

The Proportion of Failed Induction of Labour and Associated Factors among Women Undergoing Induction of Labour in Dessie Referral Hospital: Northeast Ethiopia a Cross-sectional Study

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Authors' contributions

This work was carried out in collaboration among all authors. Author TD designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author KT managed the analyses of the study. Author AW managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: There are several complications of pregnancy that confer significant ongoing risk to the mother or fetus. For these conditions, induction of labour is as an artificial termination of pregnancy utilized to decrease both maternal and neonatal morbidity and mortality. The process of inducing labour is not always successful and sometimes fails to achieve a safe vaginal delivery.

Methods: Retrospective cross-sectional study was conducted on medical records of 319 registered women who undergo labour induction at Dessie referral hospital from January 01 to February 2017. Systematic sampling techniques were used to select the samples. The data was cleaned, edited, coded, and entered into EPI INFO version 3.5 and exported and analyzed by SPSS with windows version 20.0. Bivariate and multivariate logistic regression statistical model was used to identify factors associated with the outcome variable. Adjusted odds ratio with 95% CI was computed to see the strength of association.

Results: The proportion of failed induction of labour was 19.7 %. Multivariable logistic regression analysis showed that women live in a rural area [4.171(1.358-12.807)], primipara [AOR=1.72(1.67-4.415)] and women whose Bishop score is unfavourable [0.147(0.066-0.327)] were significantly associated with failed induction of labour.

Conclusion: The proportion of failed induction of labour was relatively high in the study area. Variables which increased the likelihood of failed induction were living rural area, primigravidity and unfavourable bishop score before induction of labour.

Keywords: Proportion; failed induction of labour; associated factors; Ethiopia.

ABBREVIATIONS

CI : Confidence Interval
CS : Cesarean Section
OR : Odd Ratio
IOL : Induction of Labor
ROM : Rupture of Membrane
SPSS : Statistical Package for Social Science
WHO : World Health Organization

1. INTRODUCTION

Induction of labour is defined as the process of artificially stimulating the uterus to start labour. It is usually performed by administering oxytocin or prostaglandins to the pregnant woman or by manually rupturing the amniotic membranes. The goal of labour induction is for achieving vaginal birth by stimulating the contraction of the uterus. Labour induction may be recommended if the health of the mother or fetus is at risk [1].

The World Health Organization (WHO) recommends labour induction be performed with a clear medical indication and when expected benefits outweigh potential harms. Major Indications for induction of labour include post-term pregnancies, pre-labour rupture of membranes, maternal medical conditions like hypertensive disorders, diabetes, renal diseases, fetal compromise, chorioamnionitis, abruption placenta, intrauterine fetal death and others [2,3]. Elective induction of labour also takes place when a mother wishes to deliver at a particular time (after term). However, the World Health Organisation (WHO) recommends that induction of labour be done for medical and obstetric reasons only due to risks associated with the procedure [4].

Even though labour induction had varied benefits there is a risk to the mother or fetus, this intervention may result in an undesirable effect. Induction sometimes fails with potential risks of the increased rate of operative vaginal delivery,

caesarean birth, excessive uterine activity, abnormal fetal heart rate patterns, uterine rupture, maternal water intoxication, delivery of preterm infant due to incorrect estimation of dates, and possibly cord prolapse. Medical problems that were present before pregnancy or occurring during pregnancy may contribute to these complications [5-8].

The outcome of labour induction will be either success or failure. But no consensus has been reached regarding the diagnosis of failed induction. A variety of endpoints have been suggested including cesarean delivery, not achieving vaginal delivery within a specified time, not achieving active labour within a specified time, or failure to achieve the active phase of labour may use to diagnose failed inductions. Many factors lead to failed induction such as initial poor cervical Bishop's score at induction (indicating an unripe cervix), nulliparity, fetal macrosomia, a high body mass index and advanced maternal age [9-11].

Developing countries bear a disproportionate share of maternal deaths: 99 per cent occur in developing countries compared to 1 per cent in more developed nations. Sub-Saharan Africa and South Asia accounted for 87 per cent of global maternal deaths and 50 per cent of all deaths occurred in six nations: India, Nigeria, Pakistan, Afghanistan, Ethiopia, and the Democratic Republic of Congo [5].

