

ORIGINAL ARTICLE

DIAGNOSTIC ACCURACY OF TRANSABDOMINAL SONOGRAPHY IN DIAGNOSING SHORT CERVICAL LENGTH KEEPING TRANSVAGINAL SONOGRAPHY AS THE GOLD STANDARD**Sadia Mehmood, Rimsha Khan*, Sarah Anwar*, Sammia Yousaf, Muntiha Ibtihaj*, Alveena Waheed****

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Background: Transvaginal ultrasound is a gold standard technique for diagnosing short cervix. This study aimed to determine the diagnostic accuracy of transabdominal sonography (TAS) in diagnosing short cervical length in 20–28 week pregnant women keeping transvaginal ultrasound as the gold standard. **Methods:** It was a cross-sectional study, conducted in the Department of Radiology, DHQ Hospital, Narowal from 1st July 2023 to 1st March 2024. A total of 321, 20–28 week pregnant women were included. Cervical length was measured initially by transabdominal ultrasound followed by transvaginal ultrasound. **Results:** Of the total 321 patients, 264 were true negative, 28 were false negative, 14 were false positive and 15 were true positive. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy of TAS in assessing accurate cervical length are 34.8%, 94.8%, 51.7%, 90.4%, and 86.9% respectively. In all cases with transabdominal cervical length >35 mm, the NPV of transabdominal ultrasound reached 100%. **Conclusion:** TAS exhibits limited accuracy in correctly identifying short cervical length in women who indeed have a short cervical length. However, it demonstrates a strong ability to exclude short cervical length in women with a normal cervical length. Cervical length measured via transabdominal ultrasound can be reliably reported as safe if it exceeds 35 mm. For measurements below it, further evaluation with transvaginal ultrasound is recommended.

Keywords: diagnostic accuracy, cervical length, transabdominal sonography, TAS, transvaginal sonography

Pak J Physiol 2024;20(3):49–52, DOI: <https://doi.org/10.69656/pjp.v20i3.1651>**INTRODUCTION**

The average duration of a typical pregnancy falls within the range of 37–40 weeks. Any birth occurring before 37-week mark is categorized as preterm. Researches suggest that approximately 13.4 million newborns were delivered prematurely (before 37 weeks) in 2020.¹ Complications stemming from preterm birth often result in neonatal deaths. Approximately 93.8 million deaths occurred in 2019 due to complications associated with preterm birth.²

According to the American College of Obstetricians and Gynaecologists, factors contributing to preterm birth comprise a short cervical length, early dilation of the cervical os, prior cervical procedures, injury from a previous delivery, carrying multiple foetuses, ante partum haemorrhage, maternal vaginal infections, low maternal weight, smoking during pregnancy, dietary deficiencies, and extreme maternal ages. Cervical effacement and dilation are particularly significant among the listed causes.

In Pakistan, incompetent cervix accounts for 20% of preterm births.³ Short cervical length is associated with an increased likelihood of preterm delivery. A study involving pregnant women of Asian descent between 28 and 32 weeks gestation found that a cervical length measurement cut-off of 2.49 Cm can

reliably predict preterm birth.⁴ Various treatment options exist for addressing short cervix to mitigate the risk of preterm births, such as vaginal progesterone and cervical cerclage.⁵ The implementation of universal cervical length screening has the potential to prevent numerous preterm births and lower the risk of neonatal deaths.⁶

Cervical length can be evaluated through digital manual examination, but for precise assessment, ultrasound is preferred. Various sonographic techniques, including transabdominal, transperineal, and transvaginal approaches, are utilized for cervical imaging. Among these, transvaginal sonography is considered the gold standard for accurately measuring cervical length.⁷

Transvaginal ultrasound offers superior image resolution. When measuring cervical length using transvaginal ultrasound, factors like bladder distension or myometrial contractions don't influence the accuracy, unlike transabdominal and transperineal approaches which may present a false normal cervical appearance under these circumstances. Maternal obesity can compromise the quality of images obtained through transabdominal scans.⁸ While transvaginal scanning provides high-quality images, it can be invasive and inconvenient for patients, leading to hesitation and refusal. The procedure requires covering the

transvaginal probe with a latex sheath before each examination and using sterile gel to prevent infection transmission between patients, making it more time-consuming and costly. Furthermore, not every ultrasound machine is equipped with a transvaginal probe, adding to its limitations.

