Original Article

Accuracy of Transvaginal Ultrasound Measured Cervical length and Bishop Score in Predicting Successful Induction of Labor at Term

Ayesha Kamran[1], Ghulam Mujtaba Nasir[2], Mohsana Saeed Zia[3], Zubina Adnan[4], Aalia Jadaan[5]

[1]Assistant Professor of Radiology, Sargodha Medical College, DHQ hospital Sargodha.
[2]Assistant Professor, Community Medicine, Nishtar Medical University, Multan
[3]Assistant Professor, Gynaecology and obstetrics department Azad Jammu and Kashmir Medical College, Muzaffarabad.
[4]Assistant Professor, Obstetrics and Gynecology Department, AJKMC /CMH Muzaffarabad.
[5]Associate Professor of Obstetrics & Gynecology, Aziz Fatimah Medical and Dental College and Hospital, Faisalabad.

Correspondence: Dr. Ayesha Kamran
Assistant Professor of Radiology, Sargodha Medical College, DHQ hospital Sargodha.
ayeshakamranbabar@gmail.com

Abstract

Objectives: To assess the accuracy of transvaginal ultrasound measured cervical length and bishop score in predicting successful induction of labor at term.

Methodology: The study was conducted at Departments of Radiology and Obstetrics & Gynecology, Sargodha Medical College, DHQ hospital Sargodha, in a period of six months from November 2021 to April 2022. After initial cervical assessments and vaginal examination, females were classified as favorable or unfavorable cases based on the bishop score. The researcher herself then performed transvaginal ultrasonography on female subjects. The women's bladders were empty when they were inspected in the dorsal lithotomy position. When the exterior cervical os, cervical canal, and internal cervical os were visible, a sagittal plane through the cervix was detected and cervical length was measured. When a vaginal delivery occurs within 24 hours it was considered as successful induction.

Results: In this study, a total of 131 women were included, of whom 80 (61.07%) had normal vaginal delivery and 51 (38.93%) delivered through caesarean section. The mean age was comparatively (P-value < 0.05) higher in caesarian section group. The mean cervical length was found to be significantly (P-value < 0.05) higher in women who delivered by caesarean section (27.95 ± 7.24 vs. 24.85 ± 7.68 mm) in comparison to normal delivery group. The sensitivity (87.50% vs. 80.0%) and specificity (56.29% vs. 35.29%), Positive Predictive Value (76.09% vs. 65.98%), and Negative Predictive Values (76.09% vs. 65.98%), and Negative Predictive Values (76.09% vs. 65.98%) were comparatively higher on the basis of cervical length (27 mm) in comparison to the bishop score (> 5).

Conclusion: Transvaginal sonography of cervical length is more accurate and objective than the Bishop Score, and it can be used to predict the likelihood that a labour induction would be successful.

Key Words: Transvaginal Ultrasound, Cervical Length, Bishop Score, Induction of Labor

Cite this article as: Kamran A, Nasir GM, Zia MS, Adnan Z, Jadaan A. Accuracy of Transvaginal Ultrasound Measured Cervical length and Bishop Score in Predicting Successful Induction of Labor at Term. J Soc Obstet Gynaecol Pak. 2022; 12(3):183-187.

Introduction

The phrase "labour" is used to refer to all stages of childbirth, including the latent stage and placenta delivery. The latent period starts whenever the mother notices regular contractions. Most women's latent phases end when their cervical dilatation reaches 3 to 4 cm. This threshold might be useful from a therapeutic standpoint because it indicates the cervical dilatation ranges beyond which active labour can be predicted. Induction of labour (IOL) is the artificial stimulation of uterine contractions prior to the onset of spontaneous labor, and it is used to achieve delivery in women who have obstetric, medical, or foetal complications.[1,2]

The most frequent reasons for inducing labour are PROM or medical conditions that occur during pregnancy. Induction of labour is the process when uterine contractions are started by medical or surgical techniques before the commencement of natural labour. It is easier to see the necessity for additional objective criteria for the prediction of effective induction of labour when one considers that 18% of patients undergoing induction of labour require a caesarean section for

Authorship Contribution: [1,3,5]Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work, Final approval of the version to be published, [2,4]Drafting the work or revising it critically for important intellectual content, participated in the acquisition and data analysis.

