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Original Research

Indication for Induction, Mode of Delivery, Indication for LSCS and Neonatal outcome among pregnant women reporting to a tertiary care center

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ABSTRACT:

Aim and objectives: The present study was done to assess the Indication for Induction, Mode of Delivery, Indication for LSCS and Neonatal outcome among pregnant women reporting to a tertiary care center. **Materials and method:** This present cross-sectional study was conducted in the Department of Obstetrics and Gynaecology Kamla Nehru State Hospital (KNSH) for Mother and Child, Shimla, Himachal Pradesh (H.P.). The Study population included 100 antenatal subjects attending the antenatal clinic at KNSH Shimla requiring IOL were admitted and enrolled for the study at a gestation 37-42 weeks. **Results:** Majority of the study population belonged to 21-25 years (43.0%) and 60% subjects had gestational age of 39 wks to 40+6wks. The indication for induction were postdatism in most (42.0%) of the subjects. The mean Bishop Score was 3.82±1.17. The transvaginally measured cervical length ranged from 1.20 cm to 4.50 cm. The mean cervical length was 2.76±0.71 cms. Majority had vaginal delivery (73.0%) followed by vaginal instrumental (2.0%) and LSCS in 25.0% women. The caesarean delivery rate (defined as the number of caesarean sections/ total inductions) was 25%. The indication of LSCS was failed induction. **Conclusion:** Although the obstetricians doing the cervical assessment were blinded to the TVS-CL findings, the possibility of subjective bias cannot be denied as the Bishop scoring was done by different observers. **Keywords:** Bishop Score, Caesarean delivery, Vaginal delivery

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INTRODUCTION

Every pregnancy should culminate in a healthy baby and a healthy mother. To achieve this objective, we cannot wait for the spontaneous onset of labor in all cases. Induction of labor refers to the iatrogenic stimulation of uterine contractions before the onset of spontaneous labor to accomplish vaginal delivery. Key indication for labor induction includes hypertensive disorder of pregnancy (e.g., preeclampsia, eclampsia, gestational hypertension), maternal medical conditions chronic (e.g., hypertension, diabetes mellitus, renal disease, cholestasis of pregnancy,), chorioamnionitis, placental abruption, fetal condition (e.g., fetal growth restriction, oligohydramnios, intra uterine fetal death and Rh alloimmunization) and post term pregnancy.

Labor induction may also be performed electively for non-medical reasons.¹

Induction of labor (IOL) is a process where uterine contractions are initiated by medical or surgical means before the spontaneous onset of labor and is carried out in approximately 20% of pregnancies.² The commonest indication for induction is prolonged pregnancy and several studies have shown that induction, compared to expectant management, is associated with a substantial reduction in perinatal mortality.³⁻⁵ Predicting whether an induced labor will result in successful vaginal delivery is based on the pre-induction favorability of the cervix as assessed by the Bishop Score (BS) is the traditional method. However, this assessment is subjective and several studies have demonstrated a poor predictive value for

the outcome of induction especially in women with a low Bishop Score.⁶

Before induction of labor, cervical ripening is denoted by Bishop scoring which was introduced by Bishop in 1964.⁷ In Bishop Score, the dilatation, effacement, consistency and position of the cervix and station of fetal head are assessed by vaginal examination. Bishop Score was modified by Burnett in 1966. In the original Bishop Score, each item was scored in a range from zero to two or three points and subsequently combined into a single score with a maximum of 13. Among women who scored 9 and above, induction of labor did not fail. A score of 4 or less indicates that the cervix is not ripe for induction of labor and requires the use of prelabor induction while 6 and above is thought to be favorable with a higher chance of success.⁸⁻¹¹

The classical digital examinations are subjective and have intra and inter observer variability. Bishop Score though used to evaluate the success of induction of labor, is not a good method in predicting birth outcome since its sensitivity is 24%-64%. Bishop Score has poor reproducibility and assessment especially with a closed cervix.⁸⁻¹¹

