Effects of Induction of Labor on Maternal and Perinatal Outcome in Postdated Nulliparous Pregnancy

Shreyasi Karmakar¹, Sabyasachi Bid², Tapan K Maiti³

ABSTRACT

Objective: This study aimed at determining the mode of delivery, maternal, and perinatal outcomes of induction of labor (IOL) in postdated pregnancies.

Methods: It was a prospective observational study. Nulliparous women with uncomplicated singleton pregnancies who have crossed their estimated date of delivery (EDD) were included in the study. Inclusion and exclusion criteria were strictly followed. A total of 280 patients were divided into study and control groups. Those who underwent IOL immediately after EDD were compared with women who were managed expectantly up to 42 weeks.

Results: The study group and control group consisted of 150 and 130 women, respectively. The rate of cesarean section (CS) (64.62%) was significantly higher in an expectantly managed group. The most common indication of the CS was fetal distress in both groups, and the occurrence of oligohydramnios was quite higher in the control group. The rate of shoulder dystocia, cervical tear, and third- and fourth-degree perineal tear was significantly more in an expectantly managed group. Fetal distress was also more in that group.

Conclusion: Our study suggests that labor should be induced after crossing EDD if gestational age is confirmed so that the incidence of maternal and perinatal complications can be brought down to an acceptable level.

Keywords: Cesarean section, Induction of labor, Maternal complications, Perinatal complications, Postdated pregnancy.

Journal of South Asian Federation of Obstetrics and Gynaecology (2021): 10.5005/jp-journals-10006-1870

INTRODUCTION

Postdated pregnancy is defined as a pregnancy that has extended beyond the estimated date of delivery (EDD)—American College of Obstetrics and Gynecology, 2004.¹ The terms prolonged pregnancy, postdated, and postdatism are used to describe the same condition.

The incidence of postdated pregnancy is about 3 to 12% of all pregnancies. The common cause of prolonged pregnancy is inaccurate dating.² Clinical methods that are used to confirm the period of gestation are last menstrual period, uterine size as estimated by bimanual examination in the first trimester, time of the first perception of fetal movements, and symphysis fundal height in a singleton pregnancy. Risk factors for postdatism are primiparity, history of previous post-term pregnancy,³ male fetuses,⁴ obesity,⁵ hormonal factors, and genetic predisposition.⁶

Post-term pregnancies are related to high fetal and neonatal morbidity and mortality as well as maternal morbidity. The perinatal mortality (stillbirths plus early neonatal deaths) at 42 weeks of gestation is double as compared to that at term (4–7 vs 2–3 per 1000 deliveries, respectively).⁷ It is thought that uteroplacental insufficiency, meconium aspiration, and intrauterine infection are the main causes of the increased perinatal death in these cases.⁸ Fetal morbidities like the passage of meconium, meconium aspiration syndrome (MAS), macrosomia, and dysmaturity are increased in post-term pregnancies. Post-term pregnancy itself leads to low umbilical cord pH levels (neonatal acidemia), low 5-minute Apgar scores, neonatal encephalopathy, and infant death.⁷

Post-term pregnancy may cause significant risks to the mother also. There is a high chance of: (1) labor dystocia (9–12% vs 2–7% at term); (2) major degree of perineal lacerations (third- and fourth-degree tears), due to macrosomia (3.3% vs 2.6% at term); (3) instrumental vaginal delivery; and (4) doubling in cesarean section

¹Department of Obstetrics and Gynecology, ESI-PGIMS, ESIC Medical College, Joka, Kolkata, India

²Department of Anaesthesiology and Critical Care, ESI-PGIMS, ESIC Medical College, Joka, Kolkata, India

³Department of Obstetrics and Gynecology, N.R.S. Medical College and Hospital, Kolkata, India

Corresponding Author: Shreyasi Karmakar, Department of Obstetrics and Gynecology, ESI-PGIMS, ESIC Medical College, Joka, Kolkata, India, Phone: +91 9830525422, e-mail: drshreyasibid@gmail.com

How to cite this article: Karmakar S, Bid S, Maiti TK. Effects of Induction of Labor on Maternal and Perinatal Outcome in Postdated Nulliparous Pregnancy. *J South Asian Feder Obst Gynae* 2021;13(2):106–110.

