Prevalence of Failed Induction of Labor and Associated Factors Among Women Delivered in Hawassa Public Health Facilities, Ethiopia, 2015

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Abstract

Background: Induction of labor is an increasingly being done obstetric procedure throughout the world. It is carried out in approximately 20% of all pregnancies. It is associated with poorer outcomes when compared with spontaneous labor.

Method: Institutional based cross sectional study was made on medical records of 294 women admitted for induction of labor in Hawassa public health facilities from 1st Jan, to 31st Dec, 2014. Systematic sampling technique was used to select samples. Data was collected by structured questionnaire and edited, then entered into Epi-Data version 3.1. Data was analyzed with Statistical Package for Social Science, version 21. First percentage, frequency and mean were calculated. Then, multivariable logistic regression analysis was done to evaluate the possible association of all variables that were candidate after binary logistic regression analysis. P-value of less than 0.05 in multivariable logistic regression was considered as statistically significant. Finally the result is summarized and presented in texts and charts.

Result: The prevalence of failed induction of labor was 17.3%. Multivariable logistic regression analysis showed that advanced maternal age [AOR 9.21 (2.70-31.35)], Nulliparity [AOR 3.11 (1.01-9.62)], poor Bishop Score [AOR 4.54 (1.56-13.19)], greater for gestation [AOR 6.57 (2.18-19.72)], bad obstetric history [AOR 5.60 (1.35-23.29)], post term [AOR=4.52 (1.20-17.00)] and premature rapture of membrane [AOR 5.66 (1.96-16.32)] were significantly associated with failed induction of labor .

Conclusion: Advanced age, Primiparity, unfavorable bishop score, premature rupture of membrane, greater for gestation and bad obstetric history had positive association with failed induction of labor. Developing practice guidelines may help to prevent unwarranted case selection and help to reduce the current high failure rates.

Keywords: Induction of labor; failed induction; Caesarean section

Abbreviations: AOR: Adjusted Odd Ratio; ARM: Artificial Rupture of Membranes; CI: Confidence Intervals; IOL:Induction Of Labor; IUGR: Intrauterine Growth Retardation; MDGs: Millennium Development Goals; PGE: Prostaglandin E; PIH: Pregnancy Induced Hypertension; PROM: Pre-labor or Premature Rupture of the Membranes; SPSS: Statistical Package for Social Scientists; SVD: Spontaneous Vaginal Delivery; WHO: World Health Organization.

Introduction

Labor is the physiological process by which regular painful uterine contractions result in progressive effacement, dilatation of the cervix and ultimately leads to delivery of the fetus through the birth canal [1]. Induction of labour is defined as an intervention designed to artificially initiate uterine contractions leading to progressive dilatation and effacement of the cervix and birth of the baby [2].

Indications for induction of labour include post term pregnancies, pre-labour rupture of membranes, maternal medical conditions like hypertensive disorders, diabetes, renal diseases etc., fetal compromise, chorioamnionitis, abruptio placenta, intrauterine fetal death and others [3].

The risks associated with induction of labor include uterine hyper stimulation, increased rates of operative deliveries and caesarean sections (in those that undergo induction), fetal heart rate pattern abnormalities, premature deliveries, infections in some cases and in the worst scenario may result in a uterine rupture [3].

Induction of labor is carried out in approximately 20% of pregnancies. It has been strongly associated with poor maternal and perinatal outcomes [4]. In developed countries, up to 25% of all deliveries at term now involve induction of labour. In developing countries, the rates are generally lower, but in some settings they can be as high as those observed in developed countries [3].

The study done in a health resource poor setting showed induction of labor giving an induction rate of 11.5 %, [5]. It is lower in African region as shown by the recent WHO Global Survey dealing with determinants of use of induction of labor in Africa showing an average rate of induction ranging from 1.4% to 6.8% [6].

In Ethiopia, including the study area, induction of labor is a commonly performed procedure but there is a limitation in undertaking a study on the magnitude and factors associated with its failure. The latest EDHS report that was done in the year 2011 didn't include information on induction of labor [7].The consequence of a failed induction that usually result in a Cesarean-section, compared to vaginal birth, is more potential health risks to the woman and the baby, as well as, a significantly longer recovery period for the woman. Therefore, an induction of labor should be recommended only when it is necessary [8].

