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Systematic Review

Maternal and Neonatal Outcomes Following Induction of Labor at (39 to 42) Gestational Weeks; Systematic Review

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Abstract

Background: Induction of labor is a technique used to accomplish vaginal delivery prior to the spontaneous commencement of labor. This systematic review study was out to evaluate the impact of IOL on the woman, fetus, and CS rate in a singleton uncomplicated full-term pregnancy.

Method: This investigation was conducted in accordance with the PRISMA criteria. In this systematic study, we examine labor-related issues for mothers following IOL at 39 to 42 gestational weeks in contrast to EM. We searched PubMed, Embase, Cochrane Central Library, and Google Scholar databases for publications published between 2015 and 2024.

Result: In this review we included 7 studies, all were randomized controlled trials. Five of our included studies take CS as outcome, 2 of which found less events of CS in the IOL, while one study found more CS rates, and 2 studies found no significant relation between both groups in CS events. According to 3 studies, perinatal death and still birth was less in the IOL. Six studies discussed admission to Neonatal ICU as outcome, it was less in 5 studies, with no significant difference between the groups.

Conclusion: We draw the conclusion that the majority of the included studies did not significantly differ in the incidence of unfavorable outcomes for mothers or newborns among the IOL and EM groups. CS rates were lower in the IOL group in most of the studies.

Keywords: Induction of Labor; Neonatal Outcome; Maternal Outcome; Expectant Management

Abbreviations

CS: Cesarean Section; IOL: Induction of Labor; EM: EM; VD: Vaginal Delivery; ICU: Intensive Care Unit

Introduction

Induction of labor is a technique used to accomplish vaginal delivery prior to the spontaneous commencement of labor [1]. According to the American Obstetricians and Gynecologists College, an elective induction cannot be considered before 39 weeks of estimated gestation, however it may be considered for other considerations. In 2012, twenty-three percent of all pregnant women in the US had an induction [2]. The prevalence of elective or non-medically indicated induction is thought to explain for the discrepancy in the rates of pregnancy-related complications, which have not increased at the same rate [3]. By definition, there is no obvious medical advantage from this intervention, hence a thorough assessment of the related outcomes for mothers and newborns is necessary [4]. The outcome that is most impacted by a defective control group is the CS rates [5].

Allowing the pregnancy to proceed to a later gestational age is called EM. Then, in order to determine the best course of action for delivery, women and their medical professionals wait for labor to begin or for a pregnancy complication to manifest. Studies that compare elective IOL with EM in the past have not shown that there is a higher chance of cesarean birth [6,7]. The biggest of these studies shows that elective IOL at term may lessen perinatal mortality when compared to EM, in addition to showing a lower rate of CS [8]. In comparison to EM, a 20% decrease in CSs is observed with elective IOL, according to a meta-analysis of the randomized trials [9].

The risk of newborn mortality and antepartum and intrapartum stillbirths is increased in women 35 years of age or older [10]. Because members of this population are comparatively less likely to become pregnant in the future, stillbirth is particularly significant to them. Since 38 weeks is the gestational age of delivery linked with the lowest risk of perinatal death, induction at or before the due date may be advantageous [11].

This study included women who were nulliparous or multiparous, as well as those who were elderly and carrying low-risk pregnancies, with the goal of examining maternal and newborn problems after elective IOL at 39 to 42 weeks of gestation in comparison with EM.

Method

The PRISMA guidelines were followed in the conduct of this investigation. We investigate maternal labor-related problems after IOL at 39 to 42 gestational weeks in comparison with EM,

in this systematic review. Induction of labor, perinatal outcomes, and neonatal outcomes are among the search phrases. For articles published between 2015 and 2024, we examined the databases and registries of PubMed, Embase, Cochrane Central Library, and Google Scholar. Included were the randomized clinical trials looking into the relationship between perinatal outcomes and elective induction at 39 to 42 weeks. The included studies contrasted those receiving EM with those undergoing elective labor induction between 39 and 42 gestational weeks. Studies that solely evaluated multiple pregnancies or those in the IOL with medical indications for induction were omitted.

Initially we collected 272 articles from electronic databases, following duplication removal 211 remained which were screened for title and abstract, 13 full text articles were then assessed for eligibility and 7 randomized controlled trials were included in the review (Figure 1).

Reviewers separately screened titles, examined entire texts, and retrieved data from relevant research after removing duplicate studies. To prevent missing or redundant data, data was extracted and shared with all authors in a Google Sheet document.