In developing countries, the improvement of maternal and perinatal health strongly depends on the strengthening of health systems. When resources are scarce, caesarean sections that are not medically indicated, if done in large numbers, represent a serious resource drain. At the same time as unnecessary overuse of surgical practices is being assessed in some countries, millions of women in other countries who need these procedures do not have access to them, putting their own and their children's lives at risk [12].

For pregnant women, optimizing intrapartum care appears to be the single most important intervention for reducing maternal mortality in high-income countries (resource-rich settings), middle income and low-income countries (resource-limited settings). This intrapartum care is not the only intervention for reducing maternal mortality and morbidity but also it reduces neonatal mortality and morbidity by improving the outcome of pregnancy [13].

There are several numbers of complications of pregnancy that confer significant ongoing risk to the mother or fetus. Most of these were preeclampsia; preterm premature rupture of the membranes (PPROM); intrauterine growth restriction (IUGR); and post-term pregnancy). For these conditions, induction of labour is often the principal medical intervention utilized to decrease both maternal and neonatal morbidity and mortality [1].

Because of the risk of failed induction of labour, a variety of maternal and fetal factors as well as screening tests have been suggested to predict labour induction success. These include maternal factors such as parity, height, weight, body mass index (BMI), maternal age, Bishop Score and its components and fetal factors such as birth weight and gestational age [9,14,15,16].

Even though there is the fact that induction of labour plays a significant role in the reduction of maternal mortality and neonatal mortality the success rate and contributing factors, as well as failed induction and aggravating factors, were not known. Also with controversies surrounding the use of induction with oxytocin to initiate labour and the absence of technological supports to evaluate the likelihood of success in resource-limited settings, there are little evidence about the outcome of induction in Ethiopian hospitals. So in this study, we aimed to assess the proportion of failed labour induction and associated factors among women undergoing labour induction at the Dessie referral hospital (Fig. 1).

2. MATERIALS AND METHODS

A facility-based cross-sectional study was conducted at Dessie referral hospital, Dessie town, south-east Ethiopia from January 01 to February, 2017. In Dessie town, there are seven health centres and one hospital owned by the government, two nongovernment clinics and privately owned three hospitals and five higher

clinics. The total population of Dessie town was 198,801. Single population formula was used to calculate the sample size, by using 21.4% of the proportion of failed induction of labour. Systematic random sampling technique was used to select a sample from the list of women who underwent induction of labour.

2.1 Data Collection Methods

Data were collected from medical records of women for whom induction of labour was performed in Dessie Referral hospital using a pre-tested structured questionnaire. Items were developed from different kinds of literature to assess socio demography factors, obstetric factors, types of induction performed and health indication for labour induction. The questionnaire consists of five sections that have a total of 23 items which describe the purpose of the study.

2.2 Analysis

After checking its completeness and appropriateness, the collected data were entered by EPI INFO version 3.5 and exported to SPSS version 20.0 for analysis. Different statistical analysis including descriptive statistics and bivariate and multivariate logistic regression analysis was conducted to determine the relationship between the dependent and independent variables. First binary logistic regression was used to identify variables and after these variables having p value, less than 0.25 was fitted to a multivariate logistic regression model to determine the relationship between the dependent and independent variables. Adjusted odds ratio with 95% CI was computed to see the strength of association. The analyzed data was presented using texts, tables, charts and graphs.

3. RESULTS

3.1 Socio-demographic Characteristics

A total of 319 medical records of mothers who gave birth after induction of labour were selected for study purpose. The age of the study subjects ranged from 19-37 years and mean age and standard deviation of the selected women was 25.97 (SD=4.81) and 256 of all samples were below 30 years of age (Table 1).

3.2 Obstetric Condition

Most of the women 198(62.1%) were primiparous. The mean gestational age was 37.96 weeks (range: 32-43 weeks) (Table 2).

Of the included 319 women, 133(41.7%) undergone induction of labour due to hypertensive disorder followed by 111(34.8%) due to premature rupture of membrane (PROM). (Fig. 2).

