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ORIGNAL ARTICLE

Comparison of Transvaginal and Transabdominal Ultrasound for Detection of Fetal Heartbeat During 5–8 Weeks of Gestation in Obese Women

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All the authors have no conflict of interest
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Abstract
An essential part of prenatal care during the first trimester is the early confirmation of fetal heart activity. Because of soft tissue attenuation, maternal obesity may lower the diagnostic accuracy of transabdominal ultrasonography (TAUS). The purpose of this study is to assess the efficacy of transvaginal ultrasound (TVUS) and transabdominal ultrasonography in identifying fetal heartbeats in obese women between weeks five and eight of pregnancy. Methods: At a diagnostic center in Kot Addu,71 obese pregnant women between 5 and 8 weeks of gestation participated in a cross-sectional study. Every individual was examined using both TVUS and TAUS. Crown-rump length (CRL), gestational sac visibility, and fetal heart rate (FHR) were measured. SPSS was used to analyze the data using t-tests, chi-square, regression, correlation, and descriptive statistics. Results: In comparison to TAUS (M = 1.56, variance = 0.249), TVUS showed a greater mean detection rate (M = 1.82, variance = 0.152). 67.6% of instances had a normal fetal heart rate, and 23.9% had no heartbeat at all. In 56.3% of cases, TAUS was unable to identify fetal heart activity. Gestational age and fetal visualization were found to have a somewhat positive connection (r = 0.299). Significant correlations between fetal observation levels and ultrasonography modality were established by statistical analysis ($p < 0.05$).In conclusion, when it comes to identifying the fetal heartbeat in the early stages of pregnancy in obese women, transvaginal ultrasound is far more accurate than transabdominal ultrasound. To increase the accuracy of early pregnancy assessment in this population, TVUS ought to be the primary imaging modality.

Keywords: fetal heartbeat, early pregnancy, obesity, first trimester, transvaginal ultrasound, transabdominal ultrasound, fetal heart rate.

Introduction

The first milestone in pregnancy viability is to detect fetal cardiac activity at an early stage. The most common diagnostic method in the initial period of gestation is ultrasound imaging. There are two methods used: transabdominal ultrasound (TAUS) and transvaginal ultrasound (TVUS)(1. Florian Recker, 2024)**.**

TAUS involves a low-frequency probe that is placed over the abdomen and a full bladder enhances visualization. Nevertheless, maternal obesity is a major challenge since it causes more fat deposits in the abdomen thus limiting the penetration of sound waves and image quality. TVUS, however, is performed with the help of a high-frequency probe placed in the vaginal canal. This offers improved clarity and makes the probe nearer to the uterus.(A Kaur, 2011)

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waves and image quality. TVUS, however, is performed with the help of a high-frequency probe placed in the vaginal canal. This offers improved clarity and makes the probe nearer to the uterus.(A Kaur, 2011)
It is particularly applicable to early pregnancy (58 weeks), where it is difficult to observe the embryonic structures due to their smallness. Since the prevalence of maternal obesity is on the increase, it is important to identify the most credible ultrasound technique in identifying early fetal heartbeat.(JK Pedersen, 2021)

Materials and Methods
A quantitative cross-sectional study was employed to collate the well-being of transvaginal and transabdominal ultrasound to detect fetal heart activity in the first trimester of pregnancy. This study was being carried out in the Umer Lab and Diagnostic Center at Kot Addu. A cohort of pregnant women aged 18 to 40 with a known gestational age of 5 to 8 weeks was used in the study (n=71) to study obese women during pregnancy.
Participants were picked based on the criteria of inclusions and exclusion. Women between age 18 and 40 years old with diagnosis of obesity based on body mass index (BMI) and gestational age of 5 to 8 weeks were eligible to participate. To guarantee the authenticity and reliability of the data, patients whose clinical data was inadequate or those with neurological disorders were excluded.

Each of the participants received transabdominal ultrasound (TAUS) and transvaginal ultrasound (TVUS). TAUS was recorded with a 2 -4 MHz curvilinear probe, and the urinary bladder was full so that it would be easier to visualize the pelvic structures. Following the emptying of bladder, TVUS was performed with a 5 -12 MHz high frequency probe to obtain clearer images and approach the uterus. The fetal heart activity was monitored using M-mode ultrasonography and normal fetal heart rate was established as 110-160 beats per minute.

