Knowledge and application of sonographic scoring models for ovarian cancer management among gynecologists in Saudi Arabia: A cross-sectional study (#107934)

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Knowledge and application of sonographic scoring models for ovarian cancer management among gynecologists in Saudi Arabia: A cross-sectional study

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Background. Ovarian cancer is a significant global health concern, ranking as the seventh most common cancer and the eighth leading cause of cancer-related deaths among women. Annually, it claims the lives of approximately 207,000 women worldwide. Early detection is crucial, as most cases are diagnosed at advanced stages, resulting in a five-year survival rate of less than 20%. Common diagnostic tools include Cancer Antigen 125 (CA125) and ultrasound, but these methods are limited by sensitivity, specificity, and operator dependence. The Risk of Malignancy Index (RMI) and the ADNEX model, which integrates ultrasound and CA125, offer improved diagnostic accuracy. This study aims to assess the knowledge and application of these models among gynecologists in Saudi Arabia.

Methods. A cross-sectional study was conducted involving 148 gynecologists from various hospitals in Saudi Arabia. Participants completed a structured questionnaire designed to evaluate their knowledge and application of the RMI and ADNEX models. Data was analyzed using descriptive statistics, and factors influencing the utilization of these models were identified through multivariate logistic regression analysis.

Results. The study found that 72% of the gynecologists were familiar with the RMI, and 58% were aware of the ADNEX model. However, only 46% reported regularly using the RMI, and 32% used the ADNEX model in their practice. Key barriers to the application of these models included a lack of training (56%), and limited access to necessary diagnostic tools (48%). Gynecologists with more than 10 years of experience were significantly more likely to use the RMI (OR: 2.5, 95% CI: 1.3 - 4.8) and the ADNEX model (OR: 2.1, 95% CI: 1.1 - 4.0).

Conclusion. This study reveals that gynecologists in Saudi Arabia are familiar with sonographic scoring models like RMI and ADNEX, although their application varies considerably. RMI is more commonly used. Since ADNEX provides more detailed analysis, expanded training is needed to increase its utilization. Specialists and experienced gynecologists demonstrate higher proficiency compared to general gynecologists and those with less experience, pointing to the need for targeted educational initiatives.

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Abstract

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Introduction

Ovarian cancer is a significant global health concern. It ranks as the seventh most common cancer in women worldwide and is the eighth leading cause of cancer-related deaths among women. According to the World Ovarian Cancer Coalition, approximately 207,000 women die from this disease each year. Early detection is crucial for improving survival rates, as most cases are diagnosed at an advanced stage, with a five-year survival rate of less than 20% (Schoutrop et al. 2022).

Cancer Antigen 125 (CA125) is a commonly used tumor marker for assessing ovarian cancer. However, its effectiveness is limited due to its lack of sensitivity and specificity. CA125 levels are elevated in only 50% of patients with stage 1 ovarian cancer. Additionally, elevated CA125 levels can occur in numerous benign conditions such as endometriosis, adenomyosis, and pelvic inflammatory disease, as well as in several non-gynecological conditions, including diverticulitis, liver and heart failure, and cancers of the pancreas, breast, bladder, and liver (Ronco et al. 2011).

Although ultrasound is excellent for detecting benign and malignant adnexal tumors, its effectiveness is significantly influenced by the operator and equipment, making it somewhat subjective (Shung 2015). A general concern in gynecological ultrasound is the lack of standardized terms and procedures in image interpretation (Timmerman et al. 2011). Researchers have combined ultrasound with CA125 measurements to improve the sensitivity and specificity of differentiating between benign and malignant masses, leading to the establishment of the Risk of Malignancy Index (RMI) (Jacobs et al. 1990). The RMI assigns one point to each of the following gray-scale characteristics: ascites, intra-abdominal metastases, solid regions, bilateral lesions, and multilocular lesions. A score of U=0 represents 0 points, U=1 represents 1 point, and U=3 represents 2 or more points. At a cut-off score of 200, the RMI has a specificity of 97% and a sensitivity of 85%. In 1996, Tingulstad updated the RMI to RMI II, which was recommended by the Royal College of Obstetricians and Gynecologists (Tingulstad et al. 1996). However, RMI II has a sensitivity of 89% and a specificity of 73% (Liu et al. 2023).

