International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Mansour HA et al. Int J Reprod Contracept Obstet Gynecol. 2025 Aug;14(8):2433-2438
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20252154

Original Research Article

Predicting mode of delivery using mid-pregnancy ultrasonographic measurement of cervical length among nulliparous women

Hossam Abdelfatah Mansour[1]*, Ruqayyah Ali Ahmed[2], Ahmed Mohamed[3], Basem Hamed[4], Alaa Eldin Abdelsalam Ahmed[4], Ekramy A. Mohamed[4]

[1]Department of Obstetrics and Gynecology, Mansoura University Hospital MUH, Mansoura, Egypt
[2]Department of General Medicine and Surgery, Batterjee Medical College for Science and Technology, Jeddah, Saudi Arabia
[3]Faculty of Medicine, Mansoura University, Mansoura, Egypt
[4]Department of Obstetrics and Gynecology, Zagazig University Hospital ZUH, Zagazig, Egypt

Received: 10 June 2025
Revised: 25 June 2025
Accepted: 26 June 2025

***Correspondence:**
Dr. Hossam Abdelfatah Mansour,
E-mail: hosam.mansour1257@gmail.com

ABSTRACT

Background: Numerous studies have demonstrated that measuring the cervical length using transvaginal ultrasonography in singleton pregnancies at 20-24 weeks gestation can be a valuable technique for predicting the likelihood of a severe preterm birth. The association between cervical length at 20-24 weeks and the likelihood of a term cesarean section birth has, however, not been well researched. The purpose of this research is to ascertain if mid-pregnancy ultrasonography cervical length measurements are effective in anticipating term cesarean sections. Our hypothesis in this study is that there is no correlation between mid-pregnancy cervical length and the chance of a cesarean section during term labor.
Methods: One hundred pregnant women, ranging in gestation from twenty to twenty-four weeks, were enrolled in the study. Individuals were chosen from the prenatal outpatient clinic. The gestational age varied from 36 to 40 (38.7±2.2 weeks). Of the cases, 53 women (53%) had a normal birth, and 47 women (47%) had a cesarean section. Four sets of data were identified based on the cervical length quartile: first quartile (15-24 mm), second quartile (25-29 mm), third quartile (30-39 mm), and fourth quartile (40-50 mm).
Results: Patients with cervical lengths in the second quartile (18.2%) had the lowest rate of cesarean sections (18.6%), whereas patients with cervical lengths in the fourth quartile (96.6%) had considerably higher rates ($p<0.00$). Patients in the fourth quartile had a substantially higher ($p<0.00$) frequency of cesarean sections due to labor failure (6.38%). Logistic regression analysis revealed that the odds ratio (OR) for cesarean section in labor was lowest among patients in the first quartile (OR=1.94) and highest among patients in the fourth quartile (OR=2.95). The cervical length quartile did not significantly differ in terms of neonatal outcomes, with exception of birth weight, which did significantly differ.
Conclusions: For patients who are nulliparous, the cervical length measured by transvaginal ultrasonography at mid-gestation can be used to predict the chance of a cesarean delivery at term.

Keywords: Cervical length, Delivery, Nulliparous, Transvaginal ultrasonography

INTRODUCTION

Numerous studies have demonstrated that measuring the cervical length using transvaginal ultrasonography in singleton pregnancies at 20-24 weeks gestation can be a valuable technique for predicting the likelihood of a severe preterm birth.[1]

The association between cervical length at 20-24 weeks and the likelihood of a term cesarean section birth has,

however, not been well researched. In one such study, transvaginal cervical length measurement at 20-22 weeks was examined in 27,427 nulliparous individuals' data by a retrospective analysis (Smith et al). In their research, they discovered a positive relationship between the risk of a term cesarean birth and cervical length assessed at 20-22 weeks.[2]

In nulliparous patients, the chance of a cesarean delivery at term may be predicted using the cervical length measured by transvaginal ultrasonography at mid-gestation.[3]

According to physiological and biochemical research, the uterus's planned growth in the early stages of pregnancy is necessary for a healthy parturition at term. It is known that there is a higher chance of spontaneous preterm delivery in mid-pregnancy when there is a short cervix. Our hypothesis was that during labor at term, a longer cervix in mid-pregnancy would be linked to a higher probability of cesarean delivery.[2]

Aim

The study's goal is to ascertain if transvaginal ultrasound measurements of cervical length in nulliparous women at 20-24 weeks gestation may be utilized to predict term cesarean delivery in laboring nulliparous women.