Transabdominal assessment of cervical length can be conducted using a curvilinear transducer which is standard equipment available with all greyscale and Doppler ultrasound machines. Patients generally find transabdominal scanning more comfortable. Consequently, in our population, most radiologists and sonologists prefer transabdominal ultrasound for reporting cervical length due to these reasons. Internationally, studies have compared transvaginal and transabdominal approaches for cervical length measurement.⁹ In one such study conducted in Pakistan, the diagnostic accuracy of transperineal ultrasound in assessing cervical length was evaluated, with transvaginal ultrasound considered the gold standard for comparison.¹⁰ However, there is limited local data available regarding the diagnostic accuracy of transabdominal ultrasound for assessing cervical length.

Our study aimed to assess the diagnostic accuracy of transabdominal ultrasound in detecting short cervical length. The results of this study offer valuable guidelines for selecting the optimal diagnostic approach for cervical length assessment in pregnant women.

MATERIAL AND METHODS

This cross-sectional validation study conducted at the Obstetrics & Gynaecology Department of DHQ Hospital, Narowal, from 1st July 2023 to 1st March 2024 after approval from the Hospital Ethical Review Committee. These patients were referred by the Gynaecology Department for ultrasonographic assessment. Patients with multiple pregnancies and polyhydramnios were excluded from the study.

A sample size of 321 was calculated using a sensitivity/specificity calculator; and confidence interval=90%, margin of error=10%, prevalence of cervical incompetence=20%², internationally studied sensitivity=25%, and specificity=98%³ were used.

Pregnant patients meeting the inclusion criteria were enrolled in the study. After obtaining informed consent and relevant history, a 3.75 MHz conventional curvilinear transducer for transabdominal scans, and a gloved 6 MHz endocavity transducer for transvaginal ultrasound were used for assessment. Figure-1 and 2 illustrate the methods used for cervical length measurement.

Cervical length <25 mm on transvaginal ultrasound was considered short.⁴ The collected data underwent analysis using SPSS-25. For quantitative variables, mean and standard deviation were calculated, while frequency and percentages were computed for

qualitative variables. A 2×2 contingency table was utilized to determine the sensitivity, specificity, PPV, NPV, and diagnostic accuracy of transabdominal ultrasound in detecting short cervical length, with transvaginal ultrasound serving as the gold standard.

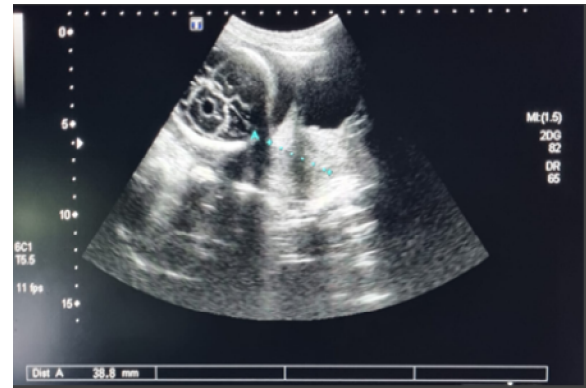


Figure-1: Technique for measurement of cervical length (Distance A), from internal to external OS along endocervical canal on transabdominal ultrasound. The maternal bladder is minimally filled during the scan to avoid pseudo-lengthening of the cervix due to over distended urinary bladder.

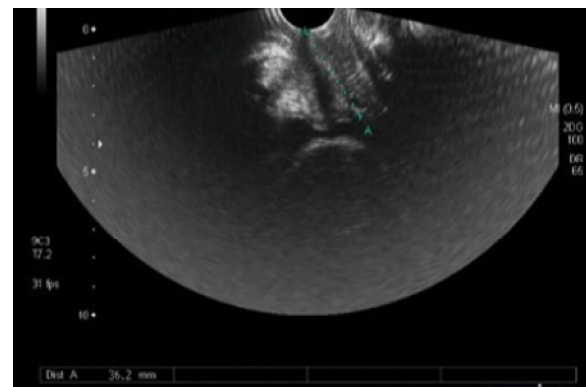


Figure-2: Technique for measurement of cervical length (Distance A), from internal to external OS along endocervical canal on transvaginal ultrasound

RESULTS

Descriptive statistics of maternal age, mean gestational age, and cervical length were calculated as Mean±SD (Table-1). The results of transabdominal and transvaginal ultrasounds are compared in a 2×2 table (Table-2).