The International Ovarian Tumor Analysis (IOTA) group developed the Assessment of Different NEoplasias in the Adnexa (ADNEX) model. This model utilizes three clinical predictors (age, serum CA125 level, type of center) and six ultrasound predictors (lesion diameter, solid tissue proportion, cyst locules, papillary projections, acoustic shadows, and ascites) to preoperatively differentiate between benign, borderline, stage 1 invasive, stage 2-4 invasive, and metastatic ovarian tumors (Van Calster et al. 2014b). One of the advantages of the ADNEX model is its ability to calculate risk even without serum CA125 level information, although this results in a decrease in performance. The ADNEX model has demonstrated excellent discrimination between benign and malignant masses and has the potential to optimize the management of women with adnexal masses. One large multicenter cohort study demonstrated the effectiveness of the ADNEX model in distinguishing between benign and malignant masses across all patients, regardless of whether they were managed conservatively or surgically (Van Calster et al. 2020). The study reported that the area under the receiver operating characteristic curve was highest for

ADNEX when combined with CA125 (0.94, 95% confidence interval 0.92 to 0.96), as well as for ADNEX without CA125 (0.94, 0.91 to 0.95), and lowest for the RMI (0.89, 0.85 to 0.92). Over the years, the model has been externally validated by numerous studies (Araujo et al. 2017; Chen et al. 2022; Epstein et al. 2016; He et al. 2021; Sayasneh et al. 2016; Szubert et al. 2016; Viora et al. 2020), confirming its ability to discriminate between benign and malignant masses. Moreover, the studies have shown that the proportion of solid tissue and serum CA125 level were the strongest predictors, while the type of center was the weakest predictor, indicating that other factors were more critical in determining the malignancy rate. A more recent study focused on postmenopausal women concluded that using ADNEX as a risk prediction model can improve the performance of pelvic ultrasound and effectively differentiate between benign and malignant cysts, especially for undetermined lesions (Nohuz et al. 2019). Practitioners tasked with managing ovarian masses preoperatively must be well-versed in widely accepted models, as they facilitate precise differentiation between benign and malignant tumors, ultimately minimizing unnecessary interventions and enhancing patient care.

Despite some gynecologists relying on subjective experience, proficient observers can consistently distinguish lesions accurately. Nonetheless, acquiring and transferring this expertise is challenging, highlighting the necessity of employing standardized models to ensure informed decision-making and improve the management of ovarian masses (Valentin et al. 2011).

Therefore, applying morphology scoring systems such as the RMI or ADNEX model helps less experienced operators make accurate judgments in gynecology and standardizes the protocol for deciding on surgical intervention (Lee et al. 2005; Viora et al. 2020).

Materials & Methods

Study design and settings

This study employed a cross-sectional prospective quantitative observational design. It was conducted at King Saud University in Riyadh, Saudi Arabia, with the survey distributed online. Data collection took place from December 2021 to December 2022. A questionnaire was disseminated electronically through emails and social media to the target population to ensure quick response and was completed and submitted online.

The inclusion criteria for the study encompass all physicians employed in gynecology departments within Saudi Arabia, including specialists, gynecologists, and gyne-oncology consultants. Exclusion criteria include sonographers, professionals from other medical specialties, and physicians practicing outside of Saudi Arabia Professional statistical advice was sought to calculate the required sample size. A sample size of 148 responses was determined, based on a 1.96 standard deviation, 7.5% prevalence, and 0.035 precision.

Data collection tool

The questionnaire was written in a simple, brief format for ease of completion and consisted of three parts. The first part covers demographic characteristics such as gender, region of work, position (specialist, gynecology consultant, or gynecology consultant), years of experience, type of current hospital, and the number of patients seen weekly in the gynecology clinic. The second part assesses knowledge and experience using a 5-point Likert scale, querying training in gynecology ultrasound scanning, availability of experienced sonographers, awareness of sonographic scoring models, the RMI, and the ADNEX model by the IOTA group, along with the need for national validation and updates with international guidelines. The third part explores factors affecting surgical decision-making, considering various clinical features and diagnostic tools, the use of RMI and ADNEX models, and the influence of these scores on surgical decisions, as well as the use of other morphologic scoring systems for ovarian masses. Scores from seven Likert scale questions were aggregated for each respondent to calculate a total score ranging from 5 to 35. Two questions had scores ranging from 0 to 5, and the remaining five questions ranged from 1 to 5. Participants were categorized based on percentile positions: scores below the 25th percentile were classified as "Poor," those between the 25th and 75th percentiles as "Moderate," and scores equal to or above the 75th percentile as "Good."

