



A Prospective Comparative Study in Successful Induction of Labour in Primigravida in Relation to their Body Mass Index

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Abstract

Background and objective: Induction of labour is considered when the benefits of prompt delivery outweigh the risk of expecting the natural onset of labour. Over recent decades, more pregnant women around the world have undergone induction of labour, especially those with high body mass index. Thus, this study aimed to determine the success rate of induction of labour in primigravida women in relation to their body mass index.

Methods: This prospective cross-sectional was conducted on 100 primigravida women who attended the Sulaimani Maternity Teaching Hospital, Sulaimaniyah, Iraq, from May 2022 to May 2023, using a simple random sampling method. Their gestational age was calculated with first-trimester ultrasound. Then, a validated questionnaire was used to record their basic/clinical data. Consequently, labour was induced with either misoprostol or oxytocin. Finally, the mode of delivery was compared with maternal age, Bishop score and body mass index.

Results: The mean age of studied pregnant women was 28.43 ± 6.09 years. Most of them aged 20-30 years (60%), had normal weight (72%), took misoprostol (72%), and had normal vaginal delivery (59%). The maternal age was not significantly correlated to the success of induction of labour ($P > 0.05$), while Bishop score/body mass index was highly significant ($P < 0.001$), and induction of labour was significantly ($P = 0.011$) associated with the mode of delivery among primigravida women.

Conclusions: Body weight, Bishop score and type of labour induction directly played a role in successful expected vaginal delivery, while maternal age did not.

Keywords: Body mass index, Comparative study, Induction of labour, Primigravida

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Introduction

Induction of labour (IOL) is a process of artificially initiating uterine contractions before their spontaneous onset with the intention of achieving vaginal birth. Induction of labour is usually implemented when there is a concern for the mother's/baby's health.¹ Bishop score can be used to guess how near a pregnancy is to labour and it can be determined according to the alterations in the cervix (dilatation, position, effacement, consistency and the station of fetal presentation). Bishop's score ranges from 0 - 13 when zero means not ready for induction, and 13 means more chances for successful induction.² Bishop score is positively associated with the success of IOL and is the frequently used cervical scoring system to expect the consequence of induced labour.³ Maternal factors directly correlated to IOL are body mass index (BMI), parity, age, race, and fetal weight. These factors are essential when predicting successful IOL, especially in primigravida.⁴ Induction of labour can be done through medication and mechanical and physical processes. Pharmacological induction is more commonly preferable as it is less invasive, more scientific, and safer than other methods.⁵ In this approach, intravaginal misoprostol E1/dinoprostone E2 (pessary) prostaglandins, and oxytocin can be used due to their safety and effectivity in cervical ripening and softening before IOL; contractions and the fetal heart rate must be monitored. Misoprostol effects more promptly induce labour; cesarean labour results in fetal heart rate issues more commonly during misoprostol use.⁶ On the other hand, the mechanical approach is the primary modality established to ripen the cervix and consequent labour induction. Recently, this approach has been replaced by pharmacological means. Compared with pharmacological strategies, potential advantages of mechanical methods include

reduced adverse effects that might enhance neonatal goodness. The risk of bias in trials has been categorized from very low to moderate.⁷ IOL is usually offered in specific cases, including post-term gestation, intrauterine fetal development restriction, women with preeclampsia, early rupture of the membranes, fetal death before labour, and history of stillbirth, twin/triple pregnancy ongoing beyond 38 weeks (iatrogenic stimulation), and high BMI.⁸ Body mass index is a widely accepted tool for estimating body fat and identifying potential health risks related to being underweight, overweight, or obese. Normal BMI ranged from 18.5-24.9 kg/m², while a BMI of 35-39.9 kg/m² is considered obese.⁸ Maternal obesity is a rising health distress that has been linked with more need for IOL and cesarean section (C/S).⁹ Managing pregnancy in obese females is problematic because IOL is related to a significant risk of C/S and its associated problems of infection, bleeding and thrombosis. In contrast, conventional management is associated with a high risk of perinatal death.¹⁰ Thus, high BMI has adverse effects on pregnancy, IOL and neonatal life, especially in primigravida, resulting in prevalent clinical problems.¹¹ Obesity increases the chance of preexisting medical conditions and these ladies need IOL.¹⁰ Induction of labour is more effective in multiparous women, young females and those with low BMI. ¹ Unsuccessful IOL was found in average weight (28.5%) and obese (41%) women.¹² The risk of cesarean delivery increased by 13% for each 5.0 kg weight gain during pregnancy.¹³ Very few studies have been done on this topic in Iraq to date. Therefore, this study aimed to determine the successful IOL in primigravida in relation to their BMI.