Data Analysis
In addition to comparing samples from exposed and control groups, the T-test is employed to compare mean and frequency values. The P-value is regarded as statistically significant.

Results
Participant Characteristics
Fetal Heart Rate Patterns
When the fetal heart activity was monitored, a normal heart rate was detected (110-160) beats per minute) in 67.6% of cases. Abnormal heart rate patterns were not so widespread, tachycardia and bradycardia were observed among only 4.2% individuals. Interestingly, the absence of a fetal heartbeat could be detected in 23.9 per cent of the cases, which might have been caused by extremely early gestational age or the technical constraints of some imaging techniques. These results are best illustrated on the graph where it is obvious that normal heart activity is far more frequent than abnormal or absent results.

Figure 01: An early intrauterine pregnancy is visible on a transabdominal ultrasound scan. On January 13, 2025, a scan was conducted at UMER Lab & Diagnostics utilizing a Toshiba Aplio 500.

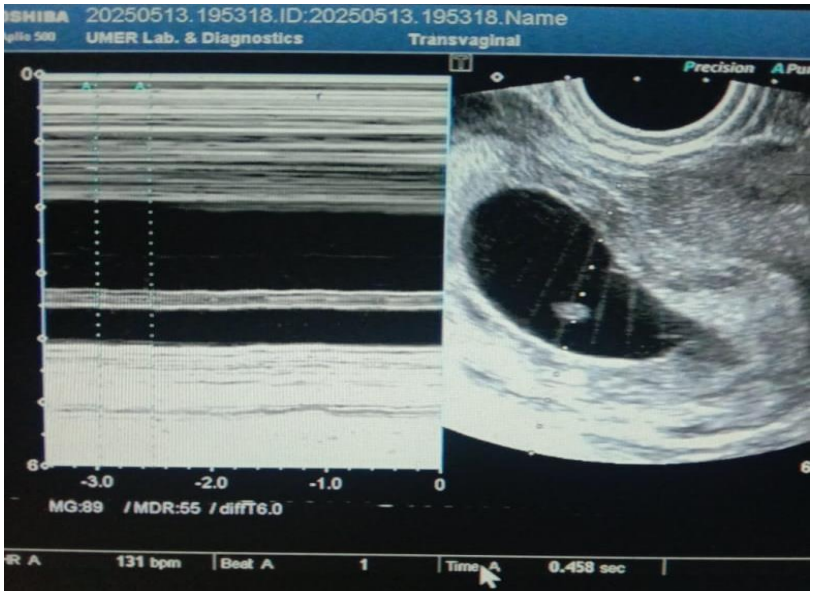


Figure 02: Transvaginal ultrasound scan showing a viable early intrauterine pregnancy. Scan performed on January 2025 at UMER Lab & Diagnostics.

Comparison of Ultrasound Modalities

Comparative study on ultrasound modalities showed that transabdominal ultrasound (TAUS) detected fetal heartbeat only in 43.7% cases and it showed no visible cardiac activity in 56.3% cases of fetal ultrasound. On the other hand, the transvaginal ultrasound
(TVUS) was found to have a higher detection rate,

statistically significant correlation among variables, as their value is greater than the built standard. high consistency and better visualization in early gestation as shown in the comparative charts.

Descriptive statistical analysis revealed that TVUS (Mean = 1.82; Variance = 0.152) had a higher mean detection value than TAUS (Mean = 1.56; Variance = 0.249) and thus had a better reliability and less

Despite this, the*p-value* of BMI is *0.05*, which is statistically significant.

