Original Article

A Comparison of Fetomaternal Outcomes of Spontaneous and Induced Labour among Nulliparous Women: A Cross-sectional Study in a Tertiary Care Hospital in Manipur, India

Suhana Parveen[1], Yanal Umar A[2]

[1]Post Graduate Trainee, Dept. of Obstetrics and Gynaecology, Jawaharlal Nehru Institute of Medical Sciences, Manipur, India, [2]Senior Resident, Dept. of Community Medicine, Regional Institute of Medical Sciences, Manipur, India.

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Abstract

Background: Labour induction is one of the most commonly done obstetric interventions. Due to rise in incidence of induced labour it is important to weigh in the associated fetomaternal complications. This study was undertaken to compare fetomaternal outcomes of spontaneous and induced labour among nulliparous women in a tertiary care hospital in Manipur.

Methods: A cross-sectional study was conducted among 340 nulliparous women admitted in the hospital. Convenience sampling was done. A pre-designed proforma was used for data collection. Descriptive statistics likemean, standard deviation, frequency and percentage was used to summarise the data. Chi-square test and t test was used to check for association between variables of interest.

Results: A total of 340 nulliparous women were included in the study, out of which 170 underwent spontaneous labour and 170 underwent induced labour. The most common indication for labour induction was post-dated pregnancy (n=84, 49.4%). The babies of women who underwent induced labour were more likely to have APGAR score <7 (*P*=0.041)and were more likely to have NICU admission(*P*=0.027) compared to babies of women who underwent spontaneous labour. There was no significant association between type of labour and maternal outcomes.

Conclusion: Babies born by induced labour were more likely to have a low APGAR score and require NICU admission. Induction of labour should only be carried out when benefits of delivery outweigh the risk of continuing the pregnancy.

Keywords: Spontaneous labour, induced labour, fetomaternal outcomes, Manipur.

Corresponding Author: Yanal Umar A, Senior Resident, Dept. of Community Medicine, Regional Institute of Medical Sciences, Manipur, India.

E-mail: yanal333@gmail.com

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Introduction

Labour is the last few hours of pregnancy. It is characterized by forceful and painful uterine contractions that result in cervical dilatation and cause the fetus to descend through the birth canal. Induction of labour is the stimulation of contractions before the spontaneous onset of labour, with or without rupture of membranes.[1]Labour induction is one of the most commonly done obstetric interventions. It is carried out in over 20% of pregnancies in developed countries.[2] The prevalence of induction is about 22% in India.[3] Yet the WHO recommendations on induction of labour cites weak evidence due to lack of adequate research on the topic.[4]

Labour induction is usually carried out when benefits of delivery of the fetusover shadow the risk of continuing the pregnancy.[5] The indication for labour induction must be substantiated before the intervention is instituted.[6] The most common indication for induction of labour is prolonged pregnancy.[7] Other indications include rupture of membrane without labour, oligohydramnios, gestational hypertension, non-reassuring fetal status and maternal conditions like diabetes and chronic hypertension[8] Before induction, there are several factors that needs to be considered to estimate the success of induction and minimize the risk of caesarean section. This include the Bishop score, prior vaginal delivery, body mass index, maternal age and estimated fetal weight.[9] There is a consensus that the success of induced labour is directly related to the favourability of cervix, as assessed using the Bishop's scoring system.[10] Of the Bishop score criteria for predicting successful induction, the most important one is cervical dilatation, followed by effacement, station, and position, with the least important being cervical consistency.[9]

Oxytocinsare in use for decades to induce or augment labour. Other methods of induction include prostaglandins (eg: misoprostol or dinoprostone) and mechanical methods (eg: membrane stripping, artificial rupture of membrane, extra amniotic saline infusion, transcervical balloons etc.).[1] Clinical induction of labour with intravaginal or intracervical prostaglandin E2 or continuous infusion of oxytocin is commonly done. The effectiveness of both methods is similar as long as it is applied after the rupture of membranes. If membranes are intact, prostaglandins has shown to provide better outcome.[11,12]

Ensuring safety of the mother along with the delivery of a healthy baby is the ultimate objective of all obstetricians.[13] According to the Office of Registrar General and Census Commissioner of India, Maternal Mortality Ratio of India was 97 per 100,000 live births for the period 2018-2020. The perinatal mortality was 18 per 1000 live births for the same period. Discussions about complications of induction are broad, mainly concerning the incidence of secondary caesareans and instrumental vaginal births.[14] Elective induction may alter normal physiology when delivery begins and increase the rate of caesarean section especially among women with an unfavourable cervix.[15] Other adverse maternal outcomes due to elective induction includes greater need for epidural analgesia, postpartum haemorrhage, increased need for blood transfusion and longer hospital stays.[16] Due to the rise in incidence of induced labour, it is important to weigh in the associated fetomaternal complications. Hence this study was undertaken to compare fetomaternal outcomes of induced and spontaneous labour among nulliparous women in a tertiary care hospital in Manipur.

