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Validity of Abdominal Ct Scan Scoring System in Distinguishing Benign and Malignant Ovarian Tumors

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ABSTRACT

Ovarian tumors are one of the most commonly found gynecological malignancies, with significant differences in characteristics between benign and malignant tumors. This study aims to obtain the validity of the abdominal CT scan scoring system in distinguishing benign and malignant ovarian tumors. This study is an observational study with a diagnostic test by analyzing 70 cases of ovarian tumors that have been confirmed through histopathology at Ngoerah Hospital. The variables analyzed included socio-demographic characteristics such as menarche age and family history of malignancy (breast or ovarian malignancy), tumor size, location, tumor components, wall thickness, septa, papillary projection, contrast enhancement, as well as additional findings such as ascites and pelvic organ invasion. Statistical analysis was performed to assess the relationship between these variables and the malignancy status of ovarian tumors. The analysis showed that parameters such as bilateral location, solid-cystic components, contrast enhancement, as well as the presence of ascites, thickening of the peritoneum, and invasion of the pelvic organs had a higher tendency to malignancy. The scoring system developed showed that the cut-off score of ≥4 had a sensitivity of 83.02% and specificity of 64.7%, positive predictive value of 88%, negative predictive value of 55%, with diagnostic accuracy of 78.57%. The abdominal CT scan-based scoring system developed in this study can help in assessing the malignancy of ovarian tumors with a fairly good level of accuracy. Nonetheless, further studies with larger samples are needed to improve the validity and reliability of this scoring system in clinical practice.

KEYWORDS Ovarian tumors, malignancies, CT scan of the abdomen, scoring system

INTRODUCTION

Ovarian cancer is one of the most common gynecological cancers, ranking third after cervical cancer and uterine cancer, and can affect the health status of women of all ages, including children, although its occurrence in children is rare. This cancer has the worst prognosis and the highest mortality rate. Although the prevalence of ovarian cancer is lower compared to breast cancer, it is three times deadlier, and it is predicted that by 2040, the death rate from this cancer will increase significantly. The high mortality rate of ovarian cancer is caused by asymptomatic and hidden tumor growth, symptoms that appear late, as well as the lack of proper screening, so diagnosis is often made at an advanced stage. Therefore, this cancer is known as the "silent killer" (Momenimovahed Z et al., 2019).

Based on data from the International Agency for Research on Cancer (*GLOBOCAN*) in 2020, ovarian cancer accounts for a total of 313,959 new cases worldwide, with a mortality rate of 207,252 people. In Indonesia, ovarian cancer ranks 10th among the most common cancers, with 14,979 new cases and a mortality rate of 9,581 people (Momenimovahed Z et al., 2019).

The cause of ovarian tumors is still unknown, but several risk factors can increase their incidence, namely age, obesity, family history, smoking, and a history of breast or colon malignancy, among others. The risk of ovarian malignancy increases with age. This is supported by studies showing that ovarian tumors often occur in women over the age of 40 and are closely related to menopause (Daniilidis A et al., 2012).

Ovarian tumors are generally asymptomatic (*asymptomatic*) in the early stages but become symptomatic in the advanced stages (Ebell et al., 2016; van Nagell & Miller, 2016). Up to 70–80% of ovarian tumor patients seek medical attention at an advanced stage, leading to a high mortality rate. The diagnosis of ovarian tumors requires anamnesis in the form of perceived symptoms, previous medical history, family medical history, physical examination, and supporting diagnostic tests. Delays in diagnosis can result in complications, treatment side effects, pain due to tumor spread, and increased mortality. The survival rate in early-stage disease is 70–90% within five years of diagnosis, while in the advanced stage, the five-year survival rate is less than 20% (Made N, Suastari P., 2018).

Given the above phenomenon, it is important to detect the malignancy of ovarian tumors early. The earlier the stage of ovarian malignancy is identified, the higher the survival rate. This underscores the importance of predicting ovarian malignancies as part of efforts to improve quality of life and reduce morbidity and mortality in patients with malignant ovarian tumors (Thomassin-Naggara I et al., 2013).

