

# Can We Use the Bishop Score as a Prediction Tool for the Mode of Delivery in Primiparous Women at Term Before the Onset of Labor?

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**ABSTRACT:** The Bishop score serves as an evaluation system performed by digital vaginal examination (DVE) to determine cervical ripening. The scoring system includes cervical dilatation, position, effacement and consistency of the cervix and fetal head station. Nowadays, the Bishop score is frequently used as an important parameter for the prediction of successful induction of labor. Objective: Our objective was to demonstrate the role of the Bishop scoring system in prediction of the mode of delivery in primiparous women at term before the onset of labor. Method: We included in this study unselected primiparous women at term, after 37 weeks of gestation, who presented to the Prenatal Diagnostic Unit (PDU) of the University Emergency County Hospital of Craiova. We excluded from the study multiparous patients, pregnancies with a planned Caesarean section delivery (CD), non-cephalic presentations and multiple pregnancies, twin pregnancies and those with detected fetal anomalies. The protocol included weekly DVEs until delivery for all patients, to determine the evolution of the Bishop score at term and in the week before delivery, and potential correlations with delivery outcome. To reduce clinical bias, the DVEs were performed by three experienced obstetricians involved in the research. Results: Statistical analysis yielded a 4 to 6 Bishop score in all weekly examinations. At 37 weeks of gestation, the majority of primiparous women had a Bishop score of 4, with no significant differences between the primiparous who delivered vaginally and the ones where Caesarean section was necessary. During the following weekly evaluations, we noted a slight turn to a Bishop score of 6 for most of them, without any significant differences between the two groups. However, at 41 weeks of gestation, there was a significant higher Bishop score in the group of primiparous women who delivered vaginally. Conclusion: In our study, the use of the Bishop score failed as a prediction tool for the mode of delivery in primiparous women at term before the onset of labor, at a gestational age less than 40 weeks. Therefore, Bishop score should not be used to counsel regarding the probability of an uncomplicated vaginal delivery (VD) before the onset of labor.

**KEYWORDS:** Bishop score, vaginal delivery, primiparous women, labor.

## Introduction

The Bishop score was firstly introduced by Edward Bishop in 1964. The scoring system included several clinical parameters such as dilatation, effacement, position and consistency of the cervix and foetal head situation [1]. All these parameters were graded with a score ranged from 0 to 13 [1]. The Bishop score is a pre-labor evaluation system used for the prediction of successful labor. A score of more than 8 appeared as a good predictor for elective induction in multiparous women at term with uncomplicated pregnancies [2]. Determination of the Bishop score is the most commonly used empirical method to assess the cervix before induction [3,4]. It can also be used to establish the risk of spontaneous preterm delivery.

The prediction of vaginal delivery (VD) outcome, preferably before the onset of labor, was always an important target [5,6] in obstetrical practice, because emergency CD is associated with considerable high morbidity and mortality for both foetus and mother [7]. The Bishop score, described as a subjective and uncomfortable method of examination [8-9], still remains the gold standard for assessing the prognosis of labor induction [10], although nowadays there is increasing evidence on the role of ultrasound in this field [11-13].

From this premise, the aim of the study was to demonstrate if assessment of the Bishop score, in primiparous women at term before the onset of labor can predict the mode of delivery.

In our original approach we investigated the clinical value and variation of Bishop score from the beginning of term (37 gestational weeks),

and longitudinally between 37 and 41 gestational weeks with special attention to the significance of the week before delivery data. Finally, we analyzed if these strategies to use Bishop scoring system would impact the counselling of term primiparous women, before labor onset.

## Material and Methods

We present the data recorded in the Prenatal Diagnostic Unit (PDU) of the University Emergency County Hospital of Craiova.

We invited all primiparous women that presented for the well-being evaluation in the third trimester, to a series of weekly scans and clinical examinations starting at 37 weeks of gestation (GW) until delivery, including Bishop score (Table 1). Unselected pregnant women were included in study, thus, the first evaluation at term was not necessarily performed at 37 GW. We excluded from the study multiparous patients, pregnancies with a planned Caesarean section delivery, non-cephalic presentations and multiple pregnancies, twin pregnancies and those with detected fetal anomalies.

