

Adverse Birth Outcome and Associated Factors among Newborns Delivered In Public Health Institutions, Southern Ethiopia

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Abstract

Background: Adverse birth outcomes are big public health problems in developing nations. However, there is limited information on it in Ethiopia. Therefore, this study was aimed to assess the magnitude of adverse birth outcomes and associated factors among newborns delivered in public health institutions of Kembata Tembaro Zone, Southern Ethiopia.

Methods: A cross-sectional study was conducted on 770 delivery records from January 31 to February 15, 2017 in randomly selected health facilities of the zone. A systematic random sampling method was used to select individual record. Data were collected by using pretested checklist and analyzed by Statistical Package for the Social Sciences (SPSS) for further analysis. Logistic regression analysis was carried out to identify factors associated with adverse birth outcomes.

Results: The magnitude of adverse birth outcome was 13.9% (95% CI: 11.1, 16.1). Lack of antenatal care follow-up (AOR=11.13; 95% CI: 3.2, 30), mal-presentation (AOR=6.08; 95% CI: 1.8, 19.9) ruptured membrane at admission (AOR=2.5; 95% CI: 1.42, 4.49), substandard monitoring of fetal heart beat (AOR=2.7; 95% CI: 1.47, 5.3), urine test not done for protein and ketone (AOR=2.13; 95% CI: 1.09, 4.16), antepartum hemorrhage (AOR=8.08; 95% CI: 2.62; 24.91), pregnancy induced hypertension (AOR=8.42; 95% CI: 2.48, 28.54) and premature rupture of membrane (AOR=6.19; 95% CI: 1.74, 21.94) were factors associated with adverse birth outcomes.

Conclusion: Adverse birth outcomes are significant health problem. Lack of antenatal care follow-up, pre mature rupture of membrane, lack of standard fetal heart beat monitoring, absence of urine for protein and ketone tests, presence antepartum hemorrhage and hypertension were identified factors. Therefore, strengthening antenatal care follow-up and proper medical care during pregnancy and delivery period are recommended.

Keywords: *Adverse Birth Outcomes; Public Health Institutions; Southern Ethiopia*

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Introduction

Adverse birth outcomes, which are like, stillbirth, Low Birth Weight (LBW), preterm birth and asphyxia remains a big challenges to maternal and neonatal health in low income countries (Ariff *et al.*, 2016). One-third of still birth occurs during birth and 99% of them take place in middle and low income countries. In sub-Saharan Africa 46.5% of stillbirth and neonatal deaths are contributed by intrapartum related events (Lawn *et al.*, 2011; Ashish K.C. *et al.*, 2016). There were also

report in 2015, preterm complications and intrapartum related events estimated to account 1.055 million neonatal deaths (Liu *et al.*, 2016). Moreover, birth asphyxia contributes for 24% neonatal deaths and the complications may range from minimal brain damage to severe neurologic disorders (Golubnitschaja *et al.*, 2011; Fottrell *et al.*, 2015; Wardlaw *et al.*, 2014).

Studies conducted in different part of Ethiopia reported significant number of adverse birth outcomes,



(Adane *et al.*, 2014; Berhan and Berhan 2014; Abdo *et al.*, 2016). The trends of stillbirth rate, early neonatal deaths, and perinatal mortality increased from 37 to 46 per 1,000 pregnancies, 26.9 to 28.7 death per 1,000 live births, 10.4 to 16.9 death per 1,000 pregnancies, respectively by the year 2005 and 2011 in Ethiopia (Central Statistical Agency (CSA and ICF, 2012). Adverse birth outcomes can affect the maternal mental health; which could be manifested with depression, anxiety, post-traumatic stress disorders, and relationship difficulties with family (Parets, *et al.*, 2014; Üstündağ- Budak *et al.*, 2015; Redshaw *et al.*, 2016; Gosis *et al.*, 2017; Rommel *et al.*, 2017). There might be also an increased risk of disability which put heavy load on families and health system (Kinney *et al.*, 2012; WHO, 2012).