Transvaginal ultrasonography (TVS) is a well-known objective technique for assessing cervical length (CL). TVS allows visualization of cervix beyond a closed external os and measures the cervical length accurately, without much inter observer variation especially in cases with non-palpable cervix on digital examination. Using preinduction sonographic parameters and maternal characteristics to predict the outcome of induction might lead to reduction in caesarean delivery and its complication.¹²

Theoretically, transvaginal ultrasonographic measurement of the cervix could represent a more accurate assessment of the cervix than digital examination, because the supra vaginal portion of the cervix usually comprising about 50% of the cervical length and is very difficult to assess digitally in a closed cervix. In addition, the assessment of the effacement which starts at the internal os, will be difficult to predict in a closed cervix. In contrast, transvaginal sonographic measurement of the cervical length is quantitative and easily reproducible method of assessing the cervix which can be achieved easily with minimal discomfort to the patient.¹²

The present study was done to assess the Indication for Induction, Mode of Delivery, Indication for LSCS and Neontal out come among pregnant women reporting to a tertiary care center.

MATERIALS AND METHODS

This present cross-sectional study was conducted in the Department of Obstetrics and Gynaecology Kamla Nehru State Hospital (KNSH) for Mother and Child, Shimla, Himachal Pradesh (H.P.) after approval from Institutional Ethics Committee, IGMC Shimla. The study was conducted for a period of 1 year from 1st August 2019 to 31st July, 2020. The Study population included 100 antenatal subjects attending the antenatal clinic at KNSH Shimla requiring IOL were admitted and enrolled for the study at a gestation 37-42 weeks. The gestational age was determined by accurate dating methods (last menstrual period in women who are sure of dates and have regular menstrual cycles, a first trimester scan and crown rump length for others). An informed written consent was taken from all the participants. The research procedure was in accordance with the approved ethical standards of Indira Gandhi Medical College and Hospital, Shimla.

CALCULATION OF SAMPLE SIZE

We calculated the sample size by the methodological review by Karimallah Hajan-Tilaki. Taking the area under curve (AUC)=0.625, from a study by Khandelwal et al, confidence limit of 95% and marginal error of 10%, the final sample size came out to be 120. Taking area under the curve (AUC)=0.625 for transvaginal ultrasonography cervical length and AUC=0.824 for Bishop Score with 95% confidence level and 80% power, the final sample size came out to be 82. So, the average sample size turned out to be 100.

STUDY POPULATION

The study included 18-40 years old women with singleton pregnancy at 37-42 weeks of gestation, irrespective of parity, having Cephalic presentation and Pregnancy complication necessitating induction of labor (IOL) (gestational hypertension, preeclampsia, chronic hypertension, diabetes. cholestasis, chorioamnionitis, rupture of membranes, oligohydramnios. post-dated pregnancy, oligohydramnios, intra uterine growth restriction, Rh alloimmunization and elective indications after 39 weeks).

The study excluded women aged <18yrs and >40 years, BMI >35 kg/m², Gestation < 37 weeks and >42 weeks, Fetal malpresentation, Multi fetal gestation, Congenital anomalies of fetus, Intrauterine death of fetus, Previous caesarean delivery or other uterine surgery (myomectomy, hysterotomy, septoplasty, metroplasty, etc.), Previous surgery on cervix (encirclage, conisation, loop electrosurgical excision, Fothergill-Manchester operation), History of Cephalopelvic antepartum haemorrhage, disproportion and any contraindication for vaginal delivery (VD).

The eligible subjects were enrolled in the study after obtaining an informed, written consent. Baseline characteristics such as age, parity, gestational age at induction and indication of induction were noted. A detailed history was taken from all the participants followed by general physical examination and systemic examination. Obstetrical examination to assess the lie of the fetus, engagement of head, and per vaginum examination for the cervical Bishop Score (BS) and pelvic assessment was done followed by transvaginal sonographic (TVS) measurement of cervical length (CL). TVS was done by an expert radiologist blinded to the BS, using LOGIQ P6 (GE) ultrasound machine with an E8CS TVS probe. The vaginal probe was inserted under direct vision in lithotomy position. After visualization of urinary bladder, amniotic fluid and presenting part, midline sagittal plane of cervix was localised and vaginal probe was pulled back until lightest touch possible provided good image of cervical canal. Probe was slightly moved to get the best longitudinal axis of the cervix. The image was magnified so that it occupied $2/3^{rd}$ of the screen and external and internal os were well seen. Calipers were placed between the external os and the V-shaped indentation marking the internal os and the distance was measured as a straight line. Three separate readings of CL were taken and shortest CL in mm was reported.

