

Adverse Birth Outcomes among Women Who Gave Birth at Selected Public Hospitals in Eastern Ethiopia

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Abstract

Background: Adverse birth outcomes such as preterm birth, low birth weight, and stillbirth are major public health problems in low resourced countries like Ethiopia. However, there is a paucity of studies on the magnitude of adverse birth outcomes and its underlying factors, particularly in Eastern Ethiopia. Therefore, this study aimed to assess the prevalence and factors associated with adverse birth outcomes among women who gave birth at selected public hospitals in Eastern Ethiopia.

Methods: A facility-based cross-sectional study was conducted among 562 consecutively selected labouring women who gave birth at selected public hospitals in eastern Ethiopia from December 1-28/ 2019. Data were collected using a pretested interviewer-administered questionnaire, maternal medical record review, and measurement of the weight of the newborn. A multivariable logistic regression model was employed to control for confounding factors in exploring the association between the dependent and independent variables. Statistical significance was declared at a cut-off p-value of 0.05.

Results: The overall prevalence of adverse birth outcomes was 76 (13.7%) (95% CI: 11.7%, 17.6%). The prevalence of low birth weight, stillbirth and preterm births were 40 (7.2%) (95% CI: 5.1 %, 10.6%), 37 (6.7%) (95% CI: 4.7%, 9.2%) and 28 (5%) (95% CI: 3.4%, 7.5%) respectively. Hypertension (AOR=8.69; 95% CI: 2.05, 16.76), history of adverse birth outcomes (AOR=12.12; 95% CI: 6.5, 22.52), and multiple pregnancies (AOR=6.23; 95%CI: 2.63, 14.74) were significantly associated with adverse birth outcomes.

Conclusion: In this study, the prevalence of adverse birth outcomes was high. Prenatal risk identification and early detection of complications among mothers with hypertension, multiple pregnancies, and previous history of adverse outcomes were vital to alleviate this problem.

Keywords: *Adverse birth outcomes; Public Hospitals, Eastern Ethiopia*

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Introduction

Adverse birth outcomes such as preterm birth, low birth weight (LBW), and stillbirth are major public health problems and leading causes of neonatal morbidity and mortality over the world. Worldwide, around 15 million preterm babies are born every year. Almost 35% of neonatal mortality is related to preterm birth and 99% occurs in low-income countries (Beck *et al.*, 2010; Blencowe *et al.*, 2012)

The rate of stillbirth is three to four per thousand births in resourced countries, whereas 10 folds higher in low-resourced countries. Around 3.3 million stillbirths occurred annually in low-resourced countries (McClure *et al.*, 2009). In sub-Saharan Africa, an estimated 900,000 babies die annually due to stillbirths, and two-thirds of all stillbirth mortality happened before the onset of labor (Lincetto *et al.*, 2011). Low birth weight (LBW) is also one of the major causes of neonatal

death. Worldwide, more than 20 million infants (15.5% of all births) are born as LBW of which 95.6% are in low-income countries (Wardlaw, 2004). It contributes to 60% to 80% of all neonatal deaths, annually (World Health Organization, 2016). It is directly or indirectly related to early and late health problems like coronary heart disease, non-insulin-dependent diabetes, hypertension, behavioral disorders, impaired cognitive function, psychological disorders, and long-term sequels in the child (Kayode *et al.*, 2014; Wardlaw, 2004).

The burden of adverse birth outcomes is high in Ethiopia. About 320,000 preterm babies are born each year (Qiu *et al.*, 2020; USAID, 2015). In 2014, there were 27,243 neonatal deaths due to low birth weight, which accounts for 4.53% of total deaths (Bililign *et al.* 2014).



A recent study showed that the pooled prevalence of adverse birth outcomes in Ethiopia was 26.88%. Low birth weight (10.06%), prematurity (8.76%), and still-birth (7.09%) were the most common adverse birth outcomes (Gedefaw *et al.*, 2020).

The causes of adverse birth outcomes are generally similar across developing countries which include maternal infection, a variety of medical conditions of the mother, fetomaternal complications related to pregnancy and labor, inadequate care during pregnancy and childbirth (Kang *et al.*, 2015; Ota *et al.*, 2014).

Most of the causes of adverse birth outcomes are preventable through early detection of complications during pregnancy and childbirth with quality, comprehensive, and emergency obstetric care. Ethiopia accomplished the millennium development goal of reducing the child mortality rate by 67% from the 1990 estimate, however neonatal mortality is not reduced as expected (48%) (Federal Ministry of Health, 2015).

