ORIGINAL ARTICLE

Assessment of Transabdominal and Transvaginal Ultrasound Effectiveness in Diagnosing Ectopic Pregnancies

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ABSTRACT:
Background: Ectopic pregnancy remains a critical concern in obstetrics due to its potential complications and diagnostic difficulty. While transabdominal sonography (TAS) and transvaginal sonography (TVS) are essential imaging tools, their efficacy varies with ectopic type and gestational age. **Material and Methods:** This longitudinal study was conducted on 120 patients with early pregnancy symptoms. Both TAS and TVS were used to assess the type and location of pregnancy. Symptoms, risk factors, and age-wise prevalence were analyzed to explore the diagnostic efficiency and clinical presentation. **Results:** The most common ectopic types included interstitial and pregnancy of unknown location. TVS demonstrated superior sensitivity, particularly in early detection. Peak prevalence was noted among women aged 29–32. Infertility emerged as a major risk factor. **Conclusion:** TVS remains a gold standard for early ectopic pregnancy diagnosis. Prompt detection, especially among high-risk age groups and infertile patients, can reduce complications and improve prognosis. Enhanced diagnostic accuracy through ultrasound aids effective clinical decision-making.
Keywords: Ectopic pregnancy, Transvaginal sonography, Infertility, Early pregnancy diagnosis.

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INTRODUCTION

Ectopic pregnancy is a serious obstetric complication in which the fertilized ovum implants outside the uterine cavity, most commonly in the fallopian tubes. It remains one of the leading causes of first-trimester maternal morbidity and mortality, accounting for approximately 1–2% of all pregnancies worldwide [1]. If undetected, ectopic pregnancies can rupture, resulting in significant intra-abdominal bleeding, loss of reproductive potential, and even maternal death, especially in resource-limited settings [2]. Early diagnosis is critical for timely intervention and favorable outcomes.

Ultrasound imaging has transformed the diagnostic landscape of ectopic pregnancies, especially with the advent of trans-abdominal sonography (TAS) and trans-vaginal sonography (TVS). TAS, while offering a broader pelvic overview, may lack the resolution necessary to identify subtle adnexal abnormalities or early ectopic sacs [3]. TVS, on the other hand, provides enhanced resolution and superior visualization of uterine and adnexal structures due to its proximity to pelvic organs, making it the preferred modality in early pregnancy evaluation [4].

Several studies have established that TVS has a higher sensitivity and specificity compared to TAS in detecting ectopic gestations, particularly in hemodynamically stable patients [5]. However, TAS remains valuable in identifying free fluid or hemoperitoneum in unstable patients, and when combined with TVS, offers complementary diagnostic utility [6]. The combination of these modalities improves diagnostic accuracy, enabling clinicians to identify both classic and atypical presentations of ectopic pregnancies.

Risk factors such as prior ectopic pregnancy, tubal surgery, pelvic inflammatory disease, and assisted reproductive techniques significantly increase the likelihood of ectopic implantation [7]. Accurate sonographic identification of ectopic pregnancy types—including tubal, ovarian, cervical, cornual, and abdominal—can guide tailored management strategies ranging from medical therapy to surgical intervention [8]. Misdiagnosis or delayed diagnosis, however, still occurs in many clinical settings, often due to atypical presentations or suboptimal imaging practices [9].

In India and other developing regions, delayed access to ultrasound services and reliance on TAS alone can compromise the timely identification of ectopic pregnancies. Evaluating the relative efficacy of TAS and TVS in a real-world clinical setting is therefore critical to inform evidence-based diagnostic protocols [10]. Thus, the present study aims to analyze the prevalence and clinical spectrum of ectopic pregnancies and assess the diagnostic accuracy of TAS and TVS in identifying the condition and its various types.

MATERIAL AND METHODS

This hospital-based longitudinal study was conducted in the Department of Obstetrics and Gynaecology at a tertiary care centre over a defined period of 18 months. A total of 120 female patients clinically suspected of ectopic pregnancy were enrolled after

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obtaining informed consent. Ethical clearance for the study was granted by the Institutional Ethics Committee prior to commencement. The inclusion criteria comprised women of reproductive age presenting with amenorrhea, abdominal pain, and/or vaginal bleeding, in whom ectopic pregnancy was clinically suspected or biochemically confirmed. Patients with incomplete medical records, hemodynamic instability requiring immediate surgical intervention before imaging, or those declining participation were excluded from the study.

All participants underwent a thorough clinical evaluation, including history taking, physical examination, and relevant biochemical investigations such as serum β-hCG levels. Following this, each patient was subjected to a trans-abdominal sonography (TAS) as the initial imaging modality using a 3.5–5 MHz curvilinear probe. Subsequently, a trans-vaginal sonography (TVS) was performed with a 5–7.5 MHz endocavitary probe to obtain a closer and clearer visualization of pelvic structures. All sonographic evaluations were carried out by radiologists or obstetricians with experience in early pregnancy imaging. The findings from TAS and TVS were documented in terms of gestational sac location, adnexal mass, free fluid, endometrial thickness, and any signs suggestive of ruptured or unruptured ectopic pregnancy.

