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## Perinatal Outcomes of Induction of Labour in Primigravida Women

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### ABSTRACT

**Background:** Induction of labour is vital in preventing obstetrical complications; however, adverse prenatal outcomes are commonly reported.

**Objective:** To assess the effect of induction of labour on perinatal outcomes in primigravida women.

**Patients and methods:** A case-control study was conducted in the high-risk and labour room of the Maternity Teaching Hospital, Erbil, Kurdistan Region, Iraq, from January 1 to June 30, 2025, on a sample of 100 primigravida women undergoing labour induction. Patients were divided into two study groups of pregnant women with adverse perinatal outcomes (n=50) and women without adverse perinatal outcomes (n=50). A validated questionnaire was used to collect patients' sociodemographic and clinical data, as well as perinatal outcomes and maternal outcomes after delivery (including induction of labour). The collected data were analyzed, compared between the two groups, and interpreted.

**Results:** Common significant adverse perinatal outcomes of induction of labour among primigravida women were low APGAR score after 5 minutes, NICU admission, respiratory distress syndrome and meconium aspiration. Primigravida women with adverse perinatal outcomes were significantly younger, uneducated, had low numbers of antenatal care visits, shorter time between induction and delivery and underwent more cesarean section deliveries. Shorter labour duration, maternal complications and more extended hospital stay were predominant in primigravida women with adverse perinatal outcomes.

**Conclusions:** The induction of labour for primigravida women is associated with adverse perinatal and maternal outcomes.

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## Introduction:

Induction of labour is a prevalent procedure which commences the birth sequence through artificial activation of uterine muscle contractions before a natural start of birth. When the hazards of continuing the pregnancy outweigh the advantages, the goal is to achieve a safe childbirth. In affluent nations, the induction of labour rate is significantly higher, accounting for 26% in Australia and 23.3% in the United Kingdom, whereas it is only 4-12% in poorer nations<sup>1</sup>. According to reports, higher incidence rates of induction of labour were recorded in Iraq, especially among primigravida women<sup>2</sup>. The risk to both the mother and the fetus rises with the length of the pregnancy, particularly during the third trimester. Gestation exceeding 41 weeks is linked to a heightened risk of adverse outcomes during pregnancy, with more severe consequences observed following 42 weeks<sup>3</sup>. Therefore, it is advocated that women with low-risk pregnancies terminate their pregnancies between 41 - 42 weeks of gestation, and that the gestational age of delivery not exceed 42 weeks<sup>4</sup>. Consequently, induction of labour is frequently advised for women exceeding 41 weeks of gestation without spontaneous labour onset. In Erbil, Kurdistan Region, Iraq, postdate gestation was the common indication for induction of labour<sup>5</sup>.

In addition to anxiety, primigravidity (the first gestation) is accompanied by various adverse outcomes; for that, primigravida women are regarded as high-risk pregnancies<sup>6</sup>. The primigravid woman is more likely to experience different problems during gestation and labour, commonly preeclampsia, prematurity, atypical labour patterns, cesarean sections

(CS), elevated rates of neonatal intensive care unit admissions and increased perinatal mortality<sup>7</sup>. However, the effect of inducing labour on maternal and perinatal outcomes is still controversial. The APGAR score is a quick test performed on newborns at 1 and 5 minutes after birth to assess their physical condition. It evaluates five characteristics, including Appearance (skin color), Pulse rate, Grimace (reflex irritability), Activity (muscle tone), and Respiration. Each characteristic is scored 0, 1, or 2, with a total possible score ranging from 0 to 10. A score of  $\geq 7$  is generally considered normal, while lower scores may indicate the need for further medical attention<sup>8</sup>. At the same time, the Bishop score is a pre-labour scoring system used to assess a woman's cervix's readiness for labour induction<sup>9</sup>.

Previous literature revealed that inducing labour after 39 weeks of gestation allowed primigravida to prevent one CS for every 28 induced deliveries. The induction of labour was correlated with a reduced risk of perinatal mortality and a diminished prevalence of serious newborn problems<sup>10</sup>. Different organizations support providing elective induction of labour after 39 weeks of gestation to primigravida women with precisely assessed gestational age<sup>11</sup>. Therefore, this study aimed to determine the effect of induction of labour on perinatal outcomes in primigravida women.