Patients and methods

This prospective cross-sectional study was done on 100 primigravida women who attended the Sulaimani Maternity Teaching





Hospital, Sulaimaniyah, Iraq, to IOL from May 1st 2022 to May 1st 2023, using a simple random sampling method. Primigravida women with gestational age beyond 40 weeks who had singleton cephalic pregnancy were included, while women with any previous pregnancy, pregnancy complicated by medical disease (like PET disease, chronic hypertension and type 2 diabetes mellitus), malpresentation and those with gestational diabetes mellitus (DM), and intrauterine growth restriction (IUGR) were excluded. A validated questionnaire was utilized to collect participants' basic and clinical data, including age, BMI, gravity, parity, gestational age, mode of delivery and outcomes of the delivery. The Scientific and Ethics Committees approved the study protocol at the Kurdistan Higher Council for Medical Specialties (KHCMS). Participants' written consent was obtained before the study. The gestational age and fetal presentation among studied women were diagnosed and confirmed with ultrasound based on the end of the first-trimester ultrasound and last menstrual period (LMP). Regarding the BMI measurements, women were grouped based on the World Health Organization (WHO) to normal weight (BMI of 18.5–24.99 kg/m²), overweight (BMI of 25–29.99 kg/m²), and obese (BMI \geq 30 kg/m²).¹⁴ Simultaneously, Bishop's scores were estimated by vaginal examination. Next, a questionnaire was filled out for all patients, and IOL was conducted using either artificial rupture membrane (ARM), misoprostol alone (200 mcg) or oxytocin (Pitocin) alone (10 IU/mL), or altogether. Consequently, the pregnant women gave birth either vaginally or by C/S under spinal or general anaesthesia. The Statistical Package for the Social Sciences (SPSS, Chicago, USA, version 27), including Shapiro-Wilk and Kolmogorov–Smirnov tests, were used to find the normal distribution of the data. The Chi-square test was used for categorical variables. A $P \leq 0.05$

value was considered significant, while $p \leq 0.001$ was set as highly significant.

Results

The mean age of women was 28.43 ± 6.09 years, mostly between 20–30 years (60%), followed by > 30 years (21%), then <20 years (19%). The mean BMI of women was 23.01 ± 3.21 kg/m²; 72% were average weight, 25% were overweight, and only 3.0% were obese. Then, 72% of women were received misoprostol and 28% were received oxytocin for IOL. Nearly, two third (59%) had successful IOL and delivered vaginally, while 41% underwent C/S, as shown in Table (1).

Table (1): Baseline Features of the Studied Primigravida Women.

Variable		Frequency	Percentage
Maternal age (Years)	< 20	19	19
	20-30	60	60
	> 30	21	21
Body mass index	Normal weigh	72	72
	Overweight	25	25
	Obese	3.0	3.0
Induction of labour	Misoprostol	72	72
	Oxytocin	28	28
Mode of delivery	Vaginal	59	59
	Cesarean	41	41
Total		100	100

Maternal age was 24.29 ± 4.77 years in those who delivered vaginally, and it was 26.1 ± 5.46 in those who underwent C/S ($P > 0.05$). Bishop's score was highly significantly correlated with the mode of delivery ($P < 0.001$), as its value was 4.14 ± 2.13 in vaginal delivery and 2.56 ± 1.43 in those delivered by C/S. Most of those delivered by C/S received misoprostol (85.36%), and only 14.64% received oxytocin compared to those delivered vaginally (62.71% received misoprostol and 37.29% received oxytocin) ($P = 0.011$), as shown in Table (2).





Table (2): Correlation Between Maternal Age, Bishop Score and Methods of IOL with Mode of Delivery.

Variable		Mode of delivery		P-value Chi-square test
		Vagina l (n=59)	Cesarea n (n=41)	
Maternal age (Years)	Mean ± SD	24.29 ± 4.77	26.1 ± 5.46	0.082
	< 20	13 (68.42)	6.0 (31.58)	0.58
		11 (52.38)	10 (47.62)	
	>30	35 (58.33)	25 (41.67)	
Bishop score	Mean ± SD	4.14 ± 2.13	2.56 ± 1.43	<0.001*
Induction of labour	Misoprostol	37 (62.71)	35 (85.36)	0.011*
	Oxytocin	22 (37.29)	6.0 (14.64)	

*Significant difference; **: Highly significant difference

Moreover, results revealed that BMI was highly significantly linked to the success of labour ($P<0.001$), as the mean BMI in normal vaginal delivery was 21.62 ± 2.34 and was 25.25 ± 3.39 in cesarean women. Most pregnant women with vaginal delivery (91.5%) had normal weight, while most women who experienced C/S were overweight (48.78%), as shown in Table (3).