Materials and Methods

A cross-sectional study was carried out from January 2021 to December 2022 in a tertiary care hospital of Imphal East district of Manipur, India. In the year 2020, about 3280 deliveries were conducted in the hospital of which 1459 (44.5%) were normal vaginal deliveries. The study was conducted among nulliparous pregnant women aged < 35 years with a gestational age of 37 to 42 weeks without any uncontrolled medical or surgical complications who were admitted in the hospital during the study period. Women who had recognized contraindications to induction of labour, those who had undergone infertility treatment and those with multiple pregnancies were excluded from the study.

Sample Size: Taking the prevalence of induced labour as 33% and an absolute error of 5%, a sample size of 340 was calculated.[17] Equal number of participants undergoing spontaneous labour and induced labour (n=170 in each group) were included in the study.

Sampling: Convenience sampling was done. All eligible cases were consecutively enrolled as per the in-patient department register until the calculated sample size was obtained.

Study instrument: A pre-designed structured proforma was used for data collection. The progress of labour was assessed using a modified WHO partograph.

Data collection: After explaining the purpose of the study, an informed written consent was obtained from all the participants. Data were recorded in the pre-designed proforma at the appropriate time.

Data analysis: Data collected were checked for consistency and completeness and entered in IBM SPSSv21 for Windows (IBM Inc. Armonk, New York, USA). It was then summarised using descriptive statistics of mean, standard deviation, frequency and percentage. Chi square test and t test was used to check for association between variables of interest. *P* value of less than 0.05 was considered as statistically significant.

Ethical issues: Ethical approval was obtained from the Institutional Ethics Committee of the hospital(No.Ac/03/IEC/JNIMS/2018). Informed written consent were obtained from all the participants prior to data collection. Identifiers like name and address were not taken and a unique code was allotted for each participant. Data was accessed only by the investigator.

Results

A total of 340 pregnant women were included in the study, 170 women who underwent spontaneous labour and 170 women who were induced. Table 1 shows the distribution of participants based on their background characteristics. The mean age of the participants was 23.19±3.89 years in those who underwent spontaneous labour and 24.44±3.86 years in those who underwent induced labour.

Table 1: Distribution of participants based on their background characteristics (N=340)

Background characteristics	Type of labour	
	Spontaneous n (%)	Induced n (%)
Educational qualifications		
No formal education	0 (0.0)	0 (0.0)
Class I-V	20 (11.8)	22 (12.9)
Class VI-X	82 (48.2)	86 (50.6)
Class XI-XII	66 (38.8)	58 (34.1)
Graduate and above	2 (1.2)	4 (2.4)
Occupation		
Home maker	146 (85.9)	142 (83.5)
Others	24 (14.1)	28 (16.5)
Gestational age		
Early term ($37^{0/7}$- $38^{6/7}$ weeks)	48 (28.2)	24 (14.2)
Term ($39^{0/7}$- $40^{6/7}$ weeks)	72 (42.4)	56 (32.9)
Late term ($41^{0/7}$- $41^{6/7}$ weeks)	50 (29.4)	90 (52.9)
Pregnancy associated complications		
No complications	119 (70.0)	123 (72.3)
Anemia	33 (19.4)	21 (12.3)
Hypertensive disorders	10 (5.8)	12 (7.1)
Diabetes	4 (2.4)	10 (5.9)
Thyroid disorders	4 (2.4)	4 (2.4)

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Chief presenting complaint		
Abdomenal pain	98 (57.6)	38 (22.3)
Leaking per vaginum	46 (27.1)	54 (31.8)
Bleeding per vaginum	22 (12.9)	2 (1.2)
Others*	4 (2.4)	10 (5.8)
No specific complaints	0 (0)	66 (38.9)

* Other complaints: Decreased fetal movement, burning micturition and pedal oedema.

Figure 1 shows distribution of participants based on indication for induction. The most common indication for induction was post-dated pregnancy (n=84, 49.4%). Majority (n=92, 54.1%) of the participants was induced by dinoprostone gel and the rest were induced using misoprostol tablet.

