

Outcome of Labor Induction and it's Associated Factor among Laboring Women at Dilchora Referral Hospital, Dire Dawa, Eastern Ethiopia

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Abstract

Background: Induction of labor has a great role to prevent neonatal and maternal mortality and morbidity. Despite its role Induction sometimes fails with a potential risk of increasing maternal and neonatal mortality and morbidity. In Dire Dawa, there was no study done on outcomes of labor inductions. Therefore, this study is planned to fill this gap by studying the outcome of labor induction and associated factors among women who had delivered at Dilchora referral hospital in Dire Dawa, East Ethiopia.

Objective: To determine the outcome of labor induction and associated factors among women who had delivered at Dilchora referral hospital Dire Dawa East Ethiopia, May 15 to June 1, 2020.

Methods: Hospital-based retrospective cross-sectional study (July 8, 2014 up to July 08, 2019) was employed by using a pre-tested structured questionnaire to collect data from a sample of 444 charts using a systematic random sampling method by trained data collectors. First, bi-variate analysis was done to select variables for multivariate analysis and those variables with p-value 0.25 or less interred into multivariate analysis. In multivariable analysis, those variables with p-value <0.05 are considered as significantly associated. The model adequacy was checked by using the Hosmer and Lemeshow goodness of fit test.

Result: The result of the study reveled Post-Term mother [(AOR: 0.49 (0.25-0.98).The mother whose labor is induced by misoprostol [(AOR: 2.5 (1.08-5.94] the mother whose labor is induced by both (oxytocin and misoprostol) [(AOR: 0.33 (0.13-0.86)] and non-reassuring fetal heart rate pattern [(AOR: 0.10(0.03-0.30)] were significantly associated with success of induction.

Conclusion: The prevalence rate of success of labor induction was found (83.6%). And the most common indications for labor inductions were PROM and Post term. Furthermore, the study described that the most common method of induction in Dilchora referral Hospital is iv oxytocin and the minister of health should develop national evidence-based clinical practice guidelines for labour of induction and enforce its implementation.

Introduction

Induction of labor refers to the iatrogenic stimulation of uterine contractions before the onset of spontaneous labor to accomplish vaginal delivery(Cunningham et al., 2010). It is usually performed by administering oxytocin or prostaglandins to the pregnant woman, or by artificially rupturing the amniotic membranes(World health organization, 2018). and it indicated only when the risk of continuing the pregnancy to the mother and/or fetus exceeds the risk associated with the induced labor and birth (SOGC, 2008).Induction of Labor is not risk-free, and many women find it uncomfortable. the incidence of inducing labor Over the past several decades has continued to rise. In developed countries, the proportion of infants delivered at term following induction of labor can be as high as one in four births. In low- and middle-income countries the rates are generally lower, but in some low-income countries, they can be as high as those observed in high-income countries. (World health organization, 2018).

An increased rate of induction of labor for post-term pregnancies over 15 years was associated with decreased stillbirth rates in Canada (Vogel et al., 2014). For a long period many health care providers has recommended the use of induction of labor in circumstances in which the benefit of continuing a pregnancy must be outweighed than the potential maternal and fetal risk associated with the procedure and waiting for the onset of spontaneous labor. These circumstances generally include gestational age of 41 completed weeks or more, pre-labor rupture of amniotic membranes, hypertensive disorders, maternal medical complications, fetal death, fetal growth restriction, chorioamnionitis, multiple pregnancies, vaginal bleeding, and other complications. Following this condition, many neonates and mothers die in each hour throughout the world to prevent maternal and neonatal death WHO design and implement a strategy in the area of improving and availing comprehensive emergency obstetric services. one of the strategies is the induction of labor(World health organization, 2018)

In Dire Dawa, there were un area with a high rate of maternal mortality and morbidity MMR calculated for the two periods (2013-2015) was 511 and 505 per 100,000 live births during baseline and trial periods, respectively (Tseyon, 2015). Those maternal mortality is due to poor access to comprehensive emergency obstetric care. Knowing labor outcome and associated factors following induction is crucial. In the investigator knowledge there is no study conduct in Dilchora referral hospital. Therefore, this study aimed to determine the outcomes of induction of labor and factors associated with induction of labor at Dilchora referral hospital.