**Table 1. Bishop scoring system used during the weekly clinical evaluations.**

Score	Dilatation (cm)	Position of cervix	Effacement (%)	Station (-3 to 0)	Cervical Consistency
0	closed	posterior	0-30	-3	firm
1	1-2cm	mid position	40-50	-2	medium
2	>2cm	anterior	<60-70	-1,0	soft

Each patient was properly informed regarding the protocol of the study and signed a written informed consent regarding the publication of these data. The study was approved by the Ethics Committee of the University of Medicine and Pharmacy of Craiova. The protocol included weekly DVEs of all enrolled patients. For each primiparous woman examined, a Bishop score was noted in the database. To reduce the clinical bias, the DVEs were performed only by three experienced obstetricians involved in the research. There were no cases of examination difficulties. Maternal characteristics were noted: age, height, weight, gestational age. We also recorded the mode and the date of delivery.

Statistical analysis was performed using IBM SPSS Statistics 22. Categorical data are presented as percentages and continuous variables are presented with mean±standard deviation (SD) or median with minimum and maximum, where appropriate.

The predictive value of DVE for a successful vaginal delivery was evaluated using receiver-operating characteristics (ROC) curves in which the area under the curve (AUC) is used as discriminator to test the diagnostic performance of certain markers.  $P < 0.05$  was considered statistically significant.

Finally, after we documented all the results, we performed a statistical analysis in order to investigate the prediction value regarding the mode of delivery of the following parameters: Bishop score at 37 gestational weeks, the

longitudinal variation of Bishop score between 37 and 41 gestational weeks and the Bishop score evaluation in the week before delivery.

## Results

Overall, the study recruited 174 Caucasian primiparous women at 37 weeks of gestation, 40 patients at 38 weeks of gestation, 38 patients of 39 weeks of gestation, 16 patients at 40 weeks of gestation and 8 patients at 41 weeks of gestation. 19 patients were previously excluded because they did not respect the protocol of weekly evaluations. 93% of the enrolled patients were classified in the 21-30 years old group. 78% of the patients who delivered vaginally and 59% of the patients who delivered by Caesarean section were enrolled in the 21-30 years old group. Over 70% of the primiparous women were at their first pregnancy, regardless of the mode of delivery.

The characteristics of all 276 primiparous enrolled are given in Table 2. The mean age of women was  $27.74 \pm 3.85$  (range: 18-35) years, the mean body mass index (BMI) was  $25.97.7 \pm 3.06$  (range: 18.65-38.37) and the mean gestation age (weeks) was  $39.5 \pm 1.20$  (range: 37-42.1) weeks.

**Table 2. Baseline characteristics of enrolled women**

Characteristics	Mean±SD	Range
Maternal age (years)	$27.74 \pm 3.85$	18-35
BMI	$25.97.7 \pm 3.06$	18.65-38.37
Gestation (wks)	$39.5 \pm 1.20$	37-4 2.1

The protocol included weekly DVEs of the patients enrolled in order to note the Bishop score. At the weekly assessments, most primiparous women presented a Bishop score of 4 (102 pregnant women of 174 evaluated at 37 weeks of gestation, 80 women of 178 evaluated at 38 weeks of gestation, 59 women of 158 evaluated at 39 weeks of gestation, 10 women of 27 evaluated at 41 weeks of gestation). The exception was the 40th week of gestation when

almost half of the primiparous examined had a Bishop score of 6 (31 women of 64 patients).

At 37 weeks of gestation, 55.2 % (74/134) of the patients who delivered vaginally and 67.5% (27/40) of the patients who delivered by Caesarean section had a Bishop score of 4. Only 17.2 % (23/134) of the primiparous women in the VD group and 12.5% (5/40) of the primiparous women in the CD group presented a Bishop score of 6 (Figure 1).