Funding Source: none
Conflict of Interest: none

Received: June 27, 2022
Accepted: Sept 01, 2022

delivery.[3,4] The disparity in digital assessments of the cervix among the medical team is one of the most frequent issues in the labour ward. The primary cause of this controversy is the cervix's subjective digital inspection, particularly the measurement of the cervical length. The choice of induction agent, which may affect the length of labour and the result, is the primary goal of cervical examination prior to induction of labour. For cervical assessment, a number of scoring systems, including the Bishop score, have been introduced.[5, 6]

Over the past 20 years, labour inductions have gradually grown. Many nations today have rates that are higher than 20% of all births. Approximately 20% of inductions result in caesarean sections. Bishop Score and transvaginal ultrasound for evaluating cervical length are the two most often utilized techniques for cervical assessment prior to labour induction. When deciding whether or not to induce labour and whether a woman is prepared for a successful vaginal delivery, the bishop's score is considered. Bishop's Score is made up of dilation, effacement, location, and consistency. The fetus's descent into the pelvis is referred to as "station. Between 0 and 10, centimetres are used to quantify dilation. The cervix thins during effacement. The cervix softens out entirely and is ready for a regular delivery when it is fully effaced.[7,8]

In a research published in 2017, Sharma et al compared several statistical analyses of earlier studies. Nine out of the 13 studies revealed that cervical length is a better predictor for the success of induction of labour, while three studies showed Bishop's scoring to be statistically significant but not significantly different from cervical length measurement, and one study found that Bishop's scoring is superior to cervical length measurement.[9]

Transvaginal ultrasound and Bishops score did not significantly differ in terms of the primary outcomes, such as vaginal birth or caesarean delivery, and induction to delivery interval, according to a recent Cochrane review published in 2015.[10] The goal of the current study is to determine whether Bishop's Score and transvaginal cervix ultrasonography are predictive of effective labour induction.

Methodology

In this cross-sectional study, all the patients visiting the departments of Radiology for predelivery ultrasound and Obstetrics & Gynecology for delivery at term were included from November 2021 to April 2022 at Sargodha Medical College, DHQ hospital, Sargodha. Following receipt of the study's approval from the hospital ethical review committee, the data gathering process for this was initiated. By using a non-probability consecutive sampling method, patients who satisfied our selection criteria were enrolled. The study methodology was explained to every individual that was chosen, and the researcher obtained their signed informed consent. Regarding both their medical and non-medical information, confidentiality was upheld. The study involved 131 people in total. The sample size was calculated by the WHO sample size calculator with the help of 90% sensitivity, 58.9% specificity, 50% expected prevalence, and 10% precision level along with a 95% confidence interval.[8]

The study included pregnant women who were between the ages of 18 and 40, had a single-tongue pregnancy, were at term (>38 weeks gestation), had a cephalic presentation, and did not have any medical conditions that would preclude vaginal birth. The study excluded patients with pregnancy-induced hypertension, pre-eclampsia, eclampsia, or gestational diabetes, as well as pregnancies with ruptured membranes, foetal abnormalities or foetal death, emergency delivery rationale, and history of caesarean delivery.

The same examiner performed the initial cervical assessments on each patient. Following a vaginal examination, females had their cases classified as favorable or unfavorable based on the bishop score. The researcher herself then performed transvaginal ultrasonography on female subjects. The women's bladders were empty when they were inspected in the dorsal lithotomy position. When the exterior cervical os, cervical canal, and internal cervical os were visible, a sagittal plane through the cervix was detected. The cervical length was then determined by calculating the distance between the internal and external cervical os, and the case was classified as positive or negative. Positive cervical length was defined as less than 27 mm. On TVS, cervical length greater than 27 mm was deemed negative. Vaginal delivery occurring in 24 hours as anticipated by TVS (length 27mm) was considered a success of induction on TVS. A Bishop Score of 5 was considered favourable. A Bishop's score of below five was deemed bad. When a vaginal delivery occurs within 24 hours as indicated by the bishop score (bishop score 5), that is considered a successful induction. All this information along with other demographic information including name, age, weight, BMI, gestational age and parity, was noted on a predesigned performa.

SPSS version 21 was used to enter and analyze all the recorded data. Quantitative factors are given using mean and standard deviation, while qualitative variables are expressed as frequency and percentages. Both quantitative and qualitative data were compared between the two groups using the independent sample t-test and the chi-square test, respectively. P-values under 0.05 were considered significant.