Identifying magnitude and factors associated with labor induction outcomes will emphasize improvements in access to qualified care for laboring women that are necessary for a reduction in maternal life-threatening conditions. Since the labor induction outcomes, exploring and analyzing the severity of factors that provides important information for laboring women as well as for health care providers in setting priorities for in-depth assessments and health care improvements in maternal health. Furthermore, studies on labor induction outcomes related events in the study area are crucial to further understanding associated issues and to provide an evidence-based platform for appropriate interventions.

Since the study will explain factors associated with labor induction outcomes, study results will serve as an input for the health bureaus, health offices/departments, local NGOs and other stakeholders working in Dire Dawa city administration in planning and implementation of preventive and intervention strategies to improve maternal and neonatal health. Moreover, the study can also be used as a baseline framework for researchers for further studies that will be conducted in similar setups

Materials And Methods

STUDY SETTING

Hospital-based cross-sectional study was carried out From May 15 up to June 1, 2020 in Dilchora referral hospital. The hospital gives a referral service for different parts of the Oromiya and Somalia region. According to data from the hospitals labor ward registration book more than 400 inductions has been

conducted in the 2018. The average monthly delivery service on Dilchora referral hospital in 2018 G.C is about 325. So far, there have not been any properly documented studies to show induction of labor, its associated factor and labor outcome.

POPULATION

Source population was All women who had induction of labor and gave birth after 28 weeks of gestation in Dilchora referral hospital and the study population was All women who had induction and gave birth after 28 weeks of gestation in the Dilchora referral Hospital during the study period. All registered women who delivered through induction of labor after period of viability (28 weeks) were included in this study.

SAMPLING SIZE AND SAMPLING TECHNIQUE

The sample "size of outcome variable" for induction of labor is calculated using single population proportion formula considering the following assumptions: the level of confidence of 95%, margin of error 4%, proportion of success of labor induction from previous study to be 78%,(Girma and Wolde, 2016). By adding 10% of the non-response rate the final sample size will be $404 + 40 = 444$. (Table 1)

A systematic random sampling procedure was used to choose the study participants using delivery registration book $k =$ Sampling interval from the first selected sample to the next to be selected in registration book, $N =$ total population (1334), $n =$ sample size(444). The sampling interval (k) was calculated by dividing total population to sample size ($K=3$) So, the sample was picked every three charts from registration book. When there was missing chart for the selected sample, we picked the next. Lottery method was used to select the first sample from the first three.

DATA COLLECTION AND PROCEDURE

Data was collected by using a structured data-collecting checklist that was prepared and developed from previous studies Pretest of the questionnaire was done to 5% of the sample size to validate and customize the tool. Two midwifery professional, who are not working in the study sites was recruited as a Data collector and one integrated emergency obstetric surgeon as supervisors. Data collector was oriented to the data collection format by supervisor and principal investigator on daily basis P.I and supervisor was review all collected data and take corrective measures. Those midwives Who would be trained as data collector was collect the data on the data collection tool and procedures under the supervision of one integrated emergency surgeon and the principal investigator For their completeness, accuracy and consistency . The data collector was start data collection after reviewing mothers chart for legibility. Those mother medical chart not fulfill the inclusion criteria will be replaced by next legible mother medical chart Based on the information obtained from the hospital delivery registration log books, and medical record a total of 444 patients card filled .

OPERATIONAL DEFINITIONS

Failed induction:- Failed induction is failure to initiate good uterine contraction. It is diagnosed if adequate uterine contractions are not achieved after 6 to 8 hours of induction (Federal Ministry of Health, 2010)

Outcome Of Labor Induction:- Proportion Of Success/Failure Of Induced Labor.