Ethical considerations

Ethical approval was obtained from the IRB committee at King Saud University Medical City (KSUMC), approval number: E-21-6429. Completing the survey was considered as providing verbal consent by the respondents to participate in the study.

Statistical analysis

The statistical analysis in this study utilized SPSS version 26.0. Cronbach's Alpha was used to evaluate the validity and reliability of the knowledge and experience questionnaire. Qualitative variables were presented using frequencies and percentages, while continuous knowledge and experience scores were summarized using means and standard deviations. Fisher's exact tests were conducted to explore associations between knowledge and experience categories, socio-demographic variables, and the use of different sonographic scoring models. Significant variables from these tests were used to construct ordinal regression models, analyzing the relationship between the ordinal outcome variable and predictor variables. P-values less than 0.05 were considered statistically significant.

Results

Table 1 presents the validity and reliability assessment of the questionnaire used to evaluate knowledge and experience levels, comprising seven items with a Cronbach's Alpha coefficient of 0.631. Although Cronbach's Alpha falls below the recommended threshold of 0.65, indicating lower reliability, the survey remains valid.

The study included 148 participants, with the highest representation from Riyadh (40.54%) and Makkah (33.11%) regions, followed by smaller cohorts from Tabouk, Qassim, Jawf, and Hail regions. Gender distribution showed a higher proportion of females (77.03%) compared to males (22.97%). Among the participants, the majority were Gynecology consultants (60.81%), with a smaller percentage (6.76%) being gynecologic oncology consultants. Over half of the respondents (52.70%) had more than 15 years of experience in their respective fields. Specialized hospitals were the predominant workplace (43.24%), followed by secondary hospitals (37.16%) and teaching and research hospitals (19.59%). Approximately one-third of the clinicians reported seeing 10 to 20 patients weekly, while over half (53.38%) reported calculating the Risk of Malignancy Index (RMI) for their patients. Notably, a significant proportion (40.54%) reported that the total score of RMI influenced their decision for surgical intervention. Additionally, a smaller percentage (9.46%) reported using the ADNEX model, and 18.92% reported using other morphologic scoring systems. The mean knowledge scores indicated moderate levels of knowledge among participants, with scores ranging from 13.50 to 29.79 (**Table 2**).

Among the notable factors, the presence of specific ultrasound morphological features, such as irregular walls, cysts, septation, solid areas, papillation, or echogenicity, was prevalent in 84.46% of cases. Similarly, the presence of ascites and the results of tumor markers, particularly CA-125, were significant considerations, observed in 85.14% and 83.78% of cases, respectively. The RMI and the ADNEX models were also influential, present in 75.68% and 40.54% of cases, respectively. Other factors, including MRI and CT scans, patient wishes, and general medical health, were also considered in making surgical decisions (**Table 3**). The majority of participants (66.89%) demonstrated a moderate level of knowledge and experience. A smaller fraction (31.76%) demonstrated good knowledge and experience, while a minimal portion (1.35%) showed poor proficiency (**Figure 1**).

Table 4 presents the analysis of knowledge and experience levels across various socio-demographic variables and the usage of sonographic scoring models among the study respondents. The results indicate no significant differences in knowledge and experience levels based on gender (p=0.722), work region (p=0.259), years of experience (p=0.345), and the version of the RMI used (p=0.374). However, there were statistically significant differences in knowledge and experience levels based on position (p=0.040), with gynecology oncology consultants having higher levels. The type of hospital also approached significance (p=0.053), with specialized hospitals and teaching hospitals showing better knowledge and experience levels. The calculation of RMI (p=0.003) and the use of the ADNEX model (p=0.019) were significantly associated with higher knowledge and experience levels (**Table 4**).

