

# Proportion and Associated Factors of Adverse Birth Outcomes Among Women Who Gave Birth at Debre Markos General Hospital, East Gojjam Zone, Ethiopia, 2022: A Cross-Sectional Study

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## ABSTRACT

**Background:** Adverse birth outcomes are a common public health problem in the developing world, including Ethiopia. There are several indices of adverse birth outcomes, such as stillbirth, preterm birth, low birth weight, small for gestational age and congenital anomalies.

**Objective:** This study aimed to determine the proportion and associated factors of adverse birth outcomes among women who gave birth at Debre Markos General Hospital.

**Methods:** A health facility-based cross-sectional study was conducted from July 1 to August 1/2022 on laboring women who attended Debre Markos General Hospital. A total of 337 study participants were selected using a systematic sampling method. Data were collected through interviews with a structured questionnaire. Epi Data version 3.1 was used for data entry and analyzed using Stata Package for Social Sciences software. Bivariable and multivariable logistic regression analyses were employed; a P value of less than 0.05 was considered a statistically significant factor.

**Result:** The overall proportion of this study showed that 26.1% of women had adverse birth outcomes; 7.7% stillbirths and 9.2% each preterm and low birth weights. Rural residence, no antenatal care, antepartum hemorrhage, pregnancy-induced hypertension, illiteracy, post term pregnancy, birth interval less than two years, and age less than 20 years were independently associated with adverse birth outcomes.

**Conclusion:** In this study, the overall proportion of adverse birth outcomes was low compared to previous studies. Residence, no antenatal care follow-up, antepartum hemorrhage, pregnancy-induced hypertension, post term pregnancy, birth interval less than two years, illiteracy, and age less than 20 years were associated with adverse birth outcomes.

**Keywords:** Adverse Birth Outcome, Preterm, Low Birth Weight, Still Birth, Debre Markos

## List of Abbreviations

ABO, Adverse birth outcome; ANC, Ante-natal care; AOR, adjusted odds ratio; APH, Ante-partum hemorrhage; C/S, Cesarean section; CI, Confident interval; IUFD, Intrauterine fetal death; LBW, Low birth weight; SVD, Spontaneous vaginal delivery; PIH, Pregnancy-induced hypertension; PROM, Premature rupture of membrane; SD, Standard deviation.

## Introduction

Adverse birth outcomes are a common public health problem in the developing world, including Ethiopia. It has resulted in many negative consequences, including neonatal and infant morbidity and mortality. Globally, 15 million babies are born too prematurely each year. More than a million of them die immediately after birth, and many others suffer from lifelong physical, neurological, or educational disabilities [1]. According to the available study in Ethiopia, there was a high rate of perinatal mortality. Thirty-three deaths per 1000 live births were reported. Adverse birth outcomes are linked to advanced

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maternal age, first pregnancy, and short pregnancy intervals, especially less than 15 months of urban residence [2].

Neonatal mortality has shown less improvement than under-five mortalities in Ethiopia. In Ethiopia, the available data indicated that the under-five mortality rate decreased to 64/1000 live births in 2013. It has experienced a 69% reduction since 1990 [3]. The amazing fact here is that almost half of neonatal mortality can be prevented through the tetanus toxoid vaccine, clean and skilled care at birth, newborn resuscitation, exclusive breastfeeding, clean umbilical cord care, and management of infections in newborns [4]. A great number of intrauterine growth restrictions are caused by low body mass index, short stature and low gestational weight, which cause low birth weight in third world countries [5].

A study conducted in northern Ethiopia indicated that there were 63 deaths per 1000 live births. Among these deaths, two-thirds (34%) were attributable to prematurity, and 21 (31%) deaths were caused by asphyxia [6]. Adverse pregnancy outcomes generally increase with age. A study conducted in Nigeria in 2012 indicated that perinatal mortality, intrauterine fetal death, and neonatal death increased with age [7].