There are different reports about factors associated with adverse birth outcome. Some of them were maternal age, previous history of still birth, history of prenatal death, previous history of low birth weight, twin birth, being referred from periphery, residence, lack of antenatal care, antepartum hemorrhage and pregnancy induced hypertension (Jammeh *et al.*, 2010; Adane *et al.*, 2014; Lansky *et al.*, 2014; Ota *et al.*, 2014; Abdo *et al.*, 2016)

Though there are various studies conducted in many developing countries including Ethiopia about adverse birth outcome and associated factors (Jammeh *et al.*, 2010; Adane *et al.*, 2014; Lansky *et al.*, 2014; Ota *et al.*, 2014; Abdo *et al.*, 2016). But, there is no report about adverse birth outcome and associated factors in the study area. Hence, this study assessed the adverse birth outcomes and associated factors among newborns delivered in public health institutions of Kembata Tembaro Zone, Southern Ethiopia.

Materials and Methods

Study design and setting

Institutional based cross-sectional study was conducted from January 31 to February 15, 2017 in Kembata Tembaro Zone, southern Ethiopia. Kembata Tembaro Zone is one of the central zones of the Southern Nations Nationalities and Peoples Region (SNNPR). It is located 119 km far from Hawassa capital of the SNNPR and 306 km far from Addis Ababa capital of Ethiopia. It has one general hospital, three primary hospitals and 31 health centers. All of them were

providing delivery services during the study period. The zone has a total of 844 obstetrics care providers in different level of facilities.

Sample size determination and sampling techniques

Sample size was determined by using the assumptions of 95% CI, 80% power, exposed to unexposed ratio of 1, proportion adverse birth outcome among those pregnant moth who are with and without of antenatal care(ANC) from previous studies and design effect of 1.5 (Abdo *et al.*, 2016. The final sample size for this study was 770.

A multi-stage sampling technique was used to allocate the final sample size. Initially, the health institutions in the zone were categorized in to general hospital, primary hospitals and health centers. Then, one health institutions were selected randomly from each category; namely: Durame general hospital, Shinshicho primary hospital and Adilo health center. The final sample size was allocated proportionally based on number deliveries in the selected health institution. There was a total of 698, 489 and 394 deliveries in Durame general hospital, Shinshicho primary hospital and Adilo health center respectively from September 01/2016 to December 30/2016. Finally, records like maternal delivery, integrated maternal and new born health card and referral registrations was selected by systematic random sampling technique using delivery registration as sampling frame from the selected public health institutions.

Inclusion and exclusion criteria

Maternal delivery, integrated maternal and new born health card and referral registration. Records with incomplete information recorded were excluded.

Data collection method

The data was collected by using pretested and structured checklist which was developed after reviewing relevant literatures related to the problem under study (Jammeh *et al.*, 2010; Abdo *et al.*, 2016; Adane *et al.*, 2014). The checklist used to assess factors like demographic and obstetric (27 items), partograph related (14 items), maternal complications and intervention factors (9 items) and birth outcomes assessment (10 items). The condition of the baby such as Apgar score was also assessed and APGAR scores of = 7 was be considered satisfactory in this study. All information's

were extracted from maternal delivery record, integrated maternal and new born health card and referral registrations by first degree midwives.

Data quality control

The instrument was pretested by trained data collectors in Durame health center among 38 records before actual data collection and few modifications were made.

Operational definition

Adverse birth outcomes: a birth with birth weight of <2500gm (low birth weight), stillbirth, Apgar score of <7, admission to neonatal intensive care unit (NICU), preterm birth, birth asphyxia, or death after birth.

Still birth: dead birth after 28th week of gestation and before the expulsion from uterus and taken as recorded in the record

Partograph filled to standard: the progress of labour, maternal condition and fetal condition was filled with no omission in the manner recommended by WHO guideline.

