

FACTORS ASSOCIATED WITH PATTERNS OF BIRTH OUTCOME AT PUBLIC HOSPITALS IN MEKELLE TOWN, TIGRAY REGION, ETHIOPIA, 2013: A CASE-CONTROL STUDY

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ABSTRACT

Adverse birth outcomes in developing countries, such as Ethiopia, far outweigh those of developed countries where most pregnancies are planned, complications are few and outcomes are generally favorable for both mother and infant. Birth outcomes are the most important vital statistics used to assess maternal and child health programmes. The aim of this study was to assess Patterns and associated factors of birth outcomes at public hospitals in Mekelle town. A hospital based case control study was done in April 2013 at public hospitals in Mekelle town, Tigray regional state. Cases were mothers who had adverse birth outcomes during delivery in hospitals between January, 2011 to December, 2012 and controls were mothers who gave normal live birth in the same hospitals during same period. Simple random sampling method was used to select the case and controls. A ratio of three controls to one case was considered to assure sufficient sample size. Data were entered, cleared and analyzed using SPSS window 20. Bivariate analysis was used to determine an association between categorical variables and multiple logistic regressions was used to identify factors association with adverse birth outcomes.

Keywords: *Patterns, birth outcomes, associated factor*

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INTRODUCTION

Deaths of both mothers and infants are concentrated in the period spanning the onset of labor through the first 28 days postpartum. During those few weeks, most maternal deaths (except those due to unsafe abortion) and almost two-thirds of infant deaths occur. The intrapartum period is the most likely time for late fetuses to die. Labor is also particularly perilous for the fetus in rural areas, where few women receive skilled assistance at childbirth. Neonates are at greatest risk in the 48 hours after birth. For mothers, both periods are of high risk [1].

Worldwide, approximately 210 million women become pregnant annually; 130 million of these pregnancies result in live infant births, while the remaining 80 million result in fetal loss (stillbirths or abortions)[2]. According to WHO estimation, in 2006, the stillbirth rate was estimated to be 24 per 1000 births worldwide and 32 per 1000 births in Africa [3].

Adverse birth outcomes that have been reported include: stillbirth, preterm birth, low birth weight, congenital abnormalities, and perinatal death. Low birth weight and preterm births are important adverse outcomes of pregnancy as they are both significant in determining neonatal morbidity and mortality, inhibited growth and cognitive development, and chronic diseases later in life. More than 20 million infants worldwide, representing 15.5% of all births are born with low birth weight, 95.6% of which are in developing countries. The level of low birth weight in developing countries (16.5%) is more than double than in developed regions (7%). studies also showed that congenital abnormalities during the embryonic or fetal developmental stages occur in 3% to 6% of the general population of the World [4].

About eight million perinatal deaths are reported annually in the world almost all (98.0%) is in developing countries, and nearly five million neonates die each year in the world

of which 96% are in developing countries. Perinatal and neonatal deaths are the most significant contributors to infant's mortality and reduced life expectancy. Perinatal mortality in the developed world indicates a rate of 10/1000 live births (LB) or less, while in developing countries perinatal mortality range from 35/1000 LB to 100/1000 LB. The underlined direct causes of these deaths relate to the health and nutritional status of the woman during pregnancy, the quality of care during pregnancy and delivery and the immediate care of the newborn [5].

Ethiopian demographic and health survey 2011 showed that national perinatal mortality rate is 46 per 1,000 pregnancies of seven or more months of gestation. The perinatal mortality rate is higher among births to young mothers (less than 20 years of age) as well as among births that occur less than 15 months after the previous birth [6].

Despite the fact that maternal health care utilization is essential for further improvement of maternal and child health little is known about the current patterns of birth outcomes and associated factors. This paper therefore aimed to fill this gap using data from women attended birth at public hospitals for the period of 2011 – 2012 in Mekelle Town, Tigray region, Ethiopia.

METHODS

Study area and study population

The study was conducted in Mekelle town Tigray regional state. Tigray regional state is located at the northern part of the country. The region shares common borders with Eritrea in the north, the State of Afar in the east, the State of Amhara in the south, and the Republic of the Sudan in the west. It has an estimated area of 50,000 square kilometers. The region is divided into four zones and it has 47 Weredas (districts); out of which 35 are rural and 12 are urban. Mekelle is the capital city of the region.