The citation, year of publication, nation of the study, study design, study population, maternal outcomes (CS, tear or injury during VD, hemorrhage after delivery, and assisted VD), and neonatal outcomes (low 5-minute Apgar score less than 7 after delivery, neonatal ICU admission, macrosomia, perinatal death, and stillbirth) were all extracted.

Results

In this systematic review we included 7 studies, all were randomized controlled trials, conducted in Netherlands, Sweden, USA, Malaysia, Russia, United Kingdom and Maryland. Grobman., *et al*. 2018 study [12] had the largest sample size (EM, n = 3044 and IOL, n = 3062), while Baev., *et al*. 2017 study [13] had the smallest sample size (Mifepristone induction and cervical ripening group, n = 74, and EM, n = 75). Studies included targeted singleton pregnancy women, without complications (Table 1).

In the Keulen., *et al*. 2019 study [14], the IOL showed reduced neonatal ICU admissions, lower prenatal outcomes, and a lower 5-minute apgar score. However, no significant difference was found in the composite unfavorable maternal outcomes. The composite major perinatal outcome was the same across the groups, according to Wennerholm., *et al*. 2019 study [15]. There were six perinatal deaths reported in the group received EM, while there were none in the IOL group. Between the groups, there was no significant difference in the percentage of CS, assisted VD, or major maternal morbidity [15].

Miller., *et al*. (2015) [16] reported that the IOL group had a higher CS rate. This study focused on nulliparous women with a Bishop score of 5 or less. Walker., *et al*. (2016) [17] found that there was no significant difference in the percentage of women who had a vacuum or forceps delivery during VD, or who had a CS. Similarly, Grobman., *et al*. 2018 [12] study show that the IOL saw significantly fewer cesarean deliveries than the EM group (Table 2).

Mifepristone has been shown to be useful in cervical ripening and initiating labor in full-term pregnancies. The main outcomes for mothers and newborns were not considerably affected by the administration of mifepristone or EM [13].

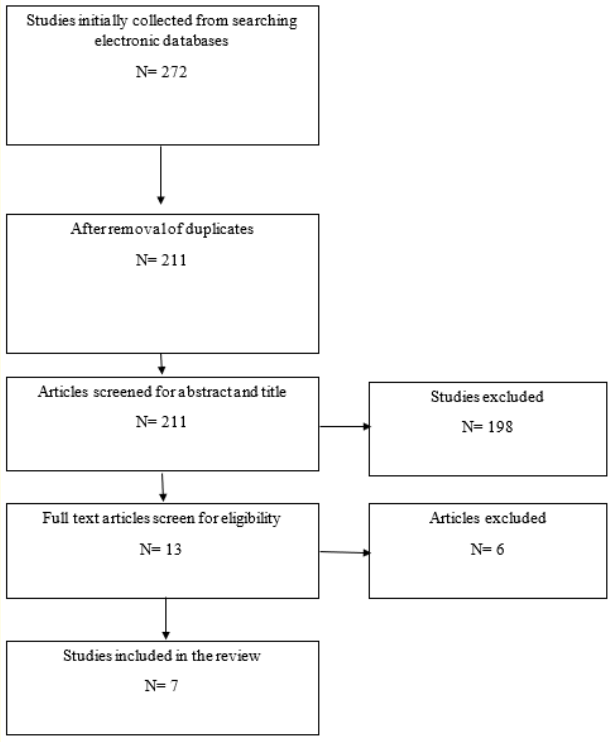

Figure 1: PRISMA consort chart of the selection process.

