

Contributing Factors to Failed Oxytocin Induction among Women Giving Birth at Referral Hospitals of Amhara Regional State, Ethiopia, in 2018: A Case-control Study

Abenezer Melkie (MSc)^{1*}, Dagne Addisu (MSc)¹, Belete Atinafu (MSc)², Maru Mekie (MSc)¹, Enyew Dagne (MSc)¹

¹ Lecturer, Department of midwifery, Faculty of health science, Debre Tabor of university, Debre Tabor, Ethiopia

² Lecturer, Department of midwifery, Faculty of health science, Debre Brihan of university, Debre Brihan, Ethiopia

ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Original article</p>	<p>Background & aim: Failed oxytocin induction of labor increases the rate of cesarean section and associated complications. The present study aimed to identify contributing factors to failed oxytocin induction among women who gave birth at the referral hospitals of Amhara regional state, Ethiopia, in 2018.</p>
<p><i>Article History:</i> Received: 25-Oct-2019 Accepted: 06-Jan-2020</p>	<p>Methods: This unmatched case-control study was conducted on a total of 336 parturient women (112 cases and 224 controls) at the referral hospitals of Amhara regional state, Ethiopia, within March 19 to May 18, 2018. Systematic and consecutive sampling methods were applied for the selection of controls and cases, respectively. Both the interviewer-administered questionnaire and medical chart review were utilized as tools for data collection. The validity of the tools was determined by content validity, and Cronbach's alpha coefficient as a measure of tool reliability was rendered at 0.82. Data analysis was carried out by SPSS software (version 23) using multivariable logistic regression analysis.</p>
<p><i>Key words:</i> Contributing Factor Oxytocin Induction Parturient Women Ethiopia</p>	<p>Results: According to the obtained results, primiparity (AOR=6.24; 95% CI: 3.32-11.73), intermediate Bishop score (AOR=11.77; 95% CI: 5.19-26.71), emergency oxytocin induction (AOR=2.47; 95% CI: 1.31-4.68), and age of ≤ 30 years (AOR=2.16; 95% CI: 1.13-4.16) were considered the determinants of failed oxytocin induction.</p> <p>Conclusion: Considering the factors of primiparity, intermediate Bishop score (5-8) and the age of ≤ 30 years as determinants of failed oxytocin induction, it is recommended to use oxytocin induction after obtaining a favorable Bishop score.</p>

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Introduction

The failed induction of labor is one of the most common indications of operative deliveries which in turn results in subsequent complications related to the surgical procedures (1). Failed oxytocin induction is unable to maintain adequate uterine contraction 6-8 h after the initiation of oxytocin induction and apply the maximum amount for 1 h and above; accordingly, cesarean section (C-section) was conducted (2).

Induction is an artificial initiation of uterine contractions before the onset of spontaneous labor using uterotonic drugs and other methods (3). The induction of labor can be carried out

due to different indications, such as obstetric, medical, and elective or social indications, among which obstetric indication is the most common (4). Labor induction is used as an obstetrical intervention when pregnancy is accompanied by complications, including pregnancy-induced hypertension, chorioamnionitis, intrauterine fetal death, polyhydramnios, and postterm pregnancy (5).

The induction of labor is recommended when the benefits of delivery outweigh the risk of continuing the pregnancy (6). Based on the evidence, it was shown that the failed induction of labor increased the rates of operative vaginal

* Corresponding author: Abenezer Melkie, Lecturer, Department of midwifery, Faculty of health science, Debre Tabor of university, Debre Tabor, Ethiopia. Email: mamushmelkie@gmail.com

deliveries, C-sections, and associated complications (1). The known risk factors for failed induction are null parity, diabetes, and hypertension (6). The age of a woman is also observed to be a predictor of failed induction. Women with the age of older than 35 years were more likely to face failed induction, compared to their counterparts (7). Conversely, the results of a study conducted in King Khalid University Hospital, Riyadh, Saudi Arabia, revealed that there was no significant association between maternal age and failed induction of labor (8).

Ethiopia is one of the countries with high rates of maternal and perinatal mortality (9). In an area with high rates of maternal and perinatal mortality due to poor access to comprehensive emergency obstetric care, it is required to identify the determinants of failed oxytocin induction. To the best of our knowledge, there is a paucity of studies on investigating the determinants of failed induction in Ethiopia, particularly the study area. With this background in mind, the present study aimed to identify the determinants of failed oxytocin induction at the referral hospitals of Amhara regional state in Ethiopia.