The region has an estimated total population of 4,565,000 consisting of 2,314,000 (50%) females. Eighty percent of the population is estimated to be rural (Ethiopian census 2007) and about 85% of the populations are farmers. The majority of the population is Christian. According to the data from Tigray Health Bureau, it has 5 zonal hospitals, 7 district hospitals, one referral university hospital, and 211 health centers. According to 2011 EDHS report, Tigray region antenatal care coverage was 50.1%, birth attended by skilled health personnel 11.6%, with 2.9% caesarean section, postnatal care coverage 13.1%, contraceptive prevalence rate 22.2 %, with total fertility rate 4.6, neonatal mortality rate was 44 deaths per 1,000 live births, post-neonatal mortality rate was 20 deaths per 1,000 live births, perinatal mortality rate was 51 deaths per 1,000 live births [6].

Case control study designed was used and women of reproductive age from the ages of 15 to 49 years who gave birth between January 1st, 2011 and December 31st 2012 were included.

The study has been conducted on 85 cases (women who had adverse birth outcome) and 255 controls (women who had normal birth outcome) total 340 randomly selected women who gave birth in 3 public Hospitals (Mekelle, Ayder and Kwuiha hospital) were included in the study.

All charts of mothers who gave birth of neonates with adverse birth outcomes and charts of mothers who gave normal child birth and those with complete information were eligible.

Sample size calculation and data collection procedures

A two population proportion formula (stat calc EPI info 7.1.1) was used to estimate the sample size required for the study. The following assumptions were considered to estimate sample size required for the study. A 95%

confidence level and 80% power were used. Since there is no data found on total adverse birth outcomes either for national or regional level, 50% was used as exposure variable to detect an odds ratio of 2.12 and case: control ratio of 1:3. The final estimated sample size was 85 for cases and 255 for controls totally 340. Cases and controls were selected with systematic random sampling from the same period registration log books respectively.

The data was collected from clinical records of mothers' and newborns' (registration log books and individual cards) using a structured data collecting format. Selected mothers' cards were traced through the hospitals' registry book. This data collection format was developed commencing questions extracted from DHS, WHO questionnaires & other literatures [2, 3, 5, 6].

This structured checklist has been prepared in English and tested before actual data collection at health institution different from targeted facilities, which was Wukro Hospital. Some of the data collected were included maternal age, residence, pregnancy and delivery history (gravidity, antenatal care, mode of delivery, and condition of the new born at birth), obstetric and medical complications of the mother. The data was collected by 4 nurses and midwife nurses who were trained for one day ahead of data collection on the proper application of the data collection tool. The principal investigator and one trained senior nurse had supervised every day data collection process and all inconvenient circumstances were correct during data collection. Data collection was held from April 14 to 30, 2013.

Quality control measures

The quality of data was assured by applying properly designed and pre-tested data collection format; the tool was pre-tested at Wukro hospital one week before the actual data collection to establish its ability to elicit

relevant information. Five percent of the sample size (5 cases and 15 controls) was collected for pre-test. In addition, training was given for data collectors and supervisor and Proper categorization, coding of the questions was mad. Finally data collectors were closely followed by the supervisor and principal investigator.

Data analysis

The data was coded, entered and cleaned in SPSS version 20.0 computer software program. Then, data was checked for consistency and completeness using logic checks and exploratory data analysis before running the actual statistical analysis. Inconsistent values was double checked against the filled checklist and corrected as necessary.

Frequencies were used to see the overall distribution of the study subjects with regard to the variables under the study. Bivariate logistic regressions were used to assess the crude association and to select important variables included in the model. Finally, multivariate logistic regressions were used to control possible confounders and identify independent predictors of birth outcomes. Odds Ratio (OR) and their 95% Confidence Interval (CI) were used to measure the association. A significance level of 0.05 was used to decide the significance of statistical tests. Finally the results were presented in text, table and graphs.

Ethical consideration

An ethical clearance was obtained before conducting this research from Mekelle University College of Health Sciences Institutional Review Board (IRB). To carry out this study permission was obtained from the Tigray Regional Health Bureau. The hospitals included in this study were asked permission using formal letters from the university and Tigray Regional Health Bureau. Furthermore, confidentiality

and anonymity was assured by analyzing and disseminating the findings in aggregate.

The study was designed to benefit mothers and society at large and it was processed without affecting the well-being of included participants as this study utilizes secondary data that are de-identified and is not traceable to any individual.