Table (3): Correlation Between Body Mass Index (BMI) and Labour Success Among Women.

BMI (kg/m ²)	Mode of delivery		P-value Chi-square test
	Vaginal (n=59)	Cesarean (n=41)	
Mean ± SD	21.62 ± 2.34	25.25 ± 3.39	<0.001**
Normal weight	54 (91.5)	18 (43.9)	
Overweight	5.0 (8.5)	20 (48.78)	
Obese	0.0 (0.0)	3.0 (7.32)	

**Highly significant difference

Discussion

The obese females are more likely to be induced due to medical indications, whether

primiparous or multiparous.¹¹ The IOL has increased in the last two decades as a therapeutic tool and substitute to C/S for pregnancies at risk of maternal/neonatal morbidity.¹⁵ Successful IOL is usually more anticipated with an accepted Bishop score/gestational age and average body weight.¹⁶ In this study, the mean age of studied primigravida women was 28.43 ± 6.09 years, and most of them (60%) were young (aged 20-30 years) and had normal BMI (72%). Consequently, maternal age was not significantly related to the success of IOL, which might be related to the fact that most patients were young with normal body weight. These findings are in line with a study that observed a mean age of 27.61 ± 4.31 years, with most women (67%) having normal BMI.¹¹ Moreover, the results revealed that BMI was highly significantly associated with the success of labour, as the mean BMI in expected vaginal delivery was 21.62 ± 2.34 and was 25.25 ± 3.39 in C/S women. This means that primiparous normal-weight women had less chance of C/S than obese women. These outcomes parallel to Yousuf et al. which stated that increased BMI results in a high chance of having C/S in primigravida; however, duration of C/S and blood loss were not significantly related to high BMI. Thus, obesity may lead to numerous problems and adverse effects in primigravida during pregnancy/labour, but without significant impact.¹¹ Athukorala et al. mentioned that obese/overweight women were more likely to be induced ($P=0.001$) and need a C/S ($P=0.000$) compared with women of normal BMI.¹⁷ Generally, misoprostol (Prostaglandin E1) was used most frequently for IOL worldwide compared to other agents because it is cheap, has a good shelf life, and has several routes of administration.¹⁸ On the other hand, Pitocin, synthetic oxytocin, appeared to be not more effective in obese women, resulting in frequent unintended C/S for sluggish labour progress. However, it is





not clear whether obese women need advanced amounts of oxytocin due to maternal, fetal, or labour factors.¹⁹ Thus, in the current study, most patients received misoprostol (62.71% in vaginal delivery and 85.36% in C/S). In comparison, minors received oxytocin (37.29% in vaginal delivery and 14.64% in C/S) which resulted in a significant difference between IOL and mode of delivery ($P=0.011$) among primigravida women. These outcomes indicated that misoprostol is preferable to oxytocin for IOL and vaginal delivery. In this respect, a recent study showed that misoprostol orally caused more vaginal labour in the first 24 h and less C/S.²⁰ Furthermore, Bishop score was highly significantly associated with mode of delivery as patients with higher Bishop score (4.14 ± 2.13) resulted in vaginal delivery, and those with a lower score (2.56 ± 1.43) underwent C/S. On the contrary, another study indicated that Bishop's score was an unfortunate predictor for the consequence of induced delivery and cannot be used to make the decision to IOL²¹. Similarly, Athukorala et al. showed that maternal age of ≥ 30 years and BMI of ≥ 31 increased risk for C/S in medically/electively induced nulliparous at term with a single cephalic fetus, predominantly in those that had an unfavourable Bishop score at admission.²⁰ On the other hand, another study reported that risk factors related to an increased C/S were older age, greater BMI/weight gain during pregnancy, older gestational age, and initial cervical dilation of < 3 cm (Bishop score).²² These contradictory results might be related to the fact that most studies were done in high-income nations with various contexts, such as racial, cultural, and socioeconomic factors.²³ Collectively, some maternal factors (Bishop score and BMI) might directly affect IOL success rate and mode of delivery among primigravida. The limitation is that the samples were collected from a single center,

so the results can't be generalized. Hence, we couldn't reach the necessary sample size for sub-group analysis and more interpretation. Thus, the additional multi-centre study should be conducted to correlate the success of labour to BMI in primigravida and induction methods in the setting of delivery modality and to directly compare misoprostol with other available medications in a larger sample size with a longer duration.

Conclusions

Misoprostol was a better labour inducer than oxytocin in successful normal vaginal deliveries. The maternal age does not affect the delivery modality, while both Bishop score and BMI substantially impacted IOL.

Conflict of interest

It is not declared.

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