

Transvaginal versus Transabdominal Ultrasonography for Early Pregnancy Assessment: A Comparative Study of Gestational Sac Detection**Konapur Bhavani¹, Latha V², Chhaya Bohare³**¹Assistant Professor, Department of Obstetrics and Gynaecology, Vanivilas Hospital, Bangalore Medical College and Research Institute, Banagalore, Karnataka, India²Professor and HOD, Department of Obstetrics and Gynaecology, Basaveshwara Medical College Chitradurga, Karnataka, India³Assistant Professor, Department of Community Medicine, LNMC & RC, JK Hospital, Bhopal, Madhya Pradesh, India

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Abstract**Objective:** The present study was undertaken to compare the diagnostic performance of transvaginal sonography (TVS) and transabdominal sonography (TAS) for identifying the gestational sac during the early first trimester of pregnancy. Early and accurate confirmation of an intrauterine pregnancy is essential for appropriate clinical management and timely recognition of pregnancy-related complications.**Methods:** A prospective comparative study was conducted on 100 pregnant women aged 15–45 years who presented with a positive pregnancy test during the first trimester. Each participant underwent both transabdominal and transvaginal ultrasonographic examinations using standardized scanning protocols. The ability of each imaging modality to detect the gestational sac was compared, and statistical analysis was performed using the Pearson Chi-square test.**Results:** Transvaginal sonography demonstrated a significantly higher gestational sac detection rate than transabdominal sonography. Gestational sacs were identified in 80% of women examined by TVS compared with 30% by TAS. This difference was statistically significant (Pearson Chi-square = 32.727, $P < 0.001$). Although TAS provided valuable preliminary information, TVS offered superior image resolution and facilitated earlier visualization of intrauterine pregnancy. Nevertheless, TVS has practical limitations, including restricted assessment of structures beyond the pelvis and the requirement for appropriate patient counselling and operator expertise.**Conclusion:** Transvaginal sonography is a more sensitive and reliable imaging technique than transabdominal sonography for detecting gestational sacs during the early first trimester. Its enhanced diagnostic capability enables earlier confirmation of intrauterine pregnancy and supports prompt clinical decision-making, making it the preferred ultrasound modality for evaluating early pregnancy.**Keywords:** Transvaginal Sonography, Transabdominal Sonography, Early Pregnancy, Gestational Sac, Ultrasonography, First Trimester.**DOI:** 10.25258/ijcpr.18.8.63This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Early pregnancy is a critical period during which timely diagnosis plays a pivotal role in ensuring favourable maternal and fetal outcomes. Women presenting during the first trimester frequently complain of lower abdominal pain, pelvic discomfort, vaginal spotting, or bleeding, symptoms that may represent a normal intrauterine pregnancy, an early pregnancy loss, or an ectopic pregnancy. Accurate differentiation among these clinical conditions is essential because delayed or incorrect diagnosis can lead to serious maternal morbidity and adversely affect pregnancy

outcomes. Approximately 50–60% of women presenting with early pregnancy-related symptoms eventually continue to have a viable intrauterine pregnancy, whereas nearly 10% are diagnosed with ectopic pregnancy, a potentially life-threatening condition requiring urgent intervention. In addition, spontaneous miscarriage accounts for nearly 40% of symptomatic first-trimester pregnancies, making early evaluation a crucial component of obstetric care.[1] Clinical assessment alone is often insufficient to reliably distinguish these entities, and studies have reported that a substantial

proportion of ectopic pregnancies may remain unrecognized during the initial clinical evaluation.[2,3] Consequently, delayed diagnosis continues to pose a significant challenge, with nearly half of ectopic pregnancies initially being misdiagnosed.[4]

Ultrasonography has become the cornerstone of first-trimester pregnancy assessment because it is non-invasive, readily available, and capable of providing rapid diagnostic information. It enables confirmation of intrauterine pregnancy, assessment of gestational viability, estimation of gestational age, and early recognition of pregnancy-related complications.[5] Although transabdominal sonography (TAS) has traditionally been used as the initial imaging modality, advances in ultrasound technology have established transvaginal sonography (TVS) as a more sensitive technique for evaluating early pregnancy. Owing to its higher-frequency transducer and closer proximity to the pelvic organs, TVS provides superior image resolution and allows visualization of early embryonic structures before they become apparent on TAS. This improved diagnostic capability facilitates earlier identification of intrauterine gestation and contributes to prompt diagnosis of ectopic pregnancy and other early pregnancy abnormalities.[6,7]