Materials and Methods

This facility-based unmatched case-control study was carried out at five referral hospitals in Amhara regional state within March 19 to May 18, 2018. Ethical clearance was obtained from the ethics committee of the college of medicine and health science, Bahirdar university, Bahirdar, Ethiopia (30.458.543-20 (01/01/2018)). The study was conducted in Felege Hiwot Referral Hospital (FHRH), University of Gondar Referral Hospital (UoGRH), Debre Markos Referral Hospital (DMRH), Dessie Referral Hospital (DRH), and Debre Birhan Referral Hospital (DBRH). The study participants were women who delivered using the oxytocin induction of labor in the five selected referral hospitals.

All the subjects who underwent oxytocin induction during the study period were included in the current study. The women with C-section after the initiation of oxytocin induction for fetal distress, unpredicted cephalopelvic disproportion, uterine rupture, intrapartum bleeding, and maternal medical

condition were excluded from the study. The cases were mothers undergoing C-section after oxytocin induction for the diagnosis of failed oxytocin induction by the physicians in the ward. Moreover, the controls were mothers giving birth vaginally after oxytocin induction.

The double population proportion formula was used to calculate sample size with a 95% confidence level, 80% power, and a 2:1 control to case ratio. The final sample size after the consideration of 10% nonresponse rate was 336 subjects (112 cases and 224 controls). The proportions of cases and controls were taken from a study conducted in Jimma University Hospital in Ethiopia (2). The calculated sample size of 336 subjects was proportionally allocated to each health facility based on the oxytocin induction report of the last 3 months. In this regard, the subjects were chosen from FHRH (n=72), UoGRH (n=87), DMRH (n=69), DRH (n=54), and DBRH (n=54) hospitals. Since labor induction is a rare event, consecutive sampling was employed for the selection of the cases and controls from mothers undergoing oxytocin induction.

Data collection was performed through interviews with women who had oxytocin induction and review of the medical records to cross-check the quality of the obtained data by the interview and confirm the diagnosis using a pretested structured questionnaire and abstraction checklist. A questionnaire was used for the assessment of sociodemographic, obstetric, and institutional factors, as well as health indications of labor induction. The questionnaire for this study was adapted from different studies (additional file 1) (2, 8, 10). The validity of the tools was assessed using content validity and confirmed by the experts, including the lecturers in the associated academic fields and research and community service coordinators of the College of Medicine and Health Sciences of Bahir Dar University in Ethiopia.

Firstly, the validation process was carried out with a review of the collected data by experts to check their feedback and then by a second review after the modification of the tool. Therefore, the vague language was rephrased, and unclear items were removed. Cronbach's alpha coefficient was measured to confirm the

reliability of the tools rendered as 0.82 for this study.

Then, the data were entered into a template prepared in Epi Info software (version 7). Subsequently, data analysis was conducted using SPSS software (version 23). Descriptive analysis, such as frequency and percentage, were used to describe different characteristics of the study participants. Bivariate and multivariate logistic regression analyses were performed to identify associated factors with failed induction. The variables with a p-value less than 0.2 in the bivariate analysis were entered in the multivariable model to determine the predictors of failed induction by controlling possible confounding factors at a 95% confidence level. The adjusted odds ratio (AOR) was used to identify the independent predictors of failed induction. A p-value less than 0.05 was used to state the significance of the associations.

An ethical clearance letter was obtained from the Research Ethics Committee of Bahir Dar University College of Medicine and Health Sciences. Official permission letters were also obtained from Amhara Public Health Institute and all respective study health facilities. Written informed consent was obtained from each study participant before the initiation of the data collection process. In addition, the purpose of the study was explained to the subjects. The privacy and autonomy of the study participants were maintained in the study. Furthermore, consent to publication was not applicable.

Results

Sociodemographic characteristics

A total of 336 respondents (112 cases and 224 controls) were included in the present study with a response rate of 100% for both cases and controls. The mean values of the participants' age were reported as 26.31±4.94 and 30.00±4.263 years for the cases and controls, respectively (Table 1).

Obstetric characteristics and associated factors of study participants

In terms of parity, 60.71% (n=68) and 12.5% (n=28) of the cases and controls were primiparous, respectively. In addition, 92.86%

(n=104) and 43.30% (n=97) of the cases and controls were observed to have intermediate Bishop Scores, respectively (Table 2).