METHODS

Study selection

The present prospective study included the pregnant women with singleton pregnancy of 20-24 weeks gestation (calculated from 1 day of LMP). Patients were recruited from the antenatal out clinic at Zagazig university hospital from 1st October 2024 till 31st January 2025 and keep following up till delivery according to the following criteria:

Inclusion criteria

Our study included nulliparous women with a singleton vertex gestation and a cervical length greater than 15 mm.

The primary outcome measure will be delivery by cesarean section at term because of failure of progress in labor due to cervical dystocia.

Exclusion criteria

Patients with multi-fetal pregnancy, any fetal congenital malformations, and medical or obstetrical complications were excluded. The study also excluded patients with a cervical length of 15 mm or shorter, pre-term delivery, pre-labor cesarean section, and if the delivery was not done in our hospital. Fetal presentation which was not vertex at the time of delivery was also excluded.

Patients will be subjected to: Full history, a complete clinical examination, gestational age and fetal viability confirmed by ultrasonography, routine an antenatal laboratory investigation (blood group, Rh. typing, full blood count, urine analysis, blood urea and blood sugar).

Ultrasound examination

Both transabdominal and transvaginal ultrasound were done with assessment of: fetal viability, number, fetal biometry (BPD-FL-HC), EGA, placental (site and maturity), liquor (amount and turbidity), cervical measurements by TAS and TVS.

Preparation and precautions for transvaginal ultrasound examination

Preparation of the patient to empty her bladder, put her in the dorsal lithotomy position; the transvaginal probe was inserted in to the anterior fornix to obtain a sagittal view of the cervix using the endocervical mucosa echogenicity to delineate the V-shaped notch at the internal os. The image was magnified so that the cervix occupies 75% of the screen. The onscreen calipers were then used to measure the linear distance between the area of echo density at the external os and the internal os. The process was repeated at least three times over a period of 2-3 minutes and the shortest measurement was recorded.

Patients were divided in to four groups according to quartile of cervical length:1st quartile (15-24), 2nd quartile (25-29), 3rd quartile (30-39) and 4th quartile (40-50).

Data were collected and submitted to statistical analysis (SPSS version 20.0).

RESULTS

There was a significant difference between the quartiles of cervical length as regards age and a non-significant difference as regards body mass index (Table 1). There was a significant difference between the quartiles of cervical length as regards cervical length (Table 2).

There were significant differences between the quartiles of cervical length as regard gestational age, type of delivery and causes of cesarean section (Table 3). There were non-significant differences between the cervical quartiles as regard neonatal outcome except for birth weight which exhibited a significant different (Table 4). There were non-significant correlations between cervical length and the different parameters except for age and neonatal birth weight which exhibited significant differences (Table 5). Logistic regression analysis revealed that the OR for cesarean section in labor was lowest among patients in the first quartile (OR=1.94) and highest among patients in the fourth quartile (OR=2.95). there were non-significant differences between the cervical length quartile as regards neonatal outcome except for birth weight which exhibited a significant different (Table 6).

Table 1: The sociodemographic characteristics according to the quartile of cervical length.

Variables	1st quartile	2nd quartile	3rd quartile	4th quartile	F	P value
Age (in years)						
Mean±SD	24.6±2.5	24.6±1.8	22.9±1.3	28.9±12.5	14.5	0.00 (S)
Range	22-37	20-28	20-25	22-31		
BMI (in kg/m²)						
Mean±SD	24.3±4.5	24.5±1.6	25.1±2.1	25 ± 1.3	0.47	0.71 (NS)
Range	22-28	22-28	22-28	22-27		

*P values S-significant, NS-Not significant.

Table 2: The cervical length according to the cervical length quartile.

Cervical length (mm)	1st quartile	2nd quartile	3rd quartile	4th quartile	F	P value
Mean±SD	20±1.6	26.9±1.4	33.4±2.5	40.6 ±0.9	823.1	0.00 (S)
Range	18-23	25-29	30-38	40-42		

P values S-significant

Table 3: The labor characteristics according to the quartile of cervical length, (n=100).