Previous comparative studies have consistently demonstrated the diagnostic superiority of TVS over TAS during the earliest weeks of gestation. Prospective investigations have shown that TVS identifies the gestational sac, embryo, and fetal cardiac activity considerably earlier than transabdominal scanning, particularly before eight weeks of gestation.[8] Furthermore, comparative research involving women with suspected early pregnancy failure reported that TVS provides greater diagnostic accuracy, especially before 42 days of gestation, while TAS serves as a complementary modality in more advanced early pregnancies or when confirmation is required.[9]

Gestational sac visualization by TVS is generally possible from approximately 4 weeks and 3 days, whereas fetal cardiac activity can usually be detected between 5 and 6 weeks of gestation.

In view of these observations, the present study was undertaken to compare the diagnostic effectiveness of transvaginal and transabdominal ultrasonography for detecting the gestational sac during the early first trimester of pregnancy and to determine the most appropriate imaging approach for early pregnancy evaluation.

Materials and Methods

Ultrasound Equipment: This study was performed using a Samsung Medison SonoAce R5 ultrasound system with dedicated transabdominal

and transvaginal probes for first-trimester obstetric evaluation.

Patients and place of the study: Basaveshwara Medical College and Hospital in Chitradurga, 100 women between the ages of 15 and 45 who tested positive for pregnancy in the early first trimester were included.

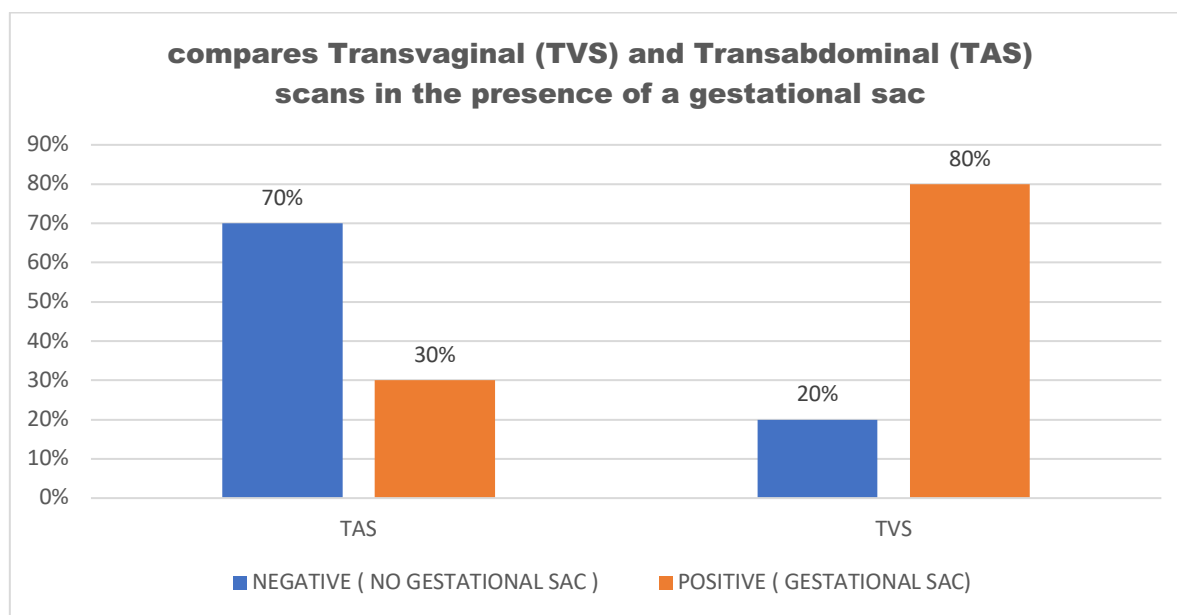
Methods

All participants underwent both transabdominal sonography (TAS) and transvaginal sonography (TVS) using standardized examination protocols to ensure uniform assessment. For the transabdominal examination, participants were positioned in the supine position on the examination table. A comfortably full urinary bladder was maintained to serve as an acoustic window, facilitating improved visualization of the pelvic organs and providing a broader field of view. Coupling gel was applied over the lower abdomen, and the transducer was systematically moved across the pelvic region to evaluate the presence of an intrauterine gestational sac and associated structures. Following TAS, transvaginal sonography was performed after the participant had emptied her urinary bladder. The patient was placed in the dorsal lithotomy position with appropriate privacy and comfort measures. A high-frequency transvaginal probe covered with a sterile condom and lubricated with acoustic gel was gently introduced into the vagina using standard aseptic precautions to minimize the risk of infection. Owing to the close proximity of the probe to the uterus and adnexa, TVS provided superior spatial resolution and enabled detailed visualization of early gestational structures. The examination facilitated clearer assessment of the gestational sac and surrounding pelvic anatomy, particularly during the earliest weeks of pregnancy when transabdominal imaging may be limited. Both scanning techniques were performed according to routine clinical practice, and the findings obtained from each modality were recorded for comparative analysis.