Success of labor induction:- if a woman delivered vaginally or by an instrument after induction with any of the methods.(Organization(WHO). 2011)

unsuccess of labor induction:- if a woman delivered by C/S due to any indication for cs after starting of induction. (Organization(WHO). 2011)

Bishop score: A group of measurements made at internal examination, used to determine whether the cervix is favorable or not. The score is based on the station of presenting part, dilation, effacement (or length), position and consistency of the cervix. A score of 8 or more generally indicates that the cervix is ripe.(World health organization, 2018)

DATA MANAGEMENT AND ANALYSIS

To keep the quality of data, detail trainings given for data collectors. day to day activities during data collection; supervised and evaluated errors was corrected by the investigator before the following day activity. The checklist was pre- tested by taking 5 percent of the sample size in the same Hospital and necessary modification in the checklist was made based on the nature of gaps identified. The collected data was checked for its completeness, entered using epi-data 3.1 version and exported to SPSS-22 database program for analysis. Frequency distributions of both dependent and independent variables was done and presented by table and texts. To determine associated factors for induction and its outcome, logistic regressions was used. First bi-variate analysis was done to select variables for multivariate analysis and those variables with p-value 0.25 or less was interred into multivariate analysis. In multivariable analysis, those variables with p-value <0.05 will be considered as significantly associated. The model adequacy was checked by using Hosmer and Lemeshow goodness of fit test.

ETHICAL CONSIDERATIONS

Institutional ethical clearance was first sought from the Institutional Health Research Ethics Review Committee (IHRERC) at Haramaya University, College of Health and Medical Sciences. Next, permission letter was taken from Dire Dawa City administration Health Bureaus and health facility officials. Before the start of data collection informed, voluntary, written and signed consent will be taken from facility head and confidentiality will be maintained and assured.

Results

Socio-demographic and obstetric Characteristics of the study participant

Documents of 444 labor induced were reviewed during the study period. The Chart retrieval rate was 100%. From the total participants 341 (76.8%) were in the age group of 20-34 years with a mean (\pm SD) of 27 (\pm 5) years. The minimum and maximum age of mother in years was 16 and 39. Of the total participants 258 (58.1%) live in rural.

Three hundred fifty five (80%) of the women were multi para while 89 (20%) were null-para. The study also revealed that 387 (87.2%) of the participants had ANC follow up during pregnancy and the rest 57 (12.8%) had no ANC follow up. 326 (73.4%) of the mother were gestational age of 37-41 weeks followed by gestational of >42 weeks 71 (16%).

Before induction time 289 (65.1%) of the women had bishop score 5-8, and the membrane was ruptured in 184 (41.4%) mother. The study also shows that from the total 444 fetuses, 423 (95.3%) of them had regular fetal heartbeat pattern during induction and 21 (4.7%) had developed none reassuring fetal-heart beat pattern (NRFHRP) after induction. (table 2)

Induction of labor

Reason and methods for induction of labor

The three most indications for inducing labor were PROM taking the highest frequency of 179 (40.3%) followed by pregnancy-induced hypertension-160 (36%) and post-term pregnancy 71 (16%). The methods of induction were either IV oxytocin infusion 212 (47.7%), 169 (38.1%) misoprostol and 63 (14.2%) both. (table 3)

Outcome of Labor Induction

Of the 444 women undergoing induction, 73 (16.4%) were delivered by caesarean section while 371 {83.6% (95% CI: 80-87)} achieved vaginal delivery. In this study The main aim of induction was to achieve vaginal delivery, all women delivered by caesarean section were considered unsuccessful in labor induction. (figure 1)

Indication for caesarean section

The main reason for caesarean section was failed induction 28 (38%) followed by fetal distress 19 (26%) and cephalo-pelvic disproportion 14 (19%), malposition and prolonged labor 4 (5%) & 8 (11) respectively. (figure 2)

Associated factors for labor induction outcome

Associated factors for labor induction outcome during bivariate binary logistic regression.

In bivariate analysis, the following factors Related to labor induction outcome: resident, post-term, bishop score, method of induction, non-reassuring fetal heart rate pattern, para significant association with success of induction of labor.

The Mother from rural area had 2.29[COR =, 95% CI: 1.37–3.81] times more likely to have succeeded in labor induction than those in urban areas. The odds of success of labor induction were 61%[COR=,95% CI: 0.39(1.44- 4.67)]less likely in post-term pregnancy than their counter parts. Moreover, those women with Bishop scores of 5-8 and ≥ 9 at admission were 2.5[(COR=,95% CI: (1.47-4.26))] times and 1.99[(COR=,95% CI: (0.71-5.60))] times more likely induction to be successful compared to those women with ≤ 4 Bishop Score at admission.