Results

In this study a total of 131 women were from which 80 (61.07%) had normal vaginal delivery and 51 (38.93%) delivered through caesarean section. The mean age was comparatively (P-value < 0.05) higher in the caesarian section group with mean of 30.21 ± 4.55 years as compared to women deliver vaginally having mean age of 28.32 ± 4.87 years. The mean body mass index (BMI) was also found to be significantly (P-value < 0.05) higher in caesarean section group (26.24 ± 4.15 vs. 28.47 ± 6.38) than women who had normal vaginal delivery. Table I shows that there was no significant (P-value > 0.05) difference between the two groups in terms of parity and gestational age.

Table I: Distribution of Demographic information of the study sample

Variables	Vaginal Birth (n=80)	Caesarean Section (n=51)	P-value
Age of patient (years)			
Mean ± SD	28.32 ± 4.87	30.21 ± 4.55	0.025
< 35	63 (78.75%)	39 (76.47%)	0.759
> 35	17 (21.25%)	12 (23.53%)	
Height (cm)			
Mean ± SD	156.15 ± 4.85	155.95 ± 5.16	0.825
Weight (kg)			
Mean ± SD	64.55 ± 12.85	67.74 ± 14.56	0.000
Body Mass Index (BMI)			
Mean ± SD	26.24 ± 4.15	28.47 ± 6.38	0.028
Parity			
Median (IQR)	1 (3)	1 (2)	----
Nulliparous	32 (40%)	30 (58.82%)	0.054
Parous	48 (60%)	21 (41.18%)	
Gestational Age (weeks)			
Mean ± SD	38.65 ± 1.22	38.75 ± 1.35	0.669

The mean cervical length was found to be significantly (P-value < 0.05) higher in women who delivered with caesarean section (27.95 ± 7.24 mm) as compared to women who delivered vaginally with mean cervical length of (24.85 ± 7.68 mm). The rate of cervical funneling was significantly higher in women who delivered vaginally (61.25% vs. 39.22%) as compared to women delivered with C-section.

The median Bishop score was significantly (P-value > 0.05) higher in vaginal delivery group (6 vs. 3) in contrast to C-section delivery group. The mean induction to delivery interval was significantly (P-value < 0.05) higher in cesarean section group (42.68 ± 28.45 vs 32.46 ± 22.56) than normal vaginal delivery group. Mean birth weight was also found significantly (P-value > 0.05) higher (3.14 ± 0.39) in C-section delivery group as compared to (3.05 ± 0.31) normal delivery group as elaborated in table II.

Table II: Feto-maternal Characteristics of both groups

Variables	Vaginal Birth (n=80)	C Section (n=51)	P-value
Cervical Length (mm)			
Mean ± SD	24.85 ± 7.68	27.95 ± 7.24	0.021
Cervical Funneling			
Present	49 (61.25%)	20 (39.22%)	0.014
Absent	31 (38.75%)	31 (60.78%)	
Bishop Score			
Median (IQR)	6 (3)	3 (3)	0.000
Induction to delivery interval			
Mean ± SD	32.46 ± 22.56	42.68 ± 28.45	0.032
Birth Weight			
Mean ± SD	3.05 ± 0.31	3.14 ± 0.39	0.049

The cross tabulation of successful induction of labor with Bishop score at a cut off value of > 5 is given in table 3. Which shows that there were 64 (48%) true positive patients and 18 (13.74%) true negative patients in the study based on bishop score (>5). The cross tabulation on the basis of cervical length with cutoff level of < 27 showed that 70 (53.43%) true positive participants and 29 (22.14%) true negative participants in the study for prediction of successful induction of labor as elaborated in table III.

Table III: Cross tabulation of Successful Induction of Labor and Bishop score and Cervical length

		Successful Induction of Labor		Total
		Yes (n=80)	No (n=51)	
Bishop Score (> 5)	Yes	64	33	97
	No	16	18	34
	Total	80	51	131
Cervical Length (< 27 mm)	Yes	70	22	92
	No	10	29	39
	Total	80	51	131

The sensitivity (87.50% vs. 80.0%) and specificity (56.86% vs. 35.29%) was comparatively higher on the basis of cervical length in comparison to bishop score. The Positive Predictive Value (76.09% vs. 65.98%) and Negative Predictive Value (27 mm) were also higher in

comparison to the Bishop Score (>5).The overall accuracy of cervical length (75.57%) was higher than Bishop score (62.60%) as elaborated in table IV.