This study aimed at determining the prevalence of failed induction of labor and identifying associated factors in Hawassa public Hospitals of Ethiopia.

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This study aimed at determining the prevalence of failed induction of labor and identifying associated factors in Hawassa public Hospitals of Ethiopia [Figures 1 and 2].
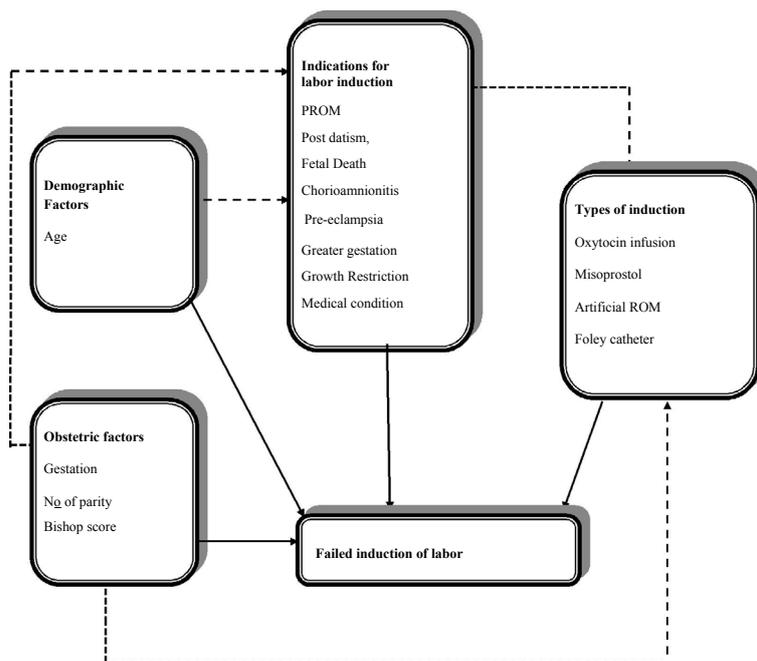
Figure 1: Conceptual frame work. Developed after reviewing relevant literatures[1,6,4,13,15].
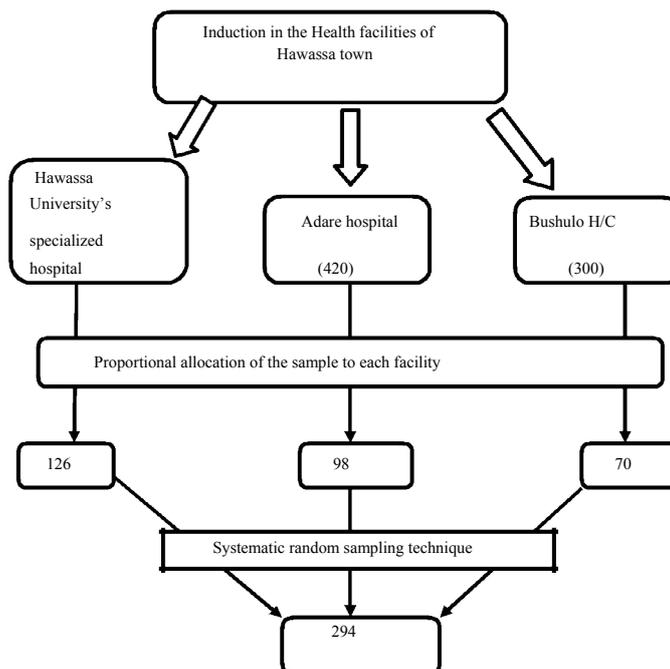
Figure 2: Schematic presentation of sampling procedure.

Materials and Methods

A facility based cross sectional study was conducted at the public health facilities of Hawassa town, southern Ethiopia from Mar 15th to April 15th, 2015. There are one referral hospital, one district hospital and nine health centers in the City administration. The single population formula was used to calculate a sample size, by using 50% of the proportion of failed induction of labor. The sample size was allocated for each health facility proportionally. Systematic random sampling technique was used to select the samples from the list of women with induction of labor.