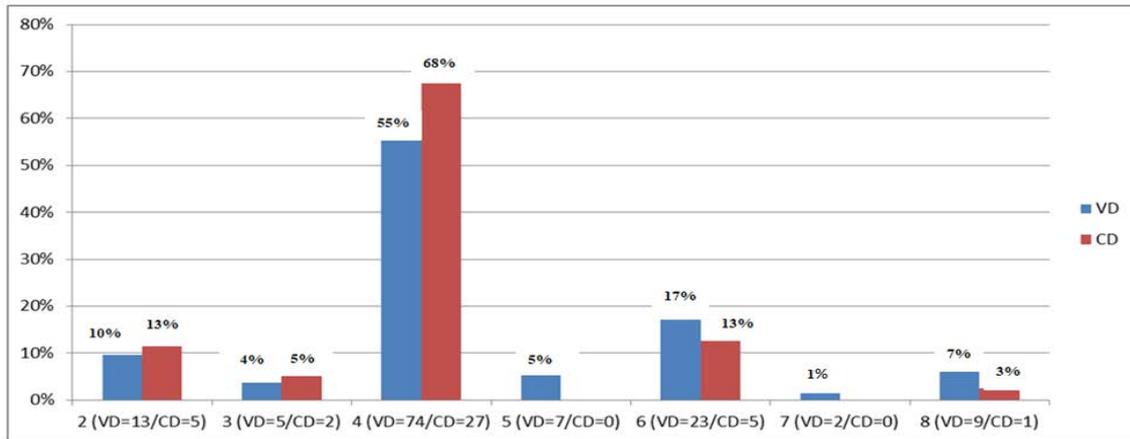


Figure 1. The comparative distribution of the Bishop scores at 37 weeks of gestation between the vaginal delivery (VD) group and the Caesarean delivery (CD) group.

At 38 weeks of gestation, a Bishop score of 4 was noted in 40.9 % (56/137) of patients in the VD group and in 58.5% (24/41) of patients in the CD second group. Similar rates in the two

groups were found also for a Bishop score of 6: 30.7 % (42/137) in VD group and 26.8% (11/41) in CD group (Figure 2).

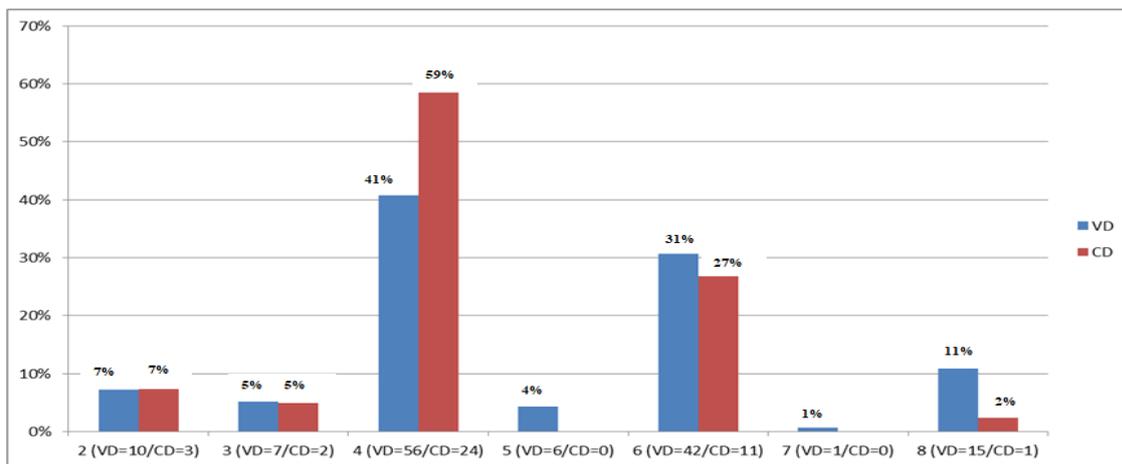
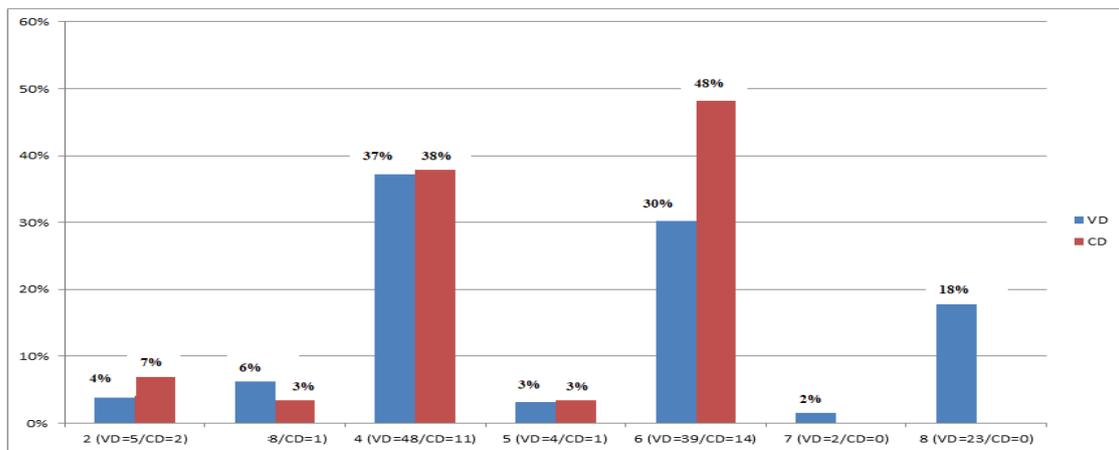


Figure 2. The comparative distribution of the Bishop scores at 38 weeks of gestation between the VD group and the CD group.

