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Original Research Article

An Analytical Case Control Study Assessing the Factors which Influence the Risk of Emergency Cesarean Delivery in Induced Labors at Term

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Abstract

Aim: The aim of this study was to identify those factors which influence the risk of emergency cesarean delivery in induced labors at term.

Material & Methods: A case–control study was conducted in the Department of Obstetrics and Gynaecology, PMCH, Patna, Bihar, over a period of one year A total of 300 women were studied, out of which 130 women delivered by emergency caesarean section and 170 women delivered vaginally. The cohort included all women with a live singleton fetus in the cephalic presentation and induced at term (37 weeks). Cases were women who delivered by emergency caesarean section and controls were women with a vaginal delivery among the cohort. Informed consent was taken for all patients.

Results: Using logistic regression analysis, all comparisons are estimated and expressed as OR with 95 % CI. Factors associated with cesarean delivery were analysed. Our study had shown that maternal age 35 years, BMI 30 kg/m2, nulliparity, preinduction Bishops score less than 5, gestational diabetes mellitus, and intrauterine growth restriction are significantly associated with caesarean delivery. The presence of epidural analgesia, gestational hypertension, post term pregnancy, and premature rupture of membranes was not associated with significant increase in cesarean delivery if labor was induced at term.

Conclusion: A vaginal delivery is the best choice for both mother and child. However, it is better to take those patients with multiple risk factors for elective cesarean section rather than inducing them at term. Women with multiple risk factors for caesarean can be taken up for elective cesarean section rather than inducing them at term.

Keywords: Induction of labor; Cesarean section; Term pregnancy; Risk factor

Introduction

Efforts to attain maternal health-related Sustainable Development Goal (SDG) which aims at ensuring healthy lives and promote wellbeing for all at all ages. [1,2]

The history of labor induction dates back to the time of Hippocrates' original descriptions in which mammary stimulation and mechanical dilation of the

cervical canal are used methods of induction. [3] Induction of labor is defined as the process of artificially stimulating the uterus to start labor. A number of obstetric interventions including labor induction (IOL) have been practiced to save lives of mothers and the unborn. Induction of labor is a common and essential element of the contemporary obstetric practice and now accounts for approximately 20% of all deliveries. [4-6] Induction of labor is thought to be associated with an increase in the risk of cesarean delivery both for nulliparous and multiparous women. [7] Being one of life-serving interventions in obstetrics, IOL can; decrease frequency of still births, reduce risks of infection, and lower caesarean section (CS) rates without increasing adverse pregnancy outcomes. [8,9] WHO recommends IOL procedure to be done only when it is more advantageous to terminate the pregnancy than to let it progress and it also recommends non-clinical interventions to reduce unnecessary CS delivery. [10] Induction is indicated when the benefits to either mother or fetus outweigh those of continuing the pregnancy. Common indications include gestational hypertension, premature rupture of membranes, non-reassuring fetal status, post term pregnancy, intrauterine growth restriction, and various maternal medical conditions such as chronic hypertension and diabetes. As the main goal of IOL is to help the mother to start labor and attain vaginal delivery, the intervention may fail to achieve this goal and hence necessitate CS intervention. [11,12] CS is a medical procedure which involves delivery of a baby through an incision made in the mother's abdomen and uterus. [13, 14] The frequency of CS has been steadily increasing globally in the past several decades with a rate of 32.8%. Reasons that have been reported to contribute to this rise include; emergence of pregnancies with multiple gestations, rise of pregnancy complications, gestational obesity, previous CS, twin pregnancy, failure of progress in labor, breech presentation, maternal request and increase in rate of labor induction. [15,16]

The past few decades have witnessed an increase in Cesarean section rate. This increase has resulted from evidence-based recommendations on how to handle certain conditions, such as anomalous fetal position, major placental abruption, placenta previa and prolapsed cord; however it is mainly the consequence of a growing number of women presenting at labor with uterine scars, delivering at advanced ages, or demanding surgical delivery. Although increased frequency of obstetric interventions, induction of labor appears to have contributed to current trends in Cesarean section rates. [17]

Induction of labor has been associated with a risk of emergency cesarean delivery. The decision to induce a delivery in less imminent situation is often difficult. If induction fails, an emergency cesarean delivery has to be performed, and maternal risks are greater in emergency cesarean delivery than those in elective cesarean deliveries. So, the aim of this study was to identify those pregnancies which are associated with greater risk of cesarean delivery when induced at term.