Generally, ovarian masses are initially evaluated using ultrasound. However, the diagnostic accuracy of ultrasound is highly dependent on the operator. Furthermore, certain conditions limiting the accuracy of transvaginal examinations, such as large mass size or virginity, may warrant the use of a CT scan (Thomassin-Naggara I et al., 2013).

CT is preferred for determining the early stages of ovarian cancer before treatment initiation. Additionally, CT scans can reveal a tumor's response to therapy and help detect persistent or recurrent disease. Furthermore, CT is more cost-effective and accessible than MRI (Areepongsa et al., 2023).

Early detection plays an important role in reducing mortality and morbidity among ovarian tumor patients. One tool for detecting ovarian tumors is the abdominal CT scan. The CT scan is the main modality for determining the stage of ovarian malignancy. In Indonesia, many hospitals still rely on CT scans to diagnose ovarian tumors. This is supported by research conducted by Razieh Deghani Firoozabadi, which found that CT scans have better diagnostic value than ultrasound and physical examination for detecting malignancies in the pelvic area (Firoozabadi RD et al., 2011).

Histopathology remains the gold standard for detecting ovarian tumor malignancy. A meta-analysis of histopathological examinations reported a sensitivity ranging from 96–99% and specificity ranging from 66–93%. This examination uses standard techniques, namely paraffin sectioning or *frozen section*,

which have long been accepted as suitable and highly accurate for clinical use, including in gynecological disorders (Geomini et al., 2015). However, not all health facilities have access to histopathological examinations. Therefore, abdominal CT scans are needed as a diagnostic tool for ovarian tumors, especially in health facilities where histopathology is not available.

There is limited research addressing the identification of benign and malignant ovarian tumors through a scoring system, for example, a modified computed tomography assessment system for ovarian tumors (Areepongsa et al., 2023), which has demonstrated high sensitivity and specificity. Given the absence of a dedicated CT scoring system to distinguish between benign and malignant ovarian tumors, the researchers decided to create a CT scoring system for that purpose, using pathological findings as the reference standard.

This study aims to evaluate the validity of each parameter in an abdominal CT scan scoring system for differentiating benign and malignant ovarian tumors by determining the weight of each parameter, developing a weighted scoring system, establishing an optimal cutoff point to distinguish between tumor types, and assessing the system's diagnostic accuracy using sensitivity, specificity, positive predictive value, and negative predictive value.

RESEARCH METHOD

Research Design

This study is an observational diagnostic test study. The design[A1] used was a *cross-sectional* study. All variables, including abdominal CT scan images used to compile scores and malignant diagnosis data, represent conditions measured over the same time period.

Place and Time of Research

This research was conducted at the Radiology Installation of *Ngoerah Hospital* Denpasar, from August 2024 to January 2025.

Scope of Research

This study falls within the fields of Radiology, Anatomical Pathology, and Gynecologic Oncology.

Population and Sample

The accessible population of this study consisted of patients with ovarian tumors who were referred to the Radiology Installation of *Ngoerah Hospital* Denpasar to undergo abdominal CT scans and had histopathological results available from January 2022 to December 2024. Samples were selected in total from the accessible population.

Data Collection Techniques

1. Data collection was performed using secondary data obtained from the medical records of patients diagnosed with ovarian tumors, retrieved from the medical records sub-section for the 2022–2024 period at *Ngoerah Hospital* Denpasar.
2. Sampling included all cases from the accessible population.
3. Abdominal CT images were accessed via the *PACS* system. These data were stored in separate files and subsequently evaluated by two radiology specialists with more than 10 years of experience in abdominal CT interpretation, based on identified CT image parameters.
4. Patients' histopathology results were taken from medical record data.

The results of these evaluations were compiled, recorded in a table, assessed for agreement, assigned scores, and then subjected to data analysis.

RESULTS AND DISCUSSION

Characteristics of Research Subjects

During the study period, 70 people with ovarian tumors were found to meet the inclusion and exclusion criteria. The majority of subjects experienced menarche at the age of ≥ 12 years, namely 59 people (84.3%), while 11 people (15.7%) experienced menarche under the age of 12 years. Only one person (1.4%) had a family history of violence, while the other 69 people (98.6%) had no such history. Based on tumor size, as many as 8 people (11.4%) had a tumor size of < 7 cm, while the majority, namely 62 people (88.5%), had a tumor size of ≥ 7 cm. In terms of location, there were 24 people (34.3%) with unilateral tumors and 46 people (65.7%) with bilateral tumors.