At 39 weeks of gestation, in the VD group we noted similar percentages of patients with a Bishop score of 4 and 6: 37.2% (48/129) and 30.2% (39/129), respectively. In the CD group,

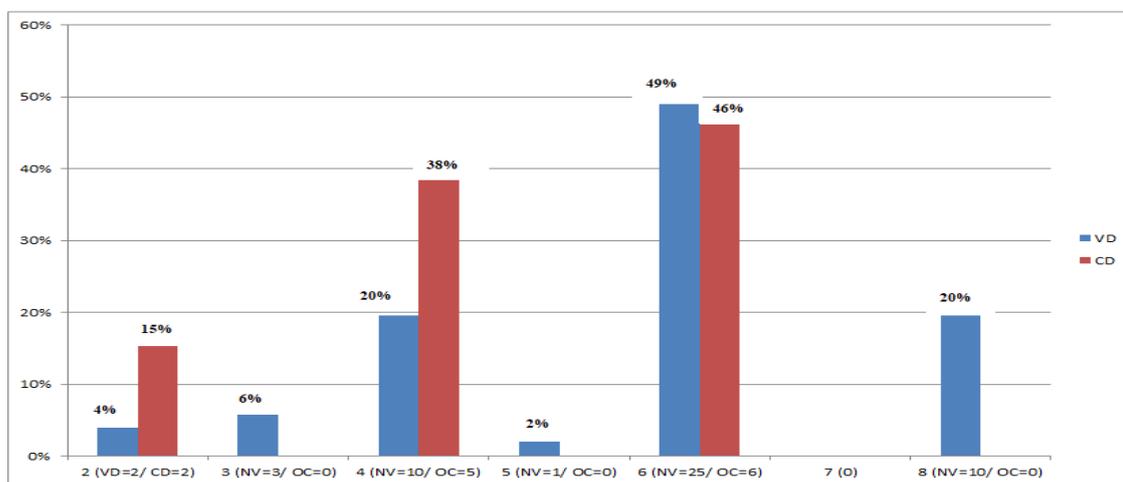
we noted surprisingly more patients with a Bishop score of 6 than patients with a Bishop score of 4, 48.3 % (11/29) compared to 37.9% (14/29), respectively (Figure 3).



**Figure 3. The comparative distribution of the Bishop scores at 39 weeks of gestation between the VD group and the CD group.**

At 40 weeks of gestation, in the CS group, close rates of patients presented with a Bishop score of 4 and 6: 38.5% (5/13) and 46.2% (6/13), respectively. Meanwhile, in the group of VD, we noted a turn to a more favorable Bishop

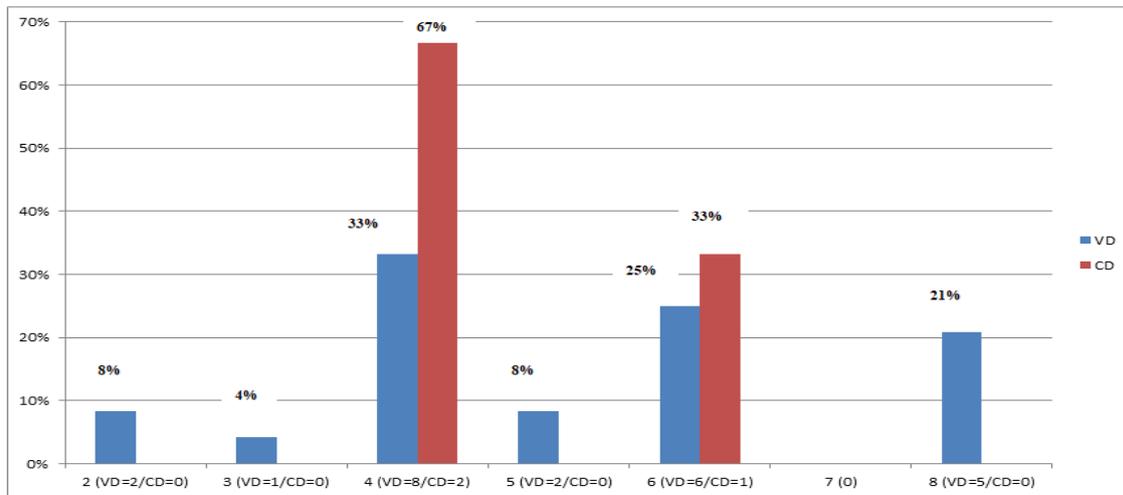
score respectively 49% (25/51) of the primiparous were found with a Bishop score of 6 and in 19.6% (10/51) of patients Bishop score was 8 (Figure 4).