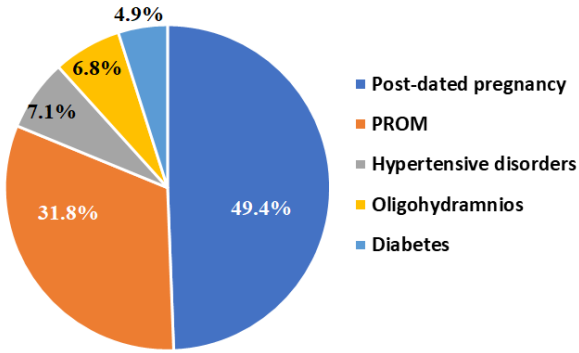

Fig.1: Distribution of participants based on indication of induction (N=170)

Table 2 shows the results of univariate analysis between type of labour and maternal outcomes. The mean duration of active phase of first stage of labour was 6.05±0.62 hours in those who underwent spontaneous labour and 6.02±0.67 hours in those who underwent induced labour (*P*=0.810). The mean duration of second stage of labour was 23.82±9.7 minutes in those who underwent spontaneous labour and 22.65±10.6 minutes in those who underwent induced labour (*P*=0.287). The mean duration of hospital stay of the mother was 2.60±0.81 days in those who underwent spontaneous labour and 2.68±0.88 days in those who underwent induced labour (*P*=0.374).

Table 2: Results of univariate analysis between type of labour and maternal outcomes (N=340)

Maternal outcomes	Type of labour		P
	Spontaneous n (%)	Induced n (%)	
Mode of delivery			
Vaginal	122 (71.7)	116 (68.2)	
Instrumental	30 (17.6)	28 (16.4)	0.433
Caesarean	18 (10.7)	26 (15.4)	
Non progress of labour			
Yes	10 (5.8)	14 (8.2)	0.397
No	160 (94.2)	156 (91.8)	
Non reassuring FHR			
Yes	4 (2.3)	10 (5.8)	0.101
No	166 (97.7)	160 (94.2)	
Obstructed labour			
Yes	4 (2.3)	2 (1.2)	0.585
No	166 (97.7)	168 (98.8)	
Post partum haemorrhage			
Yes	6 (3.5)	8 (4.7)	0.410

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No	164 (96.5)	162 (95.3)	
Sphincter injury			
Yes	2 (1.2)	0 (0)	0.156
No	168 (98.8)	170 (100)	
ICU admission			
Yes	2 (1.2)	4 (2.3)	0.410
No	168 (98.8)	166 (97.7)	

Table 3 shows results of univariate analysis between type of labour and foetal outcomes. The babies of women who underwent spontaneous labour were more likely to have APGAR score ≥ 7 compared to babies of women who underwent induced labour (*P*= 0.041). The babies of women who underwent induced labour were more likely to have NICU admission compared to babies of women who underwent spontaneous labour (*P*=0.027). The mean duration of hospital stay of babies was 1.60±0.85days in those who under went spontaneous labour and 1.76±1.05 days in those who underwent induced labour(*P*=0.374).

Table 3: Results of univariate analysis between type of labour and fetal outcomes (N=340)

Fetal outcomes	Type of labour		P
	Spontaneous n (%)	Induced n (%)	
Live birth			
Yes	168 (98.9)	168 (98.9)	1.000
No	2 (1.1)	2 (1.1)	
Meconium stained liquor			
Yes	18 (10.5)	30 (17.6)	0.062
No	152 (89.5)	140 (82.4)	
Resustication			
Yes	12 (7)	20 (11.7)	0.137
No	158 (93)	150 (88.3)	
APGAR score			
< 7	8 (4.7)	18 (10.5)	0.041
≥ 7	162 (95.3)	152 (89.5)	
NICU admission			
Yes	6 (3.5)	16 (9.4)	0.027
No	164 (96.5)	154 (90.6)	
Perinatal death			
Yes	2 (1.2)	4 (2.4)	0.410
No	168 (98.8)	166 (97.6)	

Discussion

In this study, majority of the patients who underwent spontaneous labour were term pregnancies (42.4%), with 28.2% being early term and 29.4% being late term. On the other hand, more than half (52.9%) of induced labour patients were late term, with 32.9% being term and 14.2% being early term. These findings were similar to that of Abisowo OY et al.[10] But in the study conducted by Sarvanan N et al, the majority of induced patients were early term.[18] Majority of the participants in this study did not have any pregnancy induced complications.

Most common complication in both spontaneous and induced labour patients was anaemia (19.4% and 12.3%, respectively). Hypertensive disorders (7.1%vs 5.9%) and diabetes (5.9% vs 2.4%) were more common in the induced group. In this study, more than half (57.6%) of spontaneous labour patients presented with abdominal pain. Majority (38.9%) of induced patients were admitted without any complaints for safe confinement. The most common presenting complaint among induced labour patients was leaking per vaginum (31.8%). The most common indication of induction of labour in this study was post dated pregnancy (49.4%) followed by premature rupture of membrane (31.8%). This is comparable to the study conducted by Abisowo OY et al, where the mostcommon indication of induction was also post-dated pregnancy.[10] Where as in the study conducted by Sarvanan N et al, the most common indication was oligohydramnios.[18] In this study, majority of the participants were induced using Dinoprostone gel (54.1%). In the studies conducted by Galzie SK et al and Abisowo OY et al,the most common method ofinduction was by Foley's catheter.[19,10] In the study by Kieswetter B et al, it was continuous oxytocin infusion.[20]

