Research Article

Risk of caserean delivery following induction of labor in term nulliparous women

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Abstract

Aim of the study: To analyse the risk of caesarean delivery associated with induction of labour in Nulliparous women at term in comparison to women with spontaneous onset of labour. **Material and Methods:** A case control study was conducted from August 2010 to July 2012 including Nulliparous women between ≥37 to ≤42 weeks of gestation with live singleton pregnancy with cephalic presentation. One hundred Nulliparous women at term with induced labour were compared with one hundred Nulliparous women at term with spontaneous labour. Gestational age, assessment of Bishop Score and clinical pelvimetry were done in all the patients. Method of induction and indications for induction were charted out in induction group. The risk of caesarean delivery was compared between induction group and women with spontaneous onset of labour. **Results**: The Bishop Score was found to be statistically significant ($p<0.001$). The caesarean delivery rates in study and control group were 20% and 11%. **Conclusion**: There is increased risk of caesarean delivery in Nulliparous women following induction of labor.
Keywords: caesarean delivery, induction of labor, spontaneous labor, Nulliparous, term gestation.

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INTRODUCTION

Induction of labor refers to iatrogenic stimulation of uterine contractions to accomplish delivery prior to the onset of spontaneous labor. The present incidence in our hospital is around 35-40%. Increased incidence of induction of labor (IOL) is due to the availability of better cervical ripening agents like PGE2, patient's request, obstetrician convenience, accurate dating by obstetric scan and availability of ante partum fetal surveillance. Elective induction is done for postdated pregnancy for patient and relatives pressure due to concerns about the risk of fetal demise with expectant management near term or post term also have contributed to the increased rate of induction. Medically indicated inductions done either maternal or fetal indications. Medically indicated inductions are done where continuing pregnancy is believed to be associated with greater risk to mother or fetus than intervention to deliver the pregnancy and there is no contraindication to vaginal birth[1]. Indicated inductions can improve maternal or fetal outcome[2]. The caesarean delivery is related with better outcome for mother and neonates with medical indication. However the caesarean delivery associated risks are postpartum hemorrhage, the increased incidence of scar dehiscence in subsequent pregnancies, placenta previa, wound complication and anesthesia related complications etc. Nulliparous women responds differently to cervical ripening agents. Nuthalpaty and co workers concluded that Nulliparous woman undergoing labor induction, maternal weight was associated with higher caesarean risk and longer labor and was inversely proportion to cervical dilatation[3]. When it comes to gestational age, post term fetus remains at risk for certain perinatal morbidities such as meconium aspiration syndrome, fetal distress, and shoulder dystocia. Induction of labor has become the most frequent performed obstetrical procedure.

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AIM OF THE STUDY

To analyse the risk of caesarean delivery associated with induction of labour in nulliparous women at term in comparison to women with spontaneous onset of labour.

MATERIAL AND METHODS

Source of data: Nulliparous women admitted to labor room, Fr. Muller Medical College Hospital, Mangalore Karnataka India.

Method of collection of data

Nulliparous women who came to labor room were selected after assessing inclusion and exclusion criteria. The variables like age of the patient, gestational age, Bishop Score, clinical pelvimetry and course of labor were noted in both the group. The obstetric outcome in Nulliparous women who came in spontaneous labor (n=100) were compared with Nulliparous women who underwent induction of labor (n=100). Patients for induction of labor received counseling and informed consent was taken. The indications for induction were noted. The above data was compared with delivery outcome in both the groups. Elective induction was done in patients who completed 40 weeks period of gestation without any obstetric risk factors. IOL started early in the morning after assessing fetal wellbeing by Non-Stress test. Medically indicated inductions were done to benefit mother and the baby irrespective of the timings of the day. Labor was induced with intracervical application of Dinoprostone gel (PGE_2). The trade name is Cerviprime, marketed by Astra Zeneca Pharma, India Limited. The preparation is in the gel form. Route of administration is intracervical. The quantity is 30 grams with unit 0.5 mg. Maximum dose 1.5mg of Dinoprostone (three doses of 7.5ml of gel) within 24 hours period was used at the interval of eight hours. Vaginal gel is better to reduce the incidence of hyper stimulation which was not available at the time of study. Bishop Score which is the important predictor of vaginal delivery outcome was assessed prior to instillation of intracervical PGE_2 gel. If labor has not supervened, PGE2 gel instillation was repeated. If patient had gone into active labor the progress of labor was assessed with WHO modified Partogram. The augmentation was considered wherever delay in progress of labor with ARM, Oxytocin infusion or both. Oxytocin with trade name as Syntocinon, strength 5 I.U started in 500ml of Ringer Lactate at the rate of 1.2milli I.U/ml/minute and titrated up to 32 milli I.U/ml/minute. Frequency of uterine contractions was monitored by clinical palpation as well as by continuous or Intermittent Electronic Fetal Monitoring (EFM). Patients received simple analgesia in early first stage of labor.