Partograph filled to substandard: the progress of labour, maternal condition and foetal condition filled on records not meeting any one of the WHO protocol standards or with parts misplaced/missing or inadequate for each parameter of the partograph.

Partograph not recorded: no information was documented on the parameters of the partograph

Index delivery: current birth.

Data analysis

The data was checked for completeness and consistency, and entered to EpiData software Version 3.1 then exported to Statistical Package for the Social Sciences (SPSS) version 20 for further analysis. Descriptive statistics was used to present the frequencies, proportion and summary statistics. Bivariate and multivariable logistic regression analysis was carried out to control possible confounders and identify factors associated with adverse birth outcomes. Finally variables with p-value less than 0.05 in multivariable logistic regression analysis considered as significant factors associated with adverse birth outcomes.

Ethical Considerations

Ethical clearance was obtained from Haramaya University, College of Health and Medical Science, Institutional Health Research Ethics Review Committee (IHRERC) with IHRERC number IHRERC/052/2017.

The permission and agreement consent was obtained from Southern Nations, Nationalities and Peoples Regional Health Bureau, Kembata Tembaro Zone Health Department and selected health institutions prior to the study. Each individual's personal identifying information was not extracted from the retrieved records.

Results

Socio-demographic and obstetric characteristics of study participants

A total of 718 records were retrieved with response rate of 93%. Mean \pm -SD of the study participants age were 25.46 \pm 4.49 years with range of 15-40. Most of the mothers were from rural (66%), married (96.9%), had antenatal care (ANC) follow-up (96.9%), gravidity two to four (61.1%), no past history of still birth/neonatal loss (95.4%) and with spontaneous vaginal delivery (92.6%) (Table 1).

Around three-fourth of the study participants 532 (74.9%) admitted to labor ward at active 1st stage of labor. Fifty two (7.2%) had encounter mal-presentation and 152(15.1%) had ruptured membrane on admission (Table 2).

Of all the respondents 436(60.7%) of the partograph filled to substandard and 282(39.3%) filled to standard. From the major components of the partograph fetal heart beat monitored to standard in 505(70.3%) of the respondents, whereas descent were the least monitored to standard 290(40.4%). Grade of moulding were 0 in 421(66.6%), +1 to +2 in 203(32.1%) and +3 in 8(1.3%). Urine test for protein and ketone was done in 629(87.6%); action was taken in 60(93.5%) of the action line crossed (Figure 1).

From the total respondents 117(16.3) had maternal complications, of which prolonged labor 62(8.6%), Antepartum hemorrhage (APH) 18(2.5%), pregnancy induced hypertension (PIH) 18(2.5%), PROM (premature rupture of membrane) 17(2.4%).

Magnitude of adverse birth outcomes

The overall adverse birth outcome in this study was 100 (13.9%) (95% CI: 11.1, 16.1). Of the adverse birth outcomes, Apgar score 6 or less at the 1st minute of life 64(9.2%), birth asphyxia 62(8.9%), still birth 24 (3.3%), early neonatal death 1(0.1%), preterm birth 13(1.8%), LBW 14 (2.02%), and admission to NICU 15(2.16%).

Table 1: Demographic and obstetric characteristics of the mothers visiting Public Health Institutions for delivery at Kembata Tembaro Zone, Southern Ethiopia, 2017.