Based on tumor components, 14 people (20%) were found with cystic tumors, 14 people (20%) with solid-cystic tumors, 26 people (37.1%) with cystic-solid tumors, 9 people (12.8%) with solid tumors, and 7 people (10%) with solid tumors necrosis. The thickness of the tumor wall varied, of which 27 people (38.5%) had no tumor wall, 25 people (35.7%) had a 3 mm ≤ wall, and 18 people (25.7%) had a 3 mm > wall. Meanwhile, 41 people (58.5%) did not have septa, 19 people (27.1%) had a septa ≤ 3 mm, and 10 people (14.3%) had a septa > 3 mm. Most subjects (91.4%) did not have a papillary component, while 6 people (8.5%) had such a component. A total of 69 people (98.6%) experienced contrast enhancement, while only 1 person (1.4%) did not experience it.

In terms of other characteristics, as many as 23 people (32.8%) did not experience ascites, while 47 people (67.1%) experienced it. Peritoneal thickness ≤ 2 mm was found in 60 people (85.7%), while 10 people (14.9%) had a thickness of > 2 mm. A total of 45 people (64.3%) did not experience pelvic organ invasion, while 25 people (35.7%) did. In addition, 16 people (22.8%) did not have suspicious lymphadenopathy, while 54 people (77.1%) had it. From the results of histopathological examination, as many as 53 people (75.7%) had malignant histopathology, while 17 people (24.3%) had benign histopathology.

The Relationship of Menarche Age to the Malignancy Status of Ovarian Tumors

Based on the relationship between the age of menarche and the malignancy status of ovarian tumors, the following results were obtained: Of the 53 patients with malignant histopathology, 10 patients (90.9%) had a menarche age of < 12 years, while 43 patients (72.8%) had a menarche age of ≥ 12 years. Meanwhile, of the 17 patients with benign histopathology, 1 patient (9.0%) had a menarche age <of 12 years, and 16 patients (27.1%) had a menarche age of ≥ 12 years.

Logistic regression analysis showed that the odds ratio (OR) for patients with menarche age < 12 years compared to ≥ 12 years was 3.72 (95% CI: 0.44 – 31.44), with a p value of 0.228.

Table 1. Comparison of the malignancy status of ovarian tumors by age of menarche

Menarche Age	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
< 12 year	10 (90,9%)	1 (9,0%)	3,72 (0,44 – 31,44)	0,228
≥ 12 year	43 (72,8%)	16 (27,1%)		

The Relationship of Family Malignancy with Ovarian Tumor Malignant Status

Based on table 5.2.2 regarding the logistical regression test of the relationship between family malignancy history and ovarian tumor malignant status, the following results were obtained: Of the 53 patients with malignant histopathology, 1 patient (100%) had a family history of malignancy, while 52 patients (75.3%) did not have such a history. Meanwhile, of the 17 patients with benign histopathology, none had a family history of malignancy, and 17 patients (24.6%) had no family history of malignancies. From this analysis, a p of 0.568 was also obtained.

Table 2. Comparison of Ovarian Tumor Malignancy Status Based on Family History of Malignancy

History of violence in the family	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
Exist	1 (100%)	0	N/A	
None	52 (75,3%)	17 (24,6%)		0,568

Relationship of Size to Malignant Status of Ovarian Tumors

Based on the relationship between size and malignant status of ovarian tumors, the following results were obtained: Of the 53 patients with malignant histopathology, 6 patients (75%) had a tumor size of less than 7 cm, while 47 patients (75.8%) had a tumor size of ≥ 7 cm.

Meanwhile, of the 17 patients with benign histopathology, 2 patients (25%) had a tumor size of < 7 cm, and 15 patients (24.2%) had a tumor size of ≥ 7 cm.