Table 1: Distribution of Participants by Gestational Age (n = 71)

Gestational Age (Weeks)	Frequency (n)	Percentage (%)
5 Weeks	34	47.9%
6 Weeks	21	29.6%
7 Weeks	12	16.9%
8 Weeks	4	5.6%
Total	**71**	**100%**

Table2: Obesity Classification of Participants

Obesity Level	Frequency (n)	Percentage (%)
Minimal	5	7.0%
Level 1	26	36.6%
Level 2	28	39.4%
Level 3	12	16.9%

Table 3: Fetal Heart Rate (FHR) Patterns

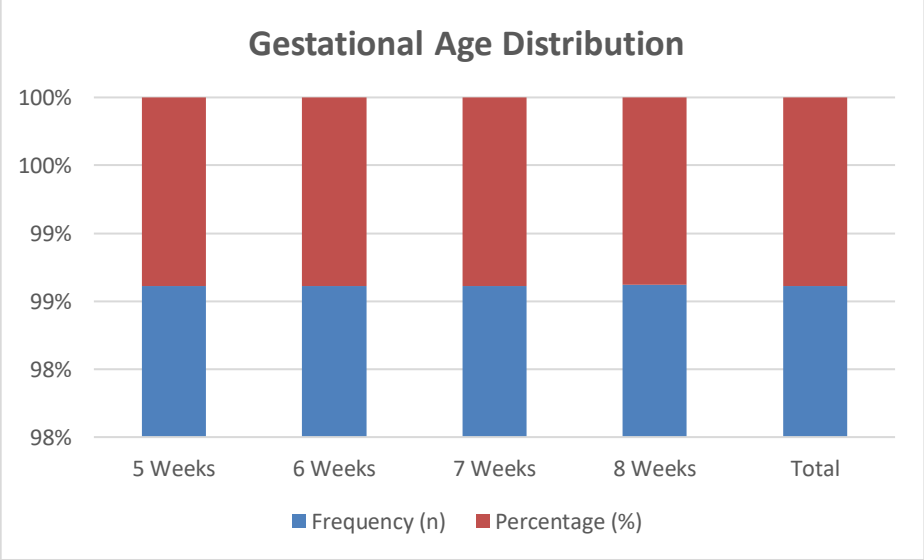
FHR Pattern	Frequency (n)	Percentage (%)
Normal	48	67.6%
Tachycardia	3	4.2%
Bradycardia	3	4.2%
No Heartbeat	17	23.9%
Total	**71**	**100%**

Table 4: Transabdominal Ultrasound (TAUS) Detection Rate

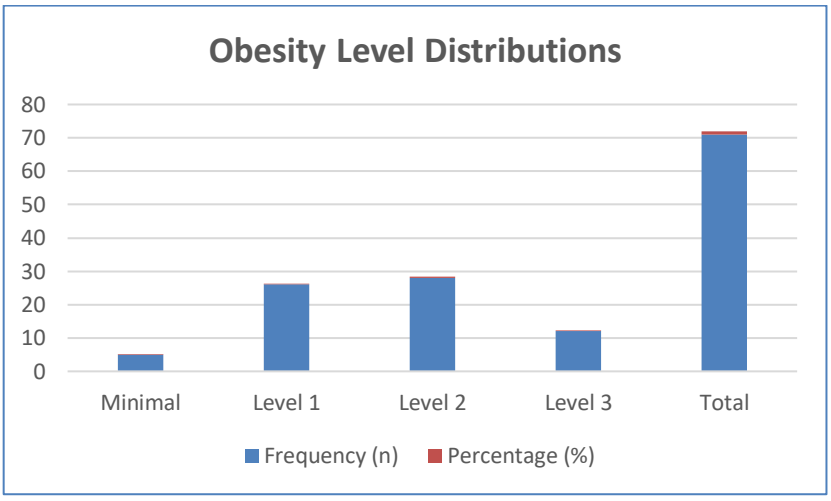
TAUS Result	Frequency (n)	Percentage (%)
Heartbeat Detected	31	43.7%
No Heartbeat Detected	40	56.3%
Total	**71**	**100%**