Despite numerous strategies and interventions, the prevention of neonatal mortality related to adverse birth outcomes has remained largely unaddressed. Thus, identifying factors associated with adverse birth outcomes will guide the development of community-based interventions aiming to reduce the occurrence of adverse birth outcomes. Moreover, epidemiological data on the magnitude and risk factors of adverse birth outcomes are limited in the study area. Therefore, this study aimed to determine the prevalence and associated factors of adverse birth outcomes at selected public hospitals in Eastern Ethiopia.

Materials and Methods

Study setting, design, and period

A facility-based cross-sectional study was conducted at four selected Public Hospitals in Eastern Ethiopia from Dec 1-28/2019. Hiwot Fana Specialized Comprehensive University Hospital, Chiro Hospital, Karamara Hospital, and Dilchora Hospital were selected purposely from Harari regional state, Oromia regional state, Somali regional state, and Dire Dawa city Administrative respectively.

Hiwot Fana Specialized Comprehensive University Hospital (HFSCUH) is located in Harari Regional State which is 526KM away from Addis Ababa (CSA,

2007). Currently, the hospital is a teaching center in Eastern Ethiopia and it serves more than 5.8 million population in the catchment area (HFSCUH Administrative Office, 2016). Dilchora Hospital is located in Dire Dawa city administration which is 515 away from Addis Ababa to the eastern (CSA, 2007). It is the only referral hospital that serves a population of approximately 5 million in Dire Dawa and the neighboring Oromia and Somali Region State (DDA Health Bureau, 2016). Chiro general hospital is situated in Chiro town, the administrative center of the western Hararghe Zone located 320 Km away from the capital Addis Ababa (CSA, 2007). It renders services approximately for more than 1, 150,000 population in the zone (Western Hararghe Zone Health Office, 2016). Karamara Hospital is one of the largest hospitals in the Somali Regional state located approximately 80km East of Harar and 60km west of the border with Somalia (CSA, 2007). It provides health care services for more than 2,000,000 people in the catchment area (Somali Regional Health Bureau, 2016).

Population, Inclusion/ Exclusion Criteria

All laboring women who were admitted for delivery at selected public hospitals were the source population and all women who gave birth at the selected hospitals were the study population. All women who gave birth during the day and night working hours of the study period were included in the study. Women with serious illnesses who were unable to respond were excluded.

Sample size determination and sampling technique

The sample size was determined using a single population proportion formula considering the proportion (P) =13.9% (Lolaso *et al.*, 2019), a confidence level of 95%, a degree of precision of 3 %, and considering a 10% non-response rate. The final sample size was 562. The sample size was allocated proportionally based on the average number of deliveries at each hospital throughout the day and night during a one-month study period in the same year. All women who gave birth at selected hospitals during the data collection period during day and night working hours were included in the study consecutively until the final sample size was obtained (Figure 1).

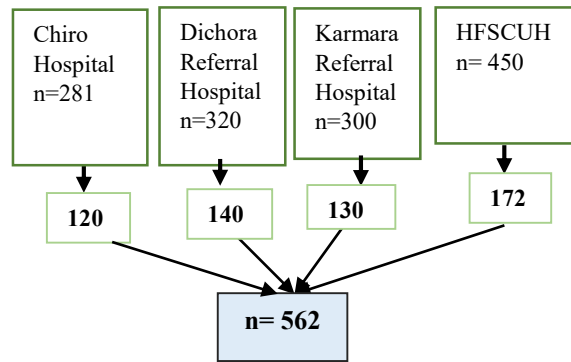


Figure 1: Schematic representation of sampling procedure.

Data collection techniques

Data were collected using a combination of a structured questionnaire from the mother, measurements of the weight of the newborn, and a medical record review. The structured questionnaire was developed by reviewing different literatures (Lolaso *et al.*, 2019, Adane *et al.*, 2014, Kassahun *et al.*, 2019). It was first prepared in English and translated to local languages (Amharic, Afan Oromo, and Somali) for administration and then translated back to English to maintain consistency.

Birth weight was measured for each newborn within an hour of birth using a calibrated weight scale. Data from the mothers were collected before they were discharged to home. Some information was obtained from their medical records, including obstetric complications with current pregnancy, current maternal medical conditions, like anemia (hemoglobin level), HIV status, ultrasound reports, and other cases which need a diagnosis for confirmation. Four Diploma Midwives and two BSc Midwives were recruited for data collection and supervision respectively.

