Diagnostic Accuracy of Transvaginal Versus Transabdominal Ultrasonography for Diagnosing Adnexal Masses

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ABSTRACT

Objectives: Our study compares the diagnostic effectiveness of transvaginal and transabdominal ultrasonography for finding adnexal lesions.

Materials and methods: This comparative study was conducted at Tikrit teaching hospital. 130 women participated in this study. We take into account factors like aged, gender, menstrual irregularities (Oligomenorrhea/Menstrual Periods), infertility, repeated multiple miscarriages, series of actions, acne vulgaris, and obesity once written agreement has been acquired. The location, size, boundaries, hypoechoic, and dilatation of ovarian lesions were all included in the ultrasound data. Group I had transabdominal ultrasound with MRI, and group II included 65 patients and underwent transvaginal ultrasound. All patients were compared for the frequency of adnexal mass using the histology data (positive/negative). All data were examined with SPSS 24.0.

Results: Patients mean age in group I was 31.7±15.48 years and had mean BMI 26.11±5.37 kg/m² and in group I mean age was 29.6±21.87 years with mean BMI 24.19±15.58 kg/m². The most prevalent issue across all instances was infertility and cycle irregularity. With a p value <0.004, we determined that group II had a lower frequency of adnexal mass than group I. Transvaginal sonography was shown to have poorer specificity, positive predictive value, and negative predictive value than transabdominal sonography.

Conclusion: We concluded that the utilization and effectiveness of abdominal ultrasonography in conjunction with MRI was superior in terms of spotting adnexal masses with real levels of specificity and sensitivity.

Keywords: Accuracy, Adnexal Masses, Complications, Transvaginal ultrasonography, Transabdominal ultrasonography.

INTRODUCTION

Due to the possibility of cancer and the difficulty in precisely distinguishing between benign and malignant lesions before surgery and histology, ovarian lesions are particularly significant in medical practice. Therefore, the evaluation of[1] ovarian lesion is primarily focused on the assessment and pre-operative diagnosis. A definitive diagnosis, however, cannot be achieved without a diagnostic of the histological tissue. To justify the[2] risk of surgery, clinicians must thus assess the chance of cancer using clinical and radiological evidence. Malignant ovarian mass is 46% common, according to a research by Ahmad A *et al*.[3]. It has taken a lot of study to analyze and create efficient screening technologies for the early and precise identification of ovarian cancer since patients with ovarian masses typically do not experience any symptoms. The most common screening method used now is serum detection of the tumor marker CA-125[4,5]. Imaging is used for ovarian mass detection as well as ovarian mass classification as benign or malignant, including the detection of unusual imaging signals that may indicate malignant disease. Due to its accessibility, affordability, and high sensitivity in detecting ovarian masses, ultrasound is the initial imaging modality that is most frequently used to assess women who are suspected of having ovarian lesions. The pelvic soft tissue structures' acoustic impedance, poor resolution, the poor transmission of ultrasound pulses in obese patients, and the presence of ovaries outside the transducer's focal region prevented previous studies using transabdominal ultrasound to assess pelvic pathology from producing satisfactory results[6].

For the identification of ovarian[7,8] and pelvic endometriosis, transvaginal sonography (TVS) is the primary imaging method advised. Ohba et al[34] used transrectal sonography (TRS) and discovered that although endometriosis affected uterosacral ligaments showed as thick and uneven arcs on both sides of the uterine cervix, normal uterosacral ligaments did not. According to Fedele et al.[33], TRS was effective for assessing endometriotic involvement of the rectovaginal septum, vagina, and rectum. Rectal endoscopic sonography was discovered to be the most effective method for detecting rectovaginal and uterosacral involvement by Chapron et al.[9]. Adnexal masses are one of the most prevalent pathologic disorders found in gynecological practice. To determine the best course of action for such individuals, a precise diagnosis is necessary. Malignant masses should be sent to tertiary care facilities for correct diagnosis and therapy while benign masses can be managed conservatively or with minimally invasive techniques[1,2]. When determining whether an adnexal tumor is benign or cancerous, ultrasound is a noninvasive, widely accessible technique. On the basis of ultrasound and Color Doppler results, it is conceivable to infer cancer, but a conclusive diagnosis cannot be made[2]. In order to more accurately forecast malignancy by acquiring intratumoral blood flow velocity waveforms to determine the resistive index (RI), Doppler

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ultrasonography is frequently paired with two-dimensional ultrasound examination of adnexal lesions[10].