Table 5: Comparison of Ultrasound Modalities

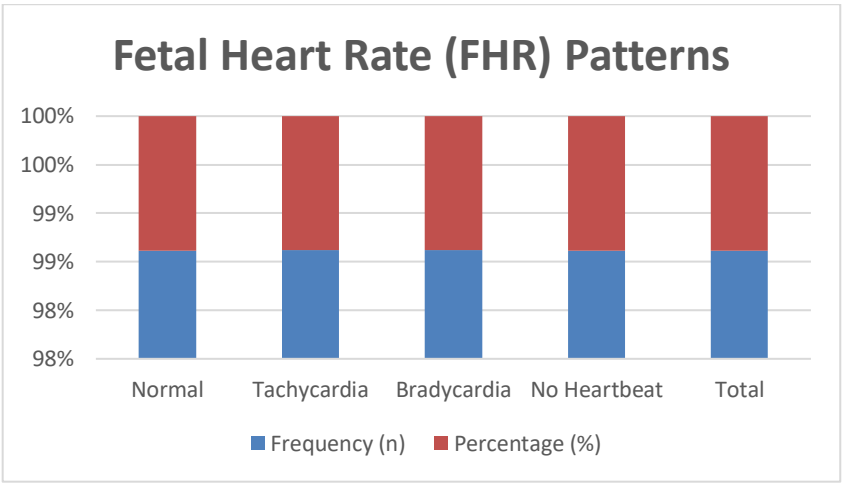
Ultrasound Modality	Mean Detection Value	Variance
Transvaginal (TVUS)	1.82	0.152
Transabdominal (TAUS)	1.56	0.249



Graph 1: Gestational Age Distribution



Graph 2: Obesity Level Distributions



Graph 3: Fetal Heart Rate Patterns

Discussion

The aim of the current study was to compare the efficiency of transvaginal ultrasound and (TAUS) in the identification of the fetal heartbeat in the early gestation period (58 weeks) in obese women. The results suggest that TVUS is much better compared to TAUS in the detection of the fetal heart in the early pregnancy stages among obese women.

The findings are similar to that of Kaur and Kaur (2011) who found that transvaginal ultrasound has better visualization and diagnostic accuracy during the first trimester than transabdominal ultrasound. The high frequency probe in TVUS is more capable of detecting early embryonic shapes, which is consistent with our finding that TVUS had less variance and greater consistency in detection of fetal heartbeat.

Likewise, Pedersen et al. (2022) discovered that handheld transabdominal ultrasound can reliably identify viable pregnancies beyond seven weeks of gestation, albeit with lower sensitivity in extremely early gestation. The participants in our study had a age range of 5-6 weeks of gestation and TAUS was

not very effective in detecting them, especially in obese women.

The quality of ultrasound image is greatly influenced by maternal obesity. This confirms the results of Tsai (2015), who emphasized that greater maternal BMI decreases the accuracy of ultrasound because of the attenuation of sound waves by adipose tissue. In our research, over fifty percent of the participants were Level 2 or Level 3 obesity groups, which led to low efficacies of TAUS.

Fetal heart examination is of clinical importance. Ultrasound is the safest and most predictable imaging type in the early stages of pregnancy (Recker, 2024).

But the choice of technique has to be based on the maternal factors and our findings support that TVUS is better at assessing early viability in obese women.
In terms of fetal heart rate abnormalities, there is variability in the interpretation of FHR, which is addressed by Engelhart (2023). In the majority of our cases, the FHR was normal (67.6%), but abnormal changes like bradycardia and tachycardia tended to be observed only with the help of detailed visualization (which was better accomplished with the help of TVUS).

Prenatal heart disease screening is crucial in preventing heart defects and enhancing pregnancy outcomes (Freud and Simpson, 2024). Our research justifies this suggestion because we have found that TVUS is the method of choice in obese patients. The moderate positive relationship between gestational age and fetal observation (r = 0.299) is also in line with the developmental expectations, since visualization becomes better as the pregnancy progresses (Leung, 2021). But despite the rising gestational age, TAUS was less stable in obese women.

Chi-square and regression analyses proved that the choice of ultrasound modality is greatly linked to the fetal state and observation level, which uphold clinical practices that emphasize transvaginal imaging in complex or ambiguous situations.

All in all, this paper has shown that TVUS has better detection rates, consistency, and reliability in detection of pregnant women with obesity during early pregnancy. These results support the suggestion that transvaginal ultrasound is the initial imaging modality of choice in this group.