Variable	Category	Frequency	Percentage
Residence	Urban	244	34
	Rural	474	66
Age category	<18	34	4.7
	18-35	674	93.9
	>35	10	1.4
Marital status	Married	696	96.9
	Single	12	1.7
	Divorced	5	0.7
	Widowed	5	0.7
ANC follow-up	Yes	696	96.9
	No	22	3.1
Number of ANC visit (n=696)	One	74	10.6
	Two	291	41.9
	Three	208	29.9
	Four and above	123	17.6
Gravidity	1	216	30.1
	2-4	439	61.1
	>=5	88	8.8
Parity	0	222	30.9
	1-4	456	63.5
	>=5	40	5.6
History of still birth/neonatal loss	Yes	33	4.6
	No	685	95.4
History of ≥ 3 consecutive abortions (n=502)	Yes	0	0
	No	502	100
Past history of LBW (n=337)	Yes	2	0.6
	No	335	99.4
Past history of PIH (n=502)	Yes	2	0.38
	No	500	99.6
Past history of surgery of reproductive tract (n=502)	Yes	17	3.4
	No	485	96.6
Urine test for infection (n=604)	Positive	3	0.5
	Negative	601	99.5
Rapid Syphilis test (n=505)	Positive	1	0.2
	Negative	504	99.8
Anemia by hemoglobin test or pallor (n=696)	Yes	24	3.4
	No	672	96.6
Iron folate supplementation ANC (n=696)	Yes	581	83.5
	No	115	16.5
Mode of past delivery (n=502)	SVD	480	95.6
	CS	17	3.3
	Instrumental	5	1.1

*ANC-antenatal care, PIH-pregnancy induced hypertension, LBW-low birth weight, SVD- spontaneous vaginal delivery, CS-cesarean section

Table 2: Intrapartum characteristics of the mothers visiting Public Health Institutions for delivery at Kembata Tembaro Zone Southern Ethiopia, 2017.

Variable	Category	Frequency	Percentage
Stage of labor at admission	Latent 1 st stage	132	18.4
	Active 1 st stage	532	74.9
	2 nd stage	48	6.7
Mal-presentation	Yes	52	7.2
	No	666	92.8
Presentation	Vertex	666	92.8
	Brow	24	3.3
	Face	9	1.3
	Breech	19	2.6
Membrane status on admission	Ruptured	152	21.2
	Intact	566	78.8
Amniotic fluid color(n=152)	Blood stained	23	15.1
	Meconium stained	33	21.7
	Clear	96	63.2
Gestational age at the onset of labor	Preterm	13	1.8
	Term	705	98.2
Mode of current delivery	SVD	515	71.7
	CS	119	16.6
	Instrumental	84	11.7
Sex of newborn	Male	388	54.1
	Female	319	44.4
	Both(male and female in twin birth)	11	1.5
Twin birth	Yes	27	3.8
	No	691	96.2
Time spent of the active phase of labor	<=12hrs	656	91.4
	>12hrs	62	8.6

* SVD- spontaneous vaginal delivery, CS-cesarean section

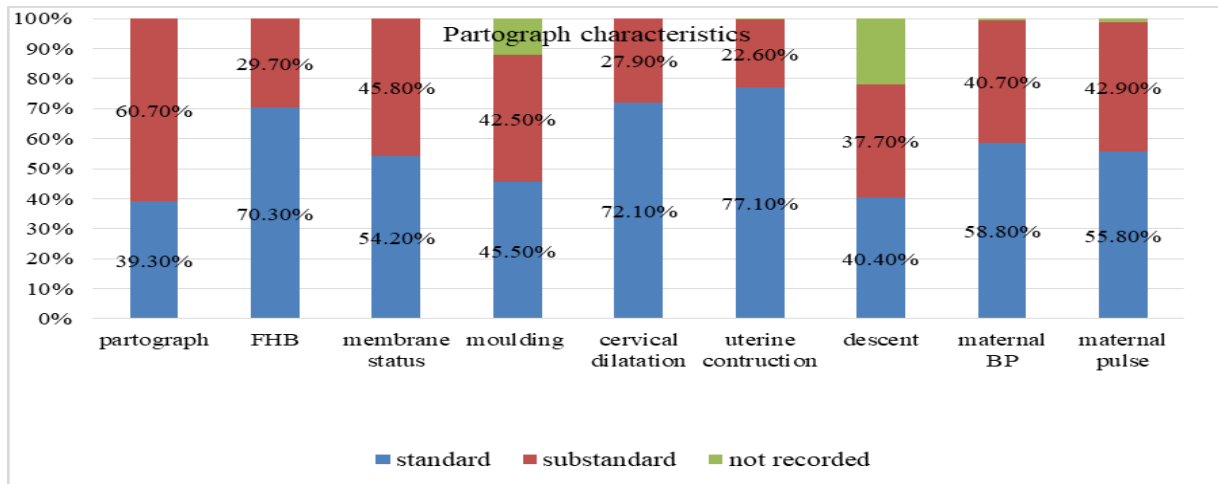
Factors associated with adverse birth outcomes among mothers