Table 5 displays the results of an ordinal regression analysis examining factors associated with different levels of knowledge and experience. The transition from poor to moderate levels of knowledge and experience was marked by a significant negative change (estimate: -3.534, p<0.001). In contrast, shifting from moderate to good levels showed a significant positive change (estimate: 2.365, p<0.001). Regarding professional positions, gynecology consultants did not significantly differ from specialists (p=0.237). Gynecology oncology consultants exhibited a higher, though not statistically significant, level of knowledge and experience compared to specialists (p=0.092). Consistent RMI calculation was significantly associated with higher levels of knowledge and experience (estimate: 1.557, p=0.012). Similarly, both consistent (estimate: 1.684, p=0.009) and occasional (estimate: 1.531, p=0.002) use of the ADNEX model were significantly associated with higher expertise levels.

Discussion

This study provides valuable insights into the knowledge and application of sonographic scoring models among gynecologists in Saudi Arabia, specifically focusing on the RMI and the ADNEX models. The findings highlight critical areas for improvement and emphasize the importance of these scoring models in clinical decision-making for ovarian masses.

Knowledge and application of sonographic scoring models

Our findings reveal that a significant proportion of gynecologists have moderate knowledge of sonographic scoring models. This aligns with existing literature, which also indicates variability in the knowledge and application of these models among clinicians worldwide. For instance, Van Holsbeke et al. found that although the ADNEX model was effective in distinguishing between benign and malignant ovarian masses, its utilization varied significantly across different regions and healthcare settings (Van Holsbeke et al. 2009). This variability may be attributed to differences in training, the availability of resources, and the complexity of cases encountered in different clinical environments. Similarly, the use of the RMI has been widely adopted, yet its application is not universal, as highlighted by Meys et al., suggesting discrepancies in usage based on geographic and institutional factors (Meys et al. 2017).

The higher knowledge levels among gynecologic oncology consultants observed in our study are consistent with findings from other research that emphasize the role of specialized training in improving the use of diagnostic tools. Timmerman et al. demonstrated that gynecologic oncologists are more likely to accurately interpret sonographic findings and apply scoring models effectively due to their extensive training and experience in managing complex ovarian masses (Timmerman et al. 2023). This highlights the need for continuous professional development and specialized training programs for general gynecologists to bridge the knowledge gap. Research by Medeiros et al. further highlights that the effectiveness of the RMI in improving diagnostic accuracy is significantly enhanced when users receive targeted training (Medeiros et al. 2009).

A critical analysis of the literature reveals that while the ADNEX model provides a more nuanced risk assessment by categorizing ovarian tumors into different histological subtypes, its adoption is still limited compared to the RMI (Sayasneh et al. 2015). This may be due to the more complex nature of the ADNEX model, which requires comprehensive ultrasound data and additional clinical information. In contrast, the RMI, which incorporates simpler parameters such as CA-125 levels, menopausal status, and ultrasound findings, is more straightforward to use and interpret (Meys et al. 2017). This simplicity likely contributes to its wider acceptance and application in various clinical settings. However, the reliance on CA-125 as a primary marker in the RMI has its limitations, particularly in premenopausal women and in cases of borderline tumors where CA-125 levels may not be elevated. As noted by Jacobs et al., while CA-125 is a valuable marker, its specificity and sensitivity can be influenced by various benign conditions (Jacobs et al. 1990).

Impact on clinical decision-making

The influence of the RMI and ADNEX models on clinical decisions regarding surgical intervention is evident from our results, which are corroborated by previous studies. The RMI and ADNEX models, by providing structured and evidence-based frameworks, significantly enhance the accuracy of diagnosing ovarian masses and guide decisions regarding surgical intervention. This is particularly critical in reducing unnecessary surgeries and improving patient outcomes. Geomini et al. reported that the use of the RMI significantly improved the accuracy of preoperative diagnosis, leading to better surgical planning and outcomes (Geomini et al. 2009). Despite its less frequent use, the ADNEX model's significant association with higher knowledge levels in our study suggests its potential utility in clinical practice. A study by Van Calster et al. also highlighted that the use of the ADNEX model improves diagnostic accuracy, thereby supporting more informed clinical decisions (Van Calster et al. 2014a). Kaijser et al. emphasized the model's effectiveness in providing detailed risk assessments that guide surgical decisions, particularly in differentiating between various types of ovarian tumors (Kaijser et al. 2013).

The study also identified key factors influencing surgical decisions, such as specific ultrasound morphological features, the presence of ascites, and tumor marker results, particularly CA-125. These factors are widely recognized in literature as critical determinants in the evaluation of ovarian masses. For instance, Timmerman et al. highlighted that specific ultrasound features, such as solid areas, multilocularity, and the presence of papillary projections, are strong predictors of malignancy (Timmerman et al. 2000). Similarly, the presence of ascites is a well-documented marker of advanced-stage ovarian cancer and is associated with poorer prognosis (Jacobs et al. 1990).