Logistic regression analysis showed that the odds ratio (OR) for tumor size < 7 cm compared to ≥ 7 cm was 1.04 (95% CI: 0.19 – 5.73), with a p value of 0.96.

Table 3. Comparison of Ovarian Tumor Malignancy Status Based on Tumor Size

Size	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
< 7 cm	6 (75%)	2 (25%)		
≥ 7 cm	47 (75,8%)	15 (24,2%)	1,04 (0,19 – 5,73)	0,96

The Relationship of Location to Ovarian Tumor Wishful Status

Based on the table on the regression test between the location and the desired status of ovarian tumors, the following results were obtained: Of the 53 patients with Histopathology Desire, 15 patients (62.5%) had unilateral tumors, while 38 patients (82.6%) had bilateral tumors. Meanwhile, of the 17 patients with Histopathology Differently, 9 patients (37.5%) had unilateral tumors, and 8 patients (17.4%) had bilateral tumors.

Logistic regression analysis showed that the odds ratio (OR) for patients with bilateral tumors compared to unilateral was 2.85 (95% CI: 0.3 – 8.77), with a p value of 0.068.

Table 4. Comparison of Ovarian Tumor Wishful Status Based on Tumor Location

Unilateral/bilateral	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
Unilateral	15 (62,5%)	9 (37,5%)		
Bilateral	38 (82,6%)	8 (17,4%)	2,85 (0,93 – 8,77)	0,068

The Relationship of Tumor Components to the Desired Status of Ovarian Tumors

Based on the relationship between tumor components and ovarian tumor desirability status, the following results were obtained, from 53 patients with Histopathology Desire, 8 patients (57.1%) had tumors with cystic components, 12 patients (85.7%) had tumors with cystic solid components, 22 patients (84.6%) had tumors with solid cystic components, 6 patients (66.6%) had tumors with solid components, and 5 patients (71.4%) had tumors with solid necrosis components.

Meanwhile, of the 17 patients with Histopathology Differently: 6 patients (42.9%) had tumors with cystic components, 2 patients (14.3%) had tumors with cystic solid components, 4 patients (15.4%) had tumors with solid cystic components, 3 patients (33.3%) had tumors with solid components, and 2 patients (28.5%) had tumors with solid necrosis components.

Logistic regression analysis showed that compared to cystic tumors as references: cystic solid tumors had OR = 4.5 (95% CI: 0.71 – 28.1) with a p value of 0.108, solid cystic tumors had OR = 4.1 (95% CI: 0.91 – 18.5) with a p value of 0.064, solid tumors had OR = 1.5 (95% CI: 0.26 – 8.57) with a p value of 0.649, and solid tumors with necrosis had OR = 1.8 (95% CI: 0.26 – 13.2) with a p value of 0.528.

Table 5. Comparison of Ovarian Tumor Desired Status Based on Tumor Components

Tumor Components	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
Cystic	8 (57,1%)	6 (42,9%)		
Solid cystic	12 (85,7%)	2 (14,3%)	4,5 (0,71 – 28,1)	0,108
Cystic solid	22 (84,6%)	4 (15,4%)	4,1 (0,91 – 18,5)	0,064
Solid	6 (66,6%)	3 (33,3%)	1,5 (0,26 – 8,57)	0,649
Solid necrosis	5 (71,4%)	2 (28,5%)	1,8 (0,26 – 13,2)	0,528

The Relationship of Wall Thickness with Ovarian Tumor Desired Status

Based on the relationship between tumor wall thickness and ovarian tumor desirability status, the following results were obtained: Of the 53 patients with Histopathology Desire, 19 patients (70.3%) had no walls, 20 patients (80%) had a wall thickness of ≤ 3 mm, and 14 patients (77.7%) had a wall thickness of > 3 mm.

Meanwhile, of the 17 patients with Histopathology Differently, 8 patients (29.6%) had no walls, 5 patients (20%) had a wall thickness of ≤ 3 mm, and 4 patients (22.2%) had a wall thickness of > 3 mm.