Eighteen independent variable were included in the bivariate analysis and fifteen of them were included in the final model. ANC follow-up, mal-presentation, membrane status at admission, FHB monitoring, urine test for protein and ketone during labor, Ante-partum hemorrhage, pregnancy induced hypertension (PIH), premature rupture of membrane (PROM) were factors significantly associated with adverse birth outcomes.

Newborns whose mother have no ANC follow-up were eleven times more likely to have adverse birth outcomes than newborns whose mother have ANC follow-up (AOR=11.13; 95% CI: 3.76, 32.9). Newborns whose mother present with mal-presentation (presentation other than vertex) were two more likely to have

adverse birth outcomes than their counter-parts (AOR=2.38; 95% CI: 1.62, 5.52). Newborns whose mother presented with ruptured membrane at admission were two times more likely to have adverse birth outcomes than newborns whose mother presented with intact membrane at admission (AOR=2.50; 95% CI: 1.42, 4.49).

Newborns whose fetal heart beat monitored to substandard were three times more likely to have adverse birth outcomes than newborns whose fetal heart beat monitored to standard (AOR=2.90; 95% CI: 1.68, 5.26), and newborns whose urine of mother not tested for protein and ketone were two times more likely to have adverse birth outcomes than newborns whose urine of mother tested for protein and ketone (AOR=2.07; 95% CI: 1.09, 3.92).



*FHB=fetal Heart Beat, BP= blood pressure

Figure 1: Partograph related characteristics of the mothers in Public Health Institutions of Kembata Tembaro Zone Southern Ethiopia, 2017.

Regarding to variables grouped in maternal complication and interventions; newborns whose mother had APH were eight times more likely to have adverse birth outcomes than newborns whose mother had no APH (AOR=8.08; 95% CI: 2.62, 24.91). Newborns whose mother had PIH were eight times more likely to have adverse birth outcomes than Newborns whose mother had no PIH (AOR=8.42; 95% CI: 2.48, 28.54). Newborns whose mother had PROM were six times more likely to have adverse birth outcomes than Newborns whose mother had no PROM (AOR=6.19; 95% CI: 1.74, 21.94) (Table 3).

Discussion

The magnitude of adverse birth outcomes was found to be 13.9 % (95% CI: 11.1, 16.1). Moreover, ANC follow-up, mal-presentation, membrane status at admission, FHB monitoring, urine test for protein and ketone during labor, APH, PIH, PROM were factors significantly associated with adverse birth outcomes. The magnitude adverse birth outcome was 13.9%. This is consistent with study done in Gambia which was 15.6% (Jammeh *et al.*, 2010). The finding was lower than study conducted in Hossana, Ethiopia (24.5%) (Abdo *et al.*, 2016) and Gondar (23%) (Adane *et al.*, 2014) and Ghana (19%) (Asundep *et al.*, 2013). Whereas the magnitude was higher than studies report from Ethiopia (25.5%) (Which is on still birth)

(Berhie and Gebresilassie, 2016), Kenya (12.3%) (Muchemi, Echoka & Ma-kokha, 2015), Lao (12%) (Olsen *et al.*, 2016) and China (6.1%) (Chen *et al.*, 2013). The variations may due the maternal health service quality, logistic parameters, the time variations and the study and place of delivery.