Many studies have shown that adverse birth outcomes have short- and long-term unwanted effects on both mothers and children. In 2016, research performed in the northwest part of Ethiopia showed that preterm delivery and low birth weight increased the chance of asthma by the age of 7 years [8]. A study conducted in Nepal in 2013 showed that the birth order of the child, with which wantedness is inextricably linked, has more powerful and pervasive effects, with first-born and second-born children being much less likely to show adverse effects [8]. Experiencing intimate partner violence during pregnancy has been associated with women's increased risk of antepartum hemorrhage and perinatal death [9]. A study conducted in the Sidama zone, southern Ethiopia, in 2014 indicated that having had neonatal, infant and/or child deaths was associated with symptoms of depression at the 14-year follow-up [10].

Adverse birth outcomes are a common and serious health problem in developing countries, including Ethiopia. Among other public health problems, adverse birth outcomes (stillbirth, low birth weight and preterm birth) are highly associated with neonatal and infant morbidity and mortality rates. Each year, approximately 15 million babies in the world, more than one in 10 births, are born prematurely. More than one million of these babies die shortly after birth; countless others suffer from lifelong physical, neurological, or educational disabilities [11,12]. Complications of preterm birth are the leading cause of neonatal mortality and account for an estimated 27% of neonatal deaths. This leads to almost four million neonatal deaths every year [12].

Worldwide, the stillbirth rate has been reduced by 14% from 22.1 to 18.9 per 1000 births, but in the African region, there was only an annual decline of less than 1%. The stillbirth rate for developed countries is estimated to be between 4.2 and 6.8 per 1000 births, whereas for the developing world, the estimate ranges from 20 to 32 per 1000 births. Two-thirds of all stillbirths occur in just two regions: Southeast Asia and Africa. From a

global standpoint, the prevalence rate of preterm birth varies from 47.5 to 138 per 1000 live births, and extreme parity, previous history of preterm birth or abortion, younger maternal age, inadequate care, reported hypertension and antepartum hemorrhage (APH) are associated with preterm birth [13,14].

In Sub-Saharan Africa, an estimated 900 000 babies die as stillbirths. From previous studies, preterm birth, increasing maternal age, history of stillbirth, reported hypertension, extreme neonatal birth and associated breach were all associated with stillbirth. Low birth weight is closely associated with increased fetal and neonatal mortality, morbidity, impaired growth and cognitive development. Worldwide, more than 20 million infants (representing 15.5% of all births, 95.6% of whom are in developing countries) are born with low birth weight (LBW). Several studies have reported that prematurity, previous history of adverse birth outcome (ABO), maternal age, anemia and lack of antenatal care (ANC) follow-up were associated with low birth weight (LBW) [14].

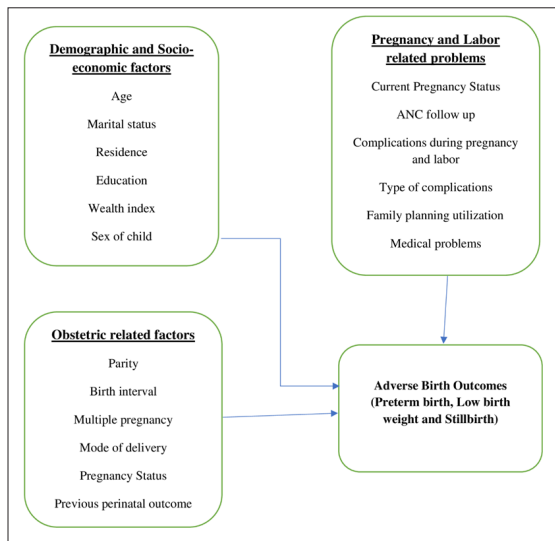
The overall proportion of adverse birth outcomes has varied in different parts of the world. Different studies on adverse birth outcomes have shown that there is a high proportion of adverse birth outcomes in developing countries compared to developed countries. According to previous studies, anemia, premature rupture of the membrane, pregnancy-induced hyperbaton, physical abuse, and poor antenatal care are among the determinants of poor or adverse birth outcomes [15]. Adverse birth outcomes such as stillbirth, low birth weight and preterm birth constituted the highest rate of all adverse pregnancy outcomes and were common in developing countries [16]. Understanding the magnitude and risk factors for adverse birth outcomes is key input for health providers, investigators, and policy makers to create awareness of its burden and prevent it.