Mothers whose labor is induced using misoprostol were two times[(COR=,95% CI: (1.04-4.06)] more likely to succeed than oxytocin. In contrast the mother whose labor was induced using both (oxytocin and misoprostol) was 80 %[(COR: 0.20(0.1-0.37))] less likely to be successful than oxytocin. The odd of success of labor induction was 91%[(COR:0.081 (0.03-0.20))] less likely in mother with non-reassuring fetal heart rate patterns than their counterparts.Multi-para women were 2.7 [(COR: (1.81-35.80))] times more likely to have a success of labor induction than null-para women. The induction of labor in mothers whose babies weight >2500gm were 59% [(COR: (0.16–1.07)] less likely to be successful than those with ≤ 2500 gm. .(table 4)

Associated factors for labor induction outcome during multivariate binary logistic regression.

In multivariate analysis, being post-term, the induction method and having non-reassuring fetal heart rate pattern have retained their significant association with successful induction. Post-Term mother were 51% [(AOR: 0.49 (0.25-0.98))] less likely induction to be successful compared to those women with term pregnancy.

The mother whose labor is induced by misoprostol where 2.5[(AOR: (1.08-5.94)] times more likely to succeed in labor induction than those induced by oxytocin. In contrast the mother whose labor is induced by both (oxytocin and misoprostol) was 67% [(AOR: (0.13-0.86))] less likely to be successful than that labor is induced by oxytocin. The odd of success of labor induction is 90% [(AOR: 0.10(0.03-0.30))] less likely in with non-reassuring fetal heart rate pattern than those of regular fetal heart rate pattern during labor.(table 5)

Discussion

From 444 card reviewed in this study 73(16.4%) of them delivered by caesarean section while 371 achieved vaginal delivery making the prevalence rate of success induction (83.6%) with (95% CI: 80% - 87%). Post-term, Method of induction, non-reassuring fetal heart rate pattern had a statistically significant Rate of success of induction in St. Luke Catholic Hospital (58%) and public hospitals of Mekelle town (76%).(Abdulkadir et al., 2017, Garang Dakjur et al., 2020) This could be because of the difference in quality of induction care provided by the hospitals, skilled professionals and different induction method practice in those setup. (Abdulkadir et al., 2017).Related to the factors associated with the success of induction the study shows that induction of labour occurred mostly in multi Para mother 80% compared to 20% in null-para mothers. Even if it does not show the significant of association in multivariate analysis, multi parous mother have two times more likely to have a success of labor induction than null-

para women. similar finding reported in the study done in Public Hospital in Ethiopia and Dessie Referral Hospital: Northeast Ethiopia (Rade et al., 2018, Dilnessa et al., 2019). increased parity had a favorable bearing on the outcome of induction. Also, labour will be prolonged in primipara women because cervix was not tested for labour. (Dilnessa et al., 2019).

This study's common indication for labor induction was PROM (40.0%) followed by post term (16%). This is in line with the study done in public hospitals of Mekelle town PROM (41%) followed by post term (19%) (Garang Lueth, 2020). Contrasting to this the most common indication for labor induction in Latin America was elective induction (30%) (Guerra et al., 2009). This difference is because of the two countries socio-economic conditions and PROM was more common in low socioeconomic societies due to wide spread nutrition and infection conditions that would facilitate the condition (Guerra et al., 2009). The study shows that post-term mothers were fifty one percent less likely induction to be successful than those women with term. A similar result was found in the previous study done in Wolliso St. Luke, Catholic Hospital and The Aga Khan University Hospital, Pakistan shows term mother had three and two time more likely to succeed in labor induction than post term mother. (Khan et al., 2012, Abdulkadir et al., 2017) This may be related to when the mothers became post term (Gestational age > 42 week) there would be respectively big fetus (macrosomia) or decreased placental insufficiency potentially causing fetopelvic disproportion and non-reassurance fetal heart beats, for induction of labor to fail (Abdulkadir et al., 2017).

