sensitivity of RMI was reported as 77.8% and specificity 80.6%.[10] However, it was different in other studies.[11-13] This study was conducted tofind out the diagnostic accuracy of RMI for identifying malignant ovarian masses taking histopathology findings as gold standard as current literature showed conflicting results.

METHODS:

Study design, place and duration: This was a cross sectional study with validation design. It was conducted at the Department of Obstetrics & Gynecology, Jinnah Postgraduate Medical Center Karachi, from May 2022 to November 2022.

Ethical considerations: The study was approved by the Institution Review Board (letter No F.2-81/2021-GENL/72587/JPMC dated 16-12-2021) and informed consent was taken from the study participants.

Inclusion criteria and exclusion criteria: All patients between the age of 20-years to 60-years who presented with any size of the ovarian mass on ultrasonography (echo patterns like papillary projections, solid component septation >3mm, free fluid and metastatic deposits) and of more than three-month duration, were included. Pregnant women, patient unfit for major surgery, inoperable cases as assessed by the surgical team, any other intra-operative mass other than the ovarian mass, and those who had biopsy proven diagnosis, were excluded.

Sample size estimation and sampling technique: Taking prevalence of the malignant ovarian masses as 54.76%,[9] 10% margin of error for sensitivity, 1.8% for specificity and sensitivity of 72.5% and specificity of 98.2% of RMI in diagnosing malignant ovarian mass, the calculated sample size was 141 with 95% confidence interval (CI). Non probability consecutive sampling technique was used.

Study protocol: In all patients detailed history was taken and physical examination performed. The demographic data like age, duration of the lesion, size of the mass, place of living (rural/urban), were noted. Risk of malignancy index was calculated for each patient. Surgery was performed as per standard guidelines and specimens were sent for histopathology. The features of malignancy were noted. RMI results were compared with histopathology results. Risk of malignancy was calculated based upon ultrasongraphic score x menopausal status × CA-125 level. The ultrasound findings suggestive of malignancy included multi loculated cysts (an echoic, multiple loculi in the cysts, evidence of solid (hyperechoic) areas, evidence of metastasis (involvement of liver and lungs), presence of ascites, and bilateral lesion. Menopausal scoring (M) was assigned for pre-menopausal women as 1 and for post-menopausal as 3. A CA-125 level (A) cut off of >200 was considered as malignant. On histopathology the presence of malignant cell (large nuclear to cytoplasmic ratio, breach of basement membrane), were noted.

Statistical analysis: Data were collected on a predesigned form and entered into SPSS version 25.0. The duration of ovarian mass and size of lesion were presented as mean and standard deviation. Parity, place of living, malignant ovarian mass on RMI and histopathology were presented as frequency and percentages. Diagnostic accuracy, sensitivity, specificity, positive predictive value and negative predictive value were calculated by using 2×2 contingency table. Stratification was done for age, parity, place of living, duration of ovarian mass and size of the lesion. Finally, the diagnostic accuracy was calculated. Chi square test was applied to calculate p-value (<0.05 as significant).

RESULTS:

The mean age of the patients was 43.22±8.39 years and mean duration of the disease 6.55±1.48 months. Seventy-two (51.06%) women presented with < 6-months duration of disease. In 91 (64.54%) women size of the lesion was < 3 cm. Ninety-six (68.01%) women were multipara while seventy-eight (55.32%) women belonged to the rural areas.

In RMI positive patients, 74 were found to be true positive whereas five were false positive. In the group of 44 RMI negative patients, ten were false negative whereas 52 were true negative (p=0.0001). This is given in table I. The overall sensitivity , specificity, positive predictive value, negative predictive value and diagnostic accuracy of RMI for diagnosing malignant ovarian masses taking histopathology findings as gold standard, were 88.10%, 91.23%, 93.67%, 83.87% and 89.36% respectively.

Diagnostic accuracy after stratification with respect to age group (n=68) revealed that 35 patients were true positive, five were false negative, three false positive and 25 true negative(p=0.001). Sensitivity

Table I: Diagnostic Accuracy of Risk Malignancy Index for Diagnosing Malignant Ovarian Masses Taking Histopathology Findings as Gold Standard

	Positive Results on Histopathology	Negative Results on Histopathology	p-value
Positive on RMI	74 (TP)*	05 (FP)***	0.0001
Negative on RMI	10 (FN)**	52 (TN)****	

*TP=True positive. **FN=False Negative, ***False Positive, ****TN=True Negative

was 87.50% whereas specificity was 89.29%, positive predictive value 92.11% whereas negative predictive value was 83.33% and diagnostic accuracy 88.24%. Stratification of diagnostic accuracy with respect to age group 41-60 years (n=73) showed that 39 women were true positive, five false negative, two false positive and 27 true negative (p=0.001). Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were 88.64%, 93.01, 95.12%, 84.38% and 90.41% respectively.