This study revealed that newborns whose mother had no ANC follow-up were more likely to have adverse birth outcomes than newborns whose mother who had ANC follow-up. This finding was consistent with the study conducted in Gambia and Ethiopia in Hossana and Gondar (Jammeh *et al.*, 2010; Adane *et al.*, 2014; Abdo *et al.*, 2016). Similarly, newborns whose mother presented with mal-presentation were more likely to have adverse birth outcomes than newborns whose mother presented with vertex presentation. This could be due the fact that mal-presentation can lead to obstructed or prolonged labor which could lead to adverse birth outcome (FMOH, 2010).

Newborns whose fetal heartbeat monitored to substandard were more likely to have adverse birth outcomes than newborns whose fetal heartbeat monitored to standard. This result is consistent with studies conducted in Uganda and Tanzania (Nyamtema *et al.*, 2008; Ogwang *et al.*, 2009). Fetal heartbeat is an indicator of fetal wellbeing, thus, fetal heartbeat not monitoring to standard can delay action.

Table 3: Factors associated with adverse birth outcomes of mothers visiting Public Health Institutions for delivery at of Kembata Tembaro Zone Southern Ethiopia, 2017 (n=718).

Variable	Category	Adverse Birth Outcomes		COR (95% CI)	AOR (95% CI)
		Yes Freq. (%)	No Freq. (%)		
ANC follow-up	Yes	86(12.3)	610 (87.7)	1	1
	No	14(63.6)	8 (36.4)	12.4(5.08, 30)	11.13(3.7, 32.9)***
Gravidity	1	40(18.5)	176(81.5)	1.074(0.515, 2.24)	1.148(0.474, 2.778)
	2-4	49(11.2)	390 (88.8)	0.59(0.29, 1.2)	0.70(0.30, 1.63)
	>=5	11(17.5)	52 (82.5)	1	1
Stage of labour at admission	Latent 1 st stage	28 (21.2)	104 (78.8)	1	1
	Active 1 st stage	61(11.3)	477(88.7)	0.47(0.29, 0.77)	0.56(0.31, 1.00)
	2 nd stage	11(22.9)	37(77.1)	1.14(0.5, 2.4)	0.48(0.17, 1.38)
Mal-presentation	Yes	14 (26.9)	38(73.1)	2.48(1.29, 4.77)	2.38(1.02, 5.52)*
	No	6 (1.0)	580 (99.0)	0.402(0.2, 0.77)	1
Status of membrane at admission	Ruptured	39(25.7)	113(74.3)	2.8(1.82, 4.48)	2.50(1.42, 4.49)*
	Intact	61(10.8)	505 (89.2)	1	1
Mode of current delivery	SVD	58(11.3)	457 (88.7)	1	1
	CS	30(25.2)	89 (74.8)	2.6(1.6, 4.3)	1.89(0.82, 3)
	Instrumental	12(14.3)	72(85.7)	1.30(0.60, 2.50)	0.93(0.41, 2.17)
Twin birth	Yes	8(29.6)	19(70.4)	1	1
	No	92(13.3)	599 (86.7)	0.36(0.15, 0.86)	0.39(0.14, 1.10)
Time spent of active phase labour	<=12hrs	86 (13.1)	570 (86.9)	1	1
	>12hrs	14 (22.6)	48(77.4)	1.90(1.02, 3.65)	1.47(0.60, 3.30)
Fetal heart beat monitored	Standard	51(10.1)	454 (89.9)	1	1
	Substandard	49 (23.0)	164(77.0)	2.60(1.70, 4.10)	2.90(1.60, 5.26)***
Cervical dilatation monitored	Standard	65(12.5)	453 (87.5)	1	1
	Substandard	35(17.5)	165 (82.5)	1.40(0.90, 2.30)	0.62(0.33, 1.19)
Urine tested for protein and ketone during labour	Yes	74(11.8)	555 (88.2)	1	1
	No	26 (29.2)	63 (70.2)	3.09(1.84, 5.20)	2.07(1.09, 3.90)*
APH	Yes	9 (50.0)	9 (50.0)	6.69(2.58, 17.30)	8.08(2.60, 24.9)***
	No	91(13)	609 (87)	1	1
PIH	Yes	10(55.6)	8 (44.4)	8.40(3.25, 22.30)	8.42(2.48, 28.50)**
	No	90(12.9)	610 (87.1)	1	1
PROM	Yes	10(58.8)	7 (41.2)	9.69(3.6, 26.12)	6.19(1.75, 21.95)*
	No	90(12.8)	611(87.2)	1	1
Oxytocin augmentation/ Induction	Yes	7(35)	13(65)	1	1
	No	93(13.3)	605 (86.7)	0.28(0.10, 0.70)	1.07(0.28, 4.04)