## Patients and methods

### Study design and setting

This case-control prospective study was conducted among 100 primigravida women at high risk in the labour room of

the Maternity Teaching Hospital, Erbil, Kurdistan Region, Iraq, over six months from January 1 to June 30, 2025.

### Inclusion criteria

Primigravida women with singleton pregnancy are subjected to induction of labour due to postdate of  $>41$  weeks and preeclampsia or eclampsia.

### Exclusion criteria

Women with multiple gestation, multiparous, fetal anomaly, post CS pregnancy, antepartum hemorrhage, and polyhydramnios.

### Study protocol

Primigravida women ( $n=100$ ) were divided into two equal study groups of pregnant women with adverse perinatal outcomes and those without adverse perinatal outcomes ( $n=50$ ). A self-prepared, validated questionnaire was used to collect data directly from enrolled women or archived records in the hospital database. The data obtained include women's sociodemographic characteristics (age, residence, educational level, and occupation), as well as clinical data (number of antenatal care visits, method of induction chosen, and Bishop score before induction). Consequently, induction of labour was decided under spinal anaesthesia that was implemented by a senior Obstetrician on call after measuring the Bishop score. Then, the time interval between induction and delivery, the delivery method and the indication of CS were also obtained. Additionally, perinatal outcomes were assessed by a specialist pediatrician, including birth weight, APGAR scores after one minute and five minutes, meconium aspiration, respiratory distress, hypoglycemia, neonatal intensive care unit admission (NICU), with duration,

and neonatal outcomes. Finally, maternal outcomes, including labour duration, complications, and length of hospital stay, were also assessed.

### Statistical analysis

The data collected were analyzed statistically using Statistical Package for Social Sciences (SPSS, IBM, Chicago, USA, version 26). Categorical variables were analyzed using Chi-square or Fisher's exact tests, while the independent sample t-test was applied for analyzing continuous variables. A  $p$ -value of  $\leq 0.05$  was set as significance, while  $p \leq 0.001$  was considered highly significant.

### Results

Primigravida women with adverse perinatal outcomes were significantly younger ( $25.2 \pm 4$  vs  $28.1 \pm 3.4$  years) ( $p < 0.001$ ). There were no significant differences between study groups regarding residence and occupation ( $p > 0.05$ ). There was a significant relationship between low educational level and primigravida women with adverse perinatal outcomes ( $p = 0.003$ ). A significant association was observed between positive antenatal care and primigravida women with adverse perinatal outcomes ( $p = 0.001$ ) (Table 1). However, the number of antenatal care visits was significantly lower for primigravida women with adverse perinatal outcomes ( $5 \pm 1.4$  times) compared to those without adverse perinatal outcomes ( $7 \pm 1$  times) ( $p < 0.001$ ).

There were no significant differences between the study groups regarding induction methods and Bishop scores before induction ( $p > 0.05$ ). Mean time interval between induction and delivery was shorter in primigravida women with adverse perinatal outcomes ( $7 \pm 1.8$  vs

$8 \pm 1.9$  hours) ( $p=0.01$ ). There was a significant relationship between higher CS rates and primigravida women with adverse perinatal outcomes ( $p=0.003$ ). A significant association was observed regarding fetal distress, meconium aspiration, and uncontrolled blood among primigravida women in both groups ( $p<0.001$ ) (Table 2).

There were no significant differences between study groups regarding birth weight and APGAR score after one minute ( $p>0.05$ ), while the mean APGAR score after 5 minutes was significantly lower in primigravida women with adverse perinatal outcomes ( $p=0.01$ ). All neonatal outcomes were recorded considerably only in primigravida women with adverse perinatal outcomes such as meconium aspiration (12%), respiratory distress (68%), hypoglycemia (4%) and NICU admission (72%), with a mean NICU admission duration of 1.7 days. There was a significant relationship between higher fetal mortality and morbidity rates in primigravida women with adverse perinatal outcomes ( $p=0.001$ ) (Table 3). Common fetal morbidities were congenital heart disease, shoulder dystocia, and lung hypoplasia.