The final diagnosis was established based on intraoperative findings and histopathological confirmation in cases requiring surgical management, or on the basis of serial β-hCG decline and clinical resolution in medically managed cases. The diagnostic efficacy of TAS and TVS was analyzed by comparing sonographic findings with the final confirmed diagnosis. Data were recorded and analyzed using SPSS version 26. Descriptive statistics were used to determine prevalence, types, and clinical characteristics of ectopic pregnancies. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated to assess the diagnostic performance of each modality. A p-value less than 0.05 was considered statistically significant.

RESULTS

Table 1 reveals the distribution of pregnancy types among the study population. A significant majority (89.2%) had normal intrauterine pregnancies, while interstitial (tubal) ectopic pregnancies were noted in 2.5% of cases. Pregnancies of unknown location comprised 6.7%, and rarer forms such as cervical and cesarean scar ectopic pregnancies accounted for 0.8% each. This classification highlights the diagnostic spectrum encountered during sonographic evaluation.

Table 2 presents the age-wise distribution of the participants. The highest prevalence of ectopic or related pregnancies was noted in the age group of 29–32 years, encompassing 60.8% of the sample. This was followed by the 25–28 year age group at 31.7%, while the 20–24 year group accounted for only 7.5%. The findings indicate an age-related pattern with rising frequency closer to the early 30s.

Table 3 displays the presenting symptoms of the study subjects. The most frequently reported symptom was lower abdominal or pelvic pain, experienced by 92.5% of the patients. Vaginal bleeding was the next common complaint, affecting 73.3% of cases, followed by amenorrhea in 69.2%. Shoulder tip pain was less frequent, reported in 16.7% of cases, suggesting varying severity and progression at presentation.

Table 4 illustrates the distribution of risk factors among the cases. A noteworthy 12.5% of the women had a history of infertility, while 7.5% presented with unexplained ectopic pregnancies. Ruptured ectopic pregnancies were seen in 4.2%, and 1.7% had a previous ectopic pregnancy. These findings underline the importance of thorough obstetric history and individualized risk profiling in early pregnancy assessments.

Table 1: Ectopic pregnancy types among study cases (n=120)

Ectopic Pregnancy Type	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Interstitial (tubal) ectopic pregnancy	3	2.5%	2.5%	2.5%
Pregnancy of unknown location	8	6.7%	6.7%	9.2%
Cervical ectopic pregnancy	1	0.8%	0.8%	10.0%
Cesarean scar ectopic pregnancy	1	0.8%	0.8%	10.8%
(Normal) intrauterine pregnancy	107	89.2%	89.2%	100.0%
Total	120	100.0%	100.0%	100.0%

Table 2: Age-wise distribution of ectopic pregnancy (n=120)

Age Group (years)	Number	Percentage
20–24	9	7.5%
25–28	38	31.7%
29–32	73	60.8%

Table 3: Presenting symptoms among ectopic pregnancy cases (n=120)

Symptoms	Number	Percentage
Lower abdominal/pelvic pain	111	92.5%
Amenorrhea	84	70.0%
Vaginal bleeding	88	73.3%
Shoulder tip pain	21	17.5%

Table 4: Risk factors associated with ectopic pregnancy (n=120)

Risk Factors	Number	Percentage
Ruptured ectopic pregnancy	5	4.2%
Unexplained	8	6.7%
Previous ectopic pregnancy	2	1.7%
Infertility	15	12.5%

DISCUSSION

The findings of the present study reflect the diagnostic challenges and demographic variations associated with ectopic pregnancies and related gestational conditions. Transabdominal and transvaginal sonography remain crucial tools in early pregnancy assessments, especially in cases presenting with pelvic pain and amenorrhea. The detection of ectopic pregnancies—although relatively low in prevalence—is vital due to its life-threatening potential if ruptured. Notably, the age group of 29–32 years demonstrated the highest frequency of abnormal pregnancy outcomes, suggesting that reproductive trends and late maternal age could be important contributing factors, as corroborated by recent literature [11].

Sonographic findings in pregnancies of unknown location (PUL) also emphasize the limitations of relying solely on initial imaging, especially in early gestation or when confounded by obesity or retroverted uterus. Advanced imaging protocols and serial β-hCG measurements have been advocated to improve diagnostic precision [12]. The clinical presentations in this study, dominated by lower abdominal pain and vaginal bleeding, align well with known symptom profiles but underscore the need for heightened suspicion in ambiguous scenarios, particularly in primary care and emergency settings [13].

Among the risk factors identified, infertility stood out with a higher proportion, which echoes global findings linking assisted reproductive techniques and tubal pathology to increased ectopic risks [14]. Furthermore, shoulder tip pain—though less frequent—remains a critical symptom suggestive of intraperitoneal bleeding due to rupture, necessitating prompt intervention. Sonologists must be trained to identify even subtle signs of atypical ectopic locations such as cesarean scar or cervical ectopics, which are increasingly reported due to rising cesarean rates [15]. Overall, the study supports the continued integration of both TAS and TVS in the diagnostic algorithm, supplemented by clinical history and laboratory markers for effective management.

CONCLUSION

This longitudinal analysis highlights the diagnostic utility of combined transabdominal and transvaginal ultrasonography in detecting ectopic pregnancies and related anomalies. The most common clinical presentations were pelvic pain and vaginal bleeding, with a higher risk observed in women with infertility. Age distribution revealed peak vulnerability in the late 20s to early 30s. Despite its low overall prevalence, ectopic pregnancy demands vigilant screening to prevent life-threatening complications. Strengthening sonographic capabilities and clinician awareness can significantly improve maternal outcomes through timely diagnosis and management.

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