



International Journal of Medical and All Body Health Research

Evaluation of diagnostic accuracy of ultrasound in detection of ectopic pregnancy and its correlation with clinical and intraoperative findings

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Article Info

ISSN (online): 2582-8940

Volume: 03

Issue: 04

July-September 2022

Received: 14-11-2022;

Accepted: 04-12-2022

Page No: 64-67

Abstract

Aim and objectives: To evaluate the diagnostic accuracy of ultrasound to detect ectopic pregnancy and correlating it with intraoperative findings.

Materials and method: This was a descriptive, prospective hospital-based study. It was conducted among all UPT positive women showing no signs of intra-uterine pregnancy on ultrasound. Categorical variables are presented as absolute numbers and percentage. The software used for the statistical analysis were SPSS (statistical package for social sciences) version 26.0.

Results: According to specific findings, 15 women (13.6%) had extra-uterine gestational sacs containing foetal poles and/or yolk sacs without cardiac activity, and 10 (9.1%) of pregnant women had positive foetal cardiac activity. Non-specific ultrasound imaging results revealed complex masses in 8 (7.2%), 67 (60.9%) with free fluid and 10 (9.1%) with free abdominal fluid. The Sensitivity of USG in diagnosis of ectopic pregnancy was 97.3%.

Conclusion: Ultrasound is highly sensitive and reliable tool for detecting ectopic pregnancy in the study population.

Keywords: pregnancy, ectopic, ultrasound

Introduction

When a fertilised ovum implants outside of the typical uterine cavity, an ectopic pregnancy results ^[1-3]. It frequently leads to morbidity and, sporadically, fatality in women who are of reproductive age ^[4]. The global incidence of ectopic pregnancy is 1-2 in 100 pregnancies. Most patients present with 5 to 9 weeks of amenorrhea, mild pelvic pain and vaginal spotting which triggers the evaluation of ectopic pregnancy. More often, patient symptoms combined with serial ultrasonography and trends in beta human chorionic gonadotropin levels are used to make the diagnosis.

Ectopic pregnancy is difficult to diagnose. Findings can occasionally be vague and resemble a number of other clinical disorders. On the basis of clinical symptoms alone, less than half of patients with ectopic pregnancy may be correctly identified ^[5]. Improvements in medical biochemistry and biophysics have led to better diagnostic accuracy, which has decreased morbidity and death ^[6].

Even while ectopic pregnancy is a less common cause of maternal death than other reasons, the accompanying morbidity is sometimes severe, which has a negative impact on fertility and obstetric outcomes ^[7].

About 6-16 percent of women with ectopic pregnancies visit the emergency room due to first trimester bleeding, discomfort, or both ^[8]. This has a direct correlation to a rise in the prevalence of pelvic inflammatory illness ^[9]. Both ruptured and enruptured cases can have symptoms ^[10]. Any woman of reproductive age who exhibits these symptoms, particularly if she has risk factors for an extrauterine pregnancy, should be suspected of having an ectopic pregnancy ^[11].

In cases of ruptured or unruptured ectopic pregnancy, the clinical presentation varies, with the great majority of patients in poorer nations presenting with the ruptured variant. Most cases of ectopic pregnancies appear as acute crises because of their delayed presentation,^[12, 13] which accounts for over half (48.5%) of all gynaecological emergencies, according to a research by Anolu *et al.* in Lagos, Nigeria^[14]. The history of menstruation and pregnancy combined with a high since cardiovascular symptoms may frequently be the evident presenting characteristic in cases of ruptured ectopic pregnancy, degree of suspicion and other clinical correlations are crucial in women of reproductive age who arrive with abdominal or pelvic symptoms^[15].

It might be challenging to diagnose. Currently, in industrialised nations, diagnosis is accomplished using a combination of serial serum beta-human chorionic gonadotrophin (β -hCG) readings and ultrasound screening^[16]. One of the rare medical diseases that may be treated surgically, medically, or expectantly is ectopic pregnancy^[1, 3].

On the basis of the outcomes of the imaging examinations (ultrasound) and laboratory testing, the diagnosis is often determined clinically (hCG). The ectopic gestation might be seen during surgery or by doing a histological analysis to confirm the diagnosis^[17]. The main method for sonographically evaluating pregnancies with unclear locations is transvaginal ultrasonography (TVUS).

Contrary to transabdominal ultrasonography (TAUS), TVUS enables earlier and more accurate diagnosis of an intrauterine or ectopic pregnancy (abdominal pregnancies are an exception) as well as more accurate foetal heartbeat detection^[17]. Up to 20% of women with an ectopic pregnancy may exhibit a pseudosac^[18]. The most typical US finding in tubal pregnancy is an extraovarian adnexal mass, which is seen in 89 to 100% of women with ectopic pregnancy^[18-20].

Materials and method

This was a descriptive, prospective hospital-based study. It was conducted among all women diagnosed clinically with ectopic pregnancy and showed no sign of gestational sac in uterine cavity were included in the study.