In this study the most common method of induction was iv infusion of oxytocin (47.7) followed by misoprostol (38.1) This is in line with other study done in Tigray region, Ethiopia 51% of induction of labour done by oxytocin infusion followed by misoprostol 49%. Other Study conducted in Egypt shows 65.5% of the women received misoprostol while 34.4% received intravenous oxytocin infusion as a method of labor induction (Abraha, 2020; Abdel Hafiz, 2014). Other study done in Latin America where oxytocin IV infusion was used in about 90% of all labor inductions (Guerra et al., 2009). The choice whether to induce with oxytocin or misoprostol was more on their dependent on the favorability of the woman's cervix and misoprostol availability and protocol used within the unit. (Bekru and Yirdaw, 2018). The mother whose labor is induced by misoprostol where 2.5 times more likely to succeed in labor induction than those induced by oxytocin.) This is in line with other study done by Coronation Hospital and University of the Witwatersrand, South Africa When compared with oxytocin, misoprostol was more effective for labour induction. The relative risk of failure to achieve vaginal delivery was 0.48 (95% CI 0.35 to 0.66) (Alfirevic, 2006). The mother whose labor is induced by both (oxytocin and misoprostol) was 67% less likely to be successful than that labor is induced by oxytocin. (Alfirevic, 2006)

The study also revealed that the presence of non-reassuring fetal heart beat pattern was significantly associated with the success of labor induction. The success of labor induction is ninety percent less likely in with non-reassuring fetal heart rate pattern than those of having regular fetal heart rate pattern. This is consistent with a study done in Wolaita Sodo, South Ethiopia. The success of labor induction is sixty four percent less likely in with non-reassuring fetal heart rate pattern than those of having regular fetal heart rate pattern (Bekru and Yirdaw, 2018). Other study conducted in Wolliso St. Luke, Catholic

Hospital, South West Shewa, Oromia revealed that Cases who had not fetal heart beat abnormality were five time more likely to be success during induction of labor in contrast with those with abnormality. (Abdulkadir et al., 2017) This could be due to the presence of fetal distress cause non reassuring fetal heart beat pattern and this sign is alarming to take immediate action in order to save the life newborn(Acharya et al., 2017).

Conclusion

The prevalence rate of success labor induction was found (83.6%). And the most common indications for labor inductions were PROM and Post term. Furthermore, the study described that the most common method of induction in Dilchora referral Hospital is IV oxytocin infusion. Variables which increased the likelihood of success of labor induction were post term, method of induction and non-reassuring fetal heart rate.

Declarations

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CONFLICT OF INTEREST

The authors declared no conflict of interest with respect to the research, authorship and publication of this article.

CONTRIBUTION OF AUTHOR (AUTHORSHIP)

Abel Shiferaw conceived the study under the supervision of Tesfaye Assebe and Melake Demena . Abel Shiferaw wrote the original draft of the manuscript. Abel Shiferaw analyzed data and its interpretation. Tesfaye Assebe and Melake Demena supervised the proposal development, data collection, analysis and the overall work. Tesfaye Assebe and Melake Demena reviewed the draft manuscript for intellectual content and participated in the revision. All authors read and approved the final version of the manuscript.

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Tables

Table 1:- Sample size calculation by considering different factor that associated with success of labor induction

Variable	percentage of outcome in unexposed group	percentage of outcome in exposed group	Sample size	Sample Size +10% non-response rate	Reference
Gestational age	47%	69%	179	197	(Abdulkadir et al., 2017)
Mother Bishop	30%	66%	84	92	(Abdulkadir et al., 2017)
Weight of new born	47%	69%	180	198	(Abdulkadir et al., 2017)

Table 2 Socio demographic and obsetetric Characteristics of Women Who Had undergone induction of labor and Gave Birth In Dilchora Referral Hospital From July 08, 2014 -July 08, 2019

Variable	Frequency (n)	Percentage (%)
Age		
<20	55	12.4
20-34	341	76.8
≥35	48	10.8
Residence		
Urban	186	41.9
Rural	258	58.1
Parity		
Null-para	89	20
Multi-para	355	80
ANC follow up		
Yes	387	87.2
No	57	12.8
Gestational Age		
Less than 36 week	47	10.6
37-41 week	326	73.4
≥ 42 week	71	16.0
Membrane status		
Intact	260	58.6
Ruptured	184	41.4
Bishop score		
less than/equal to 4	122	27.5
5-8	289	65.1
greater than/equal to 9	33	7.4
NRFHR		
yes	21	4.7
No	423	95.3