Variables	1st quartile (n=29)	2nd quartile (n=22)	3rd quartile (n=20)	4th quartile (n=29)	F	P value
GA (weeks)						
Mean±SD	38.9±0.9	38±0.72	39.5±0.8	38.7±1.2	8.4	0.00 (S)
Range	37-40	37-39	38-40	36-40		
Type of delivery, N (%)						
Normal (53)	20 (69)	18 (81.8)	14 (70)	1 (3.4)	χ^2=41.2	0.00 (S)
CS (47)	9 (31)	4 (18.2)	6 (30)	28 (96.6)		
Cause of CS, (n=47) (%)						
For failure of progress (FOP)	0 (0)	1 (2.13)	0 (0)	3 (6.38)	χ^2=23.7	0.02 (S)
Others	9 (19.1)	3 (6.38)	6 (100)	25 (53.2)		

*P values S-significant.

Table 4: The neonatal outcome according to the cervical quartiles.

Variables	1st quartile	2nd quartile	3rd quartile	4th quartile	F	P value
Birth weight						
Mean±SD	3298±0.666	3190.9±0.853	3325±0.97	3456.9±0.579	9.4	0.00 (S)
Range	3000-3500	2500-3600	3000-3800	3100-3600		
Agar score at 1 min	7.4±0.9	7±1	7.4±0.9	7.1±1	1.63	0.29 (NS)
6 no. (%)	8 (27.6)	11 (50)	6 (30)	13 (44.8)	χ^2=3.8	0.28 (NS)
8 no. (%)	27 (72.4)	11 (50)	14 (70)	16 (55.2)		
Apgar score at 5 min	9.5±0.8	9.4±0.9	9.8±0.6	9.5±0.8	0.99	0.39 (NS)
8 no. (%)	7 (24.1)	7 (31.8)	2 (10)	6 (20.7)	χ^2=3.02	0.39 (NS)
10 no. (%)	22 (75.9)	15 (68.2)	18 (90)	23 (79.3)		

*χ^2=Chi square, p values S-significant, NS-Not significant.

Table 5: The correlation between cervical length in mm and the different parameters.

Cervical length	R	P value
Age (in years)	0.28	0.01 (S)
BMI (kg/m²)	0.09	0.36 (NS)
GA	0.19	0.06 (NS)
Neonatal birth weight	0.39	0.00 (S)
Apgar score at 1 min	-0.56	0.58 (NS)
Apgar score at 5 min	0.09	0.33 (NS)

*P values S-significant, NS-Not significant.

Table 6: The OR about CS among women in the 4th quartile as compared to 1st quartile.

OR	95% confidence interval		P value
	Minimum	Maximum	
2.54	1.94	2.95	0.00 (S)

*P values S-significant

DISCUSSION

There is an inverse relationship between the length of the cervical canal and the likelihood of preterm delivery; a shorter cervix has been linked to a higher risk of spontaneous preterm birth. A longer cervix in the middle of pregnancy may raise a primiparous woman's likelihood of having a term cesarean delivery.[2]

The number of cesarean sections performed has skyrocketed globally in recent years. Cesarean section rates have been rising in less developed nations like Nigeria as a result of the procedure's growing acceptance.[4] While dystocia, or poor labor progress, is the predominant cause of primary cesarean birth, the exact physiological basis of dystocia remains unclear.[5]

A short cervix by ultrasound evaluation has been linked to an increased risk of cervical incompetence, and a negative Bishop score by digital clinical assessment has been linked to unsuccessful labor induction.[6] However, no study has found a direct correlation between the mid-trimester ultrasonographic cervical length and cesarean section.[7]

The purpose of this research is to ascertain if mid-pregnancy ultrasonographic cervical length measurements are effective in forecasting term cesarean sections. Our hypothesis in this study is that there is no correlation between mid-pregnancy cervical length and the chance of a cesarean section during term labor.

The study's gestational age varied from 36 to 40 weeks (mean±SD of 38.7±2.2 weeks). Of the 53 women (or 53%) in our cases had a normal birth, whereas the remaining 47 women 47% delivered by cesarean section.