In Ethiopia, adverse birth outcomes (ABOs) of pregnancy are still a major public health problem. The achievement of the sustainable development goal (SDG) is strongly influenced by progress in reducing neonatal death [17]. The rationale of this study is that even though birth outcomes worldwide have improved dramatically in the past 40 years, the gaps in developing countries are widening. Despite the availability of studies on different forms of adverse birth outcomes worldwide, particularly in third world countries and a few corners of Ethiopia, there are limited data in Debre Markos town, East Gojjam, Ethiopia. Generally, data on the prevalence and associated risk factors for adverse birth outcomes (ABOs) are vital to plan maternal and child health care services in poor countries.

Therefore, this study aims to determine the proportion and associated factors of adverse birth outcomes among women who gave birth at Debre Markos General Hospital in Debre Markos town. This study provides evidence about existing constraints on the proportion and associated factors of adverse birth outcomes (ABOs) to policymakers and other stakeholders for further improvement of service provision. The study will hopefully provide baseline information on ABO for concerned health facilities, nongovernmental organizations (NGOs) or health service providers and researchers to plan and act in minimizing and preventing this problem so that stillbirth, infant mortality and morbidity will decline.

### Conceptual Framework

The detailed factors or variables for adverse birth outcomes are mentioned below in the Conceptual framework section. Factors for adverse birth outcomes (Figure 1).



**Figure 1:** Conceptual framework for factors associated with adverse birth outcomes adapted from previous literature [18].

### Method and Materials

#### Study Area

The study was conducted at the laboring ward in Debre Markos General Hospital, East Gojjam Zone, Debre Markos town, Ethiopia. Debre Markos is found in the eastern part of Ethiopia and is located 229 km from Addis Ababa (the capital city of Ethiopia). This hospital provides services to both inpatients and outpatients. According to the hospital manager’s report, there are approximately 10 deliveries per day (300 per 30 days). There are medical, surgical, pediatric, emergency, obstetric and gynecological wards. Among professionals, nurses, midwives, medical doctors, surgeons, laboratory technicians, anesthesia and pharmacists have been providing services.

#### Study Design and Period

An institutional-based cross-sectional study was used to determine the proportion and associated factors of adverse birth outcomes among women who gave birth at Debre Markos General Hospital, Eastern Ethiopia, from July 1 to August 1/2022.

#### Source Population

The source population was all pregnant women admitted to the labor ward during the study period in Debre Markose General Hospital.

#### Study Population

The study population was all women who gave birth during the study period at the laboring ward in Debre Markose General Hospital and were included in the study.

#### Eligibility Criteria

##### Inclusion Criteria

All women who gave birth during the study period

##### Exclusion Criteria

Women who did not give birth during the study period

### Sampling Size and Sampling Procedure

#### Sample Size

Accordingly, for the first and second specific objectives, the sample size was calculated separately, and the larger sample size was used for this study. Sample size determination for objective one was calculated by using a single population formula by considering the following assumptions: 95% CI, prevalence (P=27.1%) of ABO taken from a previous study in Ethiopia with a nonresponse rate of 10%.

The proportion of sample size determination used is p= 27.1%

$$n = z \left( \frac{\alpha}{2} \right)^2 \frac{p(1-p)}{d^2}$$

n= Minimum Sample size

Z=confidence coefficient

d=marginal error

p=proportion

Therefore,  $n = z \left( \frac{\alpha}{2} \right)^2 \frac{p(1-p)}{d^2}$ , where n is the minimum sample size needed, p is the expected proportion of ABO, z=1.96 (95% CI) and d= 0.05 is the margin of error between the sample and the population.

Applying the above equation and substituting each value, we obtain  $n \approx 306$ .

Then, a 10% nonrespondent rate was added:  $10 * 306/100=30.6 \approx 31$ .

Therefore, the final sample size was  $306+31=337$ .

The sample size determination for objective two was calculated by using a double population formula with Epi-info version 7.2.1 Stat Calc by considering the following assumptions: two-sided significance level (1 - alpha): 95% CI, power (1 - beta, % chance of detecting): 80%, ratio of exposed: unexposed =1, and nonresponse rate of 10%. Exposed in this case means exposed to factors for ABO. Finally, the calculated sample size for the second objective with a 10% nonresponse rate is less than that of the first objective. Therefore, the sample size of the first objective was taken as the sample size of this study, which is 337.