Inclusion Criteria

Nulliparous women, Term gestation, singleton pregnancy with cephalic presentation with live fetus.

Exclusion Criteria

Fetal macrosomia, multifetal gestation, anomalous baby, intrauterine fetal death, contracted pelvis, eclampsia, placenta Previa, abruptio-placenta, active genital herpes infection, cervical cancer, meconium stained liquor, cardiac disease and bronchial asthma.

Study Type: Case Control study . Statistical analysis by software SPSS , chi-square test , Fischer exact test and student˙t' test.

RESULTS

Table 1: Pregnancy characteristics

Age of the patients	N	Mean	Std. Deviation	t
Controls	100	24.9300	3.80657	0.54000
Cases	100	25.2600	4.77709	p=0.59ns
POG(period of gestation)	**N**	**Mean**	**Std. Deviation**	**t**
Controls	100	38.9050	1.05317	0.37800
Cases	100	38.7072	5.12825	p=0.706ns
BS(Bishop score)	**N**	**Mean**	**Std. Deviation**	**T**
Controls	100	7.6800	1.53004	16.74000
Cases	100	3.72.00	1.80392	p<.001vhs

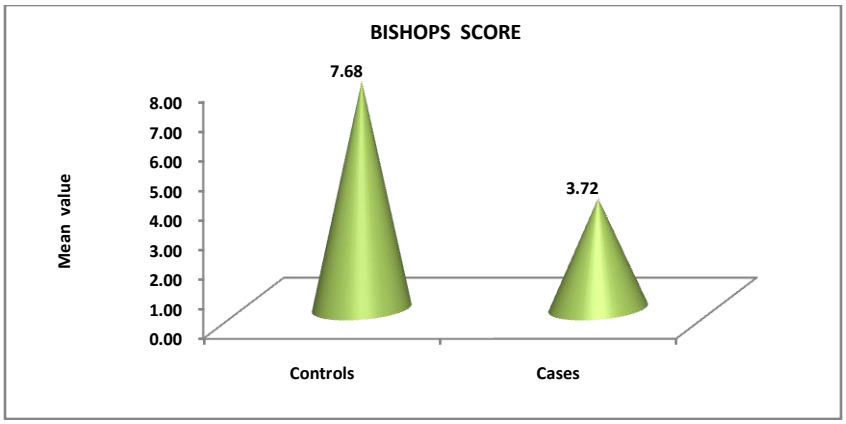

Figure 1: Bishops Score

Observation: Mean Bishops score in controls was 7.68 whereas it was 3.72 in cases. The Mean difference between cases and controls was found to be statistically significant. (P<0.001)

Table 2: Indication for induction

	Frequency	Percent
Chorioamnionitis	4	4.0
Chronic HTN	7	7.0
GDM	3	3.0
Gestational HTN	12	12.0
Non reassuring FHR	9	9.0
Post dated	35	35.0
Preeclampsia	9	9.0
PROM	21	21.0
Total	**100**	**100.0**

Observation: In the study group, majority were induced for postdated pregnancy and PROM (premature rupture of membranes).

Table 3: Bishop score at admission

		Group		Total
		Case	Control	
B-S	0-4	63(63.0%)	0(0.0%)	63(31.5%)
	4-8	37(37.0%)	68(68.0%)	105(52.5%)
	>8	0.(0%)	32(32.0%)	32(16.0%)
Total		**100(100.0%)**	**100(100.0%)**	**200(100.0%)**

Fishers exact test p=0.000, HS

Observation: Sixty three percent of patients had Bishops score less than 4 in cases. Where most of the patients had (68%) favorable Bishops score 4 to 8 in control group.

Table 4: Method of induction

		Group		Total
		Controls	Cases	
Dinoprostone gel with or without ARM	Count	0	50	50
	%	.0%	50.0%	25.0%
Oxytocin	Count	0	21	21
	%	.0%	21.0%	10.5%
Oxytocin + ARM	Count	0	29	29
	%	.0%	29.0%	14.5%
Total	**Count**	**0**	**100**	**100**
	%	**.0%**	**100.0%**	**50.0%**

χ^2=160.23 p<.001hs

Observation: Labor was induced with dinoprostone gel, oxytocin with or without ARM.