**Figure 4. The comparative distribution of the Bishop scores at 40 weeks of gestation between the VD group and the CD group.**

At 41 weeks of gestation, 33.3% (8/24) of primiparous women who delivered vaginally presented with a Bishop score of 4 and 25% (6/24) with a Bishop score of 6. In the group of primiparous women who delivered by Caesarean

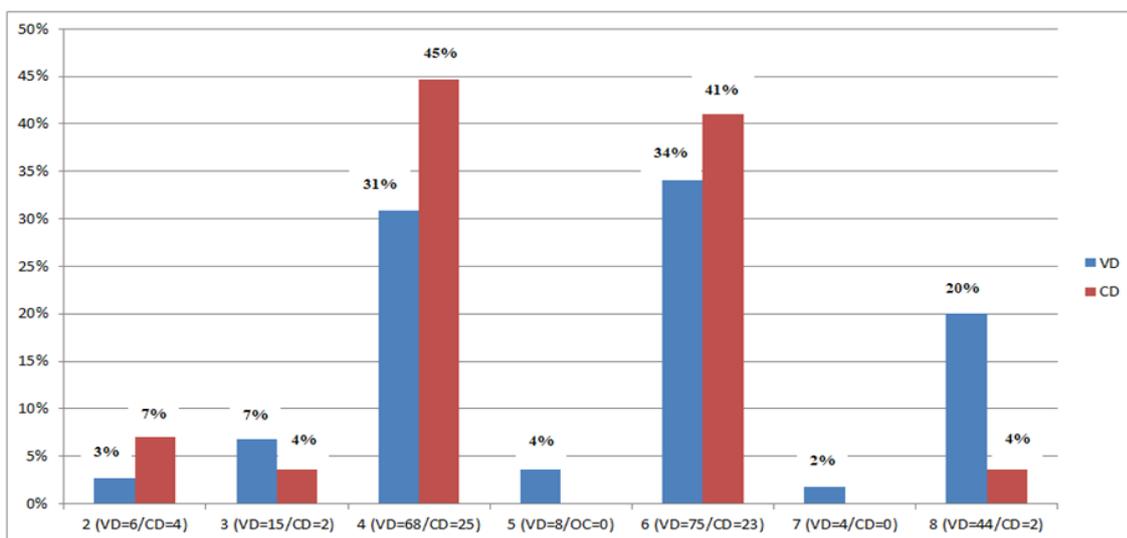
section, 66.7% (2/3) of patients presented with a Bishop score of 4, but only 33,3% (1/3) of patients had a Bishop score of 6. A Bishop score of 8 was noted only in the vaginal delivery group, in 20.8% (5/24) of patients (Figure 5).



**Figure 5. The comparative distribution of the Bishop scores at 41 weeks of gestation between the VD group and the CD group.**

In the week before delivery (WBD), in the VD group, Bishop scores 4 and 6 were recorded with similar rates, of about one third of the pregnant women: 30.9% (68/220) and respectively, 34.09% (75/220). We also recorded similar rates for a Bishop score of 4 and 6 in the

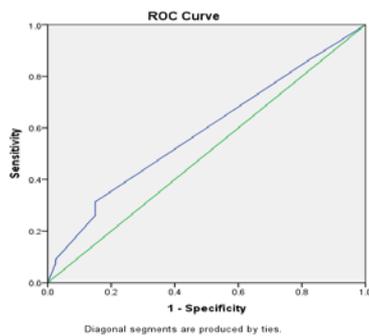
CD group of patients: 44.6% (25/56) and respectively, 41.07% (23/56) (Figure 6). Still, a high Bishop (8 and 7) was much more frequently found in VD group: 20% and 2%, compared to 4% and 0%.