Table 1. Sociodemographic characteristics of study participants (n=336) at referral hospitals of Amhara regional state, Ethiopia, in 2018

Sociodemographic characteristics	Cases (n=112)	Controls (n=224)
Age (year)		
≤30 years	90 (80.36)	127 (56.70)
>30 years	22 (19.64)	97 (43.30)
Residence		
Urban	77 (68.75)	147 (65.63)
Rural	35 (31.25)	77 (34.37)
Religion		
Orthodox	94 (83.93)	194 (86.61)
Muslim	14 (12.5)	26 (11.61)
Protestant	4 (3.57)	4 (1.78)
Ethnicity		
Amhara	106 (94.64)	212 (94.64)
Oromo	2 (1.79)	1 (0.45)
Tigray	1 (0.89)	5 (2.23)
Gurage	3 (2.68)	6 (2.68)
Marital status		
Married	106 (94.64)	203 (90.63)
Divorced	5 (4.46)	17 (7.59)
Widowed	1 (0.9)	4 (1.78)
Occupation		
Governmental worker	25 (23.32)	40 (17.86)
Daily laborer	4 (3.57)	13 (5.8)
Merchant	30 (26.79)	60 (26.79)
Housewife	50 (44.64)	106 (47.32)
Student	3 (1.68)	5 (2.23)
Household income		
≤1650	24 (21.43)	58 (25.89)
1651-3145	62 (55.36)	127 (56.69)
3146-5195	26 (23.21)	36 (16.07)
≥5196	0	3 (1.35)
Educational level		
No education	33 (29.46)	79 (35.27)
Primary	35 (31.25)	75 (33.48)
Secondary and higher	44 (39.29)	70 (31.25)

Contributing factors to failed oxytocin induction

Table 3 tabulates the associated factors with failed oxytocin induction of labor in the referral hospitals of Amhara regional state. The odds of having failed induction were observed to be 2.47 times higher among women with emergency oxytocin induction, compared to those reported for their counterparts (AOR=2.47; 95% CI: 1.31-4.68).

The odds of having failed oxytocin induction were noticed to be 11.77 times higher in women

with an intermediate Bishop score (AOR=11.77; 95% CI: 5.19-26.71), compared to those reported for the subjects with a favorable cervix. Similarly, the odds of having failed induction were observed to be 6.24 times higher among primiparous women in comparison to those reported for their counterparts (AOR=6.24; 95% CI: 3.32-11.73). In terms of age, women with ≤ 30 years of age were 2.16 times more likely to experience failed induction (AOR=2.16; 95% CI: 1.13-4.16).

Table 2. Obstetric characteristics of study participants (n=336) at referral hospitals of Amhara regional state, Ethiopia, in 2018

Obstetric characteristics	Cases (n=112)	Controls (n=224)
Parity		
Primiparous	68 (60.71)	28 (12.5)
Multiparous	44 (39.29)	196 (87.5)
Antenatal care follow-up		
Yes	62 (55.36)	143 (63.84)
No	50 (44.64)	81 (36.16)
Bad obstetric history		
Yes	8 (7.14)	7 (3.12)
No	104 (92.86)	217 (96.88)
Timing of induction		
Planned	36 (32.14)	151 (67.42)
Emergency	76 (67.86)	73 (32.58)
Bishop score		
5-8	104 (92.86)	97 (43.30)
≥ 9	8 (7.14)	127 (56.70)
Membrane rupture:		
Yes	15 (13.39)	25 (11.17)
No	97 (86.61)	198 (88.83)
Fetal age		
<37 weeks	23 (20.54)	37 (16.52)
37-42 weeks	81 (72.32)	174 (77.68)
>42 weeks	8 (7.14)	13 (5.8)
Neonatal weight		
<2500 g	23 (20.54)	28 (12.5)
2500-4000 g	80 (71.43)	185 (82.59)
>4000 g	9 (8.03)	11 (4.91)
Cervix ripening		
Yes	77 (68.75)	86 (38.39)
No	35 (31.25)	138 (61.61)

Table 3. Associated factors with failed oxytocin induction at referral hospitals of Amhara region, Ethiopia, in 2018