The mean labour duration was significantly shorter in primigravida women with adverse perinatal outcomes ( $p=0.002$ ). There was a significant relationship between maternal complications and primigravida women with adverse perinatal outcomes ( $p=0.003$ ), including infection, and others (perineal tear and uncontrolled blood pressure). The mean length of hospital stay was significantly longer in primigravida women with adverse perinatal outcomes ( $2.1 \pm 0.9$  vs  $1.5 \pm 0.5$  days) ( $p<0.001$ ) (Table 4).

## Discussion

Induction of labour is essential in saving women's and fetuses' lives. Nonetheless, induction of labour leads to numerous adverse perinatal outcomes; however, its indication is crucial in some cases, such as oligohydramnios, pre-labour rupture of the membranes, high blood pressure during pregnancy, severe fetal growth restriction, post-term pregnancy, and various maternal medical conditions, especially chronic hypertension and diabetes <sup>6</sup>. Thus, this study aimed to determine the consequences of inducing labour on perinatal outcomes in primigravida women in Erbil, Kurdistan Region, Iraq.

In this study, primigravida women with adverse perinatal outcomes were significantly younger than the other group ( $p<0.001$ ), which is inconsistent with the results of different studies, which found that advancing age in primigravida women ( $>35$  years) was linked to adverse perinatal outcomes <sup>12,13</sup>. This inconsistency is related to high teenage pregnancy rates in the Kurdistan Region of Iraq that might be associated with high adverse perinatal outcomes <sup>14</sup>. Recent literature has found a significant relationship between low educational level and primigravida, with adverse perinatal outcomes ( $p = 0.003$ ), which is in agreement with another study in the Netherlands that revealed that the low educational level of primigravida women plays a significant role in adverse perinatal outcomes <sup>15</sup>. This study also showed a significant association between positive antenatal care and primigravida women with adverse perinatal outcomes ( $p=0.001$ ); however, the number of antenatal care visits in this group was significantly lower compared to those without adverse perinatal outcomes ( $p<0.001$ ). These findings are parallel to

the results of a recent prospective observational study in Brazil, which reported that despite positive antenatal care for primigravida women, the number of antenatal care visits had a significant impact on perinatal outcomes<sup>16</sup>.

In the present study, the mean time interval between induction of labour and delivery was shorter in primigravida women with adverse perinatal outcomes ( $p=0.01$ ), which is consistent with findings of a recent systematic review and meta-analysis study in the United Kingdom, which revealed that delayed delivery following induction of labour is accompanied by better perinatal outcomes<sup>17</sup>. This study also indicated a significant relationship between higher CS rates and adverse perinatal outcomes in primigravida women ( $p=0.003$ ), which is consistent with various national and international studies that have stated that CS is linked to high adverse perinatal outcome rates, specifically in primigravida women<sup>18,19</sup>. Our study also showed a significant association between fetal distress after CS and primigravida women with adverse perinatal outcomes ( $p<0.001$ ) that coincides with outcomes of a prospective observational study in India<sup>20</sup> and a retrospective cross-sectional study in Ethiopia<sup>21</sup> that reported higher adverse outcomes of fetal distress indication of CS in primigravida women.

Common significant adverse perinatal outcomes of induction of labour in primigravida women in this study were low APGAR score after 5 minutes, NICU admission, respiratory distress syndrome and meconium aspiration. These findings are in agreement with the results of a meta-analysis study conducted in various European countries<sup>22</sup>. In this study, the perinatal mortality rate following

induction of labour was 8%, which is higher than the perinatal mortality rate reported by another study in the Kurdistan region, Iraq (2.45%)<sup>23</sup>[23]. Additionally, the perinatal mortality rate in this study is higher than that of a cohort study, which reported 0.08% after induction of labour in primigravida women<sup>24</sup>.

The current study showed that the mean labour duration was significantly shorter in primigravida women with adverse perinatal outcomes ( $p=0.002$ ), which is inconsistent with the results of a recent retrospective Chinese case-control study that reported longer labour duration following induction of labour was accompanied by adverse perinatal outcomes<sup>25</sup>. This inconsistency might be related to variances in risk factors between primigravida women and differences in sample size between the studies. Our study found a significant relationship between maternal complications (commonly infection) and primigravida women with adverse perinatal outcomes ( $p=0.003$ ). Similarly, a recent population-based cohort study in the Netherlands revealed higher maternal complications in primigravida women with adverse perinatal outcomes following induction of labour<sup>13</sup>.