Citation	Country	Aim	Population	Study arms	Design	Gestational age for induction
Keulen., *et al*. 2019 [14]	Netherlands	To compare, in low-risk women, the IOL with EM at 41 to 42 weeks.	1801 singleton pregnancy women at minimal risk	EM, n = 901 Induction, n = 900	RCT	41 to 42 weeks
Wennerholm., *et al*. 2019 [15]	Sweden	To determine if IOL at 41 weeks as opposed to EM, improves maternal and perinatal outcomes in women with uncomplicated pregnancies.	2760 women with uncomplicated pregnancy	IOL; n = 1381 EM, n = 1379	Multi center RCT	41 to 42 weeks
Miller., *et al*. 2015 [16]	USA	To assess if the CS rate is impacted by the voluntary IOL in nulliparous women with an unfavorable cervix.	Singleton gestation women who were nulliparous, with a Bishop score of 5 or less, and at 38 gestational weeks who were at least 18 years old were randomly assigned to receive either elective IOL or EM.	IOL, n = 82 EM group, n = 80	RCT	38 weeks
Tan., *et al*. 2021 [18]	Malaysia	To assess IOL in multiparas that are full-term and have ripe cervixes	Ripe cervixes and low risk multiparas, with Bishop score of more or equal to 6	IOL, n = 80 EM group, n = 80	RCT	39 week
Baev., *et al*. 2017 [13]	Russia	To compare the safety and effectiveness of using mifepristone against EM for cervical ripening and inducing labor in full-term pregnancies.	Age between 18 and 45 years old; cephalic presentation; singleton live pregnancies; at least 40 + 4 weeks gestation; intact membranes; unripe uterine cervix at enrollment; and no contraindications for VD.	Mifepristone induction and cervical ripening group, n = 74 EM, n = 75	RCT	Equal to 40 + 4 or more
Walker., *et al*. 2016 [17]	United Kingdom	To investigate the theory that among nulliparous women of advanced maternal age, inducing labor at 39 gestational weeks would lower the CS rate.	Nulliparous, with a single living fetus with a cephalic presentation, 35 or more years old, and in full term.	IOL, n = 304 EM, n = 314	RCT	39+0 to 39+6 weeks

Grobman., *et al*. 2018 [12]	Maryland	To investigate the hypothesis that, among nulliparous women, elective IOL at 39 weeks would lead to a decreased risk of a composite outcome of perinatal mortality or serious newborn problems than EM.	Low-risk nulliparous mothers having a living singleton fetus with a vertex presentation between 34 weeks 0 days and 38 weeks 6 days of gestation, no contraindication to VD, and no scheduled caesarean delivery	EM, n = 3044 IOL, n = 3062	RCT	39+0 to 39+4 weeks

Table 1: Characteristics of included articles.

Citation	Main results	Conclusion
Keulen., *et al*. 2019 [14]	Compared to 3.1% in the EM group, 1.7% of women in the IOL group experienced a poor perinatal outcome. At five minutes, 2.6% of newborns in the EM group and 1.2% of infants in the IOL had an Apgar score less than 7. At five minutes, none of the newborns in the IOL and 0.3% of those in the EM group had less than 4. There were two fetal deaths in the EM group and one in the IOL. There were no newborn fatalities. Neonatal ICU admissions were 0.9% in the EM group and 0.3% in the IOL. In terms of composite unfavorable maternal outcomes, no discernible difference was discovered.	In women with uncomplicated pregnancies at 41 weeks, this study was unable to demonstrate the difference of EM and IOL; instead, a significant difference of 1.4% was found for the risk of adverse perinatal outcomes, favoring induction, even though both strategies had high chances of a good outcome and low rates of neonatal ICU admission, perinatal mortality, and 5 minutes Apgar score of less than 4.
Wennerholm., *et al*. 2019 [15]	There was no difference in the groups' composite main perinatal outcome. Six perinatal fatalities recorded in the EM group compared to none in the IOL. There was no difference in the percentage of serious maternal morbidity, assisted VD, or caesarean delivery between the groups.	The major composite unfavorable perinatal outcome in this research does not differ significantly. Nonetheless, there is a decrease in the secondary result of perinatal death without a rise in unfavorable outcomes for mothers. IOL should be made available to less than 41 gestational weeks women, and it may be one intervention that lowers the likelihood of stillbirths.
Miller., *et al*. 2015 [16]	Compared to 17.7% in the EM group, the caesarean delivery rate was 30.5% in the IOL group (relative risk 1.7).	39 weeks IOL, as opposed to EM of pregnancy, did not increase the rate of CS significantly in nulliparous women with a Bishop score of 5 or less.
Tan., *et al*. 2021 [18]	For IOL and EM groups respectively, main delivery outcomes at normal working hours was 34% vs 37%, relative risk 0.9; presentation for spontaneous labor or rupture of membranes were 34% vs 89%; and for IOL 65% vs 19%, RR 3.4. Caesarean delivery was 10% vs 5%, RR 2.0; and mean birth weight was 3.1 vs 3.3 kg for IOL vs EM, respectively.	In low-risk multiparas, IOL has no effect on patient satisfaction or the number of deliveries. There was a notable decrease in both prenatal clinic visits and hospitalizations for non-birth.