Moreover, the important role of CA-125, despite its limitations, has been reaffirmed in recent studies that suggest combining it with other biomarkers and imaging findings to improve diagnostic performance. For example, Moore et al. demonstrated that the Risk of Ovarian Malignancy Algorithm (ROMA), which combines CA-125 with HE4, provides superior diagnostic accuracy compared to CA-125 alone (Moore et al. 2019). This integrated approach can potentially reduce the rates of unnecessary surgeries and ensure timely intervention for malignant cases.

Our findings that a significant proportion of clinicians rely on RMI and, to a lesser extent, the ADNEX model for surgical decision-making are consistent with these observations. Over half of the respondents calculate the RMI, but a significantly lower percentage utilize the ADNEX model, reflecting broader trends. This disparity can be attributed to several factors, including the complexity of the models, as discussed earlier as well as the availability of necessary data, and varying levels of training and confidence among practitioners. Recent advancements in training and the dissemination of standardized guidelines have aimed to address these gaps. For example, educational programs that emphasize hands-on training and the practical application of these models have shown promise in enhancing clinician competence and confidence (Medeiros et al. 2009). Moreover, the integration of digital tools and online resources has facilitated access to these scoring models, potentially increasing their usage. Despite these advancements, challenges remain, particularly in ensuring that all clinicians, regardless of their location or institutional affiliation, have equal access to training and resources. This highlights the need for continued efforts to standardize education and training on these models, as well as the importance of ongoing research to identify and address barriers to their implementation.

Recent advancements in artificial intelligence (AI) and machine learning have shown the potential to enhance the predictive accuracy of these models, offering a promising avenue for future research and development. For example, studies have demonstrated that AI algorithms can analyze complex sonographic data more efficiently and accurately than traditional methods, potentially augmenting the capabilities of existing scoring models (Kaijser et al. 2013).

Furthermore, debates in literature highlight the need for continuous evaluation and refinement of these models. Some researchers argue for the inclusion of additional clinical variables and biomarkers to improve predictive accuracy, while others emphasize the importance of validating these models across diverse populations and clinical settings (Sayasneh et al. 2015). This underscores the dynamic nature of this field and the necessity for ongoing research to refine and adapt these models to evolving clinical needs and technological advancements.

The nuanced application of sonographic scoring models holds substantial potential to enhance patient management by accurately differentiating between individuals who are candidates for conservative management and those necessitating prompt surgical intervention. For instance, the ADNEX model's capability to classify ovarian tumors into distinct histological subtypes significantly enhances the precision and personalization of surgical planning, which can improve patient outcomes and reduce operative morbidity (Jacobs et al. 1990).

Exploring new directions

Addressing the moderate knowledge levels among gynecologists requires innovative educational interventions to improve understanding and application of sonographic scoring models. Developing comprehensive training programs and workshops focused on the practical use and interpretation of these models could address the knowledge gaps identified in this study. Incorporating these models into standard clinical protocols and guidelines could promote consistent and evidence-based practice. To further enhance the impact and utilization of sonographic scoring models, several future research pathways can be explored. First, barrier identification and overcoming strategies should be a focus. Research should delve into the barriers to the adoption of sonographic scoring models and identify strategies to overcome these challenges. Understanding the reasons behind the variability in model usage across different regions and healthcare settings can inform targeted interventions. Second, investigating the long-term outcomes of patients managed using these models could provide valuable evidence to support their routine use in clinical practice. Longitudinal studies can track patient progress and outcomes, offering insights into the effectiveness of the models over time. Third, studies examining the effectiveness of educational interventions in improving knowledge and the application of these models would also be beneficial. By assessing the impact of various training programs, researchers can determine the most effective methods for enhancing clinician competence in using sonographic scoring models. Lastly, the potential of emerging technologies, such as artificial intelligence and machine learning, to enhance the predictive accuracy of sonographic scoring models warrants exploration (Moore et al. 2019). Integrating these advanced technologies can lead to the development of more sophisticated and reliable diagnostic tools.

