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Elective Induction of Labor at 39 Weeks among Nulliparous Women at Mansoura University Hospital

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ABSTRACT

Background: When there are greater hazards to the mother and fetus from continuing the pregnancy than from having an accelerated delivery, induction of labor (IOL) is advised. Induction of labor without a medical indication is known as elective induction of labour (eIOL). **Objective:** This study aimed to assess the impact of eIOL at 39 weeks gestation in nulliparous women on mother and neonatal outcomes compared with expectant management (EM). **Patients and Methods:** This prospective study was carried on 120 nulliparous women who were at 39 weeks gestation. The study population were distributed randomly into 2 groups with 60 participants in each: Group A comprised 60 pregnant women who underwent eIOL at 39 weeks gestational age and group B who underwent EM and acted as control group. **Results:** Incidence of Cesarean section (CS) was higher among group B than in group A. Group B was shown to have a higher incidence of perineal tears than group A. Both groups demonstrated comparable outcomes as regards postpartum hemorrhage (PPH) and need for blood transfusion. There was no statistically significant difference between the two groups regarding fetal problems. Group A exhibited a higher mean APGAR score compared to group B, and group A required fewer visits to the newborn intensive care unit (NICU) than group B. **Conclusion:** eIOL at 39 weeks led to fewer population hazards than EM. In particular, eIOL at 39 weeks gestation that was related to lower rates of CS, maternal morbidity, stillbirths, and newborn mortality, as well as decreased rates of neonatal morbidity.

Keywords: Elective induction of labour, Cesarean section, Expectant management, Bishop score, Cardiotocography.

INTRODUCTION

An optimal pregnancy requires careful consideration of the timing of delivery. There is a rise in morbidity and mortality over the entire gestational age range at delivery. On the one hand, newborn morbidity and mortality are mostly caused by premature birth. However, there is also a risk to the mother, fetus, and newborn associated with late-term and post-term pregnancies. The American College of Obstetricians and Gynecologists (ACOG) recommends that due to these hazards, IOL is advised after 42 0/7 weeks gestational age and may be considered between 41 0/7 and 41 6/7 weeks gestational age [1]. The best time to deliver a baby in pregnancies between 39- and 41-weeks' gestation is uncertain. Hazards to the mother and foetus is reduced with eIOL starting at 39 weeks. Preeclampsia and stillbirth are two possible dangers of continuing pregnancies that it helps to prevent. Furthermore, eIOL lowers the incidence of shoulder dystocia, which is associated with macrosomia [2, 3].

IOL, however, is not without risk. Fetal heart rate (FHR) tracings that are aberrant and rates of uterine hyperstimulation are greater in women who undergo IOL. Furthermore, a greater incidence of CS may be present in nulliparous patients receiving IOL who have an unfavorable cervix [4].

There are some theoretical concerns about financial cost, logistics and complications of failed trials of induction, which represent the cause of opinion against such a policy [5]. The women's predilection and awareness about IOL is an additional factor, which is commonly ignored [6].

The purpose of that study was to assess the impact of eIOL at 39th weeks gestation in nulliparous women on mother and neonatal outcomes compared to EM.

PATIENTS AND METHODS

This study was a prospective one that was performed at Outpatient Obstetrics Clinics and Emergency Departments at Mansoura University Hospital. A secondary analysis was conducted on women randomized at 38th weeks gestation to perform trial of induction at 39th weeks or EM. Deliveries earlier than 39th weeks were not adherent to study protocol. Our study involved 120 nulliparous women with a singleton pregnancy with vertex presentation at 39th weeks gestation.

Exclusion criteria: Elderly primigravida, being obese as the mother, having a history of medical problems such as hypertensive disorders, DM, cardiovascular diseases, uterine scarring, placenta previa, cephalopelvic disproportion, amniotic fluid abnormalities, foetal distress and fetal growth abnormalities. There were 2 study groups with 60 participants in each one. Group A included eIOL at 39 weeks gestational age, while group B included pregnant women underwent EM as a control group.

Sampling method: The study was double-blind randomized clinical trial. Simple random sampling was done through sealed envelope technique, every participant in the study had the equal chance to be distributed to either group, group A (Intervention group) and group B (Control group). Studied groups were matched for confounding variables (age and socioeconomic level).

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Methods

Clinical evaluation of all participants was done through history taking, abdominal and local examinations which had been done according to pelvimetry and Bishop score determination as shown in table (1).

Table (1): Bishop scoring system (Contributed by Kelly Wormer, MD CS [7]).