During the induction process, all persons involved in decision making were blinded to TVS finding. All decisions were taken according to digital cervical assessment finding. BS \leq 5 was taken as an unfavorable score and BS \geq 6 was taken as a favorable score. Those with unfavorable score were induced with dinoprostone gel (PGE2) or misoprostol (PGE1) tablets.

The study was conducted on 100 subjects delivered during the study period w.e.f. 1st August 2019 to 31st July 2020, in the Department of Obstetrics & Gynaecology, Indira Gandhi Medical College, Kamla Nehru State Hospital, Shimla in order to compare the predictive value of Bishop Score and sonographically measured transvaginal cervical length in patients undergoing IOL.

Various observations made during the study are as under.

RESULTS

Table 1: Baseline cha	aracteristics of t	he study po	pulation

		Frequency	Percent
Age groups	15-20 years	10	10.0%
	21-25 years	43	43.0%
	26-30 years	34	34.0%
	31-35 years	8	8.0%
	36-40 years	5	5.0%
Occupation	Professional	26	26.0%
	Housewife	74	74.0%
Parity	Primipara	61	61.0%
	Multipara	39	39.0%
Gestational Age (weeks)	37-38+6	40	40%
	39-40+6	60	60%

The study population consisted of 10 subjects (10.0%) from 15-20 years, 43 (43.0%) from 21-25 years, 34 (34.0%) from 26-30 years, 8 (8.0%) from 31-35 years and five (5.0%) from 36-40 years age group. There were 26 (26.0%) professionals and 74 (74.0%) housewives. There were 61 (61.0%) primipara and 39 (39.0%) multipara. There were 40 % subjects between gestational age 37wks to 38^{+6} wks and 60% subjects between 39wks to 40^{+6} wks.

 Table 2: Indication of induction of labor

Indication for Induction	Frequency	Percent
Postdatism	42	42.0%
PIH	16	16.0%
Intrahepatic Cholestasis of Pregnancy	12	12.0%
Intrauterine Growth Restriction	11	11.0%
Decreased Fetal Movement	7	7.0%
Gestational Diabetes Mellitus	7	7.0%
Prolonged Latent Phase	2	2.0%
Bad Obstetric History	2	2.0%
Premature Rupture of Membranes	1	1.0%

The indication for induction were postdatism in 42 (42.0%), pregnancy induced hypertension (PIH) in 16 (16.0%), intrahepatic cholestasis of pregnancy in 12 (12.0%), intrauterine growth restriction in 11 (11.0%), decreased fetal movement in seven (7.0%), gestational diabetes mellitus in seven (7.0%), prolonged latent phase in two (2.0%), bad obstetrics history in two (2.0%) and premature rupture of membranes in one (1.0%) subject.

Table 5. Distribution of subjects according to Distrol score	Table 3	3:	Distribution	of	subjects	according	to	BISHOP score
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		Frequency	Percent
Total Bishop Score	1	3	3.0%
	2	10	10.0%

	3	24	24.0%
	4	42	42.0%
	5	11	11.0%
	6	9	9.0%
	7	1	1.0%
Dilatation	Closed	28	28.0%
	0	0	0%
	1-2 cms	66	66.0%
	3-4 cms	6	6.0%
	≥5cm	0	0%
Effacement	0-30	76	76.0%
	40-60	23	23.0%
	60-70	1	1.0%
	80	0	0%
Station	-3	2	2.0%
	-2	8	8.0%
	-1	89	89.0%
	+1, +2	1	1.0%
Cervical Consistency	Firm	92	92.0%
	Medium	7	7.0%
	Soft	1	1.0%
Cervical Position	Posterior	22	22.0%
	Mid-	78	78.0%
	posterior		
	Anterior	0	0%

Bishop Score was one in in three (3.0%), two in ten (10%), three in 24 (24%), four in 42 (42%), five in 11 (11%), six in nine (9%) and seven in one subject (1%). The mean Bishop Score was 3.82 ± 1.17 .