Source of support: Nil

Conflict of interest: None

(CS) rates (14% vs 7% at term). Cesarean delivery itself leads to a higher incidence of endometritis, postpartum hemorrhage, and thromboembolic diseases.⁹ In most of the situation, prolonged pregnancy causes mental anxiety to the mother, which should not be underestimated.

Prevention of post-term pregnancies is the first step of management. Induction of labor (IOL) at term is a good option. However, the risk of CS is increased with IOL. So, to avoid induction and expedite the spontaneous onset of labor at term, different types of minimally invasive interventions have been recommended, like membrane sweeping,¹⁰ unprotected sexual intercourse,¹¹ nipple stimulation,¹² and acupuncture.¹³

Women who have crossed their EDD but have not reached 42 weeks of gestation should be proposed for intensified antenatal

fetal monitoring to improve perinatal outcomes. Options for assessing fetal well-being include nonstress testing [cardiotocography (CTG)], biophysical scoring (BPP), modified BPP [CTG and amniotic fluid index (AFI)], contraction stress testing, and a combination of these modalities. There are so many techniques for fetal monitoring, and no single method has been found to be superior.² Twice weekly antenatal fetal surveillance is widely practiced though there is no strict recommendation based on published research.¹ CTG and [amniotic fluid (AFI)] volume estimations are an acceptable standard modality of fetal surveillance.

IOL is done when the benefits of delivery outweigh the risks associated with the continuation of pregnancy. The main problem of IOL in post-term, low-risk pregnancies is uterine overstimulation, fetal distress, failure of induction, and increased CS rates. There is also an increased risk of uterine rupture in women with previous CS. IOL is more likely to be successful when the cervix is favorable. Different techniques can be applied to assess cervical favorability and to predict the likelihood of success of IOL. These include digital cervical examination (Bishop score), ultrasonography measurement of cervical length,¹⁴ and recently some biochemical markers (maternal serum oestriol-to-estradiol ratio).¹⁵

Several studies have used prostaglandins for labor induction in post-term pregnancies, but no standardized regime has been established so far. Higher doses of the Prostaglandins (especially PGE1) increase the risk of uterine tachysystole and hyper-stimulation, leading to non-reassuring fetal CTG. PGE1 or misoprostol is not yet approved for IOL by the Drug Controller General of India. PGE2 or dinoprostone gel or suppository is commonly used for cervical ripening and IOL in unfavorable cervix. Low dose oxytocin infusion, transcervical Foley catheter, membrane sweeping, hygroscopic dilators (laminaria tent), mifepristone, no donors, relaxin, and hyaluronidase are presently not recommended for IOL in view of the nonavailability and low-quality evidence for their use. Intravenous oxytocin with or without artificial rupture of the membrane can be used for induction with a favorable cervix.

With this background, the present study was undertaken to compare the outcome of pregnancies that crossed EDD, and IOL was done.

Objectives of the Study:

- To study the maternal and perinatal outcomes in postdated nulliparous women who underwent IOL.
- To study the maternal and perinatal outcomes in postdated nulliparous women who were observed for spontaneous onset of labor up to 2 weeks past EDD.
- To compare the maternal and perinatal outcomes between the two groups.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Obstetrics and Gynecology, IPGMER and SSKM Hospital, Kolkata, in 2016, for 2 years duration. A total of 280 patients was selected from the maternity ward and labor room and divided into study group and control group.

Inclusion Criteria

- Nulliparous women
- Singleton pregnancy
- Gestational age ≥ 40 weeks.

Exclusion Criteria

- Congenital anomaly of a fetus.
- Polyhydramnios
- Eclampsia.
- Antepartum hemorrhage
- Heart disease
- Elderly primigravida
- Medical disorder of pregnancy
- Postcesarean pregnancy.