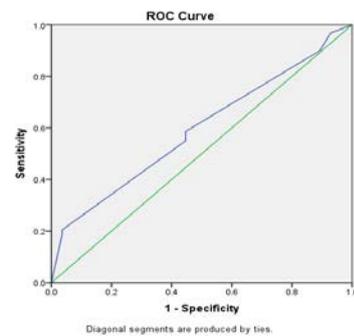
**Figure 6. The comparative distribution of the Bishop scores in the week before delivery between the VD group and the CD group.**

Bishop score evaluations both at 37 GW and in week before delivery were not found to be

efficient for the prediction of vaginal delivery (AUC<0.7) (Figures 7 and 8).



**Figure 7. Receiver-operating characteristics curve for Bishop score evaluated at 37 GW for the prediction of vaginal delivery (AUC=0.584, P>0.05).**



**Figure 8. Receiver-operating characteristics curve for Bishop score evaluated in the week before delivery for the prediction of vaginal delivery (AUC=0.594, P<0.05).**

There were not significant differences between median Bishop score between primiparous who delivered vaginally and those

with C-section at any gestational age (p>0.05) (Table 3).

**Table 3. Evolution of Bishop score (median) with GW, at primiparous who delivered vaginally versus primiparous who delivered by C-section.**

	All primiparous				Eutocic Delivery				C-Section Delivery				P* value
	N	Bishop score (median)	Min	Max	N	Bishop score (median)	Min	Max	N	Bishop score (median)	Min	Max	
37 GW	174	4	2	8	134	4	2	8	40	4	2	8	U=2230, P=0,072
38 GW	178	4	2	8	137	4	2	8	41	4	2	8	U=2351.5 P=0.093
39 GW	158	5	2	8	129	5	2	8	29	5	2	8	U=1667 P=0.337
40 GW	64	6	2	8	51	6	2	8	13	4	2	8	U=223, P=0.052
41 GW	27	5	2	8	24	5	2	8	3	4	2	8	U=30, P=0.630
WbD	276	6	2	8	220	6	2	8	56	4	2	8	

\*Mann-Whitney U test

## Discussion

Over the years, digital vaginal examination (DVE) of primiparous women during labor has proven to be less accurate, subjective, and highly-dependent on the examiner experience. Also, DVE has limitations in determining the position of the fetal skull, especially in particular situations, such as the caput succedaneum, fetal skull moulding or asynclitism [10]. However, most limitations do not exist at the onset of labor or before the onset of labor [14,15]. Therefore, digital vaginal examination remains the gold standard and each midwife, resident or obstetrician must receive appropriate training and expertise [16].

The analysis of our data showed that generally the pregnant women presents a Bishop score around 4-6 at term. At 37 weeks of

gestation, the majority of primiparous women had a Bishop score of 4, regardless the mode of delivery. Comparing the weekly evaluations data, we noted an increase of the Bishop score, as most of them scored 6, without any significant differences between the groups. At 41 weeks of gestation, there were significant more favourable Bishop scores in the group of primiparous women who delivered vaginally, but the number of patients is low. “Unfavorable” Bishop score, less than 6, was found in 82% of the primiparous women.

It appears that Bishop score alone is not a good predictor for spontaneous vaginal delivery outcome in any of the strategies we imagined: at the beginning of term (37 gestational weeks), in the week before delivery or according the longitudinal variation at term. Our findings are

consistent with other previous publications such as the Bahadori study [17], who found 74% of pregnant women with a Bishop Score of  $\leq 6$  in the week before delivery. It was also shown before that Bishop score is a poor predictor [18,19] of the likelihood of success of cervical ripening and labor induction with intravaginal misoprostol administration [20]. Previous studies reported head station as a predictor of the mode of delivery with more value to determine the risk of Caesarean delivery than the Bishop score [21,22].

In conclusion, in our study, we noticed that the use of the Bishop score as a predictor of the mode of delivery in primiparous women before the onset of labor do not provide significant additional information and should not be used as a prognostic tool to evaluate the labor outcome.

### Conflict of interests

Authors declare no conflicts of interest. They do not have interests which may be perceived as posing a conflict or bias. They have no financial interests in any company or organization that might benefit from the publication.

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