The results of logistic regression analysis showed that compared to patients without walls, patients with a wall thickness of ≤ 3 mm had an odds ratio (OR) = 1.68 (95% CI: 0.46 – 6.06) with a Value p = 0.425, while patients with a wall thickness of > 3 mm had an OR = 1.47 (95% CI: 0.36 – 5.88) with a Value p = 0.583.

Table 6. Comparison of Desirean Status of Ovarian Tumors Based on Wall Thickness

Wall Thickness	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
None	19 (70,3%)	8 (29,6%)		
≤ 3 mm	20 (80%)	5 (20%)	1,68 (0,46 – 6,06)	0,425
> 3 mm	14 (77,7%)	4 (22,2%)	1,47 (0,36 – 5,88)	0,583

Relationship of Septa to Desirean Status of Ovarian Tumors

Based on the analysis of the relationship between septa and the desired status of ovarian tumors, the following results were obtained: Of the 53 patients with Histopathology Desire, 30 patients (73.1%) did not have septa, 15 patients (78.9%) had septa with a thickness of ≤ 3 mm, and 8 patients (80%) had septa with a thickness of >3 mm.

Meanwhile, of the 17 patients with Histopathology Differently, 11 patients (26.8%) did not have septa, 4 patients (21%) had septa with a thickness of ≤ 3 mm, and 2 patients (20%) had septa with a thickness of > 3 mm.

The results of logistic regression analysis showed that compared to patients who did not have septa, patients with septa ≤ 3 mm had an odds ratio (OR) = 1.37 (95% CI: 0.37 – 5.05) with a p value = 0.632, while patients with a septa > 3 mm had an OR = 1.46 (95% CI: 0.26 – 8.0) with a p value = 0.658.

Table 7. Comparison of Desirean Status of Ovarian Tumors Based on Septa

Septa	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
None	30 (73,1%)	11 (26,8%)		
≤ 3 mm	15 (78,9%)	4 (21%)	1,37 (0,37 – 5,05)	0,632
> 3 mm	8 (80%)	2 (20%)	1,46 (0,26 – 8,0)	0,658

The Relationship of Papillary Components with the Desired Status of Ovarian Tumors

Based on the relationship between the papillary component and the desired status of ovarian tumors, the following results were obtained: Of the 70 study subjects, 64 people (91.4%) did not have a papillary component, while 6 people (8.6%) had a papillary component. In the group without a papillary component, as many as 17 people (26.56%) had Differently tumors, while 47 people (73.44%) had Desire tumors. Meanwhile, in the group with a papillary component, all (100%) had Desire tumors.

The results of logistic regression analysis showed that because there were no cases of Differently in the group with a papillary component, the odds ratio (OR) could not be calculated (N/A), with a p value of 0.147.

Table 8. Comparison of Ovarian Tumor Desirean Status Based on Papillary Components

Papillary Components	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
None	47 (73,4%)	17 (26,5%)		
Exist	6 (100%)	0	N/A	0,147

The Relationship of Contrast Enhancement with the Desirean Status of Ovarian Tumors

Based on the relationship between contrast enhancement and the desired status of ovarian tumors, the following results were obtained; Of the 70 cases observed, 1 case had no contrast enhancement, and the case was identified as Differently (100%). On the other hand, of the 69 cases that showed contrast enhancement, 53 cases (76.81%) were Desire and 16 cases (23.19%) were Differently.

Since there were no cases of Desire in the group without contrast enhancement, the odds ratio (OR) could not be calculated (N/A). The value p = 0.075 indicates that this difference does not reach statistical significance (p > 0.05).

Table 9. Comparison of Desire Status of Ovarian Tumors Based on Contrast Enhancement

Contrast Enhancement	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
None	0	1 (100%)	N/A	
Exist	53 (76,81%)	16 (23,19%)		0.075

Relationship of Ascites with Ovarian Tumor Desirean Status

Based on the relationship between ascites and the desired status of ovarian tumors, the following results were obtained: Of the 53 patients with Histopathology Desire, 12 patients (52.17%) did not have ascites, while 41 patients (87.23%) had ascites. Meanwhile, of the 17 patients with Histopathology Differently, 11 patients (47.8%) did not have ascites, and 6 patients (12.7%) had ascites.