The sensitivity of transabdominal sonography in assessing accurate cervical length was 34.8% while its specificity was 94.8%. The positive predictive value was 51.7%, and the NPV was 90.4%. Diagnostic accuracy turned out to be 86.9%, indicating the overall suitability of the test in identifying both short and normal cervical lengths. (Table-3.)

An intriguing finding in our study was that among patients with TAS indicating a cervical length

>35 mm, there were no instances of false negative results. All these patients demonstrated a normal cervical length on transvaginal sonography. Consequently, in these cases the NPV of TAS reached 100%. (Table-4).

Table-1: Demographic data of the patients

Parameters	Minimum	Maximum	Mean±SD
Age of patients (Years)	17	42	29.3±3.5
Gestational age (Weeks)	20	28	25.6±2.5
Cervical length (mm)	10	45	36.73±7.5

Table-2: Comparison of transabdominal and transvaginal ultrasound results

Sonographic Results	Result on transabdominal ultrasonography	
	Positive	Negative
Positive result on transvaginal ultrasonography	15 (TP)	28 (FN)
Negative result on transvaginal ultrasonography	14 (FP)	264 (TN)

TP=true positive, FP=false positive, FN=false negative, TN=true negative

Table-3: Performance indicators for efficacy of transabdominal ultrasound in detecting short cervical length

Performance indicator	Percentage
Sensitivity	34.8%
Specificity	94.8%
PPV	51.7%
NPV	90.4%
Diagnostic accuracy	86.9%

Table-4: Comparison of overall NPV of TAS with calculated NPV of TAS in patients with transabdominal cervical length >35 mm

No. of patients (N)	Calculated NPV of TAS
Total No. of studied patients (n=321)	90.4%
No. of patients with >35 mm cervical length on TAS (n=264)	100%

NPV=Negative predictive value, TAS=Transabdominal sonography

DISCUSSION

Transvaginal sonography is considered the gold standard for assessing cervical length due to its accuracy. However, it depends upon a high level of professional expertise of the sonographer.¹¹ In our population, transabdominal ultrasound is frequently utilized for cervical length measurement due to its cost-effectiveness, widespread availability, non-invasiveness, comfort, and acceptability among pregnant women. Nonetheless, transabdominal ultrasound does have its limitations.¹² Our study findings demonstrated that while transabdominal ultrasound exhibits low sensitivity and positive predictive value in identifying short cervical length, it demonstrates good specificity and negative predictive value.

The outcomes of our study were compared with previous work. As per one study, transabdominal ultrasound is proficient in accurately measuring cervical length greater than 34 mm. However, for cervical

lengths less than 34 mm, transvaginal ultrasound is recommended for precise assessment.⁹ In another study involving 468 patients, it was observed that all women with transabdominal cervical length measurement exceeding 3.6 Cm had a transvaginal cervical length measurement greater than 2.5 Cm.¹³

In our study, no false negative cases were found among patients with a transabdominal ultrasound showing cervical length greater than 35 mm. Therefore, in these instances, the negative predictive value of transabdominal ultrasound reached 100%.

A meta-analysis comprising 29 articles revealed a notable correlation between average transabdominal and transvaginal cervical length measurements. However, it highlighted that the variance between transabdominal and transvaginal measurements escalates as cervical length decreases.¹⁴ According to another study, women whose cervical lengths are adequately measurable and sufficiently long on transabdominal ultrasound may not necessitate further assessment with transvaginal ultrasound.¹⁵

Our study had certain limitations. Patients underwent both transabdominal and transvaginal scans during a single visit, and follow-up was not conducted to document the timing and mode of delivery. Further research is warranted to compare the effectiveness of transabdominal versus transvaginal cervical length measurement in predicting second-trimester miscarriage and preterm birth. Despite above-mentioned limitations, our study yielded important information that could serve as a guideline for sonographers involved in ante-natal imaging.

CONCLUSION

Transabdominal sonography has limited accuracy in correctly identifying short cervical length in pregnant women who indeed have a short cervical length. However, it demonstrates a strong ability to exclude short cervical length in pregnant women with a normal cervical length. There is a notable probability of transvaginal ultrasound indicating a normal cervical length if transabdominal ultrasound has ruled out short cervical length, particularly when the measured cervical length exceeds 35 mm on transabdominal ultrasound. Therefore, we recommend reporting cervical length measured through transabdominal ultrasound as safe if it surpasses 35 mm. However, further evaluation with transvaginal ultrasound should be pursued if the cervical length is below this threshold to ensure accurate results.

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