Stratification of diagnostic accuracy with respect to duration of disease < 6 months (n=72) showed true positive, false negative, false positive, true negative to be 31, 03, 04 and 34 respectively (p= 0.001). The values were 91.18%, 89.47%, 88.57%, 91.89% and 90.285 for sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy respectively. Stratification of diagnostic accuracy with respect to disease duration > 6months (n=69), 43 showed true positive, seven false negative, one false positive, and 18 were true negative (p=0.001). Data showed the values as 86.0 %, 94.74%, 97.73%, 72 % and 88.41% for sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy respectively.

Stratification of diagnostic accuracy with respect to size of lesion < 3cm (n=91) showed 48 true positive, seven false negative, one false positive, 35 true negative (p=0.001), with 87.27%, 97.22%, 97.22%, 83.33%, 91.21%, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy respectively. Stratification of diagnostic accuracy with respect to size of lesion <3cm (n=50) showed 26 true positive, three false negative, four false positive, 17 true negative (p=0.001) with 89.66% sensitivity, 80.96% specificity, 86.67% positive predictive value, 85.00% negative predictive value and 86.00% diagnostic accuracy of RMI.

Stratification of diagnostic accuracy with respect to primipara (n=45) found true positivein 17, false negative in five, false positive one, and 22 true negative (p=0.001). The values were noted to be 77.27% for sensitivity, 95.65% for specificity, 94.44% for positive predictive value, 81.48% for negative predictive value and 86.67% diagnostic accuracy of RMI. Stratification of diagnostic accuracy with respect to multiparous women (n=96) revealed that 57 were true positive, five false negative, four false positive, and 30 true negative (p=0.001). Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were 91.94%, 88.24%, 93.44%, 85.71% and 90.63% respectively.

Stratification of diagnostic accuracy with respect to rural area (n=78) showed true positive were 40, false negative three, false positive two, and true negative 33 (p=0.001). Data revealed 93.02% sensitivity, 94.29% specificity, 95.24% positive predictive value, 91.67% negative predictive value, and 93.59% diagnostic accuracy of RMI. Stratification of diagnostic accuracy with respect to urban area (n=63) showed 34 true positive, seven false negative, three false positive, 19 true negatives (p=0.001).The results showed 82.93% sensitivity, 86.36% specificity, 91.89% positive predictive value, 73.08% negative predictive value and 84.13% diagnostic accuracy of RMI.

DISCUSSION:

Our study also demonstrated high diagnostic ability of RMI with 88.1% of sensitivity and 91.23% of specificity. The rising incidence of gynecological malignancies requires a reliable diagnostic investigation to identify the exact nature of the ovarian masses either benign or malignant, before proceeding to surgery. Timely diagnosis will lead to early treatment with better prognosis and survival of the patients.

During past decade RMI emerged as important diagnostic tool in the differentiating between benign and malignant ovarian masses.[13] Same were the observations in our study. However, in literature variable results are reported. In a study, malignant ovarian mass was found in 54.76% and RMI showed a sensitivity of 72.5% and specificity of 98.2%.[9] Ray A et al have shown the sensitivity and specificity of 77.8% and 80.6% of RMI in diagnosing malignant

ovarian mass which is less than our study.[10] This may be due to difference in study population.

Another study documented that RMI had 85.71% sensitivity, 94.64% specificity, 94.64% negative predictive value, 85.71% positive predictive value and 92.20% diagnostic accuracy.[11] These results are quite similar to our study. In another study the sensitivity, specificity and diagnostic accuracy of RMI were found to be 100%, 96.3% and 96.6% respectively for diagnosing ovarian cancer.[12]

A study done in Pakistan showed 91.3% sensitivity, 76.9% specificity, 87.5% positive predictive value and 83.3% negative predictive value of RMI in diagnosing ovarian malignancy.[14] Almost similar results were reported in few other studies.[15,16] The data showed that RMI is an easy approach in making a presumptive diagnosis before a definite treatment is started. Thus it helps in the early detection of malignant ovarian masses.

Limitations of the study: It was a single center data collection and thus the generalization of the results may be limited.

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CONCLUSION:

RMI was an effective diagnostic aid as its accuracy was high in the early identification of malignant ovarian masses. It was easy to apply and interpret for the diagnosis of ovarian masses preoperatively.

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