



INCIDENCE AND RISK FACTORS FOR CAESAREAN DELIVERY AFTER INDUCTION OF LABOUR AMONG NULLIPAROUS WOMEN AT TERM

Obstetrics & Gynaecology

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ABSTRACT

Background: Induction of labour is one of the most frequently used interventions in modern obstetrics. Although the objective is vaginal delivery, induction may be associated with an increased risk of caesarean delivery, particularly in nulliparous women. Identifying factors associated with caesarean delivery after induction may assist in appropriate patient selection and counselling. **Methods:** A prospective observational study was conducted in the Department of Obstetrics and Gynaecology at Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla. A total of 233 nulliparous women with singleton, term, cephalic pregnancies undergoing induction of labour by medical, mechanical, surgical or combined methods were included. Maternal characteristics, pre-induction cervical findings, method and indication for induction, and neonatal birth weight were recorded. Associations with mode of delivery were assessed using chi-square/Fisher's exact tests, and binary logistic regression was used to assess independent factors. **Results:** Among 233 women in the study, 63 underwent caesarean delivery and 170 had vaginal delivery. The dissertation reports a caesarean delivery incidence of 27.2% (95% CI 21.5–33.3%). Caesarean delivery was significantly associated with pre-pregnancy BMI ($p<0.001$), gestational weight gain ($p<0.001$), initial cervical dilatation ($p<0.001$), cervical effacement ($p<0.001$), fetal head station ($p<0.001$), Bishop Score ($p<0.001$), induction method ($p=0.023$), and birth weight ($p=0.01$). Maternal age ($p=0.20$), gestational age ($p=0.29$), maternal height ($p=0.08$), and indication for induction ($p=0.20$) were not statistically significant. In the reported logistic regression analysis, initial cervical dilatation and effacement were independently associated with caesarean delivery. **Conclusions:** Pre-induction cervical status was the strongest predictor of caesarean delivery after induction of labour in this cohort. Initial cervical dilatation <3 cm and greater cervical length were independently associated with caesarean delivery. Pre-pregnancy BMI and birth weight were also associated with delivery outcome in unadjusted analyses.

KEYWORDS

Induction of Labour; Nulliparity ; Caesarean Delivery; Bishop Score; Cervical Dilatation; Cervical Effacement; Body Mass Index.

INTRODUCTION

Induction of labour is the artificial initiation of uterine contractions before the spontaneous onset of labour with the intention of achieving vaginal delivery¹. It is undertaken when continuation of pregnancy is considered to carry greater maternal or fetal risk than delivery². It may be achieved using pharmacological, mechanical, surgical or combined methods³.

The increasing use of induction of labour has raised concern regarding its relationship with caesarean delivery⁴. Several maternal and obstetric characteristics have been reported to influence the likelihood of caesarean delivery following induction, including maternal age, BMI, maternal height, gestational age, gestational weight gain, fetal size and pre-induction cervical status⁵.

Nulliparous women represent an important group because the first caesarean delivery contributes substantially to the overall caesarean rate and has implications for subsequent pregnancies⁶. The present study was undertaken to determine the incidence of caesarean delivery following induction of labour among nulliparous women at term and to identify factors associated with the outcome.

Objectives

1. To determine the incidence of caesarean delivery after induction of labour in nulliparous women at term.
2. To identify risk factors predicting caesarean delivery after induction of labour in nulliparous women at term.

METHODS

Study Design and Population

This was a prospective observational study conducted in the Department of Obstetrics and Gynaecology, Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla, Kerala after obtaining approval from the institutional ethical committee/review process. The study included nulliparous women with singleton, term, cephalic pregnancies undergoing induction of labour at the study centre. A sample size of 233 women was calculated assuming a 30% incidence of caesarean delivery after induction, with 20% relative precision and a 5% alpha error. Consecutive sampling was used.

Eligibility Criteria

Inclusion criteria were nulliparous women with singleton, term (≥ 37 weeks), and cephalic pregnancies undergoing induction by medical, surgical or combined methods. Women with contraindications to vaginal delivery, including malpresentation, placenta previa and prior myomectomy, as well as women with multiple gestation, intrauterine fetal death or multiparity, were excluded.