The results of logistic regression analysis showed that patients with ascites had an odds ratio (OR) = 6.26 (95% CI: 1.91 – 20.4) with a p value of 0.002, compared to patients without ascites.

Table 10. Comparison of Desirean Status of Ovarian Tumors Based on Ascites

Ascites	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
None	12 (52,17%)	11 (47,8%)		
Exist	41 (87,23%)	6 (12,7%)	6,26 (1,91 – 20,4)	0,002

The Relationship of Peritoneal Thickening with the Desirean Status of Ovarian Tumors

Based on the relationship between peritoneal thickening and the desired status of ovarian tumors, the following results were obtained: Of the total 70 patients analyzed, 60 patients had a peritoneal thickness of ≤2 mm, with a proportion of 28.33% (17 patients) diagnosed as benign and 71.67% (43 patients) as malignant.

Meanwhile, in the group with a peritoneal thickness of >2 mm (10 cases), all (100%) were diagnosed as malignant, with a p value of 0.053.

Table 11. Comparison of Desirean Status of Ovarian Tumors Based on Peritoneal Thickening

Peritoneal Thickening	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
≤ 2 mm	43 (71,6%)	17 (28,3%)		
> 2mm	10 (100%)	0	N/A	0,053

The Relationship of Pelvic Organ Invasion with the Desirean Status of Ovarian Tumors

Based on the relationship between pelvic organ invasion and ovarian tumor desirability status, the following results were obtained: Of the 53 patients with Histopathology Desire, 30 patients (66.6%) did not experience pelvic organ invasion, while 23 patients (92%) experienced pelvic organ invasion. Meanwhile, of the 17 patients with Histopathology Differently, 15 patients (33.3%) did not experience pelvic organ invasion, and 2 patients (8%) experienced pelvic organ invasion.

The results of logistic regression analysis showed that patients with pelvic organ invasion had an odds ratio (OR) = 5.75 (95% CI: 1.19 – 27.6) with a p value = 0.029, compared to patients who did not experience pelvic organ invasion.

Relationship of Suspicious Lymphadenopathy with Desirean Status of Ovarian Tumors

Based on the relationship between the presence of suspicious lymphadenopathy and the desirability status of ovarian tumors, the following results were obtained: Of the 53 patients with histopathology desire, 9 patients (56.2%) did not show suspicious lymphadenopathy, while the other 44 patients (81.4%) showed suspicious lymphadenopathy.

Meanwhile, of the 17 patients with Histopathology Differently, 7 patients (43.7%) did not show suspicious lymphadenopathy, and 10 patients (18.5%) showed suspicious lymphadenopathy.

The results of logistic regression analysis showed that patients with suspicious lymphadenopathy had an odds ratio (OR) = 3.42 (95% CI: 1.02 – 11.40) with a value p = 0.045, compared to patients with no suspicious lymphadenopathy.

Table 13. Comparison of Ovarian Tumor Desirean Status Based on Suspected Lymphadenopathy

Suspicious Lymphadenopathy	Histopathology		OR (95% CI)	Value *p*
	Desire	Differently		
None	9 (56,2%)	7 (43,7%)		
Exist	44 (81,4%)	10 (18,5%)	3,42 (1,02 – 11,40)	0,045

Discussion

The Relationship of Demographic Characteristics with Ovarian Tumor Status

This study involved 70 subjects with ovarian tumors, with histopathology results showing 75.7% benign (Desire) and 24.3% malignant (Differently) cases,

consistent with previous findings by Firoozabadi RD (44% malignant) and Ramayuda (15.9% malignant). Regarding menarche age, those with earlier onset (<12 years) showed a higher proportion of benign tumors (90.9%) compared to those with menarche ≥12 years (72.8% benign), though this difference was not statistically significant (p=0.228). While Tandarto et al. similarly found no significant link between menarche age and ovarian cancer (p=0.323), Pięta et al. (2012) suggested that early menarche (before age 11) nearly doubles ovarian cancer risk compared to later menarche (after 13), highlighting potential hormonal and ovulatory influences.