Score	Dilation (cm)	Position of cervix	Effacement (%)	Station (-3 to +3)	Cervical Consistency
0	Closed	Posterior	0-30	-3	Firm
1	1-2	Mid position	40-50	-2	Medium
2	3-4	Anterior	60-70	-1, 0	Soft
3	5-6	--	80	+1, +2	--

Prostaglandin E1 (Vagiprost) pills ("Misoprostol 25µg") were inserted intravaginally every six hours, to a maximum of four doses, in order to ripen the cervix. After educating the patient and assessing the state of the mother and her baby, the induction was begun during the day. Repeating doses of misoprostol were not administered once uterine contractions were palpated as moderate to firm, occurring at a rate of three or more per 10 minutes and lasting at least 40 seconds each. Each subject had a partogram plotted to monitor the course of labour. Additionally, Cardiotocography (CTG) or intermittent auscultation were used to measure the FHR.

The passage of meconium-stained amniotic fluid, the development of chorioamnionitis or puerperal sepsis, incidence of postpartum heamorrhage and the need for blood transfusion, the frequency of third- and fourth-degree perineal tears, the newborn's weight and APGAR score and the NICU admission, were all taken into account when evaluating the outcomes. CS was performed in cases of non-reassuring foetal condition, first-stage labour arrest, second-stage labour arrest of descent, and unsuccessful IOL (failure to attain sufficient uterine contractions (3-5C/10 min/≥ 40s) after 24h of 4 full doses of misoprostol administration).

Group (B) patients had regular checkups scheduled throughout this time. They were watched to assess the effectiveness of expectant management, including spontaneous vaginal birth and Caesarean delivery at the conclusion. Participants were assessed for foetal status, Bishop score, and foetal membrane condition after being admitted to the labour ward. For the purpose of monitoring the participants' labour progress, partograms were plotted. Additionally, foetal heart rate was assessed via CTG, if it could be done, or intermittent auscultation. Group (B)'s maternal and neonatal outcomes were evaluated using the same previously indicated parameters as group (A).

Outcomes: Primary outcome was to estimate the association of eIOL with CS compared to EM.

Secondary outcome was to evaluate maternal and perinatal outcomes of eIOL compared to EM.

Ethical approval: We obtained an Informed consent from each participant in the study after clarification of the method and risks of the study. Institutional Research Board (IRB), Faculty of Medicine, Mansoura University approved the study. The Helsinki Declaration was followed throughout the study's conduct.

Statistical analysis

Version 25 of the SPSS programme (SPSS Inc., PASW statistics for Windows) was used to analyze the data (The SPSS Inc., Chicago). Numbers and percentages were used to describe the qualitative data. For non-normally distributed data, the median (lowest and maximum) and mean ± SD were used to characterize the quantitative data. Standard deviation for data that is regularly distributed following the Kolmogorov-Smirnov test for normality. The results were evaluated for significance at the ≤0.05 level. When appropriate, Chi-Square and the Fischer exact test were utilized to compare the qualitative data between the groups. For comparing two groups under study using non-normally distributed data, the Whitney Mann U-test was used. For properly distributed data, two independent groups were compared using the Student-t test.

RESULTS

Table (1) explained no statistically significant difference between studied groups as regards age of the studied cases (mean age of group A was 22.47 ± 4.99 years versus 22.33 ± 4.16 years for group B, P=0.874). Mean gestational age was 39.20 ± 0.40 and 40.13 ± 0.81 weeks with statistically significant difference between both groups (p=0.001). There was no statistically significant difference between studied groups as regards mean hospital stay, which was higher among group B than in group A (36.20 ± 11.49 & 38.80 ± 12.67 hours respectively)

Table (1): Age, gestational age, maternal outcome and length of hospital stay of the two groups of the study

	Group A N=60	Group B N=60	Test of significance
Age (years) mean ± SD	22.47 ± 4.99	22.33 ± 4.16	t=0.159, p=0.874
Gestational age (weeks) mean±SD	39.20 ± 0.40	40.13 ± 0.81	t=7.97, p=0.001*
Maternal Outcome			
Mode of delivery Vaginal delivery CS	45 (75%) 15 (25%)	26 (43.3%) 34 (56.7%)	χ^2=12.45, p<0.001*
Perineal tear	0	5 (8.3)	χ^2=5.22, p=0.02*
Postpartum hemorrhage	2 (3.3%)	4 (6.7%)	FET=0.702 P=0.679
Need for transfusion	2 (3.3%)	4 (6.7%)	FET=0.702 P=0.679
Length of hospital stay (hours)	36.20 ± 11.49	38.80 ± 12.67	t=1.18, p=0.241

t: Student t test, Z: Mann Whitney U test, χ^2: Chi-Square test, FET: Fisher exact test *statistically significant.