Material & Methods

A case–control study was conducted in the Department of Obstetrics and Gynaecology, Pmch, Patna, Bihar, over a period of one year A total of 300 women were studied, out of which 130 women delivered by emergency caesarean section and 170 women delivered vaginally. The cohort included all women with a live singleton fetus in the cephalic presentation and induced at term (37 weeks). Cases were women who delivered by emergency caesarean section and controls were women with a vaginal delivery among the cohort. Informed consent was taken for all patients. All subjects were enrolled after they agreed to participate in the study after signing written informed consent. Ethical clearance

was obtained from institutional review and the Ethics Committee.

Exclusion Criteria

The exclusion criteria include previous cesarean section, uterine scar (myomectomy), multifetal gestation, malpresentation, and where vaginal delivery was otherwise contraindicated.

Information of women induced was obtained from case records and antenatal cards. All women enrolled were examined prior to induction and induced using Dinoprostone gel (0.5 mg) intracervically (doses may be repeated after 6 h, with a maximum of two doses in 24 h) and if required, labor was augmented using oxytocin (starting dose of 6 mU/min, with 6 mU/min increase every 40 min, but employs flexible dosing based on uterine response).

Statistical Analysis

The data were modeled through multiple logistic regressions, and adjustments were made for independent variables that had a significant influence on the risk of cesarean delivery in the univariate analysis. The data analysis was performed using IBM SPSS Statistics version 18 software and Hosmer and Lemeshow Test. Student's t-test was performed to see mean difference. Chi-square test was performed to see difference in proportions.

Results

Table 1: Analysis of risk factors for cesarean delivery

Risk factors	Cesarean delivery (N = 130)N%	Vaginal delivery (N = 170) N%	Crude odds ratio (95 % CI)
Maternal age			
<35 years	117 (90)	168 (98.83)	7.345 (1.586–34.367)
>35 years	13 (10)	2 (1.17)	
Body mass index (Kg/M^2)			
<30	90 (69.23)	160 (94.12)	5.80 (2.934–11.996)
>30	40 (30.77)	10 (5.88)	
Parity			
Nullipara (0)	117 (90)	102 (60)	0.175 (0.092–0.355)
Multipara (C1)	13 (10)	68 (40)	
Bishops score			
<5	44 (33.85)	90 (52.95)	0.4245 (0.2559–0.68 79)
>5	86 (66.15)	80 (47.05)	
Epidural analgesia			
No	40 (30.77)	51 (30)	1.1570 (0.6908–1.936 0)
Yes	90 (69.23)	119 (70)	
Hypertensive disorders in pregnancy			
Yes	32 (27.4)	51 (30)	0.8589 (0.5032–1.445 3)
No	85 (72.6)	119 (70)	
Gestational diabetes mellitus			
Yes	30 (23.07)	30 (17.65)	1.9830 (1.0587–3.72 44)
No	100 (76.93)	140 (82.35)	

Post term pregnancy			
Yes	39 (30)	51 (30)	1.0335 (0.6177–1.741 1)
No	91 (70)	119 (70)	
IUGR			
Yes	1 (0.76)	17 (10)	0.0813 (0.0108–0.64 02)
No	129 (99.24)	153 (90)	
PROM			
Yes	26 (20)	20 (11.75)	1.3889 (0.7389–2.601 9)
No	104 (80)	150 (88.25)	

Using logistic regression analysis, all comparisons are estimated and expressed as OR with 95 % CI. Factors associated with cesarean delivery were analysed. Our study had shown that maternal age 35 years, BMI 30 kg/m2, nulliparity, preinduction Bishops score less than 5, gestational diabetes mellitus, and intrauterine growth restriction are significantly associated with caesarean delivery. The presence of epidural analgesia, gestational hypertension, post term pregnancy, and premature rupture of membranes was not associated with significant increase in cesarean delivery if labor was induced at term.