The transvaginally measured cervical length ranged from 1.20 cm to 4.50 cm. The mean cervical length was 2.76 ± 0.71 cm.

Table	4:	Mode	of	delivery
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		Frequency	Percent
Mode of Delivery	Vaginal	73	73.0%
	Vaginal Instrumental	2	2.0%
	LSCS	25	25.0%
Indication for LSCS	Failed Induction	16	64.0%
	Non-reassuring Fetal Heart Rate	5	20.0%
	Meconium-Stained Liquor	3	12.0%
	NPOL	1	4.0%

Table 4 depicts the mode of delivery in 100 women enrolled for the study. It was vaginal in 73 (73.0%), vaginal instrumental in two (2.0%) and lower segment caesarean section (LSCS) in 25 (25.0%) women. The caesarean delivery rate (defined as the number of caesarean sections/ total inductions) was 25%. The indication of LSCS was failed induction in majority (16/25, 64.0%) which was defined as labor not establishing even after 12-18hrs of oxytocin augmentation. Other indications for caesarean delivery were non-reassuring fetal heart rate in 5/25 (20.0%), meconium-stained liquor in 3/25 (12.0%) and non-progress of labor (NPOL) in 1/25 (4.0%) women.

Birth weight was found to be in the range of 2.0-2.5 kgs among 13 (13.0%), 2.5-3.0 kgs among 53 (53.0%) and > 3.0 kgs among 34 (34.0%) subjects.

Table 5: neonatal APGAR score

Apgar (1min, 5 min)	Frequency	Percentage
7,9	97	97%
5,7	1	1%
6,8	1	1%
4,6	1	1%

The one minute and five-minute Apgar Score was 7 and 9 respectively in 97%, 5 and 7 respectively in 1%, 6 and 8 respectively in 1% and 4 and 6 respectively in 1%.

Table 6: NICU admission

		Frequency	Percent
NICU Admission	Yes	5	5.0%
	No	95	95.0%
Indication for NICU admission	Respiratory distress	3	60.0%
	Grunting	1	20.0%
	Hypoglycemia	1	20.0%

5/100 (5%) neonates were admitted to neonatal intensive care unit for various neonatal complications. The indications for NICU admission was respiratory distress among 3/5 (60.0%), grunting in 1/5 (20.0%) and hypoglycemia in 1/5 (20.0%) neonates.

Table 7	: Com	parison	of mean	bishop	score	& cervi	cal lengtł	ı in relatio	on to mod	le of delivery	
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	Mode of Delivery	Mean	Std. Deviation	t-test value	p-value
Bishop Score	Vaginal	4.17	1.01	6.622	< 0.001*
	LSCS	2.64	0.99		
Cervical Length	Vaginal	2.57	0.65	-5.327	< 0.001*
(cm) – USG	LSCS	3.34	0.55		
144 4 4 6	4 1*00				

Unpaired t-test * Significant difference

The mean Bishop Score and Cervical Length (cm) – USG(TVS) was compared between vaginal and LSCS delivery using the unpaired t-test. The mean Bishop Score was significantly more among subjects delivering vaginally as compared to those having caesarean delivery (4.17 ± 1.01 versus 2.64 ± 0.99 respectively, p-value<0.001). The mean Cervical Length (cm) – USG(TVS) was significantly more among those who had caesarean delivery as compared to those delivering vaginally. (3.34 ± 0.55 cm versus 2.57 ± 0.65 cm respectively, p-value <0.001)

DISCUSSION

Induction of labor is considered as a therapeutic option when the benefits of expeditious delivery outweigh the risks of continuing the pregnancy.¹³ Approximately 20% of women undergoing induction of labor end up having a Caesarean delivery.¹⁴ Prediction of successful induction of labor is important because the rate of intraoperative complications in emergency caesarean sections is 14.5% compared with 6.8% in the elective group.¹⁵

A prospective comparative study was conducted in the Department of Obstetrics and Gynaecology, Kamla Nehru State Hospital for Mother and Child, Indira Gandhi Medical College, Shimla on 100 subjects w.e.f 1st August 2019 to 31st July 2020 to compare the Bishop Score and Cervical Length (cm) – USG(TVS), before induction of labor, in predicting the success of induction of labor.