Data Collection

After obtaining written informed consent, maternal history and examination findings were recorded using a structured proforma. Variables included maternal age, gestational age, height, pre-pregnancy weight and BMI, gestational weight gain, medical complications, initial cervical dilatation, cervical length/effacement, fetal head station, Bishop Score, indication and method of induction, mode of delivery, birth weight and relevant maternal or neonatal outcomes.

Statistical Analysis

Data were entered in Microsoft Excel and analysed using SPSS 20.0. Categorical variables were compared using chi-square or Fisher's exact tests as appropriate. Binary logistic regression was used to account for confounding and odds ratios with 95% confidence intervals were planned. A p value <0.05 was considered statistically significant.

RESULTS

A total of 233 nulliparous women undergoing induction of labour at term were included. The reported study outcome was vaginal delivery in 170 women and caesarean delivery in 63 women. The dissertation reports a caesarean incidence of 27.2% (95% CI 21.5–33.3%).

Association of Maternal and Obstetric Factors with Mode of Delivery

Mode of delivery	N	%
Vaginal delivery	170	72.8
Caesarean delivery	63	27.2
Total	233	100.0

Maternal Age and Height

Caesarean delivery was more frequent among women with age > 35yrs. Among 20 women with age > 35yrs, 8 (40%) underwent caesarean delivery, compared with 18 of 85 women (21.4%) with age <25 yrs. But it could not be accounted as it is statistically not significant. (p=0.20)

Gestational Age

Caesarean delivery was more frequent among women with gestational age ≥ 40 wks. Among 9 women with gestational age ≥ 40 weeks, 4 (44.4%) underwent caesarean delivery, compared with 17 of 58 women (29.3%) with gestational age between 37- 37w+6days. But it could not be accounted as it is statistically not significant. (p=0.29)

Maternal Height

Caesarean delivery is more among women with height < 155 cm. Among 74 women with height < 155 cm, 22 (29.7.4%) underwent caesarean delivery, compared with 9 of 60 women (15%) with height >165 cm. But it is statistically not significant. (p=0.08)

Pre-pregnancy BMI

Caesarean delivery was significantly more frequent among women with higher pre-pregnancy BMI. Of 42 women with BMI >25 kg/m², 30 (71.4%) underwent caesarean delivery, compared with 3 of 20 women (10.5%) with BMI <18.5 kg/m² (p<0.001).

Gestational Weight Gain

Excessive gestational weight gain was strongly associated with caesarean delivery. Among women with weight gain >20 kg, 45 of 46 (97.8%) underwent caesarean delivery, compared with 8 of 60 (13.3%) among those with weight gain <10 kg (p<0.001).

Pre-induction Cervical Status and Bishop Score

Initial cervical dilatation was strongly associated with mode of delivery. Among women with initial cervical dilatation <3 cm, 13 of 16 (81.3%) underwent caesarean delivery, whereas only 1 of 145 (0.7%) women with dilatation >3 cm underwent caesarean delivery (p<0.001).

Cervical effacement was also significantly associated with outcome. Caesarean delivery occurred in 52 of 99 women (56.1%) with cervical length/effacement category >1 cm compared with 8 of 134 (6.0%) in the <1 cm category (p<0.001).

A higher fetal head station (above -1) was associated with a higher caesarean rate: 47 of 65 women (73.4%) with the head above -1 underwent caesarean delivery compared with 16 of 168 (9.5%) with station -1 or below (p<0.001).

The Bishop score was significantly associated with delivery outcome (p<0.001). Caesarean delivery was particularly frequent among women with an unfavourable Bishop score. In the study dataset, 49 of 55 women in the lowest Bishop-score category underwent caesarean delivery, while none of the 142 women in the highest category underwent caesarean delivery.

Method and Indication of Induction

The type of induction was significantly associated with mode of delivery (p=0.023). Caesarean delivery occurred in 5 of 14 women (35.7%) undergoing Foley catheter insertion with extra-amniotic saline infusion, 32 of 86 (37.2%) receiving oral PGE1, and 5 of 35 (14.3%) receiving oxytocin. The study data therefore show an association between induction method and delivery outcome; the observational design does not establish that a particular induction method causes caesarean delivery. The indication for induction was not significantly associated with caesarean delivery (p=0.20).

Birth Weight

The study reported a higher caesarean rate among women delivering heavier infants, particularly above 3.5 kg (p=0.01).