The study group comprised of postdated antenatal women (as per inclusion and exclusion criteria), and elective IOL was done after crossing their EDD. The control group comprised of women who have crossed EDD, and expectant management was done till 42 weeks (42 weeks + 0 days). If these women do not go into labor spontaneously, IOL was done. The expectant group may, therefore, went into spontaneous labor, elective lower uterine segment cesarean section (LUCS), or eventually ended up with an induced labor at 42 + 0 weeks.

GESTATIONAL WEEK

We have followed the commonly accepted induction methods: In cases of unfavorable cervix, induction agent was intracervical PGE2 (dinoprostone) gel, while in cases of favorable cervix, the induction was done by oxytocin infusion or amniotomy followed by oxytocin infusion.

Every labor was monitored closely in all the patients of the study and control groups. The following maternal parameters were studied: Normal vaginal delivery (NVD), instrumental vaginal delivery, CS, uterine tachysystole, precipitate labor, postpartum hemorrhage (PPH), prolonged labor, shoulder dystocia, retained placenta, uterine rupture, and maternal death. Neonatal parameters included in our study were fetal distress, stillborn, neonatal asphyxia, low birth weight (LBW), perinatal morbidities due to instrumental deliveries, MAS, neonatal sepsis, and neonatal death.

The study was accepted by the institutional ethical committee. Consent of all the patients in the study and control groups was taken. A proforma was formulated and filled for all the patients.

All the data were analyzed, plotted, and compared by using Student's t-test, chi-square test, and Fischer's exact test as appropriate.

RESULTS

We have identified 280 nulliparous women as per inclusion criteria, and then randomization was done. One hundred and fifty women were induced electively after crossing EDD, and the rest one hundred and thirty were managed conservatively till 42 weeks.

Table 1 shows among 130 women in the expectant management group, only 67 (51.54%) went to spontaneous labor, 60 (46.15%) were induced for labor, and the rest 3 (2.31%) were delivered by elective CS due to fetal indications.

Table 2 demonstrates the mode of delivery in the two groups. The mode of delivery was significantly different between the two

Table 1: Outcome of the women of an expectantly managed group ($n = 130$)

Labor induction	60 (46.15%)
Spontaneous onset of labor	67 (51.54%)
Elective LUCS	3 (2.31%)

Table 2: Comparison of mode of delivery in study and control groups

Mode of delivery	Study (n = 150)	Control (n = 130)	P-value
NVD	70 (46.67%)	30 (23.08%)	0.000
Instrumental delivery	26 (17.33%)	16 (12.31%)	
LUCS	54 (36%)	84 (64.61%)	

Table 3: Comparison of indications of CS in study versus control group

Indication of LUCS	Study (n = 54)	Control (n = 84)	p-value
Fetal distress	18 (33.33%)	22 (26.19%)	0.36
Oligohydramnios	2 (3.7%)	15 (17.86%)	0.013
Induction failure	9 (16.67%)	20 (23.81%)	0.312
NPOL	15 (27.78%)	13 (15.48%)	0.080
Thick meconium-stained liquor	10 (18.51%)	11 (13.09%)	0.384
Elective LUCS	0	3 (3.57%)	Not done

Table 4: Comparison of maternal complications in study versus control group

Maternal complications	Study (n = 150)	Control (n = 130)	p-value
Shoulder dystocia	10 (6.66%)	18 (13.84%)	0.045
Prolonged labor	24 (16%)	25 (19.23%)	0.477
PPH	5 (3.33%)	10 (7.69%)	0.105
3° and 4° perineal tear	5 (3.33%)	15 (11.53%)	0.007
Cervical tear	2 (1.33%)	9 (6.92%)	0.016
Puerperal sepsis	1 (0.66%)	3 (2.30%)	0.250

groups ($p < 0.05$). The rate of normal vaginal delivery was quite higher in the induction group than that in the expectantly managed group (46.67% vs 23.08%). On the contrary, the rate of CS was significantly higher in the expectant management group (64.61%) compared to the study group (36%). The incidence of instrumental vaginal delivery was not significantly different in the two groups. It was 17.33% in the study group and 12.31% in the control group.