Table 2: Multivariate analysis of risk factors for cesarean delivery

Risk factors	Adjusted odds ratio (95 % CI)	Sig.
Maternal age	8.540	0.003
Body mass index	28.455	0.000
Nulliparity	27.023	0.000
Bishops score	12.048	0.001
Epidural analgesia	0.309	0.535
Hypertensive disorders in pregnancy	0.384	0.540
Gestational diabetes mellitus	4.640	0.033
Post term pregnancy	0.012	0.845
IUGR	9.011	0.003
PROM	1.049	0.340

Multivariate analysis showed statistically significance in terms of maternal age, BMI, nulliparity, Bishops score, gestational DM and IUGR.

Discussion

The history of labor induction dates back to the time of Hippocrates' original descriptions in which mammary stimulation and mechanical dilation of the cervical canal are used methods of induction. [18] Induction implies stimulation of contractions before the spontaneous onset of labor, with or without ruptured membranes. Augmentation refers to stimulation of spontaneous contractions that are considered inadequate. Induction is indicated when the benefits to either mother or fetus outweigh those of continuing the pregnancy. Common indications include gestational hypertension, premature rupture of membranes, non-reassuring fetal status, post term pregnancy, intrauterine growth restriction, and various maternal medical conditions such as chronic hypertension and diabetes. Women with a previous preterm delivery had a higher risk of cesarean delivery after induced labor than those with at least one previous term delivery. This finding corresponds with the results of the study of Park et al. [19] He examined the predictive value of previous

obstetric history, Bishop score and sonographic measurement of cervical length for predicting failed induction of labor in parous women at term. Induction failed in 15 women (14%) of whom 13 delivered vaginally after 24 hours and two had a caesarean delivery (1.8%). Our results are in line with the results of Park, indicating that the course of induction in women with a history of preterm delivery differs from women with a term delivery.

Using logistic regression analysis, all comparisons are estimated and expressed as OR with 95 % CI. Factors associated with cesarean delivery were analysed. Our study had shown that maternal age 35 years, BMI 30 kg/m2, nulliparity, preinduction Bishops score less than 5, gestational diabetes mellitus, and intrauterine growth restriction are significantly associated with caesarean delivery. The presence of epidural analgesia, gestational hypertension, postterm pregnancy, and premature rupture of membranes was not associated with significant increase in cesarean delivery if labor was induced at term. Poobalan et al [20] did a systematic review on the effect of BMI in nulliparous women on mode of delivery. They concluded that cesarean delivery risk is increased by 50 % in overweight women (BMI 25–30 kg/m2), and is more than double for obese women (BMI 30–35 kg/m2) compared with women with normal BMI (20–25 kg/m2). Study by Sheiner et al [21] and Ehrenberg et al [22] also showed significant association between obesity and caesarean delivery even after the exclusion of hypertensive disorders and diabetes mellitus. Our study also has shown significant association between high BMI (>30 kg/m2) and cesarean delivery.

As far as role of preinduction Bishops score is concerned, our study has showed significant association between low preinduction Bishops score (<5) and caesarean delivery. Similar results were seen in study by Johnson et al. [23] Study by Ehrenberg et al [22] and Rosenberg et al [24] has shown significant association between cesarean delivery and pregestational as well as gestational diabetes mellitus. Our study has concluded the same results. The increased risk of CS on high birth weight infants may be explained by the high risk of labor obstruction that may be caused by shoulder dystocia which happens when the baby's anterior shoulder gets caught above the mother's pubic bone, leading to complications including brachial plexus injury or clavicle fracture, vaginal tears, and excessive bleeding. This obstruction eventually led to failure in vaginal delivery and hence, necessitates emergency CS delivery. [25]

In our study, postterm pregnancy is not significantly associated with cesarean delivery. Similar results were seen in a study by Sanchez-Ramos et al. [26] They recommended that labor induction at 41-weeks' gestation for otherwise an uncomplicated singleton pregnancy reduces cesarean delivery rates without compromising perinatal outcomes. Our study has shown that IUGR and cesarean deliveries are significantly associated. However, K E Boers and associates [27] have shown that there is no increase in operative and instrumental delivery rates in induced labors in pregnancies complicated by IUGR. In our study, pregnancies with PROM and induction of labor were not significantly associated with cesarean deliveries. Induction of labor in such cases reduces risk of maternal infections. Systematic review by Dare et al [28] concluded the same results.

Conclusion

A vaginal delivery is the best choice for both mother and child. However, it is better to take those patients with multiple risk factors for elective cesarean section rather than inducing them at term. Women with multiple risk factors for caesarean can be taken up for elective cesarean section rather than inducing them at term.

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