3.3 The Outcome of Labour Induction

Out of the total 170(53.3%) of women delivered vaginally within 8 hours after induction was started, while 136(42.6%) delivered by cesarean section (CS) (Fig. 3). From women who delivered by cesarean section 63(19.7%) undergone CS due to failed induction of labour, 40(12.5%) were due to fetal distress (Fig. 4).

Table 1. Socio demographic characteristics women who undergone induction of labor from September 1st to August 31st in 2015 (N=319)

Characteristics	Frequency N=319	Percentage %
Age		
<=20	48	15
21-25	127	39.8
26-30	103	32.3
31-35	25	7.8
>=36	16	5
Religion		
Orthodox	65	20.4
Muslim	251	78.7
Protestant	3	0.9
Ethnicity		
Amhara	319	100
Marital status		
Married	319	100
Educational level		
Unable to read and write	51	16
Grade 1-8	102	32
Grade 9-12	97	30.2
Collage and above	69	21.6
Occupation		
Unemployed	247	77.4
Formal employment	72	22.6
Residential address		
Urban	214	67.1
Rural	105	32.9

From a total of 319 women sampled in 12(3.8%) of the cases membranes were changed into meconium after induction of labour. Following induction in 15(4.7%) of the cases, fetal heart rate was recorded as non-reassuring (Table 3).

Table 2. Obstetric condition of women who undergone induction of labor from September 1st to August 31st in 2015 (N=319)

Obstetric conditions	Frequency N=319	Percentage (%)
Parity		
Para 1	198	62.1
Para 2	99	31.0
Para 3	3	0.9
Para 4	16	5.0
Para 5 and above	3	0.9
Indication of induction		
Post term	18	5.6
PROM	111	34.8
Hypertensive disorder	133	41.7
IUGR	6	1.9
IUFD	51	16.0
Gestational age		
Preterm	84	26.3
Term	191	59.9
post term	44	13.8
Membrane rupture before induction		
Yes	111	34.8
No	208	65.2
Bishop score		
Favorable	228	71.5
Unfavorable	91	28.5

3.4 Factors Associated with Failed Induction of Labour

In this study, the association of different factors of the respondents with failed induction of labour was investigated using bivariate and multivariate logistic regression analysis. Different socio-demographic and obstetric variables were entered in stepwise regression.

In the initial model, bivariate analysis there were seven variable; educational status of the mother, residence of the mother, indication of induction, Gestational age of the fetus, rupture of membrane before induction of labour, Bishop score of the cervix and parity of the mother shows statistically significant association with the outcome variable at p-value <0.25.

However, multiple logistic regressions show that educational status of the mother, residence and Bishop Score of the cervix persisted as independent factors for the outcome variable. The odds of failed induction were 4.171 times more likely in women lives in rural area [4.171(1.358-12.807)] than women who live in

urban area; the odds of failed induction of labour were 1.720 times more likely in primipara [AOR=1.72(1.67-4.415)] than women who were multipara; the odds of failed induction of labour

were 0.147 times more likely in women whose Bishop score is unfavourable [0.147(0.066-0.327)] than women whose Bishop score is favourable one (Table 4).