RESULT

Socio-demographic characteristics of participant mothers

A total of 85 women (cases) and 255 controls were included in the study. The mean age among the cases was 28.2 (SD+ 6.12) years (range 15 to 41), and among the controls 25.7 (SD+ 5.71) years (range 17 to 45). Majority of the study subjects 213(83.5%) of the controls and 65(76.5%) of the cases were Tegar in ethnicity followed by Amhara 14(16.5%) of the cases and 34(13.3%) of the controls. In addition 67.1% of cases and 32.5% controls were living in rural area. With regard to their marital status, about 60(70.6%) of the cases and 182(71.4%) of the controls were married. Majority of the respondents, 216 (84.7%) of the controls and 73 (85.9%) of the cases were followers of Orthodox Christianity followed by Muslim who accounts 7(8.2%) of the cases, 17 (6.7%) of the controls respectively. Majority of the mothers, 36 (42.4%) of the cases and 61(23.9%) of the controls, were housewives. More than 52% of the cases and 36% of the controls had no education (Table 1).

Obstetric history of the study subjects

The mean number of pregnancy for cases and controls was 3.3 and 2.2 respectively. The study also revealed that the proportion of women who received at least one ANC service was higher among controls 173 (67.8%) than cases 41(48.2%), and among cases only 47.1% had at least one injection of tetanus immunization compared to 63.9% controls that have got

tetanus vaccination during index pregnancy. Nearly two-thirds (68.6%) of the controls and 29.4% of cases were gave birth at term. Fifty six (65.9%) of the cases and 151 (59.2%) of the controls were delivered with spontaneous vaginal delivery. Eleven (12.9%) of the cases women and 7(2.7%) of the controls were experienced at least one complication during pregnancy. This study also demonstrated that fifteen (17.6%) of the cases and 9(3.5%) controls were experienced at least one complication during index child delivery. Concerning other pre-existing maternal health problems (such as cardio-vascular disorders, anemia, HIV/AIDS, etc) that was recorded during index pregnancy, and about eight percent of cases and around six percent of controls had one of these health conditions (Table 2).

Patterns of Birth outcomes of index pregnancies among Cases

This study investigated the common birth outcomes, normal term births (controls) and adverse birth outcomes (cases). Perinatal death takes majority of adverse birth outcomes comprising 62.4% of cases and out of total of 53 perinatal deaths about 98% were still births. Preterm births and low birth weight takes second and third common adverse birth outcomes respectively (Table 3). During the study period patterns of birth outcomes were almost stable. This study also indicated that perinatal deaths were 22(62.9%) for 2011 and 31(62.0%) for 2012 (Figure 1)

Results from the Multivariate Analysis

Variables considered for multivariate were those with a p-value <0.2 at bivariate analysis and these included age, residence, ethnicity, maternal education, maternal occupation, attainment of antenatal care services, tetanus immunization, pregnancy number, mode of delivery, pregnancy complications and

complications during labor and delivery . Under multivariate analysis it was found women who lived in urban areas were (AOR = 0.27; 95%CI 0.131 – 0.553) less likely to get neonates with adverse outcome compared to women who lived in rural areas. Other factors which independently associated with adverse neonatal outcome were grand multigravidity, adverse history of pregnancy complications and complication during labor and delivery. The information is summarized in table 6 below (Table 4)

DISCUSSION

This study was aimed to assess patterns of birth outcomes and associated factors in public hospitals of Mekelle Town, Tigray regional state. The finding of this study indicated the impact of women's education, age, receiving antenatal care, residence, gravidity, mode of delivery, pregnancy and labor complications including pre-existing health problems on birth outcomes. There were differences among the cases and controls in relation to the above variables. In this study the mean age of the study subjects were 28.2 years (cases) and 25.7 years for controls. The finding of this study shows that the patterns of birth outcomes were almost stable for each year.