Strengths and limitations

This study offers valuable insights into the knowledge and application of sonographic scoring models among Saudi gynecologists, particularly focusing on the RMI and the ADNEX model. The research employed a methodologically robust approach, combining structured questionnaires and interviews to gather comprehensive data from a diverse sample of practitioners across different regions. The analysis, blending qualitative and quantitative methods, provided a nuanced understanding of factors influencing model adoption. Practical implications include actionable recommendations for targeted training and integration into clinical guidelines, potentially impacting healthcare practices positively.

Despite its strengths, the study has several limitations to consider. The sample size, while diverse, may not fully represent all gynecologists practicing in Saudi Arabia, limiting the generalizability of findings. Contextual factors such as variations in hospital settings and patient demographics were not extensively explored, which could influence model adoption rates. Additionally, the cross-sectional design restricts the ability to establish causal relationships over time, suggesting a need for longitudinal studies to track evolving practice patterns and intervention outcomes accurately.

Conclusions

This study reveals that gynecologists in Saudi Arabia are familiar with sonographic scoring models like RMI and ADNEX, although their application varies considerably. RMI is more commonly used. Since ADNEX provides more detailed analysis, expanded training is needed to increase its utilization. Specialists and experienced gynecologists demonstrate higher proficiency than general gynecologists and those with less experience, pointing to the need for targeted educational initiatives. Continuous medical education is vital for improving diagnostic accuracy and patient outcomes. Enhancing knowledge and application of these models will lead to more informed decisions and better management of ovarian masses, ultimately advancing gynecological practice in the region.

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Figure 1

Distribution of knowledge and experience levels of participants

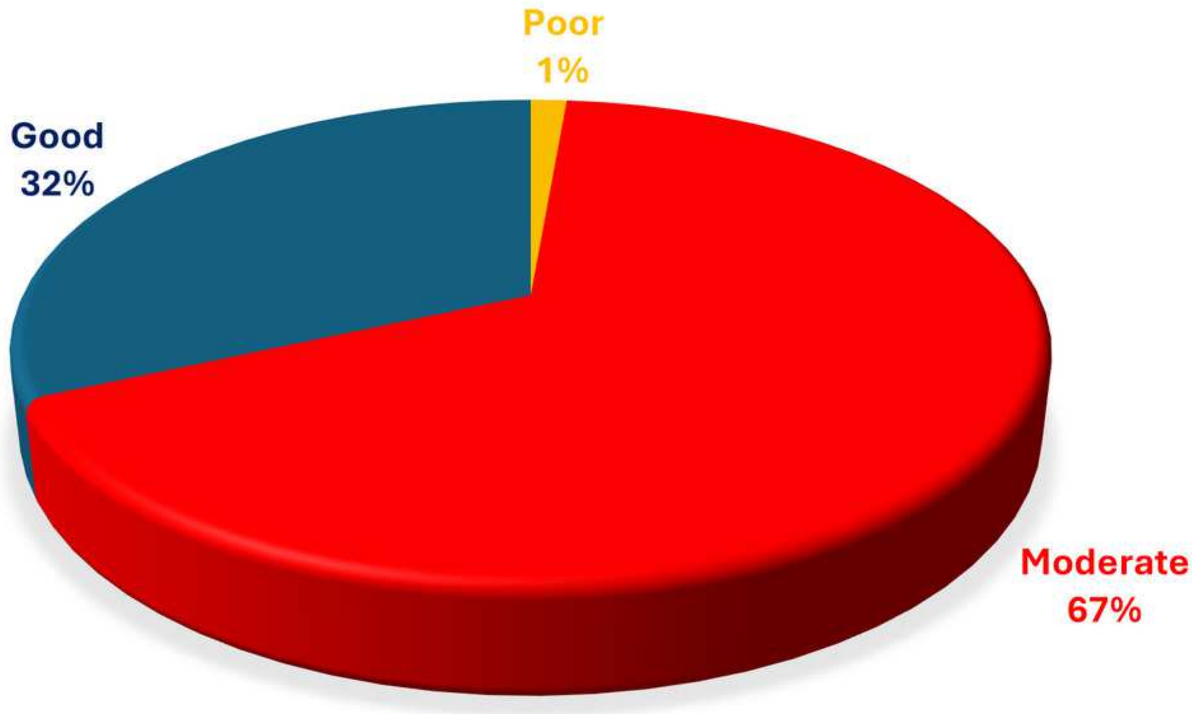

Table 1(on next page)