#### Sampling Technique

A systematically sampled 337 pregnant mothers who came to the hospital for delivery during the study period were included in the study; according to the Debre Markos General Hospital Delivery and Labor Ward registration book, approximately 300 labor deliveries per month (sampling frame) is an average of 10 per day. We selected the women who gave birth at the delivery and labor ward by using every regular interval of (K) from our study population.

Sampling frame = 300 labor/delivery in 30 days. N =300

$K = N/n, 300/337 = 0.890_1$ ; hence, all women who gave birth during the study period were included.

#### Operational Definition

**Adverse Birth Outcome:** defined as at least one of the following (stillbirth, preterm birth, low birth weight and congenital anomaly) occurring during pregnancy.

**Low Birth Weight:** fetal birth weight less than 2500 gm at birth.

**Stillbirth:** loss of pregnancy or birth of an infant that has died in the womb after having survived through at least the first 28 weeks of pregnancy or more.

**Preterm:** birth at a gestational age of < 37 completed weeks of gestation.

### Variable of the Study

#### Dependent Variable

Proportion of adverse birth outcomes (Yes/No)

#### Independent Variables

**Demographic and Socioeconomic Characteristics:** Age, Sex, Marital status, educational status, Religion, Ethnicity, income, Occupation, Number of children and age at first pregnancy.

**Obstetric and Gynecologic Related Characteristics:** pregnancy status, interpregnancy interval, abortion, previous perinatal outcome, mode of delivery, neonatal death, destructive or instrumental delivery.

**Pregnancy and Labor-Related Problems:** current pregnancy complication, type of complication during pregnancy and labor, and the status of labor and medical illness (type of medical illness, substance use). ANC follow-up, distance to health facilities, participation in the health care decision process, family planning utilization.

#### Data Collection Tools and Procedures

The data for this study were collected by using a pretested structured interview-based questionnaire that was adapted from previous literature with some modifications. The questionnaire consists of the above-listed independent variables to collect data from the women. To check for its consistency, the questionnaire was first developed in English and translated into Amharic and then finally back to English. Data collectors were three midwives (1 diploma and 2 degrees) who were not working in health facilities. Data were collected from study subjects through a face-to-face interview-guided questionnaire, and women's charts were reviewed to retrieve medical information and mothers' test results that may not have been captured by the interview.

Data were collected, and the questionnaire was completed by data collectors after obtaining written consent from the study participants. One supervisor with a master's degree and skilled in data collection supervised the data collection. The principal investigator supervised and provided all necessary items for data collection, checked completeness and logical consistency, and solved problems daily during the time of data collection. The authors had no access to information that could identify individual participants during or after data collection.

#### Data Quality Assurance

To assure the quality of data, properly designed data collection tools were used. Data collectors and supervisors were trained in research objectives, data collection tools, procedures, and interview techniques for one day. Before the actual data collection, the questionnaire was tested on 5% of the total sample size in another health facility to check the context of the data. The questionnaire was revised and amended as necessary after the pretest was completed. The principal investigator, together

with the supervisor, supervised the data collection technique and completeness of tools on a daily basis, and accordingly, appropriate feedback was forwarded. To resolve differences and assure their quality, data double entry was performed.

#### Data Processing and Analysis

After data collection, the questionnaire was checked for completeness, and data were entered, coded, checked, and cleared by using EPI DATA V-3.1 and then exported to Statistical Package for Social Science [SPSS] V-25 computer software. Then, analysis (descriptive statistics to summarize data) and bivariate logistic regression were performed at a 95% confidence level with adverse birth outcomes for each factor.

From the bivariate regression analysis, variables at  $p < 0.25$  were entered into multivariate logistic regression analysis with a 95% confidence level. Variables with a  $p$  value less than 0.05 in the multivariate logistic regression analysis were considered statistically significant factors for adverse birth outcomes.

#### Result

##### Participants' Demographic and Socioeconomic Characteristics

A total of 337 women were interviewed (included in this study), of which 292 (86.6%) were in the age group of 20-34, followed by 27 (8%) between 35-49 years, and the mean age was 26.9 ( $\pm 4.2$  SD). The majority were orthodox Christians (69.7%). More than 305 (90.5%) were married, 214 (63.5%) were urban dwellers, one hundred fifty-four participants (45.6%) were housewives, and 169 (50.1%) of the participants' family monthly income was >1000.00 Ethiopian Birr. Regarding educational status, 139 (41.5%) had elementary school education, while 90 (26.7%) were illiterate (Table 1).