Data was collected from medical records of women for whom induction of labor was performed in Hawassa public health facilities using pre tested structured checklist. Items were developed for this study to assess socio demography factors, obstetric factors, types of induction performed and health indication for labor induction. Checklist consist five sections that have a total of 21 items which describe the purpose of the study.
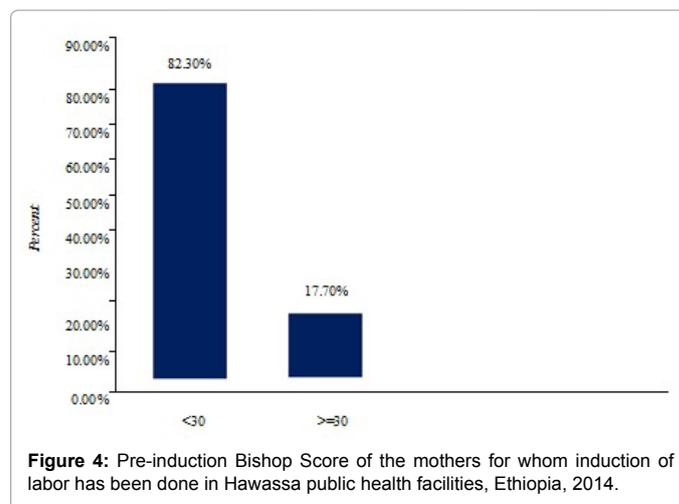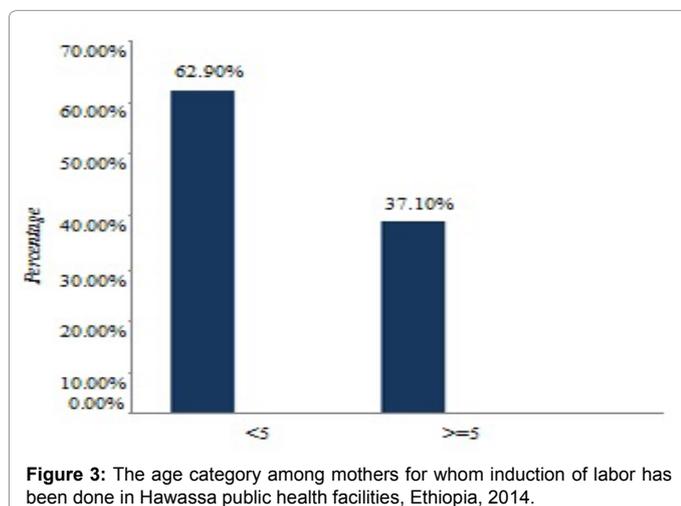
Each completed checklist was coded on pre-arranged coding sheet by principal investigator and edited to minimize errors. Then data was entered in to Epidata version 3.1 to control data entry errors and exported to SPSS version 21 for analysis. Percentage, frequency and mean were calculated. Bivariate analysis was performed between dependent variable and each of the independent variables, one at a time. Their Odds ratio (OR), at 95% CI and p-value was obtained. All variables found to be significant at bivariate level (at p-value <0.25%) has been entered in to multivariable analysis using the binary logistic regressions model to test the significance of its association.

Ethical clearance letter was obtained from ethical review board of Jimma University College of health sciences. Official permission letters was also obtained from Hawassa city health department and all the respective study health facilities. 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.

Result

Socio-demographic factors

A total of 294 medical records of mothers who gave birth after induction of labor were selected for study purpose. The mean age and standard deviation of the selected women was 26.29_4.133 and 242 of all samples were below 30 years of age (Figure 3).

Figure 3: The age category among mothers for whom induction of labor has been done in Hawassa public health facilities, Ethiopia, 2014.

Figure 4: Pre-induction Bishop Score of the mothers for whom induction of labor has been done in Hawassa public health facilities, Ethiopia, 2014.

Cervix			Score	
	0	1	2	3
Dilatation(cm)	<1	2-Jan	4-Mar	>4
Length of cervix (cm)	>3	2	1	<1
Station	-3	-2	-1, 0	+1, +2
Consistency	Firm	Medium	Soft	----
Position	Posterior	Midpoint	Anterior	----

Table 1: Modified Bishop scoring.