Conclusion

This study shows TVUS is much effective than TAUS at fetal cardiac activity at the early gestational stage (5 to 8 weeks) of the pregnancy in obese women. The results support the idea that maternal adiposity is capable of affecting the efficacy of TAUS, but TVUS, which does not go through abdominal adipose tissue, gives a better visualization and consistent detection of fetal heartbeat. The statistics indicated that TVUS had a higher mean rate of detection and less variance than TAUS, which means that it not only performs better but is also more consistent in the clinical setting. There is a mild positive relationship between gestational age and fetal visualization (r = 0.299) which indicates usually the detection is better as the fetus grows, yet TVUS has been significantly better than TAUS even in the earlier weeks. Moreover, abnormal fetal heart rates (FHR) like bradycardia and tachycardia were better measured with TVUS and thus, becomes the method of choice where an accurate cardiac determination is needed. In totality, the research highlights the need to choose the best imaging modality to use when assessing the health of the early pregnancy in obese patients. TVUS proves to be a more reliable instrument particularly in cases where early and precise fetal heart monitor is very important in pregnancy management.

References

1. Florian Recker, U. G. (2024). Clinical Ultrasound Applications in Obstetrics and Gynecology in the Year 2024. University Hospital Bonn,Germany.

2. Kaur, A., & Kaur, A. (2011). Transvaginal ultrasonography in first trimester of pregnancy and its comparison with transabdominal ultrasonography. Government Medical College and Rajindra Hospital, Punjab, India.

3. Bernard, O. E., Taofeek, A. O., David, O. A., Olufemi, A. O., Adesoji, S. A., & Olaide, R. A. (2025). Comparing Transabdominal Ultrasound Scans with Digital Vaginal Examinations in Labour.

4. Christina Hernandez Engelhart, K. G. (2023). Reliability and agreement in intrapartum fetal heart rate monitoring interpretation: A systematic review.

5. Christopher Thom, K. L. (2024). Comparison of transvaginal ultrasound utilization between radiology and point of care ultrasound in first trimester pregnancy. University of Virginia Health System, USA

6. Dominik S. Westphal, M. H. (2022). Fetal Bradycardia Caused by Monogenic Disorders.

7. Florian Recker, U. G. (2024). Clinical Ultrasound Applications in Obstetrics and Gynecology in the Year 2024. University Hospital Bonn,Germany.

8. Hamelmann, P., Vullings, R., Kolen, A. F., Bergmans, J. W., Laar, J. O., & Tortoli, P. (2020). Doppler Ultrasound Technology for Fetal Heart Rate Monitoring.

9. Judith Krossøy Pedersen, C. S. (2022). Handheld transabdominal ultrasound, after limited training, may confirm first trimester viable intrauterine pregnancy.

10. Kaur, A., & Kaur, A. (2011). Transvaginal ultrasonography in first trimester of pregnancy and its comparison with transabdominal ultrasonography. Government Medical College and Rajindra Hospital, Punjab, India.

11. Leung, K.-Y. (2021). Applications of Advanced Ultrasound Technology in Obstetrics. Gleneagles Hong Kong, Hong Kong, China.

12. Pai-Jong Stacy Tsai MD, M. (. (2015). Obesity and the challenges of ultrasound fetal abnormality diagnosis. USA.

13. Sam Hsu MD, R. (2012). Ultrasound in Pregnancy. USA.

14. Shital T. Mehta, P. A. (2022). Utility of first trimester ultrasound before 12 weeks of gestation . NHL Municipal Medical College, Ahmedabad, Gujarat, India.

15. Steinman, J. (2020). Non-Invasive Ultrasound Detection of Cerebrovascular Changes in a Mouse Model of Traumatic Brain Injury.

16. Theodor I. Stefos MD, D. E. (1998). Embryonic heart rate in early pregnancy.

17. (n.d.). Retrieved from https://radiologykey.com/first-trimester-2/.

18. (n.d.). Retrieved from https://www.reddit.com.

19. Ahemaitijiang Pahading, R. A. (2023). Study on the effectiveness of combined diagnosis of transabdominal ultrasonography and transvaginal ultrasonography in patients with acute abdomen.