Table 3 Reason And Methods for Induction of Labor in Women Who had undergone induction of labor and Gave Birth in Dilchora Referral Hospital from July 08, 2014 -July 08, 2019

Variable	Frequency(n)	Percentage (%)
Reason for induction		
Post term(n=444)	Yes	71
	No	373
Prom(n=444)	Yes	179
	No	265
IUFD(n=444)	Yes	33
	No	411
Congenital anomaly(n=444)	Yes	21
	No	423
Method of induction		
Iv oxytocin	212	47.7
Misoprostol	169	38.1
Combined	63	14.2

PROM- Premature rupture of membrane. IUFD -Intra uterine fetal death

Table 4 Bivariate Binary Logistic Regression Of Associated Factors For Labor Induction Outcome In Women Delivered In Dilchora Referral Hospital From July 08, 2014 -July 08, 2019

Variable	Outcome of Induction		COR(95%,CI)	P-value
	success	Un success		
Age				
<20	47 (85.5%)	8 (14.5%)	1.17(0.41-3.41)	0.767
20-34	284 (83.3%)	57 (16.7%)	0.99(0.44-2.24)	0.993
≥35	40 (83.3%)	8 (16.7%)	1	
Residential Address				
Rural	228 (88%)	30 (12%)	2.29(1.37-3.81)	0.002*
Urban	143 (77%)	43 (23%)	1.00	
Post-term				
Yes	50 (70%)	21 (30%)	0.39(0.21-0.69)	0.001*
No	321 (86%)	52 (14%)	1.00	
Bishop score				
5-8	253 (88%)	36 (12%)	2.50(1.47-4.26)	0.001*
≥9	28 (85%)	5 (15%)	1.99(0.71-5.60)	0.192
≤4	90 (74%)	32 (26%)	1.00	
Method of induction				
Misoprostol	156(92%)	13 (8%)	2.05(1.04-4.06)	0.038*
Combined	34 (54%)	29 (46%)	0.20(0.14-0.37)	0.001*
Oxytocin	181(85%)	31 (15%)	1.00	
NRFHRP				
Yes	7 (33%)	14 (67%)	0.08(0.03-0.21)	0.001*
No	364 (86%)	59 (14%)	1.00	
Para				
Multi Para	308(86.6)	47(13.4%)	2.7(1.56-4.89)	0.001*
Null Para	63(70.8)	26(29.2%)	1.00	
New born weight				
>2500gm	315 (82%)	68 (18%)	0.41(0.16-1.07)	0.069*
≤2500gm	56 (92%)	5 (8%)	1.00	

*- statistically significant at P-value <0.25

IUFD-intrauterine fetal death,

NRFHRP-Non reassuring fetal heart rate pattern

Table 5 Multivariate Binary Logistic Regression Of Associated Factors For Labor Induction Outcome In Women Delivered In Dilchora Referral Hospital From July 08, 2014 -July 08, 2019

Variable	AOR(95%,CI)	P-value
Residential Address		
Rural	1.68(0.91-3.10)	0.095
Urban	1.00	
post term		
Yes	0.49(0.25- 0.98)	0.044**
No	1.00	
Bishop score		
5-8	2.07(0.90-4.76)	0.086
≥9	1.53(0.40-5.82)	0.533
≤4	1.00	
Method of induction		
Oxytocin	1.00	
Misoprostol	2.53 (1.08-5.94)	0.033**
Combined	0.33(0.13-0.86)	0.022**
NRFHP		
Yes	0.10(0.03-0.30)	0.001**
No	1.00	
Para		
Multi Para	1.7 (0.94-3.47)	0.73
Null Para	1.00	
New born weight		
>2500gm	0.39(0.13-1.15)	0.088
≤2500gm	1.00	