Obstetric factors

The mean fetal gestational age with its standard deviation was 38.95 and 2.57 respectively. The result showed that 55.8% of the women in the study were primigravidas. The Bishop score of 185 study participants was less than five before induction of labor (Figure 4).

Indications for labor induction

The result showed that the predominant indications for induction of labor in the study area were premature rapture of membrane, Preeclampsia, Post term and Chorioamnionitis (Table 1).

Methods of Induction

The most commonly used methods of induction of labor in the study were oxytocin infusion (73.5%) and oral or vaginal misoprostol (26.5%).

### Maternal prenatal and antenatal factors

There was a previous history of abortion in 9.5% of the study participants, while there were other previous obstetric complication experiences in 5.4% of them. The length of time for induction of labor varied from 2 to 23 hr with its mean and standard deviation to be 8.89 and 4.08 respectively. The tone of pregnancy in all mothers was singleton. Out of the total samples, 181(61.6%) mothers ended with vaginal delivery while others delivered by cesarean section (Figure 5).

The Apgar scores of the newborns at first minute in 70.1% of the cases were greater than seven, but at fifth minute the score of 83.3% of newborns became greater than seven.

Reasons for cesarean section among women were: Cephalopelvic disproportion, fetal distress and failure of induction (Figure 6).
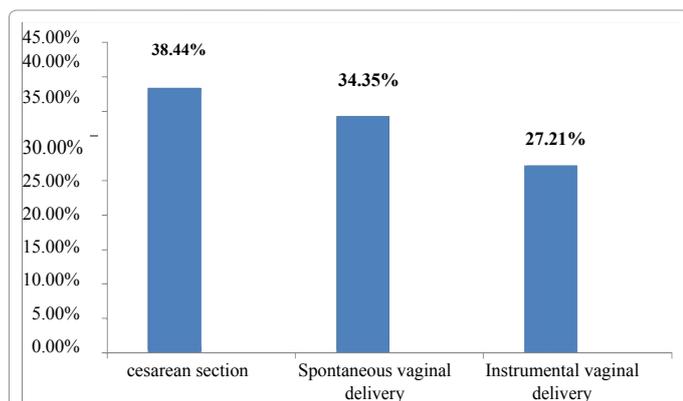
Figure 5: Mode of delivery among women delivered after induction of labor in Hawassa Public health facilities, Ethiopia, 2014.
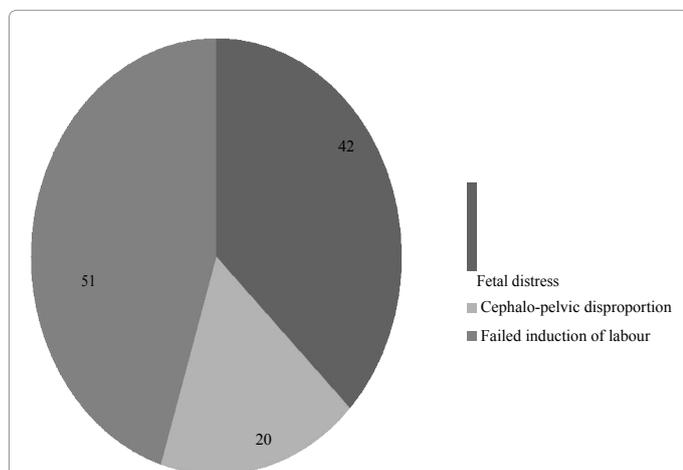
Figure 6: Frequency of reasons for cesarean section among women delivered after induction of labor in Hawassa Public health facilities, Ethiopia, 2014.

Factors associated with failed induction of labor

Different variables that were assumed to be associated with failed induction of labor were assessed first by using bivariate then multivariable logistic regression analysis methods. There were eleven variables showing significant association with the outcome variable when entered into bivariate logistic regression model analysis. These were: parity, pre-labor rapture of membrane, and age of the mother, pre-induction bishop score (a tabulated clinical score used to determine how successful an induction of labour will be based on five characteristics of the cervix: dilatation, length, consistency, station and position. A Bishop's score of 7 and above is said to be favorable for induction of labor, see Table 1, premature rapture of membrane, mothers with age greater than 30 years, and preterm rapture of membrane, post term, previous obstetric complications, fetal gestation and length of induction.