Sociodemographic information, prior ectopic pregnancies, contraceptive use, tubal pathology and surgery, PID, clinical presentation, ultrasound results, and intra-operative findings were among the variables evaluated. Clinical presentation, physical examination, and ultrasound results were all associated with intra-operative findings. According to their clinical presentation, all patients had abdominal and/or vaginal ultrasounds. Senior radiologist performed ultrasound. Specific ultrasound findings for ectopic pregnancy include a gestational sac with the embryo outside the uterine cavity

(with or without cardiac activity), as well as non-specific findings like an adnexal mass with cystic changes of the product of conception (POC), irregularity or increased or complex echogenicity that is separate from the ovary, a pseudogestational sac inside the uterine cavity or a decidual cast inside the uterine cavity, and free fluid in the abdomen. Intact gestational sac, burst ectopic mass and hematoma, and free fluid in the peritoneal cavity are intraoperative characteristics of ectopic pregnancy.

Statistical analysis

Descriptive statistics was performed by calculating mean and standard deviation for the continuous variables. Categorical variables are presented as absolute numbers and percentage. The software used for the statistical analysis were SPSS (statistical package for social sciences) version 26.0.

Results

Table 1: Showing the age and parity

		Number	Percentage
Age	20-30 years	60	54.5%
	31-40 years	46	41.8%
	Above 40 years	4	3.6%
Parity	Primigravida	15	13.6%
	Multigravida	59	53.6%
	Grandmultipara	36	32.7%

The study included 110 women who were treated at OMH and ONH who were clinically and ultrasound-diagnosed as having ectopic pregnancies. According to age groups, 60 (54.5%) of women were in the age group of 20–30 years, 46 (41.8%) in the age group of 31–40 years, and 4 (3.6%) in the age group of more than 40 years.

Table 2

Obstetric history	Number	Percentage
IUCD usage	56	50.9%
Pelvic inflammatory disease	29	26.4%
Abdominal-pelvic surgery	25	22.7%
Ectopic pregnancy	14	12.8%

Obstetric history revealed that 29 (26.4%) women had a history of PID, while 56 (50.9%) of the women had a history of IUCD use, 25 (22.7%) had a history of abdominal-pelvic surgery, and 14 (12.8%) had a history of ectopic pregnancies. Among study population, 74 women (67.3%) underwent a transvaginal scan for diagnostic confirmation, and 32.7% underwent a transabdominal scan.

Table 3

Ultrasound findings		Number	Percentage
Specific		25	22.7%
Non-Specific	Gestational with positive fetal cardiac activity	10	9.1%
	Gestational sac containing fetal pole and/or yolk sac	15	13.6%
		85	77.3%
	Complex mass	8	7.2%
	Complex mass with free fluid	67	60.9%
	Free abdominal fluid	10	9.1%

According to specific findings, 15 women (13.6%) had gestational sacs containing foetal poles (no cardiac activity) and/or yolk sacs, and 10 (9.1%) of pregnant women had

positive foetal cardiac activity. Non-specific ultrasound imaging results revealed complex masses in 8 (7.2%) patients. 67 (60.9%) patients revealed complex mass with

free fluid and 10 (9.1%) with free abdominal fluid. In each participant laparotomy surgery was used to treat it.

Table 4

Intra-operative findings	Number	Percentage
Intact Ectopic	29	26.4%
Ruptured Ectopic	77	70.0%
Negative Laprotomy	4	3.6%

Intra-operative findings showed intact ectopic pregnancy in 29 (26.4%), a ruptured ectopic was discovered in 77 (70.0%), and 4 (3.6%) laparotomies were confirmed to be negative.

The significant correlations were seen between intraoperative and ultrasound results, and among women with intact ectopic pregnancies, 21 (72.4%) of them had specific findings on ultrasound. Non-specific U/S findings were found in all of the women who had negative laparotomies, however only 75 (97.4%) of the 77 women with ruptured ectopics had these findings. There was no discernible correlation between intra-operative results and sore abdominal tissue and shocked individuals.

Discussion

According to age groups, 60 (54.5%) of women were in the age group of 20-30 years, 46 (41.8%) in the age group of 31-40 years, and 4 (3.6%) in the age group of more than 40 years. The age distribution revealed that majority (54.5%) of women were between the age of 20-30 years, 41.8% were between the age of 31-40 years, and 3.6% were more than 40 years. In the current study, multiparous women made up the majority of the female population (53.6%); nevertheless, the results also showed a significant percentage of grand multiparous women (32.7%) compared to a small number of primigravida (13.6%).

Kopani F and colleagues [21], identified multi-parity as a risk factor for ectopic pregnancy. In the current study, history of intrauterine contraceptive use, history of pelvic inflammatory disease, and history of abdomino-pelvic surgery (previous caesarean section) were the most frequently identified risk factors for ectopic pregnancy, accounting for 50.9%, 26.4%, and 22.7% of cases, respectively. Other risk factors with lower incidence were a history of ectopic pregnancy (12.8%). Similar results were published by *Parashi S. and colleagues* [22], who found a significant relationship between prior ectopic pregnancy, prior tubal ligation, use of an intrauterine device, and prior abdominal/pelvic surgery with ectopic pregnancy.