20. Bernard, O. E., Taofeek, A. O., David, O. A., Olufemi, A. O., Adesoji, S. A., & Olaide, R. A. (2025). Comparing Transabdominal Ultrasound Scans with Digital Vaginal Examinations in Labour.

21. Christina Hernandez Engelhart, K. G. (2023). Reliability and agreement in intrapartum fetal heart rate monitoring interpretation: A systematic review.

22. Christopher Thom, K. L. (2024). Comparison of transvaginal ultrasound utilization between radiology and point of care ultrasound in first trimester pregnancy. University of Virginia Health System, USA.

23. Dildora Xudoyarova, N. T. (2024). SYMPTOMS OF ACUTE ABDOMINAL IN WOMEN OF REPRODUCTIVE AGE.

24. Dominik S. Westphal 1, 2. H.-M.-F.-G. (2022). Fetal Bradycardia.

25. Dominik S. Westphal, M. H. (2022). Fetal Bradycardia Caused by Monogenic Disorders.

26. Hamelmann, P., Vullings, R., Kolen, A. F., Bergmans, J. W., Laar, J. O., & Tortoli, P. (2020). Doppler Ultrasound Technology for Fetal Heart Rate Monitoring.

27. Hui-Ping Zhang, L. B.-J.-Q. (2025). Independent risk factors for twin pregnancy adverse fetal outcomes before 28 gestational week by first trimester ultrasound screening.

28. Ilan E. Timor· Tritsch, M. D. (n.d.). A close look at early embryonic development with the high-frequency transvaginal transducer. New York.

29. Ishtiaq, R. A. (2017). Knowledge and attitude about sexually transmitted infections amongst truck drivers in Southern Punjab, Pakistan. Cureus, 09(03).

30. Judith Krossøy Pedersen, C. S. (2022). Handheld transabdominal ultrasound, after limited training, may confirm first trimester viable intrauterine pregnancy.

31. Leung, K.-Y. (2021). Applications of Advanced Ultrasound Technology in Obstetrics. Gleneagles Hong Kong, Hong Kong, China.

32. Lijue Liu, D. T. (2023). Automatic fetal ultrasound image segmentation of first trimester for

33. measuring biometric parameters based on deep learning.

34. Lindsay R. Freud, L. L. (2024). Fetal cardiac screening: 1st trimester and beyond.

35. Mir, F. a. (2020). HIV infection predominantly affecting children in Sindh, Pakistan, 2019: a cross-sectional study of an outbreak. The Lancet Infectious Diseases, 20(03), 362--370.

36. Pai-Jong Stacy Tsai MD, M. (. (2015). Obesity and the challenges of ultrasound fetal abnormality diagnosis. USA.

37. S. Yang, G. Q. (2023). Evaluation of first-trimester ultrasound screening strategy for fetal congenital heart disease.

38. Sam Hsu MD, R. (2012). Ultrasound in Pregnancy. USA.

39. Sanchita Gupta, R. G. (2025). Use of Three-dimensional US for Troubleshooting in Gynecologic Imaging.

40. Shao, X., & Xie, Q. L. (2024). The Distribution of Ectopic Pregnancy in Natural Pregnancy and the Comparison of Diagnostic Efficacy between Transabdominal Ultrasound and Transvaginal Ultrasound.

41. Shin Hashiramoto, M. K. (2024). Factors affecting the accuracy of fetal cardiac ultrasound screening in the first trimester of pregnancy.

42. Shital T. Mehta, P. A. (2022). Utility of first trimester ultrasound before 12 weeks of gestation . NHL Municipal Medical College, Ahmedabad, Gujarat, India.

43. Sohaey R, W. P. (1996). First-trimester ultrasound: the essentials. Seminars in Ultrasound CT .

44. Steinman, J. (2020). Non-Invasive Ultrasound Detection of Cerebrovascular Changes in a Mouse Model of Traumatic Brain Injury.

45. Theodor I. Stefos MD, D. E. (1998). Embryonic heart rate in early pregnancy.

46. Vandana Jha, S. P. (2024). NEED OF SONOGRAPHY IN VAGINAL BLEEDING IN EARLY PREGNANCY.