Data quality control

Pre-testing was done on 5% of the sample size at Jugal Hospital a week before data collection. Before using the questionnaire in the actual study, corrections and modifications were made to it based on the results of the pretest. Daily, collected data were reviewed for accuracy and completeness.

Data processing and analysis

Data were entered into the computer by using Epi-info-7. Data cleaning and analysis were done using SPSS-20. The outcome variable was dichotomized into adverse/favorable birth outcomes based on the outcome of the current birth. Low birth weight was defined as a weight at birth that was under a cut point of 2500g. Preterm birth refers to any birth that takes place between 28 and 37 weeks gestation, as determined by the last normal menstrual period (LNMP) or by an early ultrasound reading that has been verified by professionals. Any fetus born at or after 28 weeks of gestation with no signs of life at birth that can be verified through observation or from the chart is still considered to be a stillbirth or an IUFD. Having at least one of these (preterm birth, LBW, stillbirth) were considered as having adverse birth outcomes and favorable birth outcome if the delivery resulted in an alive-term baby with normal birth weight.

Bivariate and multivariable logistic regression analysis was used to analyze the association between the dependent and independent variables. Hosmer-Lemeshow's and Omnibus tests were done to test for model fitness. All variables with a p-value ≤ 0.2 in the bivariate analysis were taken into the multivariable model to control for all possible confounders. Finally, the results of multivariable logistic regression analysis were presented in an adjusted odds ratio with 95% confidence intervals. The level of statistical significance was declared at a p-value less than 0.05.

Ethical consideration

Ethical clearance for the study was obtained from the Institute of Health Research and Ethical Review Committee of Haramaya University College of Medical and Health Sciences with reference number IHRERC/060/2017. Informed voluntary written and fingerprint consent was obtained from study participants after explaining the purpose and procedure of the study. Confidentiality of the information was assured from all the data collectors' and supervisors' sides.

Results

Socio-demographic characteristics of participants

A total of 555 study participants participated in this study which gives a response rate of 98.8%. The mean age was 26.6 (\pm standard deviation=4.62) years. The

majority of study participants were Muslim in religion (65.8%), Oromo in ethnicity (63.6%), married in marital status (94.7%), and housewife in occupation (51.4%). One-third, 185 (33.3%) of the participants

had no formal education. The mean age at first marriage was 20.8 (\pm standard deviation=3.5) years (Table 1).

Table 1: Socio-demographic characteristics of women who gave birth at selected public hospitals in Eastern Ethiopia, 2019 (n=555)

Variables	Classification	Frequency	Percentages
Age	<20	192	34.6
	20-34	339	61.1
	35+	24	4.3
Residence	Rural	218	39.3
	Urban	337	60.7
Marital status	Married	526	94.7
	Single	29	5.3
Age at first birth	\leq 20	220	39.6
	>20	335	60.4
Ethnicity	Oromo	353	63.6
	Amhara	120	21.6
	Somali	46	8.3
	Harari	26	4.7
	Others*	10	1.8
Religion	Muslim	365	65.8
	Orthodox	159	28.6
	Protestant	27	4.9
	Others*	4	0.7
Maternal education	No formal education	185	33.3
	Primary school	152	27.4
	Secondary school	112	20.2
	College/university	106	19.1
Mother Occupation	Housewife	285	51.4
	Government employee	74	13.3
	Private employee	132	23.8
	Merchant	48	8.6
	Others**	16	2.9

Others*Tigre, Gurage, and Wolaita; Others** Catholic and Adventist; Others*** Waiter, Daily laborer, a housemaid.

Maternal and obstetric history

Out of 555 participants, 365 (65.8%) of them were multi-parous, and 249 (44.9%) mothers faced obstetric complications. A total of 396 (71.4%) were spontaneous vaginal delivery. One hundred twenty-four (22.3%) of the mothers had existing health problems; of which 75 (60.5%) of mothers were anemic (hemoglobin level less than 11 gm/dl) (Table 2). One hundred

twenty-one (27.4%) of pregnant women had four ANC visits (Figure 2). The majority 346 (86.7%) of study participants had taken Tetanus Toxoid (TT) two and above (Figure 3).