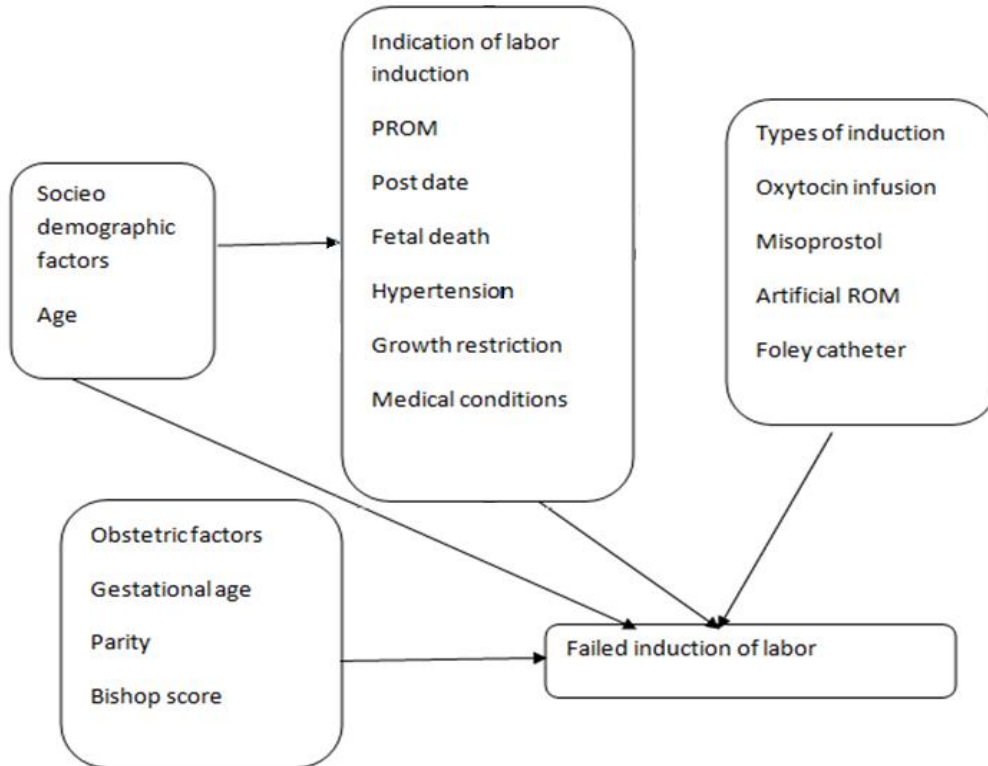


Fig. 1. Conceptual frame work of factors affecting failed induction of labor (constructed after reviewing literatures)

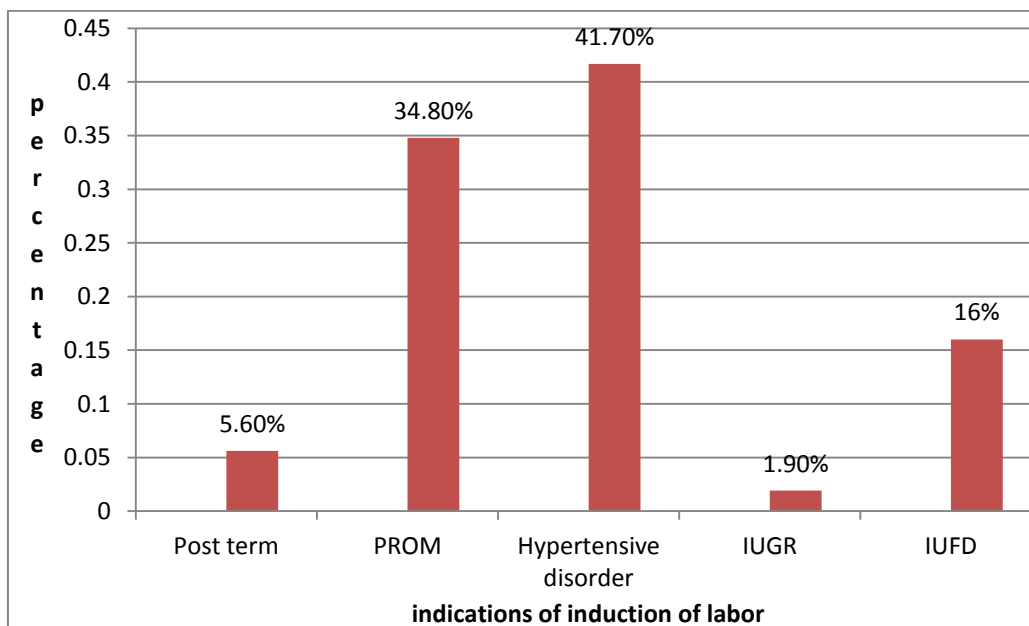


Fig. 2. Indication of induction of labor among women deliver in Dessie referral hospital, Ethiopia, 2017

Table 3. Outcome of induction of labor among women who undergone induction of labor from September 1st to August 31st in 2015 (N=319)