The limitations of this study include its single-centre design, small sample size, lack of follow-up for a more extended period, and short study duration.

## Conclusions

In this study, it is concluded that the induction of labour for primigravida women is associated with adverse perinatal and maternal outcomes. The adverse perinatal outcomes are related to younger age, uneducated women with a low number of antenatal care visits, shorter time between induction and delivery, and

CS delivery. This study recommends expectant management for postdate pregnancies over induction of labour, especially in this locality.

### Declarations

**Ethical considerations:** The research protocol was approved by the Ethics Committee of the College of Medicine, Hawler Medical University, Erbil, Iraq (No. 7/7 on May 25, 2024). Approval was also obtained from hospital authorities. All procedures were conducted by the Declaration of Helsinki (2008) and its subsequent amendments.

**Patient consent:** Written informed consent was obtained from all participants, and they were informed about the use of their data for publication purposes.

**Conflict of interest:** Declared none.

**Data availability:** The raw data are available from the corresponding author and can be provided upon request.

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**Authors' contributions:** RDR: Methodology, data collection, data analysis, prepared tables and figures, writing the original manuscript; ZMZ: Conceptualization, supervision, study registration, writing the original manuscript. Both authors agreed to submit the manuscript.

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## TABLES

**Table 1:** Distribution of general characteristics among primigravida women.

Variable	Study groups		p-value	
	Adverse	No adverse		
	No.	No.		
Residency				
Urban	34	68	36	72
Rural	16	32	14	28
Educational level				
No formal	8	16	12	24
Primary	16	32	20	40
Secondary	12	24	0	0
Tertiary	14	28	18	36
Occupation				
Housewife	26	52	32	64
Employee	12	24	14	28
Student	12	24	4	8
Antenatal care				
Yes	30	60	14	28
No	20	40	36	72

PO: Perinatal outcomes, \*: Significant difference, \*\*: Highly significant difference

**Table 2:** Induction and delivery characteristics among study groups.

Variable	Study groups		p-value
	Adverse	No	
Method of induction used		No.	
Prostaglandins	30	60	0.4
Oxytocin	20	40	24
Bishop score before induction		No.	
Mean±SD	6.6±1.4	6.3±0.9	0.2
Time interval between induction and delivery		No.	
Mean±SD	7±1.8	8±1.9	0.01*
Delivery method		No.	
Spontaneous	26	52	40
Cesarean	24	48	10
Indication of cesarean section		No.	
Fetal distress	22	91.7	0
Meconium	0	0	100
Uncontrolled	2	8.3	0

PO: Perinatal outcomes, \*: Significant difference, \*\*: Highly significant difference

**Table 3:** Perinatal outcomes regarding study groups.

Variable	Study groups		p-value
	Adverse PO	No adverse	
Birth weight (g)			

Mean±SD	3086.8±424.3	3226±511.3	0.1	
Apgar score				0.5
Mean±SD	2.8±0.8	2.9±0.9		
Apgar score after five minutes				0.01*
Mean±SD	5.3±1.2	5.8±0.7		
Meconium aspiration		No.		
Yes	6	12	0	0
No	44	88	50	100
Respiratory distress		No.		
Yes	34	68	0	0
No	16	32	50	100
Hypoglycemia				
Yes	2	4	0	0
No	48	96	50	100
NICU		admission		
Yes	36	72	0	0
No	14	28	50	100
NICU admission duration (Days)				
Mean±SD	1.7±0.8	0		
Neonatal outcome		No.		
Healthy discharge	38	76	50	100
Morbidity	8	16	0	0
Mortality	4	8	0	0

NA: Not available, NICU: Neonatal intensive care unit, PO: Perinatal outcomes,

\*: Significant difference, \*\*: Highly significant difference

**Table 4:** Maternal outcomes regarding study groups.

Variable	Study groups			p-value
	Adverse PO	No adverse		
Labour duration (Hours)				
Mean±SD	6.9±1.8	8.1±1.8		0.002*
Maternal complications				
No.	%	No.	%	
No		28	56	24
Postpartum		8	16	22
Infection		6	12	0
Others		8	16	4
Length of hospital stay (Days)				

Mean±SD	2.1±0.9	1.5±0.5	<0.001**
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PO: Perinatal outcomes, \*: Significant difference, \*\*: Highly significant difference