**Table 1: Demographic and Socioeconomic Characteristics of Participants (N=337), Debre Markos General Hospital, Ethiopia, 2022**

	Variables	Frequency	percentage
Age in years	<20	18	5.3
	20-34	292	86.6
	35-49	27	8.1
Marital status	Married	305	90.5
	Single	14	4.2
	Divorced/ separated	18	5.3
Religion	Orthodox	235	69.7
	Muslim	102	30.3
Residence	Urban	214	63.5
	Rural	123	36.5
Education	Sec and above	108	32.1
	Primary	139	41.5
	Illiterate	90	26.7
Occupation	Farmer	82	24.3
	Merchant	38	11.3
	Gov. employed	42	12.5
	Private employed	21	6.2
	House wife	154	45.6

Income	≤ 300 Birr	43	12.8
	300-1000	125	37.1
	≥1001	169	50.1

Participants’ Obstetrics- and Gynecology-Related Characteristics Among the 337 participants, approximately 215 (63.8%) were multigravida, 197 (58.5%) had a 2–4-year interpregnancy interval, and 238 (70.6%) of the pregnancies were wanted. Approximately 268 (79.5%) had antenatal care follow-up, 245 (72.7%) of the current deliveries were spontaneous vaginal delivery (SVD) and/or assisted vaginal deliveries, and 28 (8.3%) were cesarean section (c/s) (Table 2).

**Table 2: Obstetrics and Gynecology-Related Characteristics of Participants (N=337), Debre Markos General Hospital, Ethiopia, 2022**

Variables		Frequency	percentage
Gravidity	1	122	36.2
	2-5	187	55.5
	5-10	28	8.3
Parity	1	141	41.8
	2-5	172	51
	5-10	24	7.1
History of abortion	Yes	63	18.7
	No	274	81.9
ANC follow up	Yes	268	79.5
	No	69	20.4
Previous still birth	Yes	21	6.2
	No	316	93.8
	Previous preterm	9	2.7
	No	328	97.3
	Previous LBW	8	2.3
	No	329	97.7
	Mode of delivery	245	72.7
	c/s	28	8.3
	Instrument assisted	64	18.9
	Duration of labor	24	7.1
	4-24 hour	291	86.3
	≥24 hour	22	6.5
Birth interval	<2 year	90	26.7
	2-4 year	197	58.5
	>4 year	50	14.8
Pregnancy status (wanted and supported)	Yes	238	70.6
	No	99	29.1

**Pregnancy and Labor-Related Complications**

Of all study participants, approximately 90 (26.7%) mothers encountered complications during recent pregnancy, comprising 28 (31.1%) premature rupture of membrane (PROM) followed

by 24 (26.7%) pregnancy-induced hypertensions (PIH). Among all deliveries, 52 (15.4%) had experienced a complication, of which 22 (42.3%) were prolonged labor followed by malposition/presentation 16 (30.8%) and obstructed labor 14 (26.9%) (Table 3).

**Table 3: Pregnancy and Labor-Related Complications of Participants (N=337), Debre Markose General Hospital, Ethiopia, 2022 Ethiopia.**

Variables		Frequency	percentage
Current pregnancy complication (n=337)	Yes	90	26.7
	No	247	73.3
Type of complication during pregnancy (n=90)	PIH	24	26.7
	PROM	28	31.1
	APH	23	25.6
	Hyperemesis	15	16.7
Complication of labor (n=337)	Yes	52	15.4
	No	285	84.6
Type of labor complication (n=52)	Prolonged	22	42.3
	Obstructed	14	26.9
	Mal position/presentation	16	30.8

**Medical and Substance-Related Problems**

Of the 337 study participants, approximately 43 (12.7%) had a medical illness during their recent pregnancy, of which 21 (48.8%) were HIV seropositive, and 11 (25.6%) had been diagnosed with anemia during their current pregnancy. Of the total participants, 203 (60.2%) were caffeine users, and 98 (29.1%) drank alcohol. “Tela, and Tej” during the current pregnancy (Table 4).