However; multivariable logistic regression analysis showed that the odds of failed induction were 3.11 times more likely in Primiparous mothers [AOR=3.118 (1.01-9.62)] than multiparous one; the odds of failed induction were 9.21 times more likely in mothers with age greater than 30 years [AOR=9.210 (2.70-31.35)] than others; the odds of failed induction were 4.54 times more likely in mothers with pre-

Indications	N	%
Premature rapture of membrane	88	29.9
Preeclampsia	83	28.2
Greater for gestation	61	20.9
Post term	49	16.7
Chorioamnionitis	43	14.6
Growth restriction	35	11.9
Vaginal bleeding	30	10.2
Medical complications	27	9.2
Obstetric complications	17	5.8
Fetal death	10	3.4

Table 2: Indications for induction of labor among women delivered in Hawassa Public health facilities, SNNPR, Ethiopia, 2014.

induction bishop score of less than five [AOR=4.543 (1.56-13.19)] than those with pre-induction bishop score of greater than five; the odds of failed induction were 5.66 times more likely in mothers with premature rapture of membrane [AOR=5.661 (1.96,16.32)] than others; the odds of failed induction were 6.57 times more likely in mothers with greater for gestation [AOR=6.571 (2.18,19.72)] than others, the odds of failed induction were 4.52 times more likely in mothers with post term [AOR=4.523 (1.20,17.00)] than others; the odds of failed induction were 5.60 times more likely in mothers with previous obstetric complications were to have failed induction [AOR=5.609 (1.35,23.29)] than those with no bad obstetric history (Table 2).

Discussion

Induction of labor is one of the fastest growing procedures in current obstetric practice. American studies have documented a nationwide more than doubling of induction rates between the late eighties and the late nineties [9]. The recent rapid increase in induction of labor particularly for debatable indications has generated concern among clinicians.

This study showed that the prevalence of failed induction of labor was 17.3%, which is greater than the study done in Health Resource Poor Settings [5]. This difference may be due variation in commonly used methods for induction of labor, in which oxytocin infusion was the predominantly used method in the study area while in the other cases misoprostol with other alternatives like Balloon catheter was used as a common practice. The difference may also be due to unavailability of adequate facilities in the study facilities as there are complicated obstetric cases being handled.

The common indications for induction of labor in the study area were premature rapture of membrane, Preeclampsia. Greater gestation, however, the study done in Kathmandu Medical College Teaching Hospital showed predominant indications for induction were: post term pregnancy, PROM, oligohydramnious, and others [10]. In the study done at a regional hospital in KwaZulu-Natal, South Africa the three main indications for induction of labor were hypertensive disorders, post-dates pregnancy and pre-labour rupture of the membranes [11].

The finding of this study also showed that the odds of failed induction were 3.11 times more likely in primiparous mothers. This finding, though it was higher, is supported by the study done by Ramayahji RT, et al. in Kathmandu Medical College Teaching Hospital [10] and the finding of N. Khan, et al. at Aga Khan University Hospital [12].

The higher failure rate in the present study may be due to the higher proportion of primiparous women in the study; it may also be for the

reason that lack of important practices like use of cervical primers prior to induction and delayed amniotomy in the active stage of labour.

In this study, mothers with age greater than 30 years were found to be more at risk (28.8%) than others (6.4%) to have failed induction of labor, which is supported by the study done in Kathmandu Medical College Teaching Hospital [10].

The odds of failed induction were 4.54 times more likely in women with Bishop Score of 5 or less. The study done by Maria Olender, et al. also showed that Bishop score was inversely correlated with induction failure showing a predictable deline in success with lower scores [13]. The finding of this study shows that inducing of labor should better be performed at favorable 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 labor results in high failure rate if the cervix is not ripe [14,15].