The indication of CS is listed in Table 3. The most common indication of LUCS was fetal distress in both the groups (33.33% in IOL group and 26.19% in expectant group). In the list, we can see that the risk of oligohydramnios and its indication for LUCS was significantly higher in the expectantly managed group (3.7% in IOL and 17.86% in expectant). Three women in the expectant management group were delivered by elective LUCS due to oligohydramnios and macrosomic baby.

Table 4 describes various maternal complications in two groups. The analysis showed the rate of shoulder dystocia was much lower in the induction group (6.66%) compared to the expectantly managed group (13.84%). The p value was <0.05 . While analyzing various types of genital injury during vaginal delivery, it was found that the occurrence of third- and fourth-degree perineal tear (3.33% in IOL vs 11.53% in expectant, p -value = 0.007) and cervical tear (1.33% in IOL vs 6.92% in expectant, p -value = 0.016) was statistically significantly higher in the expectantly managed group.

Table 5 showed that fetal distress was significantly higher in the expectantly managed group (14.66% in IOL vs 26.92% in expectant group, p -value = 0.011). The risk of stillborn fetus, birth asphyxia, birth injury, MAS, and neonatal sepsis in our study was lower in IOL group although the difference was not statistically significant.

Table 5: Comparison of perinatal complications in study versus control group

Fetal complications	Study (n = 150)	Control (n = 130)	p-value
Fetal distress	22 (14.66%)	35 (26.92%)	0.011
Stillborn	1 (0.66%)	2 (1.53%)	0.477
Birth asphyxia	1 (0.66%)	4 (3.07%)	0.128
LBW	1 (0.66%)	0	Not done
Birth injury	2 (1.33%)	5 (3.84%)	0.180
MAS	5 (3.33%)	8 (6.15%)	0.262
Neonatal sepsis	0	2 (1.53%)	Not done
Neonatal death	8 (5.33%)	4 (3.07%)	0.352

Table 6: Comparison of birth weight in study versus control

Weight (kg)	Study (n = 150)	Control (n = 130)	p-value
<2.5	1 (0.66%)	0	0.196
2.5–4	146 (97.33%)	123 (94.61%)	
>4	3 (2%)	7 (5.38%)	

Table 6 depicts the comparison of birth weight of neonates. Although labor induction at 40 weeks was associated with a reduced chance to develop a macrosomic baby, these data were not statistically significant.

DISCUSSION

One of the most important findings in our study, a higher risk of CS in the expectantly managed group, is in accordance with other studies. The ARRIVE Trial¹⁶ was a randomized control trial where 6106 low-risk nulliparous women were recruited and were induced at 39 weeks and were compared with those who chose for expectant management till 42 weeks. There was a decrease in the incidence of CS with induction at 39 weeks (18% vs 22%, RR 0.84). Several studies indicated a lower risk of CS at 40 or 41 weeks compared to expectant management.^{17,18} Although few studies have indicated a higher likelihood of CS following labor induction, primiparous subgroup in their study found a similar trend of results (as our study) concerning the mode of delivery and risk of CS as compared to the whole study group.^{19–21} Preinduction Bishop's score, body mass index, and age of the patient are some confounding factors that may influence the results in different study groups, but overall most of the studies are in conclusion that primiparous women with expectant management beyond 41 weeks are at increased risk of cesarean delivery. These conclusions are in line with our study.

In our study, the commonest indication of CS in both the group was fetal distress (33.33% and 26.19%, respectively), but here the difference between the two groups is not statistically significant. Incidence of fetal distress substantially increases after 40 weeks of gestation due to uteroplacental insufficiency and meconium passage.⁸ One of the major complications of IOL is uterine hyperstimulation and thick meconium-stained liquor.²² Our study also reveals the same fact.

Secondly, we noted that the risk of developing oligohydramnios was more in an expectantly managed group compared to the labor induction group. The difference between the two groups is statistically significant. Oligohydramnios is an independent risk factor of prolonged pregnancy. Meconium release into an already

reduced liquor volume results in thick meconium and MAS of a fetus.^{23,24} Our study does not show a significant increase in the number of meconium-stained liquor as an indication of CS.