Table 2: Maternal and obstetric history of women who gave birth at selected public hospitals in Eastern Ethiopia, 2019 (n=555)

Variables	Classification	Frequency	Percentage
Parity	Multipara	365	65.8
	Primipara	190	34.2
**ANC follow up	Yes	441	79.5
	No	114	20.5
**TT vaccine	Yes	399	71.9
	No	156	28.1
Iron supplementation	Yes	357	64.3
	No	198	35.7
Chronic diseases	Yes	124	22.3
	No	431	77.7
Types of chronic diseases (n=124)	Hypertension	29	23.4
	Diabetes Mellitus	5.0	4.0
	Anemia	75	60.5
	**HIV	10	8.1
	*Others	5.0	4.0
History of adverse birth outcomes	Yes	99	17.8
	No	456	82.2
Obstetric complications	Yes	179	32.3
	No	376	67.7
Types of obstetric complications (n=249)	Antepartum hemorrhage	23	9.2
	Multiple pregnancies	37	14.9
	**PROM	13	5.2
	Pre-eclampsia/ eclampsia	36	14.5
	Prolonged/obstructed labor	63	25.3
	Fetal distress	57	22.9
	Postpartum hemorrhage	20	8.0
Mode of delivery	Spontaneous vaginal delivery	396	71.4
	Assisted instrumental delivery	28	5.0
	Cesarean section	131	23.6

*Others: Malaria, Tuberculosis, and cardiac diseases and genitourinary diseases; **ANC- Antenatal Care; TT- Tetanus Toxoid; HIV-Human Immune Deficiency Virus; PROM-Premature Rupture of Membrane.

Prevalence of adverse birth outcomes

Among all deliveries during the study period, 76 (13.7%) (95%CI: 11.7%- 17.6%) of them were adverse birth outcomes. The prevalence of low birth

weight, stillbirth and preterm births were 40 (7.2%) (95% CI: 5.1 %- 10.6%), 37 (6.7%) [(95% CI: 4.7% 9.2%) and 28 (5%) (95% CI: 3.4%- 7.5%) respectively.

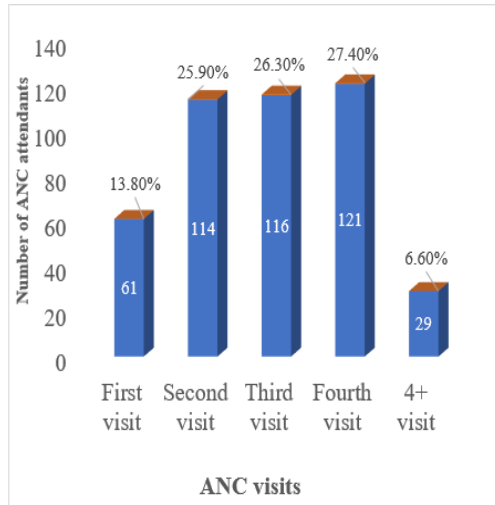


Figure 2: ANC visits among women who gave birth at selected public hospitals in Eastern Ethiopia, 2019 (n=441)

Factors associated with adverse birth outcomes

The findings from bivariate logistic regression revealed that residence, maternal education, chronic hypertension, history of adverse birth outcomes, multiple pregnancies, pregnancy-induced hypertension, and antepartum hemorrhage were the candidates for multivariable logistic regression. However, chronic hypertension, history of adverse birth outcomes, and multiple pregnancies remained significantly associated with adverse birth outcomes in the multivariable logistic regression analysis.

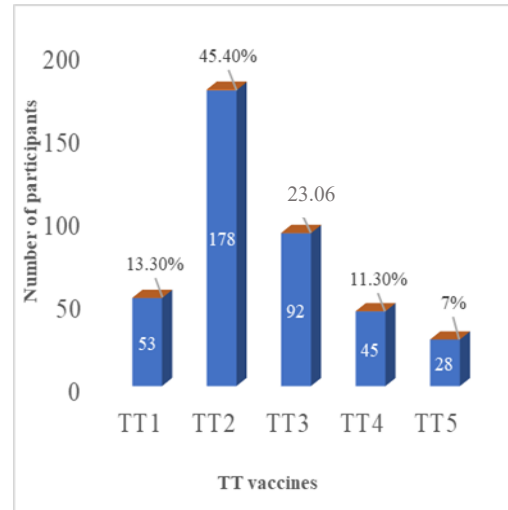


Figure 3: Number of women who had TT vaccines at selected public hospitals in Eastern Ethiopia, 2019 (n=399)