Characteristics	Frequency N=319	Percentage(%)
Time taken for induction		
<8 hour	118	37
8-16 hrs	185	58
>16 hrs	16	5
Non reassuring fetal heart rate		
Yes	15	4.7
No	304	95.3
Change of liquor to meconium		
Yes	12	3.8
No	307	96.2
Mode of delivery		
Vaginal	170	53.3
Instrumental delivery	13	4.1
Cesarean delivery	136	42.6
Indications for cesarean delivery		
Failed induction of labor	63	19.7
Fetal distress	40	12.5
CPD	18	5.6
Malposition	15	4.7
Not done	183	57.4
Alive fetus		
Yes	252	79
No	67	21
Birth weight		
<1500g	19	6
1500-2499 g	64	20.1
2500-3999 g	204	63.9
>4000 g	32	10
APGAR score		
<seven	125	39.2
>seven	194	60.8
Outcome of induction		
Failed induction of labor	63	19.7
Success induction of labor	256	80.3

4. DISCUSSION

Induction of labour is one of the fastest-growing procedures in current obstetric practice. The increasing incidence of induction of labor may be attributed to multiple possible causes. Increasing trends of maternal morbidity, which as previously discussed may increase the number of medical indications for IOL, are one possible cause. However, the fact that higher remunerative payers are associated with higher rates of IOL suggests that nonclinical factors such as provider or patient preference may also play a role. The World Health Organization and the American College of Nurse-Midwives (ACNM) both advocate that IOL should only be performed when there is a clear medical indication

supported in the literature and the benefits outweigh the potential harms [1,2,12].

The rate of failed induction was 19.7 % (15.4%-23.8%). Educational status, resident and unfavourable Bishop Scores were found to be independent factors of failed induction.

This study shows that the rate of failed induction was similar to the study done in Hawassa (17.3%) and Jimma (21.4%) [9, 10]. This is due to the similarity in the definition of failed induction and similarity in setup. In the other way, the rate of failed induction of labour is lower than the study done in a health resource-poor setting (24.1%) and study done in Addis Abeba (40.3%). The difference may also be due to complicated

obstetric cases being handled. Also, the finding of this study was higher than the study conducted in many other countries Zambia (13.4%), Australia (15.2%). This discrepancy may be due to the difference in the quality of induction care provided by the hospitals.

The common indications for induction of labour in the study area were Post-term pregnancy, premature rupture of membrane and hypertension disorder during pregnancy. Similarly, the study done in Kathmandu Medical College Teaching Hospital showed predominant indications for induction were: post-term pregnancy, PROM, oligohydramnios, and others. In the study done at a regional hospital in KwaZulu-Natal, South Africa the three main indications for induction of labour were hypertensive disorders, post-dates pregnancy

and pre-labour rupture of the membranes [7]. However, the study was done Hawassa public health facilities showed predominant indications for induction were: The premature rupture of membrane, Preeclampsia, Post-term and Chorioamnionitis. In the study done at Jimma University, Specialized hospital the three main indications for induction of labour were the premature rupture of membrane, Hypertension disorder and Post-term [9].

The finding of this study also showed that the odds of failed induction were 4.171 times more likely in women who live in the rural area than where live in the urban area. This may be due to women who live in a rural area not come to health institution and appropriate and timely intervention may not be given. So, induction of labour may fail.

Table 4. factors associated with failed induction of labor among women who undergone induction of labor from September 1st to August 31st in 2015

Variables	Failed induction of labor		COR(95% CI)	AOR(95%CI)
	Yes	No		
Educational status			0.728(0.548-0.967)*	
Unable to read and write	9(17.6%)	42(82.4%)		
Grade 1-8	9(8.8%)	93(91.2%)		
Grade 9-12	29(29.9%)	68(70.1%)	1	
Collage and above	16(23.2%)	53(76.8%)		
Resident				1
Urban	57(26.6%)	157(73.4%)	1	4.171(1.358-
Rural	6(20.7%)	99(84.3%)	5.99(2.49-14.41)*	12.807)**
Indication for induction			1.589(1.215-2.077)*	
Post term	12(66.7%)	6(33.3%)		
PROM	21(18.9%)	90(81.1%)		
Hypertensive disorder	24(18%)	109(82)		
IUGR	6(100)	0(0%)		
IUFD	0(0%)	51(100%)	1	
Gestational age				
Preterm	10(11.9%)	74(88.1%)	1	
Term	41(21.5%)	50(78.5%)		
Post term	12(27.3%)	32(72.7%)	0.889(0.8-0.988)*	
Rupture of membrane before induction of labor				
Yes	21(18.9%)	90(81.1%)	1	
No	42(20.2%)	166(79.8%)	0.922(0.515-1.653)	
Gravidity				
Primigravida	44(22.2%)	154(77.8%)	1.534(0.847-2.776)*	1.72(1.67-4.415)**
Multigravida	19(15.7%)	102(84.3%)	1	1
Bishop score				
Favorable	25(11.0%)	203(89.0%)	1	1
Not favorable	38(41.8%)	53(58.2%)	0.414(0.309-0.556)*	0.147(0.066-0.327)**