In present study, majority (43%) of the study population was 21-25 years old followed by 26-30 years (34.0%) as this is the peak reproductive age. In a study by Khalifa et al,¹⁶ the study group had age ranging from 20-35 years old. In the study by Kaur et al,¹⁷ the mean age of patients was 25.29 ± 3.28 years having an age range of 19-33 years. In the study

conducted by Anikwe et al,¹⁸ the mean maternal age was 30.6 ± 6.4 years with a range of 19 to 43 years.

In present study, there were 61 (61.0%) primiparae and 39 (39.0%) multiparae. This was similar to the findings by Khalifa et al,¹⁶ 62% primigravidae and 38% multigravidas.On the contrary in a study by Kaur et al,¹⁷ 79.48% were nullipara and 20.51% were multipara.

Our study could not find any relation of parity with the mode of delivery. These findings are similar to those with Mosbeh and Al Sharkawy,¹⁹ who found that, parity and gravidity were statistically nonsignificant in the prediction of the success of labor induction. On the contrary Vonda ware et al.,²⁰ found that parity was a main predictor of the mode of delivery.

The most common indication for induction in our study was post datism among 42.0%, PIH (16.0%), intrahepatic cholestasis of pregnancy (12.0%), intrauterine growth restriction (11.0%), decreased foetal movements (7.0%), gestational diabetes mellitus (7.0%), bad obstetrics history (2.0%), prolonged latent phase (2.0%) and premature rupture of membranes (1.0%). This was in congruence with the findings by Khandelwal et al,²¹ who observed that the majority of subjects (39.4%) underwent induction of labor for postdatism, i.e., gestational age more than 40 weeks.

The most common indication for induction of labor are prolonged pregnancy, PROM or medical disorders with pregnancy.^{22,23} Around 20% women undergoing induction of labor require a caesarean for delivery. An objective criterion to predict the successful induction of labor needs to be better understood.^{24,25}

In our study, induction of labor was done at term in 85% and remaining 15% underwent induction of labor after term. Anikwe et al.¹⁸ reported that most of the women that underwent induction were at a mean gestational age of 39.5 ± 1.5 weeks. In a study conducted by Khalifa et al.,¹⁶ all cases were post term

(>41wks). The concept about "term" was initially thought to be homogeneous in terms of fetal outcome but a study done in America has refuted this thinking showing that neonates delivered in early term have increased morbidity compared to full-term neonates.²⁴ It is now recommended that elective induction of labor should only be carried out at gestational age 39 weeks and above to reduce neonatal morbidity and mortality.²⁶

In our study the Bishop Score ranged from one to seven and 79 subjects had Bishop Score <5 with a mean Bishop Score of 3.82 ± 1.17 whereas Khalifa et al.,¹⁶ had fifty-eight patients with bishop score < 5 before starting induction with a mean bishop score of 5.31 ± 2.27 . In a study by Khandelwal et al.,²¹ the Bishop Score of the subjects ranged from two to seven and the mean Bishop Score was 4.37 ± 1.23 .

On the contrary in a study by Anikwe et al.,¹⁸ the mean Bishop Score was 7.5 ± 1.00 .

In our study the mean cervical length was 2.76 ± 0.71 cmswhich was similar to a study conducted by Khandelwal et al.,²¹ where the mean cervical length was 25.59 ± 6.07 mm. In a study by Khalifa et al.,¹⁶ 44 patients had cervical length <25 mm and the mean cervical length for the whole study group was 2.51 ± 0.82 cm. In a study by Anikwe et al.,¹⁸ the mean preinduction cervical length was 2.9 ± 0.6 cm.