Factor	Cases (n=112)	Controls (n=224)	COR (95% CI)	AOR (95% CI)
Timing of induction				
Emergency	89 (67.86)	109 (32.59)	4.08 (2.41-6.92)	2.47 (1.31-4.68)*
Planned	23 (32.14)	115 (67.42)	1	1
Bad obstetric history				
Yes	8 (7.14)	7 (3.12%)	2.38 (0.84-6.75)	1.73 (0.45-6.62)
No	104 (92.86)	217 (96.88)	1	1
Bishop score				
5-8	104 (92.86)	97 (43.30)	17.02 (7.91-36.62)	11.77 (5.19-26.71)*
≥9	8 (7.14)	127 (56.70)	1	1
Parity				
Primiparous	68 (60.71)	28 (12.5)	10.82 (6.25-18.72)	6.24 (3.32-11.73)*
Multiparous	44 (39.29)	196 (87.5)	1	1
Cervical ripening				
No	77 (68.75)	86 (38.39)	3.53 (2.18-5.72)	1.63 (0.76-3.47)
Yes	35 (31.25)	138 (61.61)	1	1
Age (year)				
≤30	90 (80.36)	127 (56.70)	3.13 (1.83-5.34)	2.16 (1.13-4.16)*
>30	22 (19.64)	97 (43.30)	1	1

AOR: Adjusted odds ratio; COR: Crude odds ratio; * Significant in AOR

Discussion

The current study aimed to identify contributing factors to failed oxytocin induction among women who gave birth at five referral hospitals of Amhara regional state. The multivariate model indicated that the odds of having failed oxytocin induction were observed to be 2.47 times higher among women with emergency induction, compared to those reported for their counterparts (AOR=2.47; 95% CI: 1.31-4.68).

The findings of the present study are in contrast to the results of a study conducted in Jimma University Hospital indicating that there was no association between emergency oxytocin induction and failed oxytocin induction (2). This might be due to the differences in sample size and study design. Moreover, this discrepancy can be explained by the variation in the proportion of intermediate Bishop Score between the present study and aforementioned study. In this regard, 198 (59%) and 68 (24.8%) mothers were reported with intermediate bishop score at the initiation of oxytocin induction in the current study and aforementioned study, respectively.

Regarding Bishop Score, the multivariate analysis showed that women with a pre-

induction intermediate Bishop score were 11.77 times more likely to experience failed oxytocin induction, compared to the subjects with a favorable Bishop score. In this regard, the findings of the current study are in line with the results of studies conducted in Jimma and USA (2). This might be due to the dependency of oxytocin induction on cervical status. The pelvis is less prepared in terms of cervical dilatation, effacement, consistency, station of the presenting part, and position of the cervixes which leads to failed oxytocin induction (11, 12). This discrepancy could be due to the differences in sample size and health service practice with the presence of subjectivity in the assessment of Bishop Score. In terms of parity, primiparity was observed to be a significant predictor of failed oxytocin induction in the present study. The odds of having failed oxytocin induction were noticed to be 6.24 times higher than those reported for multiparous mothers (AOR=6.24; 95% CI: 3.32-11.73). This finding is consistent with the results of different studies conducted at Hawassa and Jimma, Ethiopia (2, 11). It could be explained by the fact that primiparous women are different from multiparous women in pre-induction cervical effacement and

response to ripening methods. In addition, primiparous women have no labor experience; therefore, the rate of cervical collagen fiber dissolution is hard to attain among primiparous women. Furthermore, primiparous uterus could be less sensitive to oxytocin (13).

The odds of failed oxytocin among mothers with the age of ≤ 30 years were 2.16 times higher than those reported for their counterparts (AOR=2.16; 95% CI: 1.13-4.16). In this regard, the results of the present study are in line with the findings of a study carried out in a secondary care hospital in Pakistan (10). However, the results of the current study are not consistent with the findings of other studies conducted in Saudi Arabia, Jimma University specialized hospital, and Hawassa public health facility, Ethiopia (2, 8, 11). This is possibly due to the differences in the study population.

The current study had several limitations that should be considered in the evaluation of the obtained findings. Due to the retrospective nature of the study, recall bias might be a concern. The present study was performed at referral hospitals which might not be representative of the general population. Efforts were made to minimize recall bias by complementing interview with the medical chart review.

Conclusion

The women with the age of ≤ 30 years, primiparous, intermediate Bishop Score, and unplanned oxytocin induction were more likely to encounter failed induction. Appropriate cervical preparation (i.e., ripening) should be considered before the initiation of labor induction.

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Conflicts of interest

Authors declared no conflicts of interest.

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