Since there aren't enough qualified examiners and certain areas don't have access to them, a variety of ultrasound-based prediction models have been created to reliably distinguish between benign and malignant tumors[11]. The Risk of Malignancy Index (RMI), a prediction model that takes menopausal state, ultrasound findings, and serum cancer antigen (CA) 125 levels into consideration, is advised by various national recommendations[12]. But the RMI's diagnostic performance is subpar, and the calculations required to calculate it take a long time. In 2000, the International Consortium for Ovarian Tumor Analysis (IOTA) group provided a consensus statement on the ultrasound imaging characteristics of adnexal tumors. Subsequently, other diagnostic models, such as the logistic regression model 2, simple ultrasonography-based rules, or Simple Rules (SRs) model, and the Assessment of distinct NEoplasias in the adneXa (ADNEX) model, were developed and validated[13]. The SRs model is simple to use and has acceptable diagnostic performance, although it is not appropriate for all adnexal masses, according to the results of earlier external validation investigations. There is yet no study comparing the diagnostic accuracy of the aforementioned models in a Chinese context, despite the ADNEX model's great performance at distinguishing between malignant and benign tumors[14] and identifying the phases of malignant tumors.

Computerized tomography (CT), MRI, and other imaging methods are used to diagnose gynecological and obstetric disease. Due to its affordability and convenience of use, ultrasound scan is frequently utilized for gynecological and obstetric pathologies. It seems to have good sensitivity (89-100%) and specificity (73-83%) for ovarian lesions Transvagival sonography (TVS) has been found to be more accurate than transabdominal sonography (TAS) in the majority of pelvic pathology patients, according to Qureshi et al. The extent of a tumor and any metastatic illness can be precisely determined using CT scans. Contrast-enhanced CT (CECT) examinations are superior to low dose nonenhanced CT scans in that they provide better delineation of anatomical features and higher sensitivity for spotting pathological lesions[15]. For pelvic disorders, ultrasound is the most common and effective imaging technique[16]. Transvaginal sonography (TVS) or transabdominal ultrasound examination (TAS) are now the two types of pelvic sonography that are most often used. A 3-5 MHz transducer can observe the uterus and ovaries at a depth of 10-15 cm when using TAS since a full urine serves as an acoustic window. The same transducer is used in TVS to see the same tissue at a depth of 1 to 8 cm. Unquestionably, TVS provides a realistic picture of the pelvic area. Numerous pelvic conditions, including polycystic ovarian syndrome, polyp size and texture, infertility (follicular surveillance and endometrial examinations), endometriosis, and the staging of gynecological tumors have all been investigated with the TVS. TAS may be used to differentiate between healthy and cancerous growths, which is advantageous in a variety of circumstances[17]. Evaluation of soft indications, such as ovarian movement, pain, or vanished Moore pouches, may be more accurate and sensitive than TAS in the event of large masses or fluid collections[17]. Patients who are overweight, have a retroverted uterus, or have problems such wide pelvic adhesions or gas-filled bowels all benefit better with TVS.