Baev., *et al*. 2017 [13]	The IOL's mean Bishop score gain after 48 hours of enrollment was 2.58, whereas the EM group's mean gain was 1.15. The rates of failed management were 2.67% and 5.41%, respectively. In the mifepristone group, the IOL interval was substantially shorter (2.69 vs. 3.77 days). Regional analgesia and cephalopelvic disproportion were more prevalent in the IOL, whereas premature membranes rupture and meconium-stained amniotic fluid were more common in the EM group. The primary neonatal outcomes, manner of birth, and need for oxytocin supplementation were all the same.	Mifepristone proved effective in inducing labor in a full-term pregnancy and cervical ripening. The use of mifepristone and EM did not significantly alter the primary maternal and newborn outcomes. Mifepristone did not cause any significant side effects, yet certain aspects of the labor process, such as more intense contractions and an increased incidence of cephalo-pelvic disproportion, may have been caused by the medication.
Walker., *et al*. 2016 [17]	The percentage of women who had a vaginal birth with forceps or vacuum, as well as the percentage of women who had a CS, did not differ significantly across the groups. No significant variations was shown in the women's experiences of childbirth or the incidence of unfavorable outcomes for mothers or newborns across the groups.	When compared to EM, IOL at 39 weeks gestation did not significantly affect the rate of CSs among women of advanced maternal age. It also have not negative short-term consequences on the outcomes of either the mother or the newborn.

Table 2: Findings of include articles.

Discussion

The purpose of this systematic review study was to assess the effects of IOL on the mother and fetus in singleton uncomplicated full-term pregnancy, as well as the CS risk.

Based on the findings of multiple studies comparing women in IOL versus those experiencing spontaneous labor, which showed an increased risk of CS associated with IOL, there is a belief regarding an increase in CS rates following IOL [19-21].

Five of our included studies take CS as outcome, 3 of which targeted nulliparous women, Grobman., *et al*. [12] and Walker., *et al*. [17] studies found less events of CS in the IOL, while Miller 2015 study found more CS rates. Keulen., *et al*. [14] and Wennerholm., *et al*. [15] studies targeted primi and nulliparous and they both found no significant relation between both groups in CS events. When compared to EM, a prior meta-analysis by Fonseca., *et al*. 2020, indicated that IOL at term did not significantly change the risk of CS in a subset of older women.

Four of the included RCTs discussed forceps or ventouse vaginal birth, in Nulliparous [12,17] and Mixed [14,15] cases. All of the 4 studies found that operative vaginal birth was less in the IOL except Walker., *et al*. [17] found the opposite. Four of the included RCTs discussed severe perineal tear, in Nulliparous [12,17] and Mixed [14,15] cases. Grobman., *et al*. [12] and Walker., *et al*. [17] found Perineal trauma to be more in the IOL, while in Wennerholm., *et al*. [15] and Keulen., *et al*. [14] studies Perineal trauma was less in the IOL.

According to 4 studies [12,14,15,17] in this systematic review perinatal death and still birth was less in the IOL, except for Grobman., *et al*. [12] it was the same. Six studies discussed admission to Neonatal ICU as outcome, it was less in Miller [16], Keulen [14], Walker [17], Grobman [12] and Wennerholm [15], and more in Baev study, with no significant difference. IOL at 39 weeks was linked to a considerably lower risk of peripartum infection and CS, but no difference was observed in the risk of postpartum hemorrhage or severe perineal lacerations, according to the meta-analysis by Grobman., *et al*. 2019 [22] less respiratory morbidity, mortality and ICU admission, were other benefits linked to IOL.

In contrast to EM, elective IOL at 39 gestational weeks was shown to lower the risk of labor-related complications, including a 37% lower risk of third- or fourth-degree perineal injury, according to a recent meta-analysis by James., *et al*. 2022 [23]. Macrosomia, a low 5-minute Apgar score, and a decreased operative vaginal birth risk were similarly linked to IOL [23].

Most of our findings are encouraging, as reduced maternal and newborn problems were linked to IOL at 39 to 42 weeks among the women in the studies that were reviewed. This adds to the evidence supporting the safety of IOL between 39 and 42 weeks.

Conclusion

We conclude that there were no substantial differences in the incidence of adverse outcomes for mothers or babies across the groups, or in the women's experiences of childbirth, in most of the included studies. Studies demonstrated that CS rates were lower in the IOL than in the EM groups.

Conflict of Interest

None.

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None.

Ethical Approval

Not applicable.

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