Table (2) showed no statistically significant difference between studied groups as regards fetal complications zero for group A versus 1.7% of group B. Higher mean neonatal birth weight was noticed among group B than in group A with statistically significant difference between them. However, high mean APGAR score was noted in group A than in group B (8.2 ± 0.84 and 7.8 ± 0.92 respectively).

Table (2): Comparison of fetal outcome between either groups of the study

	Group A N=60	Group B N=60	Test of significance
Fetal outcome Living Dead	60(100%) 0	59 (98.3%) 1 (1.7%)	FET=1.01 P=1.0
Neonatal birth weight (gm)	3103.33 ± 180.83	3366.67 ± 285.13	t=6.04 p<0.001*
APGAR Score	8 (6-9) 8.2 ± 0.84	8(6-9) 7.8 ± 0.92	t=2.49 p=0.014*
Need for NICU	3 (5.0)	10 (16.7)	χ^2=4.23 p=0.04*

t: Student t test, χ^2: Chi-Square test, FET: Fisher exact test *statistically significant.

Table (3) demonstrated that 42.2% of the 45 successful cases received 2 doses, 40% received 1 dose and 17.3% received 3 doses.

Table (3): Number of doses needed for successful cases in group A

Successful cases	N=45	75%
Successful number doses		
1		
2	18	40.0%
3	19	42.2%
	8	17.8%

Table (4) showed that 73.3% of the 15 failed cases received 4 doses, 13.3% received 2 doses and 13.3% received 3 doses. Causes of failure were distributed as following; 73.3% failed trial, 13.3% hyperstimulation and 13.3% CTG changes.

Table (4): Failure rate, number of doses utilized and causes of failure among group A

Failed cases	N=15	25%
-Failed number doses	n=15	
2	2	13.3%
3	2	13.3%
4	11	73.3%
-Failure causes		
CTG changes	2	13.3%
Hyperstimulation	2	13.3%
Failed trial	11	73.3%

DISCUSSION

When the hazards to the mother and unborn child of carrying a pregnancy to term exceed those of an accelerated delivery, IOL is advised. IOL may be necessary for post-term pregnancies that are older than 41 weeks, for medical conditions such as hypertension or pre-labor rupture of the membranes, or in situations where there may be inadequate fetal growth [8, 9]. Induction without any medical indication is known as eIOL. In the past, eIOL has been discouraged since it has a higher chance of CS and has worse birth consequences than spontaneous labour [10]. The aim of this study was to assess the effects of eIOL at 39Th weeks in nulliparous women and comparing the results with EM on the outcomes of mothers and newborns.

In our study we found that lower population risks happened with eIOL at 39th weeks as compared to EM. Specially, eIOL at 39th weeks gestation resulted in decreased rate of CS, lower opportunity of maternal morbidity, lower rates of either stillbirths or neonatal fatalities, and decreased rates of neonatal morbidity. This comes in agreement with The ARRIVE trial, which revealed that eIOL at 39th weeks gestation in low-risk nulliparous women is linked to a lower rate of CS with no raising of the risk of unfavourable neonatal outcomes when compared to EM. Subsequent research has confirmed these findings, with some even pointing to a discernible decline in perinatal death [11].

With respect to the mother's result, there was a statistical significant difference (p=0.001) between the groups under study regarding the way of delivery, and

a higher incidence of CS was found in group B (56.7% versus 25% of the groups). Group B had increased incidence of perineal tears than group A (5.3% versus 0). Between the groups under study, there was no statistical significance difference in PPH or the requirement for blood transfusions. This is in line with the findings of **Sinkey *et al.*** [12], who displayed that among patients who were not delivered, the policy of eIOL at 39th weeks led to a lower risk for mothers and newborns than EM with IOL at 41th weeks. In the EM arm, CS rates were greater (35.9% versus 13.9%, 98p<0.01). Even with an investigation limited to women with an unfavourable cervix, 39th weeks eIOL led to decreased CS than EM (8.0% versus 26.1%, p<0.01).