According to this study, there is a strong correlation between a mid-pregnancy cervical length and a cesarean section for inadequate labor progress at term. As cervical length increases, this link progressively gets stronger until it peaks at the crucial cervical length of baby above 40 mm, at which point the rate of cesarean sections more than doubles. The mean cervical length in the 1st,2nd,3rd,4thquartile were 20±1.6,26.9±1.4,33.4±2.5, and 40.6±0.9, respectively (p<0.001).

This is in conjunction with Kalu et al he also said that, at cervical lengths of 20 to 30 mm, the rate of cesarean sections reaches the average rate; however, at cervical lengths of 30 mm and beyond, the rate of cesarean sections exceeds the average for the centers and increases considerably. These results point to a considerable correlation between poor labor progress at term and the mid-pregnancy cervical length.[8] This result is in line with research conducted in the United Kingdom by Smith et al who proposed that a key predictor of the likelihood of a term cesarean section is the cervical length at mid-pregnancy.[2]

Prior research had documented the correlation between a negative digital clinical evaluation Bishop score at term and an unsuccessful induction of birth at term.

Oboro et al notes that in order to correlate the consistency of the cervical results from an earlier pregnancy with the final mode of birth and the cause of that mode of delivery, this study did not track changes in the study group's cervical length until term.[7]

According to this study, women in the lower quartile give birth naturally in the majority of cases (69%) and by caesarean section (31%), but just one woman in the upper quartile gives birth normally (3.4%) and delivers by caesarean section (96.6%) 66.7% of all the women in the study group who had preterm birth were in regular labor and had cervical lengths in the lower quartile (<20 mm), according to 2012 research by Kalu et al. In contrast, typical labor in women whose cervical length is in the upper quartile cervical length is only 6%.[8]

This result is consistent with that of Bergherlla et al who also noted that as the cervical length of the cervix decreases, so does the risk of spontaneous preterm birth. Additionally, they found that the gestational age at which spontaneous labor occurs decreases. When the different interquartile cervical lengths were tested further for their connection with preterm labor, the cervical length of less than 20 mm [OR=19.52 (5.48-69.42)] exhibited the most positive correlation of all the interquartile lengths. There was statistical significance in this connection. There were no correlations found between cervical length and spontaneous preterm birth at a length greater than 30 mm. (p=0.0004).[9]

These results imply that a longer cervix than 30 mm protects against spontaneous preterm delivery and that there is a substantial correlation between a short cervix and preterm birth. A previously done systematic review investigated the potential use of transvaginal ultrasonographic cervix evaluation as a predictor of successful labor induction. Thirteen researches with 5029 women were included.[10] A lengthy cervix with no wedging generally increases the likelihood of a failed induction, according to combinations of cervical length's sensitivity and specificity in predicting the result of inducing labor. In

contrast, a short cervix and wedging decrease the odds of failed induction by approximately 50%.[10]

We rated the listed studies' quality as mediocre. This was mostly because very few studies recorded withdrawals, and none provided cervical assessment results that were difficult to interpret. In about 100% of cases, a clear picture of the cervix may be produced since measuring cervical length is simple to do and straightforward to understand, even for seasoned investigators.[11] This may provide a justification for not disclosing withdrawals/data that are difficult to understand, but regrettably, majority of research did not specifically address these problems.[12]

Kolkman et al included 12 more papers that were published after 2006, which appears to be a significant amount of time following the release of a systematic review on the topic. Their cervical length findings are consistent with that investigation.[13] The requirement for prompt delivery influences the utilization of prognostic testing in the choice to induce or not. For instance, vaginal birth following labor induction or, in the event that this approach is unsuccessful, cesarean delivery is required for women with pre-eclampsia at term.[14]

This balance, however, could be different in situations where there is less of a clear signal for delivery, such as in women who are healthy at 41 weeks of pregnancy. Furthermore, it should be understood that an immature cervix can be identified by a lengthy cervix or by the lack of wedging, implying a longer wait before the start of spontaneous labor in addition to a higher chance of an unsuccessful induction. Therefore, there is increasing focus on accurately interpreting test results to forecast failure induction when the mother's or child's health demands a rapid delivery. In fact, an examination of the significance of cervical length measurement in the HYPITAT trial revealed that, because the first group may be adversely affected by expectant care, induction of labor is preferable in women with hypertensive illness and an unripe cervix as opposed to those with a ripe cervix.[15]

Limitations

The composite analysis of primigravidae and multigravida is one of the study's limitations since the labor dynamics in these two groups are somewhat different. Future research will examine these groupings classifications in more detail.