*ANC-antenatal care, PIH-pregnancy induced hypertension, APH-antepartum hemorrhage, and PROM-premature rupture of membrane, SVD- spontaneous vaginal delivery, and CS-cesarean section

Urine test help for early diagnosis of complication and lead to early management. It could also tell us whether the mother is dehydrated or not because dehydration could lead to poor progress of labor and result in adverse birth outcomes (FMOH, 2013). In this study, newborns whose urine of mother not tested for protein and ketone during labor were more likely to have adverse birth outcomes than their counterparts.

Antepartum hemorrhage (APH) is the result of threat, partial or total detachment of placenta which can lead to adverse birth outcomes. In this study, newborns whose mother have APH were more likely to have adverse birth outcomes than newborns whose mother had no APH. This result was consistent with the study conducted in Gondar Ethiopia, Brazil and Bangladesh and (Adane *et al.*, 2014; Lansky *et al.*, 2014; Khanam *et*

al., 2017). Likewise newborns whose mother has pregnancy induced hypertension (PIH) were more likely to have adverse birth outcomes than newborns whose mother have no PIH. This result consistent with studies conducted in Gondar Ethiopia, Brazil, China, Bangladesh and WHO multicenter secondary analysis study (Chen *et al.*, 2013; Adane *et al.*, 2014; Lansky *et al.*, 2014; Ota *et al.*, 2014; Khanam *et al.*, 2017).

Newborns whose mother presented with ruptured membrane at admission were more likely to have adverse birth outcome than newborns whose mother presented with intact membrane at admission. This could be due to ruptured membrane can lead to complication like cord prolapse this could lead to adverse birth outcome like still birth (FMOH Ethiopia, 2013). Since, amniotic fluid is important to fetal movement and lung expansion of the fetus. In the current study, newborns whose mother has PROM were more likely to have adverse birth outcomes than newborns whose mother have no PROM. This result was consistent with study from Brazil, China and Kenya (Chen *et al.*, 2013; Lansky *et al.*, 2014; Muchemi, Echoka & Makokha, 2015).

This study assessed adverse birth outcome through retrospective document review. Records might not necessarily reflect the exact conditions of the women's and the outcome. This could underestimate the magnitude the outcome.

Conclusion

The magnitude of adverse birth outcome in this study was found to significant child and mother's health problem. Mother with lack of ANC follow-up, malpresentation, ruptured membrane at admission, substandard monitoring of fetal heartbeat during labor, antepartum hemorrhage, pregnancy induced hypertension, premature rupture of membrane and without urine test for protein and ketone were factors associated with adverse birth outcomes. This result could call for strengthening and catching-up left opportunities of ANC; improvement of intrapartum care; prevention, early diagnosis and management of maternal complications. Further, prospective study should also needed to identify more supportive evidences.

Conflict of interest

The authors declare that they do not have any conflict of interest in any aspect of the article.

Author's contributions

TL designed the study, collected, analyzed and interpreted the data, and also drafted the manuscript. LO, YD, MG and NW participated in conceptualization of the study, design, analyses and interpretation of results as well as drafting and review of the manuscript. All read and approved the final manuscript.

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