**Table 4: Medical and Substance-Related Problems of Participants (N=337) Debre Markos General Hospital, Ethiopia, 2022**

Variables		Frequency	percentage
Medical illness	Yes	43	12.7
	No	294	87.3
Type of medical illness (n=43)	DM	6	23.9
	Anemia	11	25.6
	HIV	21	48.8
	Chronic HTN	5	11.7
Alcohol use	Yes	98	19.1
	No	239	70.9
Chat chewing	Yes	26	7.7
	No	311	92.3
Caffeine use	Yes	203	60.2
	No	134	39.8

**Birth Outcome**

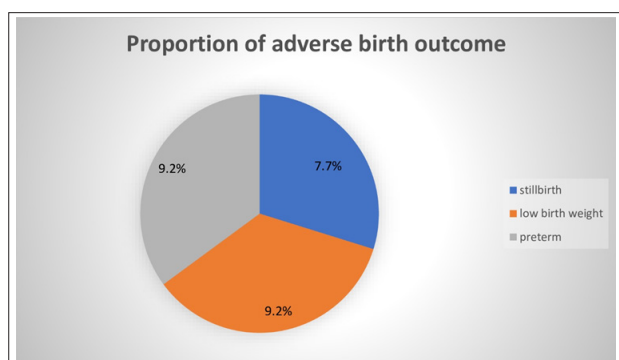
The findings of this study showed that more than 90% of neonates were live births, and from total live births, the proportion of adverse birth outcomes was 88 (26.1%), among which 31 (9.2%) were preterm, 31 (9.2%) were LBW and 26 (7.7%) were stillbirths. More than three-fourths of the babies were born without asphyxiation in the 1st and 5th minutes after delivery (Table 5).

**Table 5: Birth Outcomes of Labor Mothers (N=337), Debre Markos General Hospital, Ethiopia, 2022.**

Variables/Birth outcome		Frequency	percentage
Status of neonate at Birth	Alive	311	92.3
	Stillbirth	26	7.7
APGAR score at first minute	≥7	265	78.6
	4-6	38	11.3
	<4	34	10.1
APGAR score at fifth minute	≥7	293	87.2
	4-6	11	3.3
	<4	33	10.1
Gestational age	Term	270	80.1
	Preterm	31	9.2
	Post term	36	10.7
Birth weight of live birth (n=311)	2.5-4 kg	267	85.9
	LBW (<2.5)	31	9.2
	Macrosomia	13	3.9

**The Proportion of Adverse Birth Outcomes**

The overall proportion of adverse birth outcomes from the study findings was 88 (26.1%). The mean gestational age was 37.9 (± 2.9 SD) weeks, and the mean plus SD birth weight of the neonates was 3001.2 (±625.6 SD) grams. Among 337 study participants, 26 (7%) were stillborn, 31 (9.2%) were preterm, and 31 (9.2%) had low birth weight. The proportion of adverse birth outcomes among women is shown in Figure 2.



**Figure 2: Proportion of Adverse Birth Outcomes Among Women Who Gave Birth at Debre Markos General Hospital, 2022**

**Factors Associated with Adverse Birth Outcomes**

The study findings from 337 total participants showed that the odds of women aged less than 20 years encountering adverse birth outcomes were more than 3 times that of their counterparts (AOR 3.2, 95% CI 1.21-8.3 and p=0.0187). A mother who lived in rural dwellers encountered adverse birth outcomes 2 times more often than those who lived in urban dwellers (AOR= 2.5; 95% CI: 1.5-4.04 and p=0.0004). Similarly, illiterate mothers were more than 3 times more likely to have adverse birth outcomes than those who had a primary education level and above (AOR= 3.1; 95% CI: 1.54-6.24 and p=0.0015).

The odds of women who had a history of birth interval less than two years were more than 2 times more likely to have adverse birth outcomes than mothers whose previous birth interval was greater than 2 years (AOR= 2.3; 95% CI: 1.4-2.9 and p=0.0029).