CONCLUSION

In patients who are nulliparous, the chance of a cesarean delivery at term can be predicted by measuring the cervical length at mid-gestation with transvaginal ultrasonography.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Rozenberg P, Rudant J, Chevret S, Boulogne AI, Ville Y (2004): Repeat measurement of cervical length after successful tocolysis. Obstet Gynecol. 2004;104(5):995-9.
2. Smith GC, Celik E, To M, Khouri O, Nicolaides KH; for the Fetal Medicine Foundation Second Trimester Screening Group. Cervical Length at Mid-Pregnancy and the Risk of Primary Cesarean Delivery. N Engl J Med. 2008;358(13):1346-53.
3. Negm S, Kamel R, Magdi A, Momtaz M. Mid-gestation ultrasonic assessment of cervical length to predict cesarean delivery among nulliparous women. J Egypt Soc Gynecol Obstet. 2011;37(1):571-6.
4. Ecker JL, Frigoletto FD Jr. Cesarean delivery and the risk-benefit calculus. N Engl J Med. 2007;356(9):885-8.
5. Main DM, Main EK, Moore DH II. The relationship between maternal age and uterine dysfunction: a continuous effect throughout reproductive life. Am J Obstet Gynecol. 2020;182(6):1312-20.
6. Ejikeme BN, Umeora OU. Second trimester ultrasonography: An objective tool in predicting risk of cervical incompetence and preterm births in a Nigerian population. Ebonyi Med J. 2016;5(2):63-7.
7. Oboro VO, Isawumi AI, Akinola SE, Koolafe JO, Tijani AM, Adesina AO. Factors predicting failure of labor induction. Niger Postgrad Med J. 2007;14(2):137-9.
8. Kalu CA, Umeora OU, Egwuatu EV, Okwor A. Predicting mode of delivery using mid-pregnancy ultrasonographic measurement of cervical length. Nig J Clin Pract. 2012;15(3):338-43.
9. Berghella V, Ludmir J, Simonazzi G, Owen J. Transvaginal cervical cerclage: evidence for perioperative management strategies. Am J Obstet Gynecol. 2013;209(3):181-92.
10. Verhoeven CJ, Opmeer BC, Oei SG, Latour V, van der Post JA, Mol BW. Transvaginal sonographic assessment of cervical length and wedging for predicting outcome of labor induction at term: a systematic review and meta-analysis. Ultrasound Obstet Gynecol. 2013;42(5):500-8.
11. Vayssiere C, Moriniere C, Camus E, Le Strat Y, Poty L, Fermanian J, et al. Measuring cervical length with ultrasound: evaluation of the procedures and duration of a learning method. Ultrasound Obstet Gynecol. 2002;20(6):575-9.
12. Kolkman DG, Verhoeven CJ, Brinkhorst SJ, van der Post JA, Pajkrt E, Opmeer BC, et al. The Bishop score as a predictor of labor induction success: a systematic review. Am J Perinatol. 2013;30(08):625-30.
13. Koopmans CM, Bijlenga D, Groen H, Vijgen SM, Aarnoudse JG, Bekedam DJ, et al. Induction of labor versus expectant monitoring for gestational hypertension or mild pre-eclampsia after 36 weeks' gestation (HYPITAT): a multicentre, open-label randomised controlled trial. Lancet. 2009;374:979-88.

14. Tajik P, van der Tuuk K, Koopmans CM, Groen H, van Pampus MG, van der Berg PP, et al. Should cervical favourability play a role in the decision for labour induction in gestational hypertension or mild pre-eclampsia at term? An exploratory analysis of the HYPITAT trial. BJOG. 2012;119:1123-30.

Cite this article as: Mansour HA, Ahmed RA, Mohamed A, Hamed B, Ahmed AEA, Mohamed EA. Predicting mode of delivery using mid-pregnancy ultrasonographic measurement of cervical length among nulliparous women. Int J Reprod Contracept Obstet Gynecol 2025;14:2433-8.