Validity and reliability of the questionnaire

Knowledge and experience level assessing questions	No. of items	Cronbach's Alpha based on standardized items
	7	0.631

Table 2 (on next page)

Demographic variables, some factors, and knowledge score of the study participants (n=148)

SD: Standard deviation; RMI: Risk of malignancy index; ADNEX: Assessment of Different NEoplasias in the adnexa

1

Variables	Scale	N (%), Mean ± SD
Gender	Female	114 (77.03)
	Male	34 (22.97)
Region	Asir	3 (2.03)
	Eastern Region	13 (8.78)
	Hail	1 (0.68)
	Jawf	1 (0.68)
	Jazan	2 (1.35)
	Madinah	12 (8.11)
	Makkah	49 (33.11)
	Qassim	6 (4.05)
	Riyadh	60 (40.54)
	Tabouk	1 (0.68)
Position	Gynecology oncology consultant	10 (6.76)
	Gynecology consultant	90 (60.81)
	Specialist	48 (32.43)
Experience (years)	2-5 years	14 (9.46)
	6-10 years	23 (15.54)
	11-15 years	33 (22.30)
	More than 15 years	78 (52.70)
Type of hospital	Secondary hospital (150 beds or more)	55 (37.16)
	Specialized hospital (Tertiary)	64 (43.24)
	Teaching and Research Hospital	29 (19.59)
Number of patients seen every week	Less than 10	13 (8.78)
	10 to 20	49 (33.11)

	21 - 30	39 (26.35)
	31 - 40	47 (31.76)
Calculate the RMI	Yes	79 (53.38)
	Some of them	34 (22.97)
	No	35 (23.65)
The version of RMI used	RMI I	61 (41.22)
	RMI II	20 (13.51)
	Other version (RMI IV)	6 (4.05)
Total score of RMI affects the decision for surgical intervention	Yes	60 (40.54)
	Some of them	48 (32.43)
	No	16 (10.81)
	Not applicable	21 (14.19)
Calculate ADNEX model	Yes	14 (9.46)
	Some of them	31 (20.95)
	No	103 (69.59)
Use other morphologic scoring systems	Yes	28 (18.92)
	Sometimes	23 (15.54)
	Rarely	7 (4.73)
	No	90 (60.81)
Knowledge score	Poor	13.50 ± 0.71
	Moderate	24.12 ± 2.84
	Good	29.79 ± 1.83

2

Table 3 (on next page)

Factors affecting the decision for surgical intervention

RMI: Risk of malignancy index; ADNEX: Assessment of Different Neoplasias in the adnexa;

MRI: Magnetic resonance imaging; CT: Computed tomography

Factors	N (%)
Overall ultrasound morphology of the ovary	88 (59.46)
Ovarian diameter and size	85 (57.43)
Specific features e.g. irregular walls, number of cysts, septation, solid areas, papillation or echogenicity	125 (84.46)
Presence of abnormal morphology bilateral	96 (64.86)
Presence of doppler signal in abnormal area	83 (56.08)
Presence of ascites	126 (85.14)
Results of tumor marker CA-125	124 (83.78)
Other tumor markers	86 (58.11)
RMI	112 (75.68)
ADNEX model	60 (40.54)
MRI	101 (68.24)
CT	72 (48.65)
Other considerations: general medical health and suitability for surgery	84 (56.76)
Patient wishes	74(50.00)

Table 4(on next page)

Analysis of knowledge and experience levels across socio-demographic variables and sonographic scoring model usage among the study participants (n=148)

RMI: Risk of malignancy index; ADNEX: Assessment of Different NEoplasias in the adnexa; *: Statistically significant