The mean duration of active phase of first stage labour in induced labour patients was 6.02±0.67 hours, which was comparable to that of spontaneous labour patients(6.05±0.62 hours). Similar findings were observed by Abisowo OY et al in their study.[10] Where as Galzie SK et al and Kumari G et al observed that the duration of first stage of labour in induced patients was higher than that of spontaneous labour.[19,21] Contrary to this, Suchika G et al observed an increase in duration of first stage of labour in spontaneous labour patients.[22] There was slight increase in mean duration of second stage of labour in spontaneous labour patients (23.82 ± 9.7 minutes) compared to that of induced labour patients (22.65± 10.6 minutes) in our study. But the difference was not significant (*P*>0.05). Similar findings were observed by Kumari G et al and Suchika G et al in their study.[21,22] In the current study, among both groups, majority of the patients delivered by vaginal delivery (71.7% and 68.2% respectively). Similar findings were observed by Sarvanan N et al, Kumari G et al and Suchika G et al in their studies.[18,21,22] On the other hand, Dagli Set al observed that majority of the induced patients delivered by caesarean section.[13] Although not statistically significant (*P*>0.05), increased rate of caesarean section was seen in induced labour patients (15.4%) compared to that of spontaneous labour patients (10.7%). Zhao Y et al, Kieswetter B et al, and Abisowo OY et al found significant increase in caesarean sectionrates in induced labour group compared to spontaneous labour group.[23,20,10] Contrary to this, Sarvanan N et al, Souter V et al and Cheng YW et al observed lower rates of caesarean section in induced labour patients.[18,24,3]The rate of instrumental deliveries in both the groups were comparable (17.6% and16.4%), which is similar to the findings by Kieswetter B et al.[20] Higher rates of instrumental delivery in induced labour patients were reported by Zhao Y et al, Souter V et al and Cheng YW et al.[23,24,3] The present study observed no significant difference between the incidence of non-progress of labour and obstructed labour in the two groups. Similar findings were observed by Zhao Y etal and Dagli S et al.[23,13]In this study, there was no significant difference in the incidence of postpartum haemorrhage between the two groups. But Dagli Set al observed significant increase in incidence of postpartum haemorrhage in induced labour group.[13] On the other hand, Stock SJ et al observed a decrease in incidence of postpartum haemorrhage in induced group.[25]There is no difference in the incidence of sphincter injury in both groups, comparable to findings by Dagli Set al, Galzie SK etal and Stock SJ et al.[13,19,25]

In this study, the babies of women who delivered spontaneously were more likely to have APGAR score ≥ 7 compared to babies of women who underwent induced labour (*P*= 0.041). Similar findings were observed by Sarvanan N et al and KaziS et. al.[18,26] On the contrary, Cheng YW etal observed significantly lower APGAR score in babies born to spontaneous labour patients.[3] In this study, the babies of women who underwent induced labour were more likely to have NICU admission compared to babies of women who underwent spontaneous labour (*P*=0.027). Similar findings were observed by Stock SJ et al and Galzie SK et al.[25,19] Contradictory findings were found in studies by Souter Vet aland Cheng YW etal, where a decrease in NICU admissions were observed in induced patients.[24,3]About 11.7% of babies born to induced patients required resuscitation after birth,

compared to 7% of babies born to spontaneous labour patients, but the difference was not statistically significant (P>0.05). This was similar to the findings observed by Kazi S et al and Galzie SK et al in their study.[26,19] Though not statistically significant, this study observed an increased rate of perinatal death in babies of induced labour patients (2.2% vs 1.1%). Similar findings were observed by Abisowo OY et al.[10] Contrary to this, Gulmezoglu AM et al and Stock SJ et al observed a decrease in perinatal death in induced labour group.[27,25]

Conclusion

Babies born to participants who were induced were more likely to have a low APGAR score (<7) and require NICU admission. However, no significant difference was found in other fetomaternaloutcomes between the two groups. Ensuring safety of the mother and delivery of a healthy baby is the ultimate objective of all obstetricians. Labour induction should be carried out when benefits of the delivery outweigh the risk of continuing the pregnancy. Hence the indication for labour must be well established before this intervention is instituted

Ethical issues: Ethical approval was obtained from the Institutional Ethics Committee of the hospital (No.Ac/03/IEC/JNIMS/2018). Informed written consent were obtained from all the participants prior to data collection.

Conflict of Interest: Nil

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