Mothers who did not attend antenatal care were more than 2 times more likely to have adverse birth outcomes than mothers who attended antenatal care follow-up (AOR=2.34; 95% CI: 1.4-3.9 and p=0.0011). The odds of women who had recent pregnancy complications (such as antepartum hemorrhage, pregnancy-induced hypertension and premature rupture of membrane) were more likely to encounter adverse birth outcomes than those who had no pregnancy complications (AOR=5.1; 95% CI: 2.1-12.2 and p=0.0003, AOR= 4.5; 95% CI: 1.93-10.61 and p=0.0005, and AOR= 3.2; 95% CI: 1.44-6.96 and p=0.0039, respectively). Furthermore, the odds of women who had a postterm pregnancy were more than 4 times more likely to have adverse birth outcomes than mothers who gave birth at term (AOR 4.2, 95% CI 2.64-8.6 and p=0.0001) (Table 6).

**Table 6: Factors Associated with Adverse Birth Outcomes Among Women (N=337) Who Gave Birth at Debre Markos General Hospital, Ethiopia, 2022**

Characteristics	Adverse birth outcome		COR	P value		
	Yes	No				
<b>Residence</b>	Urban	42	172	1.00	0.0004	
	Rural	46	77	2.5 (1.5-4.04)		
<b>ANC</b>	Yes	50	188	1.00	0.0011	
	No	38	61	2.34 (1.4-3.9)		
<b>Gestational age</b>	Term	57	213	1.00	0.1620	
	Preterm	10	21	1.8 (0.8-3.99)		
	Post term	19	17	4.2 (2.04-8.6)		0.0001
<b>APH</b>	Yes	14	9	5.1(2.1-12.2)	0.0003	
	No	74	240	1.00		
<b>Education</b>	Illiterate	40	50	2.7, (1.4-4.8)	0.0017	
	Primary	29	110	0.9, (0.47-1.6)		0.666
	Secondary and above	25	83	1.00		
<b>Birth interval</b>	< 2 years	35	55	2.3, (1.4-3.9)	0.0029	
	2-4 year	43	154	1.00		
	>4 year	10	40	0.8, (0.41-1.93)		0.7787
<b>PIH</b>	Yes	14	10	4.5, (1.93-10.61)	0.0005	
	No	74	239	1.00		
<b>Maternal aged</b>	< 20 years	9	9	3.2, (1.21-8.3)	0.0187	
	20-34 years	70	222	1.00		
	35-49 years	9	18	1.6, (0.7-3.7)		0.2844

## Discussion

In this study, the overall proportion of adverse birth outcomes was 88 (26.1%), of which 26 (7.7%) were stillbirth and/or IUID, 31 (9.2%) were preterm, and 31 (9.2%) were low birth weight. In this study, the prevalence of stillbirth and/or IUID was higher than worldwide in 2017; approximately 2.6 million stillbirths occurred after 28 weeks of pregnancy for every 45 births, and a previous report from Tanzania and Ghana [16,19-21]. The difference might be methodological and socioeconomic variation since our study was performed in a hospital-based cross-sectional study, unlike the worldwide stillbirth rate report every year including communities, and it is agreed that most normal deliveries take place in health centers, while more complicated deliveries are referred to general hospitals, contributing to a higher rate of adverse birth outcomes at general hospitals.

This study's finding is also higher than previous findings across countries [20-22]. The variation between the findings might be attributable to the variations in the quality of maternal health services, facility and logistic parameters in another study area. Additionally, we considered fetal death after 28 weeks, and both stillbirth and IUID were included in this study.

Illiterate mothers showed a significant effect on adverse birth outcomes. Women who had no formal education were more than 2 times more likely to have adverse birth outcomes than those who had formal education because there might be an information-related gap in antenatal care and other maternal-related services, and this study is consistent with a study performed previously worldwide [23].

The odds of women who lived in rural dwellers encountering adverse birth outcomes were more than 2 times that of women who lived in urban dwellers. This finding is in line with a previous study in the North Wollo zone [24]. The reason why it might be delayed to seek care from a remote area to obtain accessible health facilities or even the distance between the health center and the general hospital might be associated with adverse birth outcomes. Since the main goal of ANC service utilization is to reduce maternal and neonatal mortality, it helps the prevention and treatment of disease during pregnancy through early detection and health promotion.