N.B 1 = reference; ** = statistically significant at p-value <=0.05

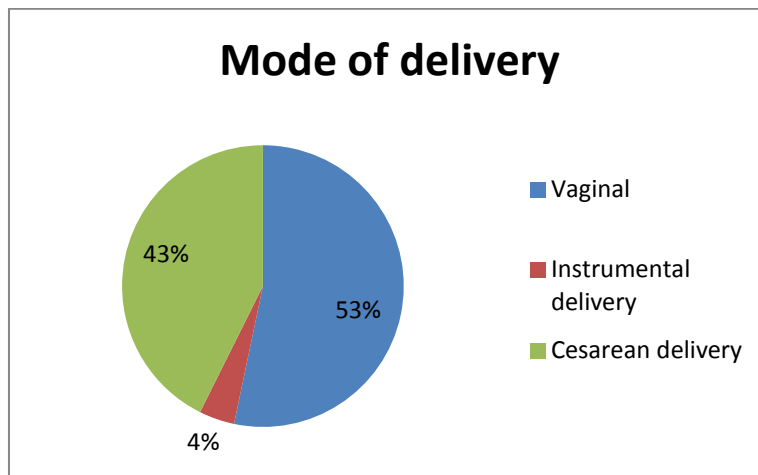


Fig. 3. Mode of delivery among women who undergone induction of labor in Dessie referral hospital, Ethiopia, 2017

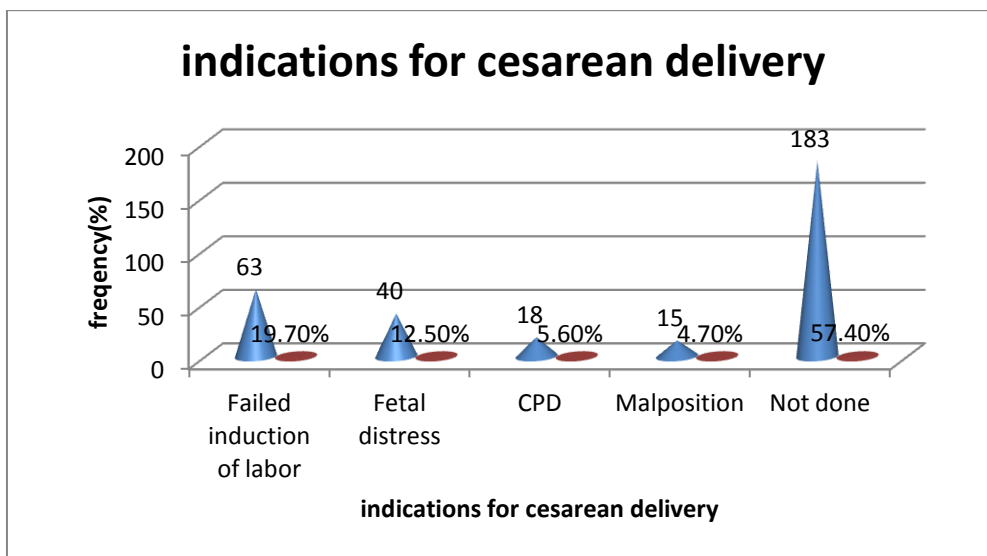


Fig. 4. Reasons for cesarean section among women delivered after induction of labor in Dessie referral hospital, Ethiopia, 2017

The finding of this study also showed that the odds of failed induction were 1.72 times more likely in primipara mothers. This finding is supported by the study done in Hawassa public health facilities, Jimma University specialized hospita [9,10]. Most authors have noted that increased parity had a favourable bearing on the outcome of induction. Also, labour prolonged in primiparara women since cervix was not tasted for labour.