The higher benign tumor prevalence in the ≥12-year menarche group (72.8%) may stem from factors like reduced lifetime ovulation due to later menstruation onset, though nulliparity or lack of contraceptive use could still allow significant ovulation, aligning with the "incessant ovulation" theory linking frequent ovulation to ovarian cell damage and cancer risk. Additionally, benign ovarian tumors encompass diverse subtypes (e.g., invasive serous, endometrioid), which may have varying risk associations with late menarche—a nuance potentially underexplored in prior studies (Gong TT, 2013). These findings underscore the multifactorial nature of ovarian tumor development, where hormonal and histological complexities may obscure clear age-related patterns.

Family history of ovarian cancer showed no significant association with tumor type in this cohort, with only 1.4% of subjects reporting such history (p=0.568), mirroring Areepongsa O et al.'s results (p=0.176). An Odds Ratio could not be calculated due to zero malignant cases in the family-history group, but the nonsignificant p-value reinforces that genetic predisposition alone does not dictate tumor behavior. Non-genetic factors—including hormonal (nulliparity, late menopause), medical (endometriosis, obesity), and lifestyle (smoking, high-fat diets, asbestos exposure)—likely interplay to influence risk, explaining why patients without familial history may still develop benign or malignant tumors. This highlights the need for comprehensive risk assessment beyond genetics in clinical evaluations.

The Relationship between Abdominal CT Scan Images and Ovarian Tumor Status

The study analyzed 70 ovarian tumor cases, finding 75.7% benign (Desire) and 24.3% malignant (Differently) tumors. Tumor size showed no significant association with malignancy (OR=1.04, p=0.96), consistent with Areepongsa O et al. and Hu C.C et al. (2019) findings, though biologically malignant tumors often grow larger due to aggressive characteristics (Kurman, R.J., 2016). Interestingly, 75% of malignant cases under 7cm suggests some aggressive tumors may be detected early, while 24.2% of benign tumors ≥7cm indicate slow-growing lesions. Bilateral tumors showed higher malignancy rates (82.6% vs unilateral 62.5%, OR=2.85, p=0.068), approaching significance and aligning with Koonings P.P et al.'s report of 2.6× higher malignancy risk in bilateral cases (p<0.001). Tumor composition analysis revealed solid-cystic (85.7% malignant) and cystic-solid (84.6% malignant) patterns had elevated odds ratios (4.5 and 4.1 respectively), supporting Saha et al. (2022) findings that solid components indicate malignancy (p<0.001), though statistical significance wasn't reached in this study.

Wall thickness analysis showed non-significant trends, with ≤3mm walls having 80% malignancy rate versus >3mm at 77.7% (OR=1.68, p=0.425), consistent with Areepongsa O et al.'s non-significant results (p=0.422). Septa characteristics showed thicker septa (>3mm) had higher malignancy rates (80% vs ≤3mm at 78.9%), though statistically insignificant, contrasting Yashi et al.'s significant findings (p=0.002). Notably, all tumors with papillary components were malignant (100%, p=0.147), strongly suggesting malignancy despite statistical non-significance, aligning with Hu C.C et al. (2019) significant findings (p<0.001) though McCluggage et al. notes some malignant subtypes may lack typical papillary structures. Contrast enhancement showed 76.81% of malignant tumors had enhancement versus one benign case without (p=0.075), with Thomassin-Naggara et al. (2008) explaining malignant tumors' irregular vascularization enhances contrast uptake.

Ascites showed strong malignancy association (87.23% malignant with ascites vs 52.17% without, OR=6.26, p=0.002), supported by Thomassin et al. (p=0.006) and Saha et al (2022) (p<0.001), though benign conditions like Meigs syndrome can also cause ascites. Peritoneal thickening >2mm was exclusively malignant (100% vs ≤2mm at 71.6%, p=0.05), matching Thomassin et al.'s findings (p=0.006) regarding peritoneal implants. Pelvic invasion significantly predicted malignancy (92% malignant cases, OR=5.75, p=0.029), consistent with Tsili et al. (2008), though Chen VW (2003) notes some benign tumors may mimic invasive patterns. Suspicious lymphadenopathy showed significant malignancy association (81.4% vs 56.2%, OR=3.42, p=0.045), corroborated by Brown DL et al. (2020) (p<0.05), though 18.5% of benign cases showed reactive lymphadenopathy, particularly with conditions like Meigs syndrome or dermoid cysts, emphasizing the need for comprehensive evaluation beyond single parameters.