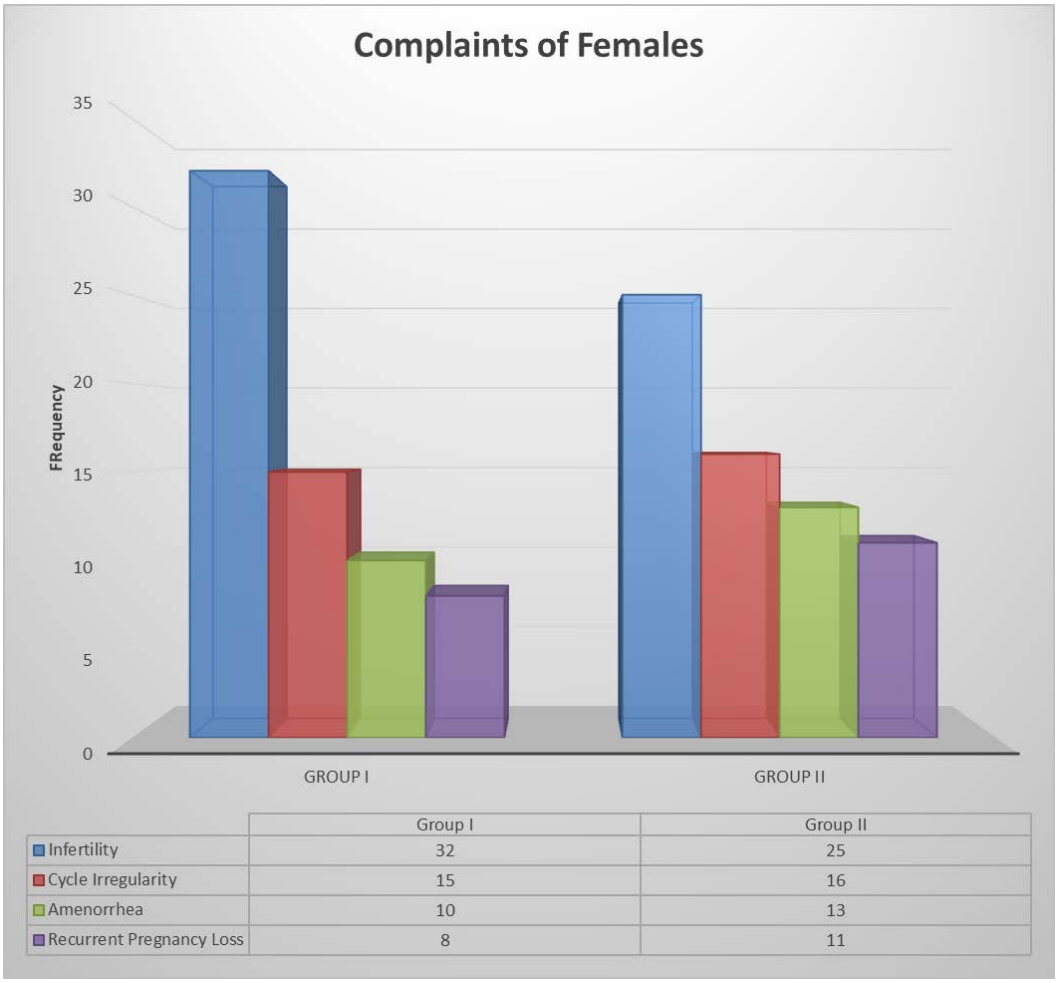
Numerous ultrasound-based algorithms for forecasting have been developed to accurately differentiate between malignant tumors due to a shortage of skilled specialists and their inaccessibility in some locations[18]. The Result of Cancer Score (RMI), an estimation model supported by numerous national standards, takes postmenopausal status, serum cancer antibody (CA) -125 levels, and ultrasound results into account. The RMI's diagnostic performance, however, falls short of expectations, and the procedures used to produce it take a long time[9]. Other diagnostic models, including the model of logistic regression 2, the Simple Regulations (SRs) model, and the Analysis of divide NEoplasias in the adneXa (ADNEX) approach, were created and validated in the years following the International Ovarian Tumor Evaluation (IOTA) organization's 2000 presentation of an agreement on the ultrasound characteristics of adnexal tumours[10]. The need specification approach has been shown in prior objective assessment studies to have a good diagnostic performance and to be straightforward to apply, although it is not suitable for all adnexal masses[19]. Ectopic pregnancies are being confirmed or ruled out via ultrasound. The authors propose an algorithm that would appear helpful for the clinical evaluation of ectopic pregnancy suspicions, which is based on the findings of abdominal sonographic study. For the quick identification, presence, and location of pregnancy, ultrasound is a low-cost, widely available, straightforward, quick, and noninvasive diagnostic tool. An abdominal ultrasonogram's accuracy can be affected by obesity, an underfilled bladder, and pelvic gas, all of which can hide structures[20]. The current study aimed to evaluate the transvaginal and transabdominal methods of ultrasonography's accuracy in detecting pelvic masses.

MATERIAL AND METHODS

This comparative study was conducted at Tikrit teaching hospital and individuals who were referred from the Department of Obstetrics and Gynecology for suspected pelvic masses over the course of a year were included in the study. After receiving informed, written agreement, comprehensive demographic information on the enrolled cases was collected. Patients undergoing adnexal mass surgery, those with a validated biopsy report, those with a history of contrast sensitivity, those with a contraindication to contrast-enhanced magnetic resonance, and those with any type of chronic illness were all not included. Women in this study ranged in age from 18 to 45. The location, size, boundaries, echogenicity, the soft tissue component, septations, and nodularity of ovarian lesions were used to assign a grade to each one. In group I, 65 patients had transabdominal ultrasound and MRI, whereas in group II, 65 patients obtained transvaginal ultrasound. Based on their echo patterns and features, ovarian masses with papillary projection, solid components, significant septations (greater than 3 mm), loculations, loose fluid, and spreading deposit accu0mulations were classified as malignant lesions. It was determined that the calcification was not malignant if it was confined inside a mass which was at least 3mm thick and if there was fat. We searched for features suggestive of malignancy, such as a high signal intensity on T1 images as well as low signal strength on T2 images, apical projection, solid part septations larger than 3mm, and free fluid, to determine if an abnormality was malignant. All of the information was examined and analyzed by a consultant radiologist (with a minimum of five years of post-fellowship experience). All patients had surgery in a suitable surgical ward; following the procedure, a specimen was obtained for histology, and the results were evaluated by a consultant pathologist. Qualitative traits' frequency and percentage distributions were examined. Between transvaginal ultrasonography and transabdominal sonography, the sensitivity, specificity, predictive value, negative predictive value, and diagnostic performance of malignant and benign adnexal masses were assessed. Using SPSS version 24.0, the entire data set was examined.