In this study perinatal death takes majority of adverse birth outcomes accounting 62.4% of cases and indicating that perinatal mortality rate of 156 per 1000 live births which is closure to result of the study done in Hawassa which was 85 per 1000 live births and developing World prevalence which can exceed 100 per 1000 live births [5, 7]. This is probably because most of the mothers of the cases in this study and other hospital based studies came very late and with serious obstetric complications. As a result, such hospital based perinatal death studies may not reflect rather may overestimate the actual perinatal mortalities at the community level, which was also noted by

previous investigator as a potential for selective referral bias [7]. But this result was far from figures of developed World (10/1000), EDHS 2011 result of 46 per 1000 live births and Sub-Saharan Africa 41 per 1000 live births [3, 6, 8]. On the other hand probably because of better care provided for the neonates in the hospitals the stillbirth to early neonatal death ratio (52:1) in this study was the reverse of EDHS 2011 report in which was close to 1:2[6]. And it was comparable with results of studies in Hawassa teaching hospital and TikurAnbessa referral hospital showed that the stillbirths share was 87% and 77.2% respectively[7, 9]. However, this finding has to be interpreted very cautiously. Firstly, some of the newborns discharged from the study hospitals as healthy probably died at home during the first week of their life. Secondly, being the study retrospective (case-control) by design is a limitation to capture all early neonatal deaths that usually occur in the neonatal units.

Another finding of this study was the low birth weight which 15 (4.4%) were low birth weight and this finding was lower than figures of an overview of the epidemiology of adverse pregnancy outcomes done in 2003 in USA revealed that Worldwide 15.5%, in developing 16.5% and in developed World 7% of all births were low birth weight [4].

Preterm defined birth as any delivery of a viable pregnancy at less than 37 completed weeks of gestation (<259 days) and more than 23 completed weeks of gestation. In this study 26(7.6%) were found to be preterm. This finding was comparable with results 2005 WHO report which described that preterm birth was 9.6% worldwide, 6.2% in Europe, 10.6 in North America and 11.9% in Africa[10].

Another adverse birth outcome that was described in this study was congenital anomaly which accounted 0.3% and which is comparable with study conducted in Nigeria that showed congenital malformation was

0.4%[11]. This finding is far away from findings of studies carried out in United states that indicated worldwide congenital anomalies were 6% and in United Kingdom which showed 3.3% of births were congenital anomalies [4, 12].

Reasons were also mentioned in various literatures conducted in developing countries influencing adverse birth outcomes at the intrapersonal or individual level are among the most often studied. These factors include biological and psychological factors, such as maternal demographic factors, maternal medical factors, infections, and multiple births. At the interpersonal-level, factors such as marital status can be identified. The organizational level influences might include work conditions. At the level of community, factors such as ethnicity may have impacts. According to this study maternal age, religion, ethnicity, education and occupation were not found to be statistically significant.

Results of the multivariate logistic regression in this study showed that those mothers who lived in urban 76 % less likely to develop adverse birth outcome as compared to those mothers who lived in rural area. This finding was consistent with a study done at Hawassa teaching hospital which indicated that, having as many perinatal deaths were mainly from rural areas[7]. This might be due to distance naturally prevents mothers from doing so even if they are knowledgeable of the benefits of antenatal care services but deprives them the opportunity for early identification and management of pregnancy related problems and may further influence their choice of place of deliver and also lack some health services.

This study shows that those primigravida mothers 21% less likely to develop adverse birth outcome as compared to grand multigravida mothers. This finding was similar with study done in USA Indiana showed that in 2003-2005,

preterm rate was 15.4 percent among fourth- or higher-order births compared to 13.5 percent among third order and 12.2 percent among first and second order births[13]. This might be due to that family size affects the demand for family resources (foods, housing, maternal care and attention, medical and health care for the children within the family). Sharing of the meager resources among closely spaced children may affect the health of younger and elder siblings. The nutritional status of the mother may be eroded by a rapid sequence of pregnancy and period of lactation, so that the health of younger siblings may be affected, therefore poor maternal nutritional status increase the risk of premature and low birth infants with lower chance of survival.

This study also shows that those mothers who developed complication during pregnancy 5.27 times more likely to develop adverse birth outcome as compared to those mothers who don't develop complication during pregnancy. This study also shows that mothers who develop complication during labour & delivery 3.82 times more likely to develop adverse birth outcome as compared to those mothers who don't develop complication during labour and delivery. This finding was also comparable with study done in Hawassa teaching hospital which revealed obstructed labor, malpresentation, preterm birth, antepartum hemorrhage and hypertensive disorders of pregnancy were independent predictors for high perinatal mortality[7].