Table IV: Accuracy of Bishop score and Cervical length for Successful Induction of Labor

Statistic	Bishop Score (> 5)	Cervical Length (< 27 mm)
Sensitivity	80.00%	87.50%
Specificity	35.29%	56.86%
Positive Predictive Value	65.98%	76.09%
Negative Predictive Value	52.94%	74.36%
Accuracy	62.60%	75.57%

Discussion

Prior to induction, it is critical to evaluate the cervical condition to ascertain the likelihood of a successful vaginal delivery. Knowing this could help clinicians choose and counsel women carefully to optimise the results of labour induction. According to the findings of this study, measuring the transvaginal cervical length before to labour induction was a reliable and independent predictor of effective labour induction. This was in line with earlier research that examined the value of determining cervical length prior to induction.[11,12]

There is no denying that the cervix plays a crucial role in labour due to its high collagen content and ligamentous support. That is why cervical measures are mostly employed in research to predict the success of labour induction. Studies examining cervical factors produce contradictory findings because the results are not consistent. The cervix is vulnerable to change due to pressure from the pelvic organs, as well as from an expanding uterus or fetus. Cervical effacement, a crucial stage of labour, theoretically shortens the cervix and extends the lower uterine segment. So, an ultrasound of a woman with a healthy cervix should reveal a short cervical length and a broad uterocervical angle.[13]

There are conflicting findings in the literature about the accuracy of sonographic cervical length measurement in predicting the outcome of labour induction. In comparison to Bishop score, several studies indicated that it had a greater sensitivity and specificity as well as a high predictive value with a cut-off of 28 mm. While others demonstrated that it was only below Bishop score.[14]

Induction of labor is indicated when labor is more beneficial than waiting for spontaneous labor. Bishop score was introduced in practice as a predictor of successful induction of labor and it is considered one of the most critical and valuable scoring systems. However, as alternatives for the conventional Bishop score, some ultrasound parameters are recommended particularly, cervical length and PCA.[15] In this current study, the cervical length measurements were assessed using transvaginal ultrasound in comparison with the Bishop score to predict the outcome of induction of labour. And it was found that the mean cervical length was found to be significantly (P-value < 0.05) higher in women who delivered with caesarean section (27.95 ± 7.24 mm) as compared to women who delivered vaginally with mean cervical length of (24.85 ± 7.68 mm). These results are parallel to the results of other study like study by Hassan SSM who found that the mean cervical length was significantly lower (28.76 ± 3.93) among the women who had successful induction of labor as compared to (34.67 ± 2.40) among women having unsuccessful induction of labor.[16]

Transvaginal ultrasonography has traditionally been a means to anticipate preterm births, and in recent years it has been used with various degrees of success to predict the result of labour induction. Despite being very subjective and having a poor predictive value for the outcome of induction, Bishop's scoring system is the most used technique to assess the effectiveness of labour induction, particularly in women with low Bishop scores.[17]

Similar findings were observed from the results of this present study. It was found that there were 48% true positive patients and 13.74% true negative patients in the study based on bishop score (>5). On the other hand, cervical length with cutoff level of < 27 showed higher number of true positives (53.43%) and true negatives (22.14%) participants for the prediction of successful induction of labor. These results are similar with the previous studies in which it was found that cervical length assessment on TVS has more accuracy than the bishop score in prediction of successful induction of labor at term.[18,19]

This present study showed that the sensitivity (87.50% vs. 80.0%) and specificity (56.86% vs. 35.29%) was comparatively higher on the basis of cervical length in comparison to bishop score. The Positive Predictive Value (76.09% vs. 65.98%) and Negative Predictive Value (27 mm) were also higher in comparison to the Bishop Score (> 5).Bishop score was less accurate overall (75.57%) than cervical length (62.60%). These results were in line with those of Pandis et al., who

discovered that the cervical length proved to be a stronger predictor than the Bishop score, with a sensitivity of 87% and a specificity of 71%.[20] Khalifa MA discovered that cervical length showed higher sensitivity in a similar manner (of 80 % vs. 64 %).[1]

After labour induction, the method of delivery can be predicted using a variety of characteristics. Although measuring cervical length using transvaginal ultrasonography is a more accurate way to assess cervical health, the Bishop score is still important for determining whether or not to induce labour.

Conclusion

Transvaginal sonography of cervical length is more accurate and objective than the Bishop Score, and it can be used to predict the likelihood that a labour induction would be successful in women who are having it because of a prolonged pregnancy. Therefore, cervical length measurement may be more advantageous than the bishop score.