RESULTS

Patients mean age in group I was 31.7±15.48 years and had mean BMI 26.11±5.37 kg/m^2 and in group I mean age was 29.6±21.87 years with mean BMI 24.19±15.58 kg/m^2. In group I parity was 3.1±4.11 while in group II 2.9±3.7 was parity. There were 34 cases in group I and 28 in group II were literate. Majority of the cases among both groups were had urban residency (table 1).



	Group I	Group II
Infertility	32	25
Cycle Irregularity	15	16
Amenorrhea	10	13
Recurrent Pregnancy Loss	8	11

Figure 1: Frequency of complaints among presented females

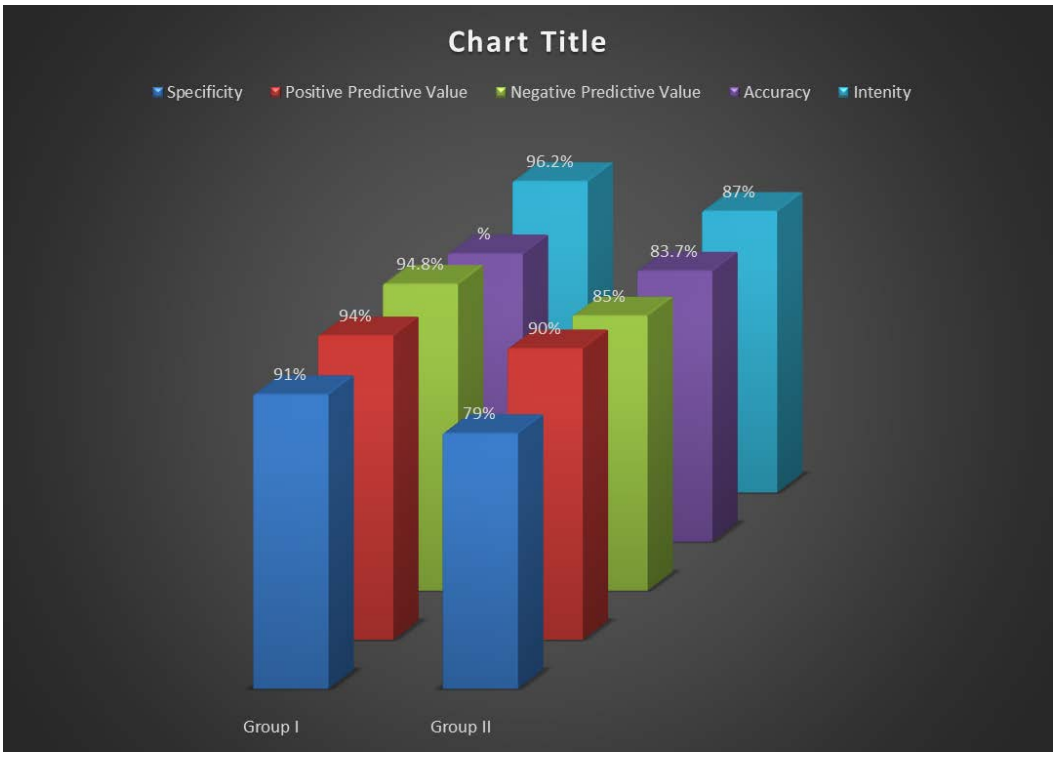


Figure 2: Assessing precision in relation to intensity and specificity

Table 1: Females with detailed demographics

Variables	Group I	Group II
Mean age (years)	31.7±15.48	29.6±21.87
Mean BMI (kg/m^2)	26.11±5.37	24.19±15.58
Mean Parity	3.1±4.11	2.9±3.7
Education status		
Educated	34 (52.3%)	28 (43.1%)
Non-educated	31 (47.7%)	37 (56.9%)
Place of Living		
Urban	37 (56.9%)	39 (60%)
Rural	28 (43.1%)	26 (40%)

The most prevalent complaint across all females was infertility and cycle irregularity followed by amenorrhea and recurrent pregnancy loss among both groups (figure 1).