In our study, when eIOL was started for cases with lower Bishop score than 4:6 some complications were encountered such as uterine tachysystole, fetal distress and abnormal CTG changes. In this context, **Wormer *et al***.[7], demonstrated that a Bishop score of ≥ 8 is believed to be favourable for IOL. A score of ≤ 6 is thought to be unfavourable for induction and therefor we can use agents of cervical ripening.

The current study found no statistically significant difference in stillbirths zero for group A versus 1.7% in group B, which represent one case of 60 participants (but it is so serious complication), it was a 41th weeks gestational age dead fetus delivered by induction. According to the analyzed groups in terms of fetal and neonatal outcomes, group B had a higher mean neonatal birth weight than group A, and there was a statistical significance difference between the two. Nonetheless, group A showed a lower need for NICU care and a mean APGAR score of 8.2 ± 0.84 compared to 7.8 ± 0.92 in group B. This comes in agreement with a research by **Sinkey *et al.*** [12] who found that in the EM arm compared to the eIOL arm, there were a higher stillbirths, neonatal fatalities, and neonatal morbidity. 39-week eIOL was preferred to EM, according to preference modelling

According to increasing stillbirths rate at EM group, **Muglu *et al.*** [13] demonstrated that the probability of a stillbirth enhanced with increasing the age of gestation in term pregnancies. With respect to gestational age, the overall potential hazard of stillbirth enhanced gradually. It increased from 0.11 per 1,000 37 weeks gestational pregnancies (95% CI 0.07 to 0.15) to 3.18 per 1,000 at 42 weeks (95% CI 1.84 to 4.35). On the other hand, the chance of neonatal death rose and was unchanged until 41 weeks of gestation. The decrease in the rates of perinatal mortality or critical neonatal problems by 20% with IOL in the newly published randomized trial (ARRIVE) on IOL versus EM in low-risk nulliparous women was not statistically significant (95% CI 0.64 to 1.00) [14]. It has been suggested that placental insufficiency is fundamental cause of many term stillbirths that go unexplained [15]. This diagnosis explains why the number of stillbirths rises as gestational age increases. IOL at 39 weeks may reduce stillbirth rates since the fetus can still receive blood from the placenta before and during labor. Growing rates of placental insufficiency may potentially be a factor in the rise in CS because of unsatisfactory fetal testing as gestational age increases [16]

According to **Burrows *et al.*** [17]**,** individuals in the group of eIOL at 39th weeks had a considerably lesser risk of composite adverse either maternal or perinatal outcomes or CS rate when compared to EM. On the same line with all results, **Grobman and Caughey** [11] did another meta-analysis, which showed that eIOL at 39th weeks was linked to a considerably decreased frequency of peripartum infection (2.8% vs 5.2%; RR, 0.53; 95% CI, 0.39–0.72) and CS (26.4% vs 29.1%; RR, 0.83; 95% CI, 0.74–0.93). In addition to decreased danger of perinatal mortality (0.04% vs 0.2%; RR, 0.27; 95% CI, 0.09–0.76), newborns of women in the eIOL group also had a decreased risk of respiratory morbidity (0.7% vs 1.5%; RR, 0.71; 95% CI, 0.59–0.85), meconium aspiration syndrome (0.7% vs 3.0%; RR, 0.49; 95% CI, 0.26–0.92), and admission to NICU (3.5% vs 5.5%; RR, 0.80; 95% CI, 0.72–0.88).

Because of the limitation of duration of our study and evaluation of the short-term outcomes we couldn't evaluate the effect of eIOL at 39th weeks on the childhood developmental vulnerability compared to EM. In this context**,** in contrast to EM, **Lindquist *et al.*** [18]**,** found no correlation between eIOL at 39 weeks gestation and developmental susceptibility in any of the individual categories or a modified risk of childhood global developmental vulnerability. They concluded that there was no relationship between eIOL at 39 weeks of gestation and developmental vulnerability in childhood. Developmental outcomes were comparable for those born by elective CS at 39 weeks gestation or after IOL. Furthermore, **Smithers *et al.*** [19] discovered that there is no evidence that suggest a substantial difference in the developmental consequences among children born at term but < 40th weeks of gestation and those born at 40th weeks.

LIMITATIONS

The current study's limited sample size has been seen as its primary weakness, despite its encouraging results. Furthermore, there was no discussion of how the IOL at 39th weeks gestation affects a child's vulnerability to developmental delays.

CONCLUSIONS

eIOL at 39th weeks led to lesser population hazards than EM, according to mathematical modelling. In particular, eIOL at 39th weeks was associated with fewer rates of CS, maternal morbidity, stillbirths, and newborn mortality, as well as decreased rates of neonatal morbidity.