Variable	Category	Poor (%)	Moderate (%)	Good (%)	p-value
Gender	Female	2 (100.00)	74 (74.75)	38 (80.85)	0.722
	Male	0 (0.00)	25 (25.25)	9 (19.15)	
Work region	Asir	0 (0.00)	2 (2.02)	1 (2.13)	0.259
	Eastern Region	0 (0.00)	6 (6.06)	7 (14.89)	
	Hail	0 (0.00)	0 (0.00)	1 (2.13)	
	Jawf	0 (0.00)	1 (1.01)	0 (0.00)	
	Jazan	0 (0.00)	0 (0.00)	2 (4.26)	
	Madinah	0 (0.00)	8 (8.08)	4 (8.51)	
	Makkah	1 (50.00)	37 (37.37)	11 (23.40)	
	Qassim	0 (0.00)	5 (5.05)	1 (2.13)	
	Riyadh	1 (50.00)	40 (40.40)	19 (40.43)	
	Tabouk	0 (0.00)	0 (0.00)	1 (2.13)	
Position	Gynecology oncology consultant	0 (0.00)	3 (3.03)	7 (14.89)	**0.040***
	Gynecology Consultant	2 (100.00)	65 (65.66)	23 (48.94)	
	Specialist	0 (0.00)	31 (31.31)	17 (36.17)	
Experience (years)	11-15 years	0 (0.00)	22 (22.22)	11 (23.40)	0.345
	2-5 years	1 (50.00)	9 (9.09)	4 (8.51)	
	6-10 years	0 (0.00)	19 (19.19)	4 (8.51)	
	> 15 years	1 (50.00)	49 (49.49)	28 (59.57)	
Type of hospital	Secondary hospital (150 beds or more)	1 (50.00)	43 (43.43)	11 (23.40)	0.053
	Specialized hospital (tertiary)	0 (0.00)	39 (39.39)	25 (53.19)	
	Teaching and Research Hospital	1 (50.00)	17 (17.17)	11 (23.40)	
Number of patients seen every week	less than 10	1 (50.00)	9 (9.09)	3 (6.38)	0.243
	10-20	0 (0.00)	37 (37.37)	12 (25.53)	
	21-30	0 (0.00)	25 (25.25)	14 (29.79)	
	31-40	1 (50.00)	28 (28.28)	18 (38.30)	
Calculate the RMI	Yes	1 (50.00)	47 (47.47)	31 (65.96)	**0.003***
	Some of them	0 (0.00)	21 (21.21)	13 (27.66)	
	No	1 (50.00)	31 (31.31)	3 (6.38)	
Version of RMI used	RMI I	0 (0.00)	39 (39.39)	22 (46.81)	0.374
	RMI II	0 (0.00)	13 (13.13)	7 (14.89)	

	Other version (RMI IV)	1 (50.00)	4 (4.04)	1 (2.13)	
A total score of RMI affects the decision for surgical intervention	Yes	0 (0.00)	38 (38.38)	22 (46.81)	0.350
	Some of them	1 (50.00)	30 (30.30)	17 (36.17)	
	Not applicable	1 (50.00)	17 (17.17)	3 (6.38)	
	No	0 (0.00)	10 (10.10)	6 (12.77)	
Calculate ADNEX model	Yes	0 (0.00)	5 (5.05)	9 (19.15)	**0.019***
	Some of them	1 (50.00)	12 (12.12)	18 (38.30)	
	No	1 (50.00)	82 (82.83)	20 (42.55)	
Use other morphologic scoring systems	Yes	0 (0.00)	18 (18.18)	10 (21.28)	0.417
	Sometimes	1 (50.00)	12 (12.12)	10 (21.28)	
	Rarely	0 (0.00)	6 (6.06)	1 (2.13)	
	No	1 (50.00)	63 (63.64)	26 (55.32)	

Table 5 (on next page)

Ordinal regression analysis for knowledge and experience level and associated predictors

RMI: Risk of malignancy index; ADNEX: Assessment of Different NEoplasias in the adnexa; *: Statistically significant

		Estimate (95% Confidence Interval)	p-value
Knowledge and experience level = poor to moderate		-3.534 (-5.150 to 1.918)	**<0.001***
Knowledge and experience level = moderate to good		2.365 (1.119 to 3.610)	**<0.001***
Position	Gynecology consultant	-0.498 (-1.324 to 0.327)	0.237
	Gynecology oncology consultant	1.461 (-0.238 to 3.160)	0.092
	Specialist	Reference	
Calculate the RMI for the patient	Yes	1.557 (0.345 to 2.769)	**0.012***
	some of them	1.283 (-1.106 to 2.672)	0.07
	No	Reference	
Calculate the ADNEX model for the patient	Yes	1.684 (0.414 to 2.954)	**0.009***
	some of them	1.531 (0.575 to 2.487)	**0.002***
	No	Reference	