In present study no case of tachysystole (defined as uterine contractions >5 in 10 min) was observed whereas in a study by Park et al.,²⁷ uterine tachysystole with abnormal fetal heart rate tracing led to early removal of the dinoprostone vaginal insert in three cases.

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Serial Number	Author	Year	Vaginal	LSCS
1	Khalifa et al	2018	78.0%	22.0%
2	Khandelwal et al	2018	83.3%	16.7%
3	Present Study	2020	75.0%	25.0%

In present study, the mode of delivery was vaginal among 75.0% including vaginal instrumental among 2.0% and caesarean section among 25.0% women. In line with our findings, Khalifa et al.¹⁶ reported that successful induction was achieved in 78.0% patients, while CS was done in 22.0% patients due to failed induction. On the contrary Khandelwal et al.²¹ reported successful induction of labor resulting in vaginal delivery in 83.3%. The higher caesarean section rate in the present study could be due to the fact that induction of labor was carried out in a uniform manner by Khandelwal et al.²¹ using a Foley bulb inserted intracervically and filled with 30ml of normal saline simultaneously with tablet misoprostol (25microgram) administered pervaginally 4hrly. On the contrary, induction of labor in the present study was done using intracervical dinoprostone gel (maximum 2 doses, 0.5mg each, administered 8 hrs apart) or sublingually administered misoprostol (25 microgram) 4hrly maximum 6 doses. Moreover, Kamla Nehru State Hospital caters to most of the population of Himachal Pradesh and gets many referrals as a tertiary care center. In current study, the indication of LSCS was failed induction among 64.0%, non-reassuring fetal heart

induction among 64.0%, non-reassuring fetal heart rate among 20.0%, meconium-stained liquor among 12.0% and NPOL among 4.0% women. Whereas in a study by Khandelwal et al.²¹ out of the 66 subjects, 55 (83.3%) had normal vaginal delivery, and 11 (16.7%) subjects were delivered by caesarean section. The indications of caesarean section were fetal distress (n = 03), pathological cardiotocography (n = 01), non-progressive first stage (n = 02), nonprogressive second stage (n = 02), deep transverse arrest. (n = 02), and persistent occipito-posterior position (n = 01). Four subjects underwent caesarean section before the onset of active labor for fetal indications. There were no cases of failed induction.⁴⁷ On the contrary 16/25 (64.0%) subjects who delivered by caesarean section had failure of IOL in the present study. The difference could be due to the different methods of IOL as well as due to the fact that the mean Bishop Score in the present study was

 3.82 ± 1.17 compared to 4.37 ± 1.23 in the study conducted by Khandelwal et al.²¹

NEONATAL COMPLICATIONS

In our study, NICU admission was done among 5.0% subjects. The Indications for NICU admission was respiratory distress among 60.0%, grunting among 20.0% and hypoglycaemia among 20.0%.

In a study by Anikwe et al.¹⁸ more than seventy-eight percent of the neonates had normal Apgar score while 3.3% had perinatal death.

On the contrary we did not observe any perinatal deaths. Majority (97%) of the neonates had 1 min and 5 min Apgar Score 7 and 9 respectively. The reason for this discrepancy could be due to the fact that >60% of the study population in the present study composed of primigravidae and only 16% of the subjects underwent IOL for PIH whereas in the study by Anikwe et al.¹⁸ 13.3% of the population was grand-multiparae and 26.7% subjects were induced for hypertensive disease of pregnancy.

CONCLUSION

In terms of induction to delivery interval (<24 hrs and \geq 24 hrs) and induction to active phase interval (<12 hrs and \geq 12 hrs), the most useful cut-off value for Bishop score was 4 and the most useful cut-off value for cervical length was 2.5cm.

The strength of our study was that TVS was done by an expert radiologist blinded to the Bishop Score and all obstetricians involved in decision making were blinded to TVS findings. Although the obstetricians doing the cervical assessment were blinded to the TVS-CL findings, the possibility of subjective bias cannot be denied as the Bishop scoring was done by different observers.

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