Table 5: Delivery Outcome -Route of delivery

		Group		Total
		Controls	Cases	
FTND	Count(%)	89(89.0%)	0(0%)	89(44.5%)
FTVD	Count(%)	0(0%)	80(80.0%)	80(40.0%)
LSCS	Count(%)	11(11.0%)	20(20.0%)	31(15.5%)
Total	**Count(%)**	**100(100.0%)**	**100(100.0%)**	**200(100.0%)**

χ^2=171.613 p<.001 hs(highly significant)

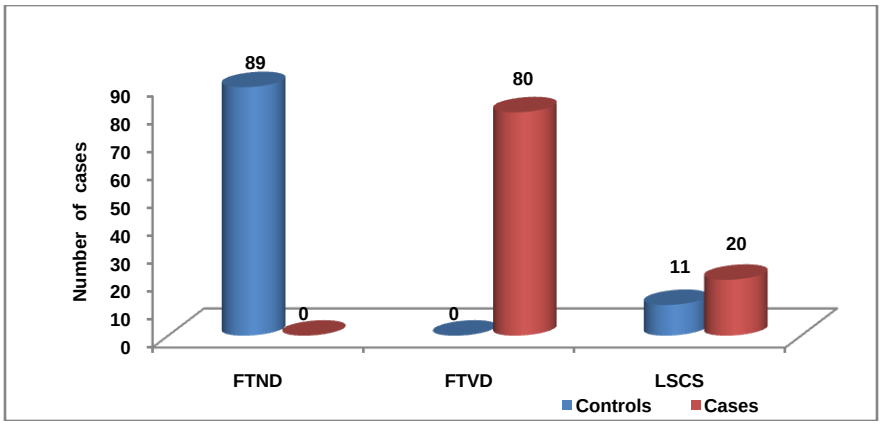

Figure 2: Route of delivery

Observation: Out of 100 cases, 20 had LSCS and 80 had vaginal delivery, out of 100 controls, 11 had LSCS and 89 had vaginal delivery. The risk of LSCS is significantly higher in cases than in controls as p < .001. Out of 20 cases of LSCS, 6 had elective induction. Unadjusted risk for cesarean delivery associated with induction was 2.2.

Table 6: Birth weight

Birth weight	N	Mean	Std. Deviation	T
Controls	100	2.9220	0.38508	0.54500
Cases	100	2.9519	0.39271	P=0.586ns

Observation: Mean Birth weight in controls is 2.922 kgs whereas the same was 2.952 in controls. The difference between case and control with regard to birth weight is found to be statistically not significant.

Table 7: Indication for caesarean section

		Group		Total
		Controls	Cases	
Arrest of cervical dilatation	Count	4	6	10
	%	4.0%	6.0%	5.0%
Arrest of descent of head	Count	2	4	6
	%	2.0%	4.0%	3.0%
Failed induction	Count	0	1	1
	%	.0%	1.0%	.5%
FHR deceleration	Count	4	8	12
	%	4.0%	8.0%	6.0%
Abruptio placentae	Count	0	1	1
	%	1.0%	.0%	.5%

χ^2=15.245 p=0.418 ns

Observation: Out of 100 cases, most common indications for caesarean section were fetal heart rate deceleration (12) and arrest of cervical dilatation (10).

Table 8: Outcome variables in study group

	Group	N	Minimum	Maximum	Mean	Std. Deviation	Median	t test value	p value
POG (wks)	Cases	100.00	4.01	42.30	38.71	5.13	39.50	0.43	0.670 NS
	Control	100.00	37.00	41.00	38.93	1.07	39.10		
	Total	200.00	4.01	42.30	38.82	3.70	39.30		
APGAR at 1′	Cases	100.00	2.00	9.00	8.08	1.11	8.00	0.37	0.712 NS
	Control	100.00	5.00	9.00	8.13	.77	8.00		
	Total	200.00	2.00	9.00	8.11	.95	8.00		
APGAR at 5′	Cases	100.00	3.00	10.00	8.77	1.14	9.00	1.42	0.156 NS
	Control	100.00	8.00	10.00	8.95	.54	9.00		
	Total	**200.00**	**3.00**	**10.00**	**8.86**	**.90**	**9.00**		

Observation: APGAR in cases and controls at 1 minutes and 5minutes were statistically not significant

The difference is found to be statistically significant (p <0.001).

Table 9: Duration of Labour

Group	N	Mean	Std.Devation	t
Controls	100	4.8100	2.16816	8.21500
Cases	100	8.4600	3.87799	p<.001 vhs

Observation: Duration of labor is found to be more in cases with mean value 8.46 and in controls it was 4.81.