Statistical Analysis: The study used the SPSS (Statistical Package for the Social Sciences) to evaluate the efficiency of TVS and TAS during the first trimester of pregnancy detection of the gestational sac. The results showed that TVS was more efficient than TAS in detecting the gestational sac (as shown in Table 1). The Pearson Chi-Square was 32.727, and the P-value was 0.000. TVS can detect the presence of an intrauterine gestational sac, which is a benefit as it excludes the possibility of ectopic pregnancy. In the early stages of the first trimester of pregnancy, Transdominal Scan (TAS) may not be able to identify the existence of a gestation sac.

Table 1: Comparison of Transvaginal (TVS) and Transabdominal (TAS) scans in the presence of Gestational Sac

		Gestational SAC					
		-Ve		+Ve		Total	
		No.	%	No.	%	No.	%
Sonography Procedures	TAS	35	70%	15	30%	50	50%
	TVS	10	20%	40	80%	50	50%
	Total	45	45%	55	55%	100	100%
Pearson Chi Square	Value	P- Value					
	25.253	0.000					

**Figure 1:**

Results

The comparative evaluation of transvaginal sonography (TVS) and transabdominal sonography (TAS) demonstrated a clear difference in their ability to detect gestational sacs during the early first trimester of pregnancy.

TVS consistently showed superior diagnostic performance compared with TAS. As presented in Table 1, gestational sacs were successfully identified in 40 of 50 women (80%) examined by TVS, whereas TAS detected gestational sacs in only 15 of 50 women (30%).

Statistical analysis confirmed that this difference was highly significant, with a Pearson Chi-square value of 32.727 and a P-value <0.001. These findings indicate that TVS has a substantially greater detection capability during the earliest weeks of pregnancy.

The improved visualization achieved with TVS enables more reliable identification of early intrauterine gestation, thereby facilitating prompt clinical assessment and appropriate patient management. Overall, the study findings strongly support the use of transvaginal sonography as the

preferred imaging modality for early gestational sac detection.

Discussion

Ultrasonography plays a fundamental role in the evaluation of early pregnancy and has become an indispensable diagnostic modality in modern obstetric practice. Accurate identification of an intrauterine gestational sac during the first trimester is essential for confirming pregnancy viability, estimating gestational age, excluding ectopic pregnancy, and guiding appropriate clinical management. Both transabdominal sonography (TAS) and transvaginal sonography (TVS) are routinely employed for this purpose. However, the findings of the present study demonstrate that TVS offers significantly greater diagnostic accuracy than TAS during the earliest weeks of gestation. The present study revealed that gestational sacs were detected in 80% of women examined by TVS compared with only 30% by TAS. The difference between the two imaging techniques was statistically highly significant, with a Pearson Chi-Square value of 32.727 and a P-value of 0.000, indicating the superior sensitivity of transvaginal imaging for early pregnancy assessment.

The higher diagnostic yield observed with TVS can be explained by its technical advantages. The transvaginal probe operates at a higher frequency and is positioned in close proximity to the uterus and adnexa, producing images with superior spatial resolution. Unlike TAS, which requires a full urinary bladder to act as an acoustic window and may be affected by maternal obesity, bowel gas, or inadequate bladder filling, TVS provides excellent visualization even during the earliest stages of gestation. This enables clinicians to identify the gestational sac, yolk sac, embryo, and fetal cardiac activity much earlier than with conventional transabdominal scanning. Early diagnosis is particularly important in women presenting with pain or vaginal bleeding, where rapid differentiation between a viable intrauterine pregnancy, miscarriage, and ectopic pregnancy directly influences patient management.

The observations of the present study are consistent with those reported by Jain KA et al., who demonstrated the superior diagnostic capability of transvaginal sonography in early pregnancy evaluation. Their study showed that TVS detected normal intrauterine pregnancies in all 55 examined cases, whereas TAS identified only 11 pregnancies, highlighting the markedly greater sensitivity of TVS for diagnosing early gestation and its associated complications. [6] These findings closely parallel the results of the present study and further strengthen the evidence supporting the routine use of transvaginal sonography during the early first trimester.