Abdominal CT Scan Scoring System to Determine the Desired Status of Ovarian Tumors

This study developed an abdominal CT scan scoring system to assess ovarian tumor malignancy, demonstrating that a cutoff score ≥4 provides reasonable diagnostic performance. The system showed 83.02% sensitivity (correctly identifying 44/53 malignant cases) and 64.7% specificity (correctly classifying 11/17 benign cases), with an 88% positive predictive value suggesting high likelihood of malignancy when scores exceed the threshold. However, the 55% negative predictive value indicates moderate accuracy in ruling out malignancy for low scores, necessitating additional clinical evaluation. These results align with Areepongsa O's 2023 findings (93.5% sensitivity, 81.6% specificity), though the current study's lower predictive values (88% PPV vs 95.3%; 55% NPV vs 75.6%) likely reflect differences in sample size and disease prevalence between populations.

The observed performance differences stem from distinct study characteristics: Areepongsa O's research included 153 malignant versus 38 benign cases, while this study analyzed 53 malignant and 17 benign tumors. The higher malignancy prevalence in referral hospital populations (like both study sites) naturally elevates positive predictive values while reducing negative predictive values. This underscores how diagnostic test interpretation must consider local

disease prevalence, particularly when applying the scoring system in non-referral settings with lower malignancy rates. The ROC curve's AUC of 0.824 confirms the system's good discriminatory capacity, with values approaching 1.0 indicating excellent differentiation between benign and malignant classifications.

Discrepancies occurred in 6 malignant cases scoring <4 and 9 benign cases scoring ≥4. False negatives may arise from malignancies mimicking benign features (e.g., well-differentiated serous carcinomas appearing cystic) or early-stage tumors lacking typical aggressive characteristics (Taylor E, 2021). Conversely, false positives often involved benign tumors like mucinous cystadenomas displaying suspicious solid-cystic components or borderline lesions with ambiguous features. The system achieved 78.57% overall accuracy, though performance is influenced by factors like the predominance of malignant cases (53 vs 17 benign) and inclusion of borderline tumors as malignant - a clinically prudent approach given their malignant potential and treatment implications, albeit potentially reducing specificity.

Key limitations include the modest sample size affecting statistical power and confidence intervals, along with potential referral bias from studying a tertiary care population with higher malignancy prevalence than general practice settings. The exclusive hospital-based recruitment may overrepresent complex benign cases with concerning features, while classifying borderline tumors as malignant (though clinically justified) could inflate false positives. Despite these constraints, the scoring system provides a practical tool for malignancy risk stratification, offering good sensitivity and reasonable accuracy to support clinical decision-making, particularly when interpreted alongside other diagnostic findings and with awareness of its performance characteristics across different prevalence settings. Future validation in more diverse populations could strengthen its generalizability.

CONCLUSION

Based on the results and discussions presented, the following conclusions can be drawn: Thirteen parameters were analyzed, four of which were significant for determining the status of ovarian tumors, namely ascites, peritoneal thickening > 2 mm, pelvic organ invasion, and suspicious lymphadenopathy. Meanwhile, two additional parameters — unilateral/bilateral (*location*) and tumor *components* (cystic-solid and solid-cystic) — although not statistically significant, showed high odds ratios and could therefore provide additional weight to increase validity. In the combined scoring system, a cut-off point of ≥ 4 indicates a *desire* ovarian tumor, while < 3 indicates a *differently* ovarian tumor. The validity test conducted on the abdominal CT scan score for determining the status of ovarian tumors yielded a sensitivity of 83.02% (70.2–91.9), specificity of 64.7% (38.3–85.8), positive predictive value of 88% (95% CI: 75.7–95.5%), negative predictive value of 55% (95% CI: 31.5–76.9%), and accuracy of 78.57%. This abdominal CT scan scoring system demonstrates good ability to detect *desire* tumors, with high sensitivity and fairly good accuracy.

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