Table 10: Duration of hospital stay

Group	N	Mean	Std.Devation	t
Controls	100	3.5600	1.42361	2.52000
Cases	100	4.2600	2.38522	P=.013sig

Observation: Duration of hospital stay is found to be more in cases with mean value of 4.3 and in controls it

was 3.6 The difference is found to be statistically significant (p=.013 sig).

Table 11: Complications of labor

Prolonged labor	10	0
Hyper stimulation	1	0
PPH	2	0

Observation: There were 10 cases of prolonged labor, 1 case of uterine hyper stimulation and 2 cases of PPH whereas no complications observed in controls. No maternal death observed in both the groups.

Table 12: Perinatal Outcome

	Study	Control
Meconium Aspiration syndrome	5	3
NICU admission	10	4
Low Apgar	2	0
Fetal death	1	0

Observation: One case of fetal death observed in Dinoprostone induced delivery in which patient developed severe placental abruption.

DISCUSSION

In the current study the maternal age, period of gestation (POG) and birth weight between the study and control group were comparable. The Bishop score which is one of the important predetermine of outcome of IOL was found to be unfavorable in control group compared to study group. Bishop Score in control group was 7.68 whereas 3.72 in study group. This was found to be statistically significant P<0.001(table-3, fig-1). In the study conducted by Peregrine E, O'Brien P *et al*[4], the current standard for predicting outcome of IOL remains the Bishop score. Bishop score <5 is the prognostic clinical risk factor for vaginal delivery outcome. Vrouenraets *et al*[5], reported that Bishop score of 5 or less was predominant risk for caesarean delivery. Study conducted by Johnson DP[6], showed among 2647 patients who underwent induction of labor the caesarean rate was 31.5% in whom the Bishop score was <5 at induction versus18.1% for patients with score >5. Hence Bishop Score is the important predictor for outcome of IOL. The indications for induction in our study were premature rupture membranes, postdated pregnancy, non-reassuring fetal heart rate (FHR), pre-eclampsia, chronic hypertension, chorioamnionitis and gestational diabetes mellitus (GDM). Majority cases induced for postdated pregnancy and PROM (table-2). In the study conducted by American college of obstetrician and gynecologists[1], common indications includes PROM, gestational hypertension, non-reassuring fetal heart rate, postdated pregnancy and various medical condition such as chronic hypertension and diabetes. In the study by Seyb ST *et al*[7], indications for induction were gestational age ≥41 weeks, premature rupture of membranes, fetal growth restriction, free eclampsia, chronic HT, non-reassuring fetal surveillance and diabetes mellitus. The above studies did not categorize the inductions as elective or medical indications. The risk of caesarean delivery is significantly higher in study group than in control group (p<0.001). In the study by Yeast *et al*[8], 197 Nulliparous women who understand elective induction had a caesarean delivery rate of 16.2% compared with 7.9% among 4086 Nulliparous women who had spontaneous labor. Seyb ST and colleagues[7], found that women experiencing spontaneous labor had 7.8% caesarean delivery rate where as women undergoing medically indicated labor induction had 17.7% caesarean delivery rate. The caesarean delivery outcome for Nulliparous women in our study showed 20% in study group and 11 % in control group (table-5) In the study by Peregrine, O Brien P *et al*[4], concluded that both medically indicated and, elective induction are associated with increased risk of caesarean delivery particularly as Nulliparous women who have overall 2.2 fold higher risk than women presenting with spontaneous labor. In our study most common indications for caesarean section were fetal heart rate deceleration and arrest of cervical dilatation -12 and 10% respectively (table-7). Vahratian *et al*[9], in their study concluded that elective induction in Nulliparous women with an unfavorable cervix has a high rate of labor arrest and subsequently increased risk of caesarean delivery. They had longer latent and early active phase and 2.3 fold increased risk of caesarean delivery compared with those with spontaneous onset of labor. In the study by Seyb S T[7], more common indications for caesarean delivery were labor dystocia. Induction of labor required significantly more time in labor. In the study by Peregrine E, O Brien *et al*[4], caesarean delivery was performed for failure to progress to labor, fetal distress on CTG and failed IOL. In the study group total hospital cost was 3 times higher than that required for Nulliparous women who came with spontaneous onset of labor. The duration of labor in cases and control was found to be statistically significant (P<0.001) and difference in duration of hospital stay and cost was found to be statistically significant (table-9 and table-10) P=0.003. Grobman WA observed that among a total of 397 Nulliparous women 32% of whom underwent cervical ripening, only 8 women (2%) never achieved active phase of labor before caesarean and the overall caesarean was 26%. A longer latent phase is related with greater risk of cesarean delivery[10]. Alexander J.M[11], conducted that admission to delivery was longer (5.7 compared with 11.1) and more likely extend beyond 10 hours in the induction group. In our study group, there