Comparable observations have also been reported by Pennell et al., who prospectively evaluated 309 consecutive pregnancies and found that transvaginal sonography was significantly superior to transabdominal sonography in detecting intrauterine embryos and fetal cardiac activity before eight menstrual weeks. [7]

Their findings demonstrate that TVS allows confirmation of pregnancy viability at an earlier stage than TAS. Early visualization not only improves diagnostic confidence but also reduces maternal anxiety and facilitates timely counselling and clinical intervention whenever pregnancy abnormalities are suspected.

The statistical findings obtained in the present investigation further reinforce these observations. The highly significant Pearson Chi-Square value of 32.727 with a P-value of 0.000 confirms that TVS has a clear diagnostic advantage over TAS for identifying gestational sacs during early pregnancy. (8) Similar conclusions were reported by Coleman et al., who performed a prospective comparison of both imaging techniques and demonstrated the superior ability of transvaginal sonography to detect early intrauterine pregnancy.

Their study established TVS as a highly reliable imaging modality for first-trimester evaluation, particularly when early diagnosis is clinically necessary.

Further support for these findings comes from the work of Ferrazzi et al., who compared 290 women undergoing TAS with 308 women evaluated using TVS for suspected early pregnancy failure. Their study demonstrated that TVS was significantly more accurate in diagnosing miscarriage before 42 days of gestation and was particularly valuable for clarifying inconclusive findings obtained on transabdominal examination. [9] They also reported that although TAS becomes increasingly useful as pregnancy progresses beyond 42 days, TVS remains the preferred modality during the earliest weeks because of its superior image quality and diagnostic precision. These observations are in close agreement with the results of the present study.

The present findings also emphasize the important clinical role of TVS in the early exclusion of ectopic pregnancy. Identification of an intrauterine gestational sac at the earliest possible stage greatly reduces diagnostic uncertainty and allows clinicians to distinguish viable intrauterine pregnancy from ectopic pregnancy or pregnancy of unknown location. Such early diagnosis facilitates prompt therapeutic decisions, minimizes maternal morbidity, and improves overall pregnancy outcomes.

Despite its demonstrated superiority, transvaginal sonography is not without limitations. Because the transducer has a relatively limited field of view, assessment of lesions located outside the pelvis may be difficult. In addition, the examination is invasive and therefore requires adequate patient counselling, informed consent, strict maintenance of privacy, and adherence to aseptic precautions. Appropriate operator training and experience are also essential to obtain high-quality images and ensure accurate interpretation. Nevertheless, these practical considerations do not diminish the considerable diagnostic advantages offered by TVS during the first trimester of pregnancy.

It is important to recognize that transabdominal sonography continues to have an important complementary role in obstetric imaging. TAS provides a wider field of view, facilitates evaluation of pelvic and abdominal structures beyond the uterus, and becomes increasingly informative as gestation advances. Therefore, the combined use of TAS and TVS, whenever clinically indicated, can further enhance diagnostic confidence and improve comprehensive pregnancy assessment. Overall, the findings of the present study, together with the available published evidence, consistently demonstrate that

transvaginal sonography provides superior diagnostic performance for early gestational sac detection. Its higher sensitivity, improved image resolution, and ability to detect early embryonic structures make it the imaging modality of choice for evaluating women during the early first trimester of pregnancy.

Conclusion

This study The present study demonstrated that transvaginal sonography is significantly more effective than transabdominal sonography for detecting gestational sacs during the early first trimester of pregnancy. The markedly higher detection rate achieved with TVS confirms its superior diagnostic sensitivity and supports its routine use in early pregnancy assessment.

Although transabdominal sonography remains a useful complementary imaging technique, particularly in more advanced gestation and for broader pelvic evaluation, its diagnostic capability during the earliest weeks of pregnancy is comparatively limited. The enhanced image resolution and earlier visualization of gestational structures offered by TVS facilitate prompt diagnosis of intrauterine pregnancy, improve exclusion of ectopic pregnancy, and support timely clinical decision-making. While appropriate patient counselling, operator expertise, and adherence to standard examination protocols remain essential, the overall clinical benefits of TVS substantially outweigh its limitations. Based on the findings of this study and the supporting literature, transvaginal sonography should be considered the preferred first-line imaging modality for accurate gestational sac detection during the early first trimester of pregnancy.

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