Contrary to the above birth outcome predictors, maternal age, ethnicity, religion, education, occupation, attainment of prenatal care and tetanus immunization and mode of delivery were not among independent predictors of birth outcomes. This finding is different from findings of studies conducted on determinants of birth outcomes in different parts of the world indicated these

factors were associated with birth outcomes[14-19].

Strength of the study

The reliability of the data was maintained by: Prior training of data collectors and the supervisor; Regular supervision by principal investigator, and Using pre tested data collection format.

Limitation of the study

The most important limitation was the challenge to get adequate data concerning birth outcomes, even the available information lacks consistence.

Exclusion of participants who do not have complete information could have resulted in selection bias and thus impacted on the results. Selection bias could have affected the accuracy of the data collected as the participants were sampled from hospitals. This might have lead to underestimation of the prevalence of adverse neonatal outcome as majority of mothers deliver at home and indeed many of them may be serviced in lower levels of health delivery.

CONCLUSION

In conclusion, this study has found that perinatal death was the highest among adverse birth outcomes and stillbirth accounts majority of these perinatal deaths. On the other hand, preterm birth was the second most adverse birth outcome followed by low birth weight and multiple births respectively. In this study, early neonatal death and congenital abnormalities were among the rare negative birth outcomes.

This study also indicated that; living in rural areas, having 5 or more pregnancy, complications during index pregnancy, and complications during labor and delivery of index child birth were found to be statistically

significant and these factors were possible predictors of birth outcomes.

On the other hand maternal age, religion, ethnicity, maternal education level, maternal occupation and maternal health seeking behaviors including antenatal care services utilization were not found to be associated with birth outcomes. Strengthening basic emergency obstetric services with special clearance. We are also grateful to Tigray regional health bureau and respective hospitals for facilitating the data collection process.

Authors' contributions

DZ designed the study, participated in the data collection, performed analysis and interpretation of data. **HB** and **VNC** assisted in

emphasis of neonatal care, maternal & child health services, use of family planning services and institutional delivery service are recommended.

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Competing interests

The authors have no competing interests.



Table 1: Socio-demographic characteristics of the cases and controls, at Mekelle public hospitals, Tigray, Ethiopia, 2011-2012.

Characteristics	Case n=85(%)	Controls n=255(%)	Total n=340(%)
Age of the mother (Years)			
15-19	7(8.2%)	23(9.0%)	30(8.8%)
20-34	60(70.6%)	201(78.8%)	261(76.8%)
>35	18(21.2%)	31(12.2%)	49(14.4%)
Mean + SD	28.19 + 6.123	25.71 + 5.711	26.33 + 5.906
Marital status			
Single	14(16.5%)	48(18.8%)	62(18.2%)
Married	60(70.6%)	182(71.4%)	242(71.2%)
Separated/Divorce/Widowed	11(12.9%)	25(9.8%)	36(10.6%)
Religion			
Orthodox Christians	73(85.9%)	216(84.7%)	289(85.0%)
Muslim	7(8.2%)	17(6.7%)	24(7.1%)
Protestant	4(4.7%)	18(7.1%)	22(6.5%)
Catholic	1(1.2%)	4(1.6%)	5(1.5%)
Residence			
Urban	28(32.9%)	172(67.5%)	200(58.8%)
Rural	57(67.1%)	83(32.5%)	140(41.2%)
Ethnicity			
Tigray	65(76.5%)	213(83.5%)	278(81.8%)
Amhara	14(16.5%)	34(13.3%)	48(14.1%)
Afar	6(7.1%)	8(3.1%)	14(4.1%)
Maternal Education			
No education	45(52.9%)	93(36.5%)	138(40.6%)
Literate	40(47.1%)	162(63.5%)	202(59.4%)
Maternal occupation			
House wife	36(42.4%)	61(23.9%)	97(28.5%)
Governmental employee	21(24.7%)	77(30.2%)	98(28.8%)
Self employee	19(22.3%)	61(23.9%)	80(23.5%)
Merchant	3(3.5%)	32(12.5%)	35(10.3%)
Student	6(7.1%)	24(9.4%)	30(8.8%)

Table 2: Obstetric history of cases and controls of the study subject at Mekelle public hospital, Tigray, Ethiopia, 2011-2012.