were 5 cases of meconium aspiration syndrome (MAS) and 2 cases of low APGAR and 10 cases for observation in NICU. Fetal mortality was in one case of Dinprostone gel induced delivery for severe preeclampsia developed abruption placenta during the course of labor (table-12). In the study by Vrouenraets *Et al*[5], in medical and elective induction groups more neonates required neonatal care, mothers required blood transfusion and maternal hospital stay was longer. In the current study, maternal complications include, 10 cases of prolonged labor, 1 case of hyper stimulation, 3 cases of PPH managed by medical management and blood transfusion (table-11) Cunningham FG and co-workers[12], studied maternal complication rates that are increased in association with labor induction include caesarean section, chorioamnionitis and uterine atony. Chorioamnionitis and PPH were more frequent in patients with latent phase of labor greater than 18 Hours (16 vs. 26%). Mercer B.M[13], in his study documented that labor induction may be complicated by uterine tachysystole, uterine hyperstimulation with FHR abnormality or fetal distress, prolonged labor, prolonged membrane rupture and chorioamnionitis. Ethrenthal D B and Collegues[14], stated that health risks to mother due to caesarean delivery include higher rates of PPH, hysterectomy, venous thromboembolism, wound complications and hospital re admission. Wigton TR[15], studied that, the risk of elective induction of labor are iatrogenic prematurity uterine hyper stimulation and resultant fetal hypoxia, failed induction with need for Caeserean delivery, cord prolapse change in fetal presentation, Intrauterine infection, PROM, uterine rupture, neonatal hyperbilirubinemia, water intoxication and increased risk of Caesarean section. Patients who do not go into spontaneous labor need induction of labor. Induction of labor whether it is medical or elective induction has increased rate of caesarean section. The elective labor induction carried out for postdated pregnancy alone without any maternal or fetal indication must be reconsidered waiting for favorable Bishop Score. Women classified in the induction group in our study included some with a relatively unfavorable cervix who were being induced for indication not associated with fetal jeopardy. We have not studied the compounding variable body mass index (BMI) associated risk of caesarean delivery following IOL, as many patients visit the hospital at or near term. The other confounding variables like age of the patients, gestational age and birth weight were comparable in both groups. Hence the selection bias has been avoided.

1. This study has important implications for the health care providers and their patients and emphasizes the need for women to be counseled about the potential risk of caesarean delivery associated with labor induction. Effects to reduce the elective labor induction might lead to decrease in the rate of caesarean delivery in Nulliparous women and thereby reducing the subsequent Cesarean delivery.
2. This study is limited in its ability to conclusively measure the effect of an intervention as it includes small sample size.
3. However, the scheduled IOL also has advantage as avoiding journey during labor as many of our patients belong to rural area as transportation is difficult.

The time required for cervical ripening is important to consider when evaluating the induction to delivery interval. An outpatient approach to cervical ripening before labor induction is one thought but the safety and efficacy in developing countries yet to be revised as most of our patients are non compliant. The usage of epidural analgesia in labor and increase in Cesarean delivery remains to be explained[16]. The subsequent trial of scar in future pregnancies is of a concern which is associated with the risk of uterine rupture. Retrospective investigation using large study population conclude that labor that is induced rather than spontaneous labor increase the risk of uterine rupture (from 0.7% to 2.9%) among women with one or more prior caesarean delivery[17]. A prospective trial concluded that FFN (fetal fibronectin) does not predict vaginal delivery in Nulliparous women[18]. The optimal timing of offering induction of labour to women at or beyond term warrants further investigation[19].

CONCLUSION

IOL is associated with a significantly increased risk of Cesarean delivery in Nulliparous women. The decisions to undertaken IOL need to be clear and clinically justified. This may reduce the primary Cesarean delivery among Nulliparous women. Patient should be counseled prior to IOL for marginally indicated induction, cost, risk of additional procedures, evidence based protocols must be available at regional level for cervical ripening and for induction. The uniformity in strength of the pharmaceutical preparation of inducing agents, route of administration, multicentre trial with similar parameters to avoid bias in selection of patients for IOL and study outcome help in deciding the protocol for the IOL. Every hospital should have the audit on the rate of induction and must be scrutinized if operative delivery or poor perinatal outcome.

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