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REFERENCES

1. **American College of Obstetricians and Gynecologists (2014):** Practice bulletin no. 146: Management of late-term and postterm pregnancies. Obstetrics & Gynecology, 124 (2): 390-396.
2. **Caughey A, Stotland N, Washington A *et al.* (2007):** Maternal and obstetric complications of pregnancy are associated with increasing gestational age at term. American Journal of Obstetrics and Gynecology, 196 (2): 151-155.
3. **Page J, Pilliod R, Snowden J *et al.* (2015):** The risk of stillbirth and infant death by each additional week of expectant management in twin pregnancies. American Journal of Obstetrics and Gynecology, 212 (5): 631-637.
4. **Vahratian A, Zhang J, Troendle J *et al.* (2005):** Labor progression and risk of cesarean delivery in electively induced nulliparas. Obstetrics & Gynecology, 105 (4): 698-704.
5. **Little S, Caughey A (2015):** Induction of labor and cesarean: what is the true relationship? Clinical Obstetrics and Gynecology, 58 (2): 269-281.
6. **Miller N, Cypher R, Foglia L *et al.* (2015):** Elective induction of labor compared with expectant management of nulliparous women at 39 weeks of gestation: A randomized controlled trial. Obstetrics & Gynecology, 126 (6): 1258-1264.
7. **Wormer K, Bauer A, Williford A (2023):** Bishop Score. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK470368/figure/ article-18340.image.f1/
8. **Hong J, Atkinson J, Mitchell A *et al.* (2023):** Comparison of Maternal Labor-Related Complications and Neonatal Outcomes Following Elective Induction of Labor at 39 Weeks of Gestation vs Expectant Management: A Systematic Review and Meta-analysis. JAMA Network Open, 6 (5): e2313162. doi: 10.1001/jamanetworkopen.2023.13162
9. **Sarvanan N, Jha N, Dhodapkar S *et al.* (2017):** Fetomaternal outcome in medically indicated induction of labour at term gestation. Journal of Clinical & Diagnostic Research, 11 (11): 21-24.
10. **Leduc D, Biringer A, Lee L *et al.* (2013):** Induction of labour. Journal of Obstetrics and Gynaecology Canada, 35 (9): 840-857.
11. **Grobman W, Caughey A (2019):** Elective induction of labor at 39 weeks compared with expectant management: a meta-analysis of cohort studies. American Journal of Obstetrics and Gynecology, 221 (4): 304-310.
12. **Sinkey R, Lacevic J, Reljic T *et al.* (2018):** Elective induction of labor at 39 weeks among nulliparous women: The impact on maternal and neonatal risk. PLoS One, 13 (4): e0193169. doi: 10.1371/journal.pone.0193169.
13. **Muglu J, Rather H, Arroyo-Manzano D *et al.* (2019):** Risks of stillbirth and neonatal death with advancing gestation at term: A systematic review and meta-analysis of cohort studies of 15 million pregnancies. PLoS Medicine, 16 (7): e1002838. doi: 10.1371/journal.pmed. 1002838.
14. **Grobman W, Rice M, Reddy U *et al.* (2018):** Labor Induction versus Expectant Management in Low-Risk Nulliparous Women. N Engl J Med., 379 (6): 513-523.
15. **Pásztor N, Keresztúri A, Kozinszky Z *et al.* (2014):** Identification of causes of stillbirth through autopsy and placental examination reports. Fetal and Pediatric Pathology, 33 (1): 49-54.
16. **Galal M, Symonds I, Murray H *et al.* (2012):** Postterm pregnancy. Facts, Views & Vision in Obgyn., 4 (3): 175-87.
17. **Burrows A, Finkenzeller K, Pudwell J *et al.* (2022):** Elective Induction of Labour at 39 Weeks Compared With Expectant Management in Nulliparous Persons Delivering in a Community Hospital. Journal of Obstetrics and Gynaecology Canada, 44 (11): 1159-1166.
18. **Lindquist A, Hastie R, Kennedy A *et al.* (2022):** Developmental outcomes for children after elective birth at 39 weeks' gestation. JAMA Pediatrics, 176 (7): 654-663.
19. **Smithers L, Searle A, Chittleborough C *et al.* (2015):** A whole-of-population study of term and post-term gestational age at birth and children's development. BJOG: An International Journal of Obstetrics & Gynaecology, 122 (10): 1303-1311.