In group I frequency of diagnosed adnexal masses was higher found in 45 (69.2%) as compared to group I in 33 (50.8%) cases significantly with p value <0.004 (table 2).

Table 2: Comparison of diagnostic adnexal masses

Variables	Abdominal Ultrasonography	Transvaginal Ultrasonography	P Value
Adnexal Masses			
Yes	45 (69.2%)	33 (50.8%)	
No	20 (30.8%)	32 (49.2%)	0.004

There were 49 (75.4%) benign cases and 16 (24.6%) malignant cases in group I while in group II 42 (64.6%) were benign and 23 (35.4%) were malignant cases (Table 3).

Table 3: Findings from histopathology for both groups

Histopathological Results	Group I	Group II
Benign	49 (75.4%)	42 (64.6%)
Malignant	16 (24.6%)	23 (35.4%)
Total	65 (100%)	65 (100%)

Among 45 cases of adnexal masses in group I cystic unilocular was the most common structure followed by cystic multilocular, solid and mixed solid and cystic while in group 33 cases of group II solid structure was most common in all cases followed by cystic unilocular, mixed solid/cystic and cystic multilocular (table 4).

Table 4: Masses distribution with different structures

Adnexal Mass Structures	Group I (n=45)	Group II (n=33)
cystic unilocular	25 (55.6%)	10 (30.3%)
cystic multilocular	11 (24.4)	2 (6.1%)
solid	6 (13.3%)	15 (45.55)
mixed solid and cystic	3 (6.7%)	6 (18.2%)

Transvaginal sonography was shown to have poorer specificity, positive predictive value, and negative predictive value than transabdominal sonography with p value <0.003 (figure 2).

DISCUSSION

Although in the[21] presence of general anesthetic, pelvic examination has significant difficulties in the detection of adnexal diseases. Diagnostic ultrasonography, in contrast, has a high sensitivity for finding ovarian masses. Its specificity for classifying an ovarian mass as benign or malignant is limited, and its sensitivity for detecting stage I ovarian cancers is about 50%. False-positive results from ovarian cancer ultrasound screening in asymptomatic women can result in needless operations for benign tumors[22]. But the final image loses sharpness since it has to pass through the abdomen and other similar structures. Transvaginal sonography is a new technique for pelvic imaging that avoids a number of the limitations of more conventional transabdominal scanning. A transvaginal transducer can accurately determine an incomplete abortion, an ectopic pregnancy, or an early embryo[23]. Its use may be very helpful in the evaluation of infertile patients and the monitoring of follicular expansion. Transvaginal sonography has recently been employed in transvaginal cyst aspirations and foetal cephalocentesis for acute hydrocephalus[24].

In current study 130 females were presented and categorized equally in two groups. Patients mean age in group I was 31.7±15.48 years and had mean BMI 26.11±5.37 kg/m^2 and in group I mean age was 29.6±21.87 years with mean BMI 24.19±15.58 kg/m^2. In group I parity was 3.1± 4.11 while in group II 2.9±3.7 was parity. Our findings were equivalent to those of earlier research[25]. Infertility and irregular cycles were the most prevalent complaints across all patients. Our findings supported previous study that indicated infertility and irregular menstrual cycles were the most often reported symptoms. A lack of or irregular menstruation, abnormal vaginal bleeding, acne, hirsutism, and obesity are a few of the patient's symptoms. This population is substantially more prone to experience endometrial cancer, recurrent miscarriages, infertility, type 2 diabetes, hypertension, and type 2 diabetes[26]. In abdominal group, frequency of diagnosed adnexal masses was higher found in 45 (69.2%) as compared to transvaginal group in 33 (50.8%) cases significantly with p value <0.004. Particularly useful was the transabdominal method in distinguishing solid from cystic tumours (including simple and complex cysts). Among 45 cases of adnexal masses in group I cystic unilocular was the most common structure followed by cystic multilocular, solid and mixed solid and cystic while in group 33 cases of group II solid structure was most common in all cases followed by cystic unilocular, mixed solid/cystic and cystic multilocular. If additional testing finds that a pelvic tumor is actually a cyst, surgical removal may not be necessary. In this situation, transvaginal sonography offers a lot of therapeutic promise. Since trans abdominal ultrasonography was introduced for the assessment of pelvic disease, the quality of detailed imaging examination of the pelvic organs has substantially increased. Pelvic ultrasound is a non-invasive, widely accessible, and affordable imaging technique, and if possible, transabdominal ultrasound should be chosen over transvaginal ultrasound since it has greater sensitivity and specificity[27,28].