The study showed that the odds of adverse birth outcomes were 8.69 times higher among participants who had chronic hypertension than normotensive women (AOR=8.69; 95% CI: 2.05, 16.76). Additionally, the odds of adverse birth outcomes were 12 times higher among women with a previous history of adverse birth outcomes than those women who did not have a previous history of adverse birth outcomes (AOR=12.12; 95% CI: 6.5, 22.52). Furthermore, the odds of adverse birth outcomes were 6 times higher among women with current multiple pregnancies than those women with singleton pregnancies (AOR=6.23; 95% CI: 2.63, 14.74) (Table 3).

Table 3: Factors associated with adverse birth outcomes among women who gave birth at selected public hospitals in Eastern Ethiopia, 2019 (n=555).

Variables	Adverse birth outcomes		Odds ratio (95% CI)		
	Yes N (%)	No N (%)	COR (95% CI)	AOR (95% CI)	p-value
Residence					
Rural	41 (18.8)	177 (81.2)	1.99 (1.23, 3.25)	1.12 (0.6, 2.38)	0.288
Urban	35 (10.4)	302 (89.6)	1	1	
Maternal education					
No formal education	39 (21.1)	146 (78.9)	1	1	0.139
Primary school	23 (15.1)	129 (84.9)	1.49 (0.85, 2.64)	0.89 (0.42, 1.90)	
Secondary school and above	14 (6.4)	204 (93.6)	3.89 (2.04, 7.43)	2.14 (0.89, 5.17)	0.156
Chronic hypertension					
Yes	9 (31)	20 (69)	4.38 (1.207, 15.89)	8.69 (2.05, 16.76)	0.001*
No	67 (10.8)	459 (87.2)	1	1	
History of adverse birth outcome					
Yes	46(46.5)	53 (53.5)	12.32 (7.17, 21.17)	12.12 (6.5, 22.52)	0.000*
No	30(6.6)	426 (93.4)	1	1	
Multiple Pregnancy					
Yes	15 (40.6)	22 (59.4)	5.12 (2.51, 10.38)	6.23 (2.63, 14.74)	0.003*
No	61 (11.8)	457 (88.2)	1	1	
Pregnancy induced Hypertension					
Yes	13 (36.1)	23 (63.9)	4.09 (1.973, 8.48)	1.80 (0.75, 4.31)	0.125
No	63 (12.1)	456 (87.9)	1	1	
Antepartum hemorrhage					
Yes	7 (30.4)	16 (69.6)	2.94 (1.17, 7.4)	1.16 (0.37,3.64)	0.086
No	69 (13)	463 (87)	1	1	

*statically Significant at $p < 0.05$; COR: Crude Odds Ratio; AOR: Adjusted Odds ratio

Discussion

This study assessed the prevalence and factors associated with adverse birth outcomes among women who gave birth at selected public hospitals in Eastern Ethiopia. The study revealed that the overall prevalence of adverse birth outcomes was 13.7% (95% CI: 11.7%, 17.6%) which was in line with other study findings from the Kembata Tembaro zone (13.9%), Ethiopia (Lolaso *et al.*, 2019), and Zimbabwe (15.61%) (Chaibva *et al.*, 2019). This study's findings are lower than those reported from Gondar (23%) (Adane *et al.*, 2014), Hossana town (24.5%) (Abdo *et al.*, 2016), Wollo zone (31.8%) (Kassahun *et al.*, 2019), Ethiopia, India (25.7%) (Padhi *et al.*, 2015), and China (23.5%) (Lin *et al.*, 2018), but higher than that of Uganda (10.8%) (Asiki *et al.*, 2015). This discrepancy might be due to methodological differences in the study setting, study, and interventions.

In this study, 7.2% of babies were delivered with low birth weight. This finding is relatively similar to studies from Butajira (8.9%), Ethiopia (Abdo *et al.*, 2019), and Nepal (9.4%) (Kandel and Kafle, 2017), but lower than that of Zimbabwe (16.7%) (Feresu *et al.*, 2015), and India (18%) (Shashikantha and Sheethal, 2016). The variation might be due to the difference in the lifestyle of the study population, nutrition, and cultural practices of feeding during pregnancy.