Regarding maternal complications, our study shows that the expectantly managed group had a significantly higher rate of shoulder dystocia, third- and fourth-degree perineal tear, and cervical tear. Although the chances of prolonged labor, PPH, and puerperal sepsis were more in the aforementioned group than that in the induced labor group, the result is imprecise, not statistically significant. Other studies, like Treger et al. and Rand et al., have also found that the incidence of macrosomia and as a result perineal tear are more in late-term pregnancy.^{25,26} In our study, increased shoulder dystocia in the expectant management group is mainly due to a big size baby. Perineal and cervical tears were also caused during the delivery of a big-sized baby. There are other studies that have not shown a significant difference in the mode of delivery and maternal complications in both groups of women.^{27,28} Their results were probably influenced by the parity of the patients. Induction in multiparous women has more favorable outcome with respect to normal vaginal delivery, and so, the rate of postdelivery complications is also less. We have omitted this biasness by excluding the multiparous women from our study.

While analyzing the fetal complications, our study shows that the rate of fetal distress was significantly more in an expectantly managed group than that in the induction group. Here, prolonged duration of pregnancy leading to oligohydramnios and cord compression was the causes of fetal distress. IOL has not contributed much to the occurrence of fetal distress. There are mixed supportive data in this regard. Some studies have shown that induction parse is responsible for fetal distress.²² On the contrary, most of the studies have concluded that advanced gestational age (>40 weeks) is at high risk of developing fetal distress due to decreased volume of liquor amnii, umbilical cord compression, and thick meconium in liquor.^{29,30} Present study also showed a higher rate of MAS, but it is not statistically significant. In this context, we would like to mention that method of labor induction also has an influence on fetomaternal complications. Misoprostol (PGE1) administered vaginally causes meconium staining of liquor particularly in unfavorable cervix and MAS in the fetus.^{31,32} Christensen et al. demonstrated that the combination of oxytocin induction, preceded by dinoprostone application, is safe and significantly shortens induction delivery interval.³³ Analysis of birth weight did not show any statistically significant difference while comparing the two groups. This result is in accordance with other studies.³⁴

By analyzing all the differences between the two groups, it must be kept in mind that a higher gestational age is associated with an increasing rate of fetomaternal complications. Alexander et al. observed a higher rate of labor complications, such as prolonged duration of labor.³⁵ Furthermore, the risk of maternal infections, PPH, and obstetric trauma increases with gestational age.^{30,36,37} There is also an increased risk of CS with higher gestational age.^{30,38} Present study found that the risk of fetal distress rises strongly with gestational age. So, it should be emphasized that higher gestational age is associated with a rise in stillbirth, perinatal or neonatal deaths, meconium aspiration, pneumonia, or asphyxia as evidenced by other studies.

CONCLUSION

The aim of this study was to compare the effect of routine labor induction immediately after EDD to the practice of waiting for

spontaneous onset of labor until 2 weeks after EDD. We found that routine induction at 40+ 0 to 6 weeks gestation is associated with a decreased risk of CS, oligohydramnios, shoulder dystocia, third- and fourth-degree perineal tear, cervical tear, and fetal distress of newborn. Our study has strictly included the nulliparous women, which may be the reason of unfavorable maternal outcomes in cases of expectant management. Our findings do not support waiting for spontaneous onset of labor up to 2 weeks past EDD. It highlights the importance of discussing whether the risk related to the procedure of IOL outweighs the harm of ongoing pregnancy. It also gives some idea whether IOL should be applied to a larger population of low-risk women.

CLINICAL SIGNIFICANCE

Any pregnancy that goes beyond 40 weeks should be considered as high risk. So, proper management should be done to decrease the rate of perinatal morbidity and mortality. The emotional impact as well as peripartum complications of a mother should also be taken into consideration while allowing a pregnancy to prolong. So, a policy should be made to intervene in pregnancy at an optimum gestational period so that a proper balance could be made between the risk of induction and that of ongoing pregnancy.

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