In a retrospective descriptive research conducted at the Federal Medical Centre in Owerri by *Cornelius et al.*, [23] haemoperitoneum was discovered in 99.5% of the cases. *Igberase* [24] and *Akaba et al.* [12] also detected haemoperitoneum in 95.3% and 83.1% of patients, respectively. In 98.1% of cases, ruptured gestation was recorded by *Baffoe* [25] in Ghana.

Obajimi et al. [26] showed that lower abdomen discomfort was the most often reported presenting symptom in this investigation, occurring in 24 individuals (72%). In eight individuals, this was followed by vaginal haemorrhage. Unsurprisingly, the most prevalent symptom found at late presentations is lower abdominal discomfort, which frequently results from rupture. Less than half of the patients had a large uterus, which was consistent with their early gestational age.

With regard to the risk factors identified by *Kopani F. and colleagues.*, [21] prior surgery was recorded in 26% of patients, and 7-8% of patients reported a high incidence of ectopic pregnancy. [10,11] Contrary to prior research, the vast majority of women in the current study (86.4%) reported vaginal bleeding and abdominal pain, with 13.6% of women reporting abdominal pain. These results are consistent with those made public by *Parashi S. and colleagues* [22]. Who discovered that the non-specific early symptoms included an amenorrheic period and abdominal pain or tenderness, together with or without unexpected vaginal bleeding. Dull or sharp new-onset pain that was either widespread or restricted to one place was described.

Additionally, they expressed concern over sporadic or irregular vaginal bleeding. According to another study, 56 percent of women with vaginal bleeding and 74 percent of women with amenorrhea reported having belly pain as a presenting symptom. Most patients were found to be stable, pale, and to have abdominal soreness at the initial examination; these percentages were 71.8%, 57.3%, and 54.5%, respectively.

In our study, 10% of people had shock, and no soft abdomen was apparent. Clinical signs of ectopic pregnancy, which range widely from asymptomatic to acute abdominal and hemodynamic shock, confound the diagnosis in the absence of ultrasound evidence and HCG results. Less women were diagnosed using transabdominal scanning (6.7%) than through transvaginal scanning. Transvaginal ultrasonography has a sensitivity of 97% and a specificity of 95%, according to research by *Kopani F and colleagues* [21].

In the current investigation, the most prevalent intra-operative finding was a ruptured ectopic (70.0%), followed by an intact ectopic (26.4%), and a negative laparotomy (3.6%). *Tulandi T* [10]. On intra-operative data revealed that, in one representative series of 147 patients with ectopic pregnancy, 78% of those pregnancies ruptured. Contrarily, the majority of ultrasound diagnosis results were non-specific (77.3%) (e.g., complex mass with free fluid and free abdominal fluid), whereas 17.3% cases (e.g., gestational sac including foetal pole and/or yolk sac) reported particular findings. According to a recent study, the most frequent non-specific sonographic finding in tubal pregnancy in the US was an extra ovarian adnexal mass, which was reported to be present in 89 to 100 percent of ectopic pregnancy cases [27, 28]. In the current investigation, the sensitivity of the U/S technique was found to be 97.3%. The study's findings showed that ultrasonography had a high degree of accuracy for diagnosing ectopic pregnancies since imaging was typically performed by elderly citizens and questionable results were frequently repeated in different locations.

Only 4 of 110 cases tested negative for ectopic pregnancy using the U/S technique. The study by *Condous G. and colleagues* [29]. To compare U/S imaging and intra-operative diagnosis in patients with ectopic pregnancy is one of the limitations of the current study. It evaluated TVS accuracy and reported that the sensitivity of TVS was 90.9%.

Since all of the women in the current study underwent surgical laparotomies were ectopic, salpingectomy was performed on all of them. Intra-operative results showed that there were 28 intact ectopic, of which 67.9% had specific findings in the US, whereas there were 77 ruptured ectopic, with the majority of cases having non-specific findings in the US and non-specific findings in all negative laparotomies. Except for one example, all of the frightened women in the

study were discovered to have ruptured ectopics, according to intra-operative examinations. The statistical significance of the correlation between intra-operative results and startled cases and abdominal soreness was not found (P value was 0.326 and 0.230 respectively).

According to Nyberg *et al.*,^[17] transvaginal sonography revealed novel information in 15 of 25 ectopic gestations that were not seen on transabdominal sonography. In this investigation, there was good agreement between surgical findings and histological diagnosis ($\kappa = 1.00$), confirming our use of intraoperative findings as a gold standard.

Conclusion

We may come to the conclusion that when comparing intra-operative results to the function of ultrasonography in identifying ectopic pregnancy, a high level of diagnostic accuracy was found with a sensitivity of 97.3%. As a result of the majority of imaging being performed by seniors and the repeated testing of any dubious data, the study produced positive results. According to the study, using an intrauterine device in the past, having pelvic inflammatory illness in the past, and having had abdominal-pelvic surgery in the past are risk factors for ectopic pregnancy. The current study's most frequent intraoperative results were ruptured ectopic, followed by intact ectopic and negative laparotomy.

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