The odds of failed induction were 6.57 times more likely in women with greater for gestation than others. This finding is in line with the study done in Aga Khan university Hospital [12]. This may be related with inaccurate determination of gestational age to ascertain greater for gestation that may sometimes be an obstetric dilemma due to unsure date of the last menstrual period and non-availability of early dating ultrasound scan as often the case in resource constrained settings. It might also be due to the practice of early induction at 40 weeks by the obstetricians which may be because of lack of facilities for intensive care.

This study also showed that mothers with bad obstetric history were 5.60 times more likely to have failed induction than others. This is supported by the study finding of Neelofur Babar Khan, et al. at Aga Khan University Hospital [10]. This may be for the reason that women with previous obstetric complications many times are not allowed to go beyond 40 weeks and therefore will have unfavorable cervix conditions at time of induction.

The mostly used method of induction in the study area was oxytocin infusion (72.8%), this is in contrary with the study done in regional hospital of KwaZulu-Natal, South Africa where the most commonly used methods of IOL were oral misoprostol (63.5%) and vaginal misoprostol (30.3%) [11] and the finding of the study done in health resource poor setting in Catholic Maternity Hospital in Ogoja , Nigeria indicated that use of misoprostol took the higher score78.2% [5]. The reason for use of oxytocin as the most common method of induction of labor in the study area may be its better availability in the study settings or it may be due to the induction protocol of the facilities.The proportion of failure of induction of labor when using oxytocin infusion was higher (19.4%) as compared to that of using misoprostol (11.5%). This is supported by the study conducted by Bangal BV, et al. and Ezechu AC, et al. [16, 17]. The study finding also showed that relatively safe methods of induction of labor such as the Foley catheter were not used at the study site. This may be due to the induction protocol of the study facilities probably reinforced the use of oxytocin infusion and misoprostol as the main modes for induction of labor [18-20]. (Table 3).

Variables		Failed induction of labor		COR(95.0%CI)	AOR(95.0%CI)
		Yes(N=51)	No(N=243)		
Age in years	≤30	33	209	1	
	>30	18	34	3.35(1.70,6.61) **	9.21(2.70,31.35) **
Parity	Multi	15	115	1	
	Primi	36	128	2.156(1.12,4.14)*	3.11(1.01,9.62) *
Pre-induction rapture of membrane	No	19	181	1	
	Yes	32	62	4.91(2.601,9.294) **	
pre-induction bishop score	>5	7	102	1	
	≤5	44	142	4.54(1.96,10.50) **	4.54(1.56,13.19) *
Chronic disease	No	47	219	1	
	Yes	4	24	0.77(0.25,2.34)	
Preterm rapture of membrane	No	42	231	1	
	Yes	9	12	4.12(1.636,10.39)*	
Premature rapture of membrane	No	14	192	1	
	Yes	37	51	9.95(5.00,19.80) **	5.66(1.96,16.32) *
greater gestation	No	26	207	1	
	Yes	25	36	5.52(2.87,10.62)**	6.57(2.18,19.72) *
Fetal birth weight	≥2.5kg	8	44	1	
	>2.5kg	43	202	1.188(0.522,2.704)	
post term	No	34	211	1	
	Yes	17	32	3.29(1.65,6.57) *	4.52(1.20,17.00) *
previous obstetric complications	No	43	235	1	
	Yes	8	8	5.46(1.94,15.34) *	5.60(1.35,23.29) *
preeclampsia	No	39	172	1	
	Yes	12	71	0.74(0.36,1.50)	
Length of induction	>12m	36	203	1	
	>12m	15	40	2.11(1.05,4.22) *	
Fetal gestation	37-41w	25	169	1	
	Others	26	74	2.37(1.28,4.38)*	

**=statistically significant at p<0.001.

Table 3: Statistically significant at p<0.05 others=<37and >41 weeks of gestation.

Conclusion

The prevalence of failed induction of labor was relatively high in the study area. Variables which increased the likelihood of failed induction were advanced maternal age, unfavorable bishop score, postdates delivery, premature rupture of membrane, mothers with age greater than 30 years and previous obstetric complications.

Competing interests

The authors declare that they have no competing interests.

Author's contributions

All authors participated in the design and analysis of the study.MG searched the databases, and wrote the first and second draft of the article. TB and BF reviewed proposal development activities and each drafts of the result article. All authors revised the manuscript and approved the final version.

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