******- statistically significant at P-Value ≤ 0.05

IUFD- intrauterine fetal death

NRFHRP- Non reassuring fetal heart rate pattern

Figures

Outcome of labor Induction

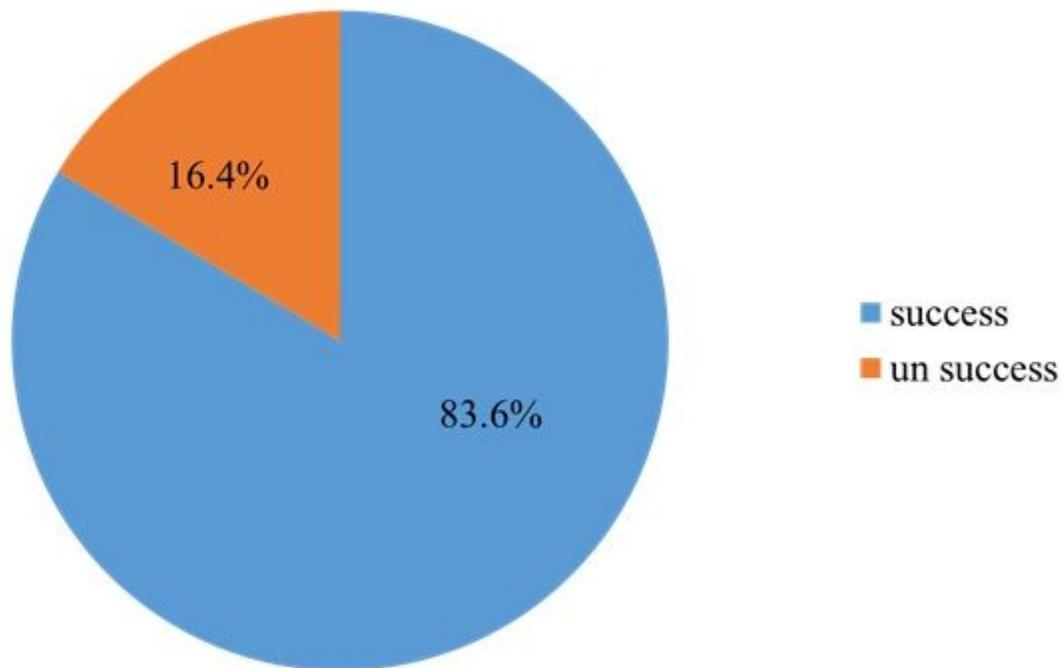


Figure 1

Outcome Of Labor Induction among Women Who Had undergone induction of labor and Gave Birth In Dilchora Referral Hospital From July 08, 2014 – July 08, 2019

Indication for CS

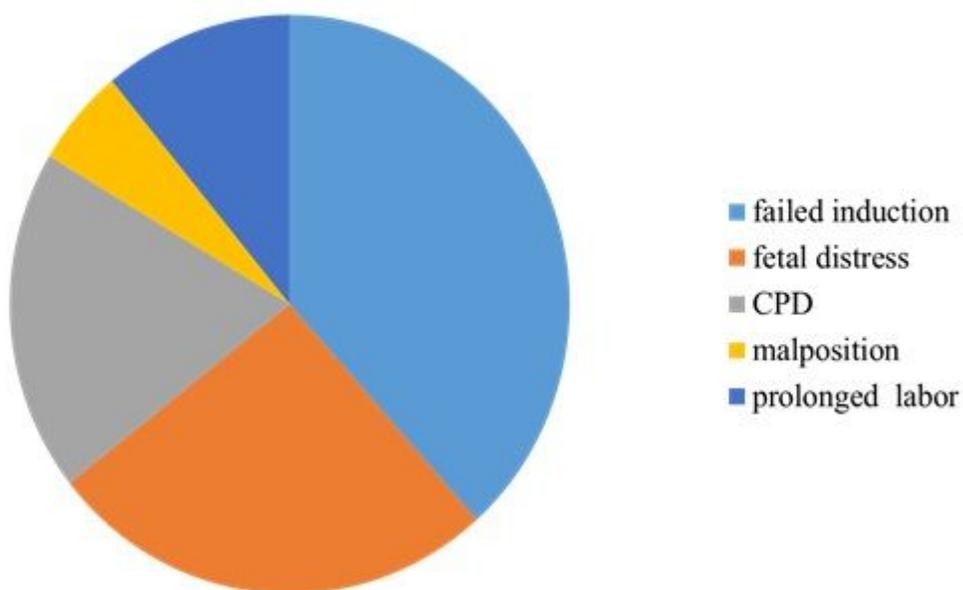


Figure 2

Indication for CS among Women Who had undergone induction of labor and Gave Birth in Dilchora Referral Hospital from July 08, 2014 – July 08, 2019

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendix.docx](#)