In our study, 6.7% of deliveries have resulted in stillbirth. This finding is in line with studies conducted in Gondar (7.1%) (Abdo *et al.*, 2019) and Wollo (7.8%) (Eshete *et al.*, 2013), but higher than the finding of studies conducted in Hawassa (2.7%) (Tsegaye and Kassa, 2018), Kembata Tembaro (3.3%) (Lolaso *et al.*, 2019), Butajira (3.5%) (Abdo *et al.*, 2019), Axum (3.7%), Ethiopia (Berhe *et al.*, 2019), Nigeria (4.8%) (Mbachu *et al.*, 2018), and Tanzania (3.5%) (Chuwa *et al.*, 2017). This disparity could be due to low access to

maternal health care and difference in the quality of health care services provided among the facilities. Furthermore, in this study, most of the mothers were referred from peripheral facilities for further management of pregnancy related medical conditions and life-threatening obstetric complications which may increase the chance of stillbirths (Kang *et al.*, 2015; Ota *et al.*, 2014).

In this study, the prevalence of preterm birth was 5%. This finding is consistent with a study report from Gondar (4.4%) (Gebreslasie, 2016), Hawassa (3.6%) (Tsegaye and Kassa, 2018), and the WHO report for developing countries (5% to 7%) (Beck *et al.*, 2010). However, this finding was lower than findings reported in Malawi (16.3%) (Van den Broek *et al.*, 2014), and Nigeria (23.7%) (Onankpa and Isezuo, 2014). This variation might be because of exposure to different risk factors for premature birth. Though the exact mechanism for this is not well established, the presence of unidentified factors such as infections and some chronic conditions such as hypertension, and diabetes may also precipitate preterm delivery (Beck *et al.*, 2010; Blencowe *et al.*, 2012)

This study showed that chronic hypertension is significantly associated with adverse birth outcomes. This finding is supported by evidence from various studies in different contexts. The association can be justified by uteroplacental hypo-perfusion secondary to vasoconstriction which results in diminished blood supply to the fetus causing adverse fetal/birth outcomes (Adhena *et al.*, 2017; Adane *et al.*, 2014; Chen *et al.*, 2013; Watson-Jones *et al.*, 2007).

In this study previous history of adverse birth outcomes is also significantly associated with the current adverse birth outcomes. The mechanism is unknown; however, some studies suggest that persistent or recurrent intrauterine infection during multiple pregnancies, combined with preterm birth disorders (e.g., gestational diabetes, hypertension, and obesity) that tend to persist from pregnancy to pregnancy, could explain many repetitive spontaneous and induced preterm births (Goldenberg *et al.*, 2008). This is in line with other studies from China, Ethiopia, and Tanzania (Chen *et al.*, 2013; Tsegaye and Kassa, 2018; Adane *et al.*, 2014; Adhena *et al.*, 2017; Muluaem *et al.*, 2019; Watson-Jones *et al.*, 2007).

Furthermore, multiple pregnancies were significantly associated with adverse birth outcomes. This finding is similar to other studies finding from Ethiopia and evidence from the WHO Multicounty Survey on Maternal and Newborn Health (Santana *et al.*, 2018, Muluaem *et al.*, 2019; Adhena *et al.*, 2017). This may be due to multiple pregnancies increases the risk of pregnancy-related complications including antepartum, hemorrhage, congenital malformation, intrauterine growth restriction, mal-presentation, and anemia, which further increase the risk of adverse birth outcomes (Ota *et al.*, 2014; Lin *et al.*, 2018).

This study may provide a clue about the prevalence of adverse birth outcomes and its associated factors which may help hospital administrators and stakeholders with future planning and interventions of appropriate strategies to halt problems associated with adverse birth outcomes. However, the findings of this study were based on self-report which was not possible to validate claims made by respondents in the course of questionnaire administration. The study also shares the weakness of cross-sectional design which is difficult to establish a temporal relationship between exposure and outcome.

Conclusion

The prevalence of adverse birth outcomes in this study was high. Early detection and treatment of complications among mothers with Hypertension, multiple pregnancies, and prior history of adverse outcomes are vital to reduce the problem in the study area. Prenatal risk identification, early diagnosis and treatment, a prompt referral system, and adequate care for mothers are all essential. Furthermore, additional longitudinal studies that take into account maternal nutritional status and pre-conception health status of women are recommended.

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Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

TMD, ADK, TFG, and YDB conceived the study and were involved in the study design, reviewed the article, analyzed, the report writing, and drafted the manuscript. All authors have read and approved the final manuscript.

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