The odds of failed induction were 0.147 more likely in women with unfavourable Bishop score than women with favourable Bishop score. This finding is supported by the study done in most studies reviewed. The finding of this study shows that inducing of labour should better be

performed at the favourable cervix for a good outcome. It also supports the scientific findings of different literatures that the condition of the cervix at the start of induction is an important predictor, with the modified Bishop score being a widely used scoring system. Induction of labour results in a high failure rate if the cervix is not ripe [2,7,17,14,18,19].

5. CONCLUSION

The proportion of failed induction of labour was relatively high in the study area. Variables which increased the likelihood of failed induction were living rural area, primigravidity and unfavourable bishop score before induction of labour.

CONSENT

As per international standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical clearance letter was obtained from the ethical review board of Wollo University College of Medicine and health sciences. Official permission letters were also obtained from Dessie town health department and for Dessie referral hospital. Confidentiality and anonymity of the record had been ensured throughout the execution of the study by taking only the required information without using the name of the client.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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ANNEX: QUESTIONNAIRE

Factors associated with failed induction of labor at Dessie referral hospital, 2016

Participant ID # _____ Date: _____

Part 1: Socio-Demographic and baseline health information

1. Age (years).....
2. Parity -----
3. Religion of the women
 1. Orthodox
 2. Muslim
 3. Protestant
 4. Others specify
4. Ethnic group
 1. Amhara
 2. Oromo
 3. Tigrie
 4. Other specify
5. Marital Status
 1. Single
 2. Married
 3. Widowed
 4. Divorced
 5. Other (Specify)
6. Education Level
 1. unable to read and write
 2. Grade 1-8
 3. Grade 9-12
 4. Collage and above
 5. Other specify
7. Occupation
 1. Unemployed
 2. Formal Employment
 3. Informal Sector
 4. Other (Specify)
8. Residential Address
 1. Urban
 2. Rural

Part 2: Induction of labor

1. Date and Time induction commenced (from notes).....
2. Indication(s) for Induction, tick where applicable
 1. Post term
 2. PROM
 3. Hypertensive disorders
 4. Diabetes
 5. IUGR
 6. Others specify
3. Gestation age in weeks (indicate).....
4. Membranes already ruptured before induction
 1. Yes
 2. No

If yes go to 5, if no go straight to 6

5. Liquor foul smelling...

1. Yes 2. No

6. Bishop's score (indicate).....

7. Method of induction (indicate)

1. Aminotomy
2. Intravenous oxytocin infusion
3. Complimentary methods

8. If misoprostol only, route of administration

1. Vaginal 2. Oral 3. Sublingual 4. Not applicable

9. Total amount of misoprostol given (indicate).....

1. 50 ug 2. 100 ug 3. 150 ug 4. 200 ug 5. >200 ug

10. Uterine hyper stimulation present (as recorded in notes)

1. Yes 2. No

11. Fetal heart rate non-reassuring following induction of labor

1. Yes 2. No

12. Change of color of liquor to meconium stained

1. Yes 2. No

13. Mode of delivery

1. Vaginal delivery
2. Instrumental vaginal delivery
3. Caesarean section

14. If delivery by caesarean section, indication:

1. Failed induction of labour
2. Fetal distress
3. cephalopelvic disproportion
4. Malposition
5. Others indicate.....

15. Ruptured Uterus present

1. Yes 2. No

16. Any other serious maternal morbidity (indicate).....

17. Date and time of delivery.....

18. Newborn status during delivery

1. Alive 2. fresh/macerated stillbirth

19. Birth weight in grams.....

20. Apgar score at 1 and 5 min..... /.....

21. Admission to NICU after delivery

1. Yes 2. No

22. Reason for admission to NICU (mention).....

23. Perinatal death

1. Yes 2. No

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