In this study, women who did not attend ANC follow-up were more likely to have an adverse birth outcome. This finding is consistent with the study performed in Gondar and the north Wollo Zone, Nigeria [7,23,24]. This is because at the time of ANC follow-up, the women may get information and advice related to the dangerous signs of pregnancy, nutrition and regular ANC follow-up, which also help a pregnant woman to seek early diagnosis and treatment and to have referred to the appropriate health facility needed, but if she fails to get ANC to follow up, she will be at risk.

Similarly, women who had a postterm pregnancy were more than 4 times more likely to have adverse birth outcomes than mothers who gave birth at term, mainly because of placental insufficiency (aged) to supply oxygen and nutrition to the fetus. Mothers with recent pregnancy complications (antepartum hemorrhage, pregnancy-induced hypertension, and premature rupture of membrane) were found to have a higher rate of adverse

birth outcomes than mothers who did not have recent pregnancy complications. This finding was consistent with previous studies performed in Nigeria, Tanzania, the North Wollo zone, Gondar, and Negest Elene [7,20-24].

The link might be explained by the fact that complications that occur during pregnancy affect the overall well-being of the fetus inside the uterus, even if that well-suited fetus might be affected by unintended complications such as antepartum hemorrhage and premature rupture of the membrane.

This study revealed that the odds of mothers who had a birth interval of fewer than 2 years were 2 times more likely to have adverse birth outcomes than those women's birth intervals greater than 2 years, which is in agreement with a study conducted in Brazil and Nigeria [7]. This might be related to unintended pregnancy and potentially serious delivery-related complications (a "scarring" effect because it causes women to rush into the next pregnancy without properly recovering from the previous pregnancy), including premature birth and low birth weight.

Furthermore, maternal age of fewer than 20 years was significantly associated with adverse birth outcomes, and the finding was consistent with studies done previously in Bangladesh, Nigeria, and Negest Elene, Ethiopia [7,22,23]. This might be because younger pregnancies the first time are probably linked to PIH and other pregnancy risks, low socioeconomic status, inadequate prenatal care, and the women neglected to seek health institutions related to a lack of awareness of the importance of services.

Although parity, history of preterm labor, history of LBW, anemia, income, alcohol use, mode of delivery, and labor complications were identified as risk factors for adverse birth outcomes, they did not show a statistically significant association with adverse birth outcomes.

## Limitations

Since it is a cross-sectional study, it is not possible to establish a temporal relationship between adverse birth outcomes and explanatory variables. In addition, as the study was in a general hospital, it may not show the real picture of these adverse birth outcomes in the study area.

## Conclusion and Recommendation

### Conclusion

The overall proportion of adverse birth outcomes among the study population was 88 (26.1%). This study finding was greater when we compare it with EDHS 2016. Residence, ANC follow-up, post term pregnancy, recent pregnancy complications (such as antepartum hemorrhage, pregnancy-induced hypertension, and premature rupture of membrane), educational status, birth interval, and age were associated with adverse birth outcomes.

### Recommendation

Increasing accessibility and improving awareness in the rural community to seek ANC as well as encouraging women's education to a higher level are vital to improving good birth outcomes. It is also a timely healthcare service for women before pregnancy, during pregnancy (ANC) and labor and delivery, and it is expected from health professionals, especially midwives, in

the study area. Hospitals, health centers, and health extension workers should create awareness and give quality services for mothers to have a healthy outcome of pregnancy in all aspects.

### Ethical Approval and Informed Consent

The study received research ethics approval from Debre Markos University, College of Medicine and Health Sciences Institutional Review Board (IRB). Permission and agreement consent were obtained from the Debre Markos Health Department, and voluntary, informed, written, and signed consent were obtained from the heads of Debre Markos General Hospital and participants before data collection started. The participants were also assured that their responses could not result in any harm and offered full rights not to participate, the name did not write on the tool, and confidentiality was maintained.

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### Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work or the publication of this paper.

### Author Contributions

The corresponding author (YM) contributed in conceptualization, designing the protocol, data entry and analysis, interpretation, manuscript drafting, paper writing and review, and preparing the manuscript. FB, KS, SW and ZF contributed equally in resource acquisition, editorial, interpretation, manuscript drafting, paper writing and review and read and approved the final paper.

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