References

1. Khalifa MA, Abbas AM, Gaber MA, Salah M. Bishop score versus transvaginal ultrasonographic measurement of cervical length in predicting successful labor induction in post-term pregnancy: prospective cohort study. Int J Reprod Contracept Obstet Gynecol. 2018;7:4646-51.
2. Kamel RA, Negm SM, Aly Youssef, Bianchini L, Brunelli E, Pilu G, et al. Predicting cesarean delivery for failure to progress as an outcome of labor induction in term singleton pregnancy. Am J Obstet Gynecol. 2021;224(6):609.e1-e11.
3. Abdelazim IA, Abu faza ML. Sonographic assessment of the cervical length before induction of labor. Asian Pacific J Reproduct. 2012;1(4):253-7.
4. Ezebialu IU, Eke AC, Eleje GU, Nwachukwu CE. Methods for assessing pre-induction cervical ripening. Cochrane Database Syst Rev. 2015;2015(6):CD010762.
5. Kehila M, Abouda HS, Hmid RB, Touhami O, Miled CB, Godcha I, et al. The opening of the internal cervical os predicts cervical ripening better than Bishop's score in nulliparous women at 41 weeks gestation. Pan Afr Med J. 2016;25:203.
6. Verhoeven CJM, Opmeer BC, Oei SG, Latour V, Van Der Post JAM, Mol BWJ. 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;42:500-8.
7. Deepika G, Kumar A, Sood R, Sood A. Prospective evaluation of clinical andultrasonicfeto-maternal parameters as predictors of caesarean delivery after induction of labour. Biomed Res Int. 2014;5(1):264-67.
8. Wajid, R, Hafeez S, Batool A. The accuracy of transvaginal ultrasound and bishop score to predict the successful induction of labor in primigravidas at term. Ann King Edward Med Uni. 2018;24(2):40-5.
9. Sharma SK, Nagpal M, Thukral C. Evaluation of pre induction scoring by clinical examination vs transvaginal sonography. Int J Reproduct Contracept Obstetric Gynecol. 2017;6(1):229.
10. Ezebialu IU, Eke AC, Eleje GU, Nwachukwu CE. Methods for assessing pre-induction cervical ripening. Cochrane Database Syst Review. 2015(6).
11. Aggarwal K, Yadav A. Role of transvaginal ultrasonographic cervical assessment in predicting the outcome of induction of labor. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2019 Feb 1;8(2):628-37.
12. Abdullah ZHA, Chew KT, Velayudham VRV, Yahaya Z, Jamil AAM, Abu MA, et al. Pre-induction cervical assessment using transvaginal ultrasound versus Bishops cervical scoring as predictors of successful induction of labour in term pregnancies: A hospital-based comparative clinical trial. PLoS ONE. 2022;17(1):e0262387.
13. Abdelhafeez, MA, Elguindy AE, Hamed MAM, Nawara M. Transvaginal Sonographic Assessment of the Cervix for Prediction of Successful Induction of Labor in Nulliparous Women. Open J Obstetr Gynecol. 2020;10:892-901.
14. Gokturk, U, Cavkaytar S, Danısman N. Can measurement of cervical length, fetal head position and posterior cervical angle be an alternative method to bishop score in the prediction of successful labor induction? J Maternal Fetal & Neonatal Med. 2015;28:1360-5.
15. De Vivo V, Carbone L, Saccone G. Early amniotomy after cervical ripening for induction of labor: A systematic review and meta-analysis of randomized controlled trials. Am J Obstet Gynecol. 2020;222(4):320-29.
16. Hassan SSM, Omar AEA, Essam AM, Mansour EM. Cervical length and posterior-cervical angle in prediction of successful induction of labor. Gin Pol Med Project. 2021;4(59):001-05.
17. Eid M, Abdallah AK, ElHalwagy A. Value of transvaginal ultrasonography versus Bishop Score in predicting successful induction of labor. Evidence Based Women's Health J. 2017;7(4):125-30.
18. Hafeez S, Akhtar M, Siddique S, Jabeen S. Induction of labour; accuracy of transvaginal ultrasonography and bishop score in prediction of successful induction of labour at term. Professional Med J 2019; 26(3):434-7.
19. Pandis GK, Papageorghiou AT, Ramanathan VG, Thompson MO, Nicolaides KH. Preinduction sonographic measurement of cervical length in the prediction of successful induction of labor. ultrasound Obstet Gynecol. 2001;18(6):623-28.
20. Sagane K, Patil SK, Patil Y. Predicting success of induction of labor by comparing transvaginal ultrasonographically assessed cervical factors with Bishop Score. Int J Special Education. 2022;73(3):9308-23.