There were 49 (75.4%) benign cases and 16 (24.6%) malignant cases in group I while in group II 42 (64.6%) were benign and 23 (35.4%) were malignant cases. Among 45 cases of adnexal masses in group I cystic unilocular was the most common structure followed by cystic multilocular, solid and mixed solid and cystic while in group 33 cases of group II solid structure was most common in all cases followed by cystic unilocular, mixed solid/cystic and cystic multilocular. Transvaginal sonography's specificity, positive value for prediction, and negative predictive value were all shown to be inferior to those of transabdominal sonography. The degree of specificity of auditory and chemical characteristics, according to Marret H, is 80% & 93%, respectively[29]. Trans-abdominal ultrasound has a positive predictive accuracy (PPV) of 1.5%, a specificity of 97%, and a sensitivity of 100% for detecting adnexal malignant tumors. According to a study, MRI is a reliable diagnostic method for determining adnexal masses (benign vs malignant) since it is 95% sensitive and 94% specific for doing so[30].

In a second research, gadolinium-enhanced MRI had an accuracy rate of 93% and detected 91 normal and 96 aggressive adnexal masses in 94% of the cases[31]. The utilization of laparoscopic adnexal mass ectomy in 96 adolescents was the subject of research by Yogini KD et al. It is possible to properly and safely treat adolescent adnexal masses using laparoscopic surgery and ultrasonography, which have both been demonstrated to be the gold standards in pre-examinations to determine whether an item is benign in origin[32].

In current study, transvaginal sonography was shown to have poorer specificity, positive predictive value, and negative predictive value than transabdominal sonography with p value <0.003. Fedele *et al.*[33] reported a sensitivity and specificity of 80% (8/10) and 97% (127/130), respectively, for uterosacral ligament involvement. This discrepancy could be explained by the small number of uterosacral ligaments analyzed in the latter study[33]. In our experience, retroflexed uterus, subserous leiomyoma and endometriotic ovarian cysts lying on the uterosacral ligament, which hide the insertion and proximal part of this ligament, hinder TVS diagnosis. Using TRS, Ohba *et al.*[34] demonstrated that the thickness of the uterosacral ligaments depended on the point of measurement. Indeed, the mean thickness of the normal uterosacral ligament, at its insertion on the torus uterinum, and in its medial and posterior portions, was 18.1, 11.7 and 5.6 mm, respectively.

TVS Doppler USG sensitivity and specificity were determined to be 98% and 94%, respectively, in contrast to our work by Gupta et al. They took localisation of the vasculature within the ovarian tumor into consideration in addition to the detection of color flow. They took into account uterine fibroids and endo16 metrial carcinomas as well as other pelvic masses besides ovarian tumors[35]. Twelve studies analyzing ultrasound results were included in Wattar et al.'s meta-analysis[36] of the diagnostic evaluation of ultrasound, CT, and MRI (magnetic resonance imaging) for the diagnosis of adnexal torsion. Both surgical results and clinical follow-up were utilized as the reference standard in this meta-analysis's included studies. Because spontaneously detorsion can happen and instances with adnexal torsion may be labeled as true-negative cases, including research utilizing clinical follow-up as the standard of reference could result in bias. Additionally, there was no detailed investigation of the various ultrasonography signals. Only case-control studies underwent qualitative synthesis, and studies utilizing ultrasonography, CT, and MRI did not present the data separately.

CONCLUSION

We came to the conclusion that the utilization and effectiveness of abdominal ultrasonography in conjunction with MRI was superior in terms of spotting adnexal masses with real levels of specificity and sensitivity.

AUTHORS' DECLARATION STATEMENTS

Ethics approval and consent to participate: Ethical approval was obtained from Research and Ethical Review Committee of Tikrit National Hospital and College of Medicine- Tikrit University-Iraq. Ref: App. 549-2023-TUCAM.

Availability of the data and material: The data used in this study are available and will be provided by the corresponding author on request.

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Potential Conflicts of Interest: None

Competing Interest: None

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