Multivariable Analysis

In the reported logistic regression analysis, initial cervical dilatation and cervical effacement remained independently associated with caesarean delivery. Higher pre-pregnancy BMI showed higher odds in the model but did not reach statistical significance.

Variable	Estimate	Odds ratio	SE	z	P
Intercept	-0.06	0.941	1.229	-0.05	0.96

Initial cervical dilatation category	0.03	1.029	0.742	0.038	0.970
Initial cervical dilatation category	0.53	1.705	1.134	0.47	0.638
Initial cervical dilatation category	-5.00	0.007	1.249	-4.001	<0.001
Effacement category	-2.19	0.112	0.774	-2.828	0.005
Pre-pregnancy BMI category	1.41	4.089	1.081	1.302	0.193
Pre-pregnancy BMI category	1.66	5.242	1.089	1.521	0.128

DISCUSSION

The present prospective observational study evaluated 233 nulliparous women undergoing induction of labour at term. The principal finding was that pre-induction cervical status was strongly associated with the likelihood of caesarean delivery. Initial cervical dilatation, cervical effacement, fetal head station and Bishop Score were all significantly associated with delivery outcome.

The study found that women with an unfavourable cervix were more likely to undergo caesarean delivery after induction. A favourable cervix may reflect greater cervical readiness for labour and may therefore be associated with a higher probability of vaginal delivery.

Pre-pregnancy BMI and gestational weight gain were also significantly associated with caesarean delivery in the unadjusted analyses. In particular, the caesarean rate was substantially higher among women with BMI >25 kg/m² and among women with excessive gestational weight gain. However, BMI did not remain statistically significant in the reported multivariable model, highlighting the importance of distinguishing unadjusted associations from independent predictors.

Birth weight was significantly associated with caesarean delivery, with a higher proportion of caesarean deliveries among women with heavier babies. The study also found an association between induction method and delivery outcome. Because the choice of induction method may itself be influenced by cervical status and other clinical factors, these findings should be interpreted as associations rather than evidence that one induction method is intrinsically superior.

Maternal age, gestational age and maternal height showed trends toward higher caesarean delivery in some categories, but the associations did not reach statistical significance. The dissertation notes that the sample size was small in the older age, post-40-week gestation and short-stature groups, which may have limited the power to detect associations.

The study has practical relevance because identification of women at higher risk of caesarean delivery can support counselling and individualized intrapartum management. Particular attention to the pre-induction cervical assessment may be useful when counselling nulliparous women undergoing induction.

CONCLUSION

In this cohort of nulliparous women undergoing induction of labour at term, caesarean delivery was reported in 27.2% of cases. Pre-induction cervical status was the most important determinant of outcome. Initial cervical dilatation <3 cm and reduced cervical effacement were independently associated with caesarean delivery in the reported multivariable analysis. Higher pre-pregnancy BMI, excessive gestational weight gain, higher fetal head station, lower Bishop Score, induction method and higher birth weight were significantly associated with caesarean delivery in unadjusted analyses. Careful assessment of cervical favourability before induction may help in counselling women and optimizing induction management.

REFERENCES

- Misra R. Ian Donald's Practical Obstetric Problems. 7th ed. Wolters Kluwer; 2014. p.497-507
- Cunningham, Leveno, Bloom, Spong, Dash, Hoffman, Casey, Sheffield (editors). Induction and augmentation of labor. Williams Obstetrics. 24th ed. Mc Graw-Hill;2014:523-534.
- Dutta DC. Text Book of Obstetrics. 6th ed. Calcutta: New Central Book Agency; 2004. p.520-528.
- Tolcher M, Holbert M, Weaver A, McGree M, Olson J, El-Nashar S, et al. Predicting caesarean delivery after induction of labour among nulliparous women at term. Obstet Gynecol. 2015;126(5):1059-1068.
- Grobman WA, Rice MM, Reddy UM, et al. Labour induction versus Expectant Management in Low Risk Nulliparous Women. N England J Med. 2018;379(6):513-523.
- Keag OE, Norman JE, Stock SJ. Long term risks and benefits associated with caesarean delivery for mother, baby, and subsequent pregnancies: PLoS Med. 2018;15(1):e1002494.