Variables	Cases (n= 85)	Controls (n= 255)	Total 340
Gravidity			
1	20 (29.5%)	125 (49.0%)	145 (42.6%)
2 – 4	41 (48.2%)	99 (38.8%)	140 (41.2%)
> 5	24 (28.2%)	31 (12.2%)	55 (16.2%)
Antenatal care visit			
Yes	41 (48.2%)	173 (67.8%)	214 (62.9%)
No	44 (51.8%)	82 (32.2%)	126 (37.1%)
Tetanus immunization			
Yes	40 (47.1%)	163 (63.9%)	203(59.7%)
No	45 (52.9%)	92 (36.1%)	137 (40.3%)
Mode of last delivery			
SVD	56 (65.9%)	151 (59.2%)	207 (60.9%)
SVD + Episiotomy	1 (1.2%)	40 (15.7%)	41 (12.1%)
Assisted instrumental delivery	5 (5.8%)	17 (6.7%)	22 (6.4%)
Cesarean section	23 (27.1%)	47 (18.4%)	70(20.6%)
Complication during index pregnancy			
Yes	11 (12.9%)	7 (2.7%)	18 (5.3%)
No	74 (87.1%)	248(97.3%)	322 (94.7%)
Labor complication of last birth			
Yes	15 (17.6%)	9 (3.5%)	24 (7.1%)
No	70 (82.4%)	246 (96.5%)	316 (92.9%)
Other maternal disease			
Yes	7 (8.2%)	15 (5.9%)	22 (6.5%)
No	78 (91.8%)	240 (94.1%)	318(93.5%)

Table 3: Contribution of various birth outcomes to the general adverse birth out comes at Mekelle public hospital, Tigray, Ethiopia, 2011-2012.

Various outcomes	Frequency (n)	Percentage (%)
Perinatal death	53	62.4
Stillbirths	52	61.2
Low birth weight	15	17.6
Early neonatal death	1	1.2
Multiple birth	9	10.6
preterm birth	26	30.6
congenital anomalies	1	1.2
Overall adverse birth outcome	85	100

Table 4: Multivariate analysis for associated factors with birth outcomes at Mekelle public hospital, Tigray, Ethiopia, 2011-2012.

Age (Years)	Case n=85(%)	Controls n=255(%)	COR(95%ci)	AOR(95%ci)
15-19	7(8.2%)	23(9.0%)	0.52(0.188-1.463)	1.71(0.374-7.841)
20-34	60(70.6%)	201(78.8%)	0.51(0.269-0.983)	1.10(0.429-2.605)
>35	18(21.2%)	31(12.2%)	1	1
Residence				
Urban	28(32.9%)	172(67.5%)	0.24(0.141-0.400)	0.27(0.131-0.553)*
Rural	57(67.1%)	83(32.5%)	1	1
Ethnicity				
Tigray	65(76.5%)	213(83.5%)	0.41(0.136-1.215)	1.00(0.263-3.746)
Amhara	14(16.5%)	34(13.3%)	0.55(0.161-1.874)	1.55(0.343-6.989)
Afar	6(7.1%)	8(3.1%)	1	1
Maternal Education				
No education	45(52.9%)	93(36.5%)	1.96(1.193-3.219)	0.86(0.384-1.914)
Literate	40(47.1%)	162(63.5%)	1	1
Maternal occupation				
House wife	36(42.4%)	61(23.9%)	2.36(0.88-6.321)	1.41(0.326-6.078)
Governmental employee	21(24.7%)	77(30.2%)	1.01(0.395-3.015)	1.40(0.313-5.796)
Self employee	19(22.3%)	61(23.9%)	1.25(0.444-3.498)	1.04(0.264-4.095)
Merchant	3(3.5%)	32(12.5%)	0.38(0.085-1.653)	0.27(0.040-1.861)
Student	6(7.1%)	24(9.4%)	1	1
Antenatal care visit				
Yes	41(48.2%)	173(67.8%)	0.44(0.268-0.728)	0.23(0.024-2.160)
No	44(51.8%)	82(32.2%)	1	1
Tetanus immunization				
Yes	40(47.1%)	163(63.9%)	0.50(0.305-0.824)	2.36(0.254-21.859)
No	45(52.9%)	92(36.1%)	1	1
Gravidity				
1	20(23.5%)	125(49.0%)	0.21(0.101-	0.35(0.126-

			0.421)	0.971)*
2-4	41(48.2%)	99(38.8%)	0.36(0.281-1.020)	1.12(0.467-2.663)
>5	24(28.2%)	31(12.2%)	1	1
Mode of last delivery				
SVD	56(65.9%)	151(59.2%)	0.76(0.422-1.361)	1.58(0.724-3.453)
SVD + Episiotomy	1(1.2%)	40(15.7%)	0.10(0.007-0.395)	0.18(0.020-1.550)
Assisted instrumental delivery	5(5.9%)	17(6.7%)	0.60(0.197-1.833)	0.40(0.084-1.828)
Cesarean Section	23(27.1%)	47(18.4%)	1	1
Labor complication of last birth				
Yes	15(17.6%)	9(3.5%)	3.86(2.459-13.953)	9.94(3.105-31.843)*
No	70(82.4%)	246(96.5%)	1	1
Complication of last pregnancy				
Yes	11(12.9%)	7(2.7%)	5.27(1.972-14.068)	4.85(1.414-16.610)*
No	74(87.1%)	248(97.3%)	1	1

COR = Cured Odds Ratio, AOR=Adjusted odds ratio

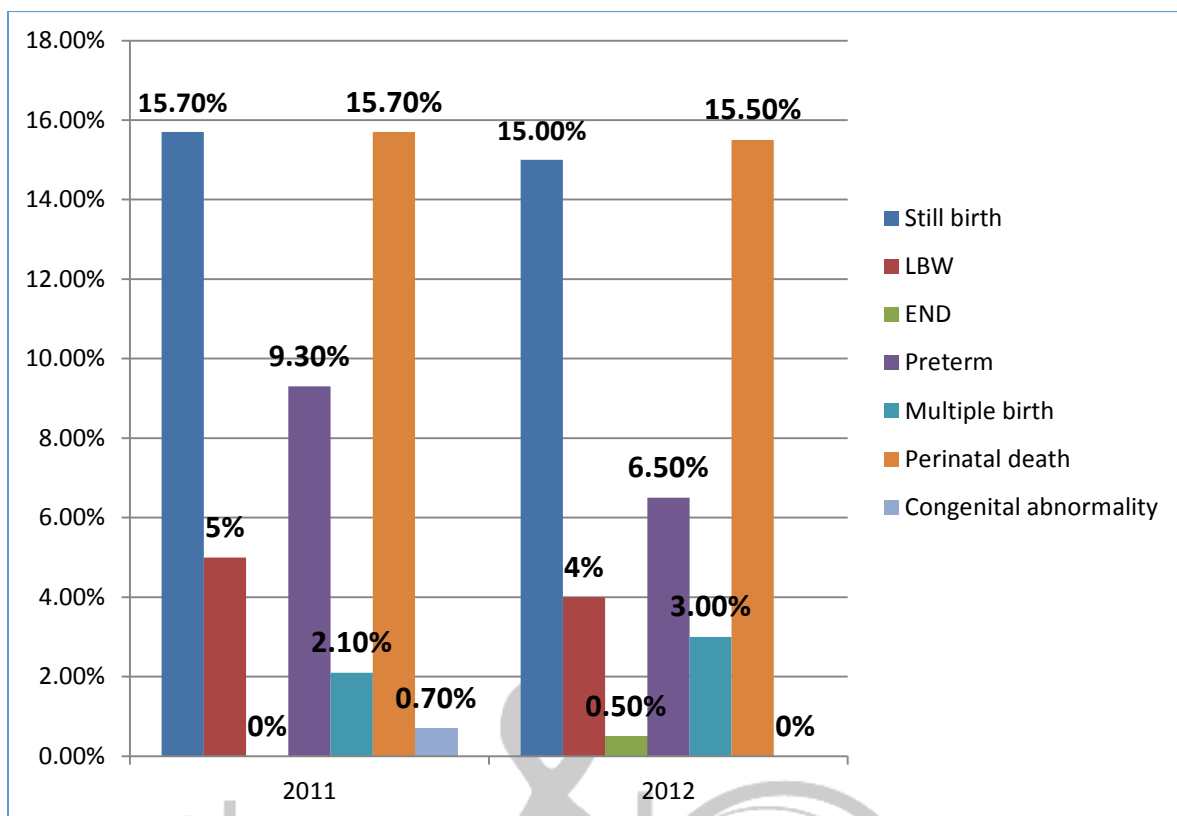


Fig 1: Patterns of birth outcomes among cases at Mekelle public hospitals, Tigray, Ethiopia 2011-2012

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