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Prevalence and predictors of adverse maternal and perinatal outcomes in twin pregnancies at Tibebe Ghion hospital, Bahir Dar, Ethiopia

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**BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES
DEPARTMENT OF OBSTETRICS AND GYNECOLOGY**

**PREVALENCE AND PREDICTORS OF ADVERSE MATERNAL
AND PERINATAL OUTCOMES IN TWIN PREGNANCIES AT
TIBEBE GHION HOSPITAL, BAHIR DAR, ETHIOPIA**

**BY: DR NYICHAR SIMON (MD, OBSTETRICS AND GYNCOLOGY
RESIDENT)**

**A THESIS TO BE SUBMITTED TO BAHIR DAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCES, DEPARTMENT
OF OBSTETRICS AND GYNECOLOGY FOR THE PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR SPECIALTY IN
OBSTETRICS AND GYNECOLOGY**

**January, 2026G.C
BAHIR DAR, ETHIOPIA**

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TIBEBE GHION HOSPITAL, BAHIRDAR, ETHIOPIA

BY: Dr Nyichar Simon (MD, obstetrics and gynecology 4th year resident)

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Declaration form

This is to certify that the thesis entitled “**Prevalence and Predictors of Adverse Maternal and Perinatal Outcomes In Twin Pregnancies At Tibebe Ghion Specialized Hospital, Bahirdar, Amhara region, Northwest Ethiopia, a Facility Based Cross Sectional,2025**”, submitted in partial fulfillment of the requirements for the specialty certificate in obstetrics and gynecology at Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been fully acknowledged.

Principle investigator:Dr. Nyichar Simon (MD, Obstetrics and Gynecology 4th year resident)

Signature----- Date-----\-----\-----

Approval of Dissertation for Defense

I hereby certify that I have supervised, read, and evaluated this thesis/dissertation titled **“Prevalence and Predictors of Adverse Maternal and Perinatal Outcomes in Twin Pregnancies at Tibebe Ghion Specialized Hospital, Bahirdar, Amhara region, Northwest Ethiopia, a Facility Based Cross Sectional, 2025”** by Dr. Nyichar Simon (MD, obstetrics and gynecology 4th year resident) was prepared under my guidance. In my judgment, the thesis meets the necessary standards of academic rigor and originality required for partial fulfillment of the requirement for the specialty certificate in obstetrics and gynecology at Bahir Dar University. Therefore I recommend the thesis/dissertation be submitted for oral defense.

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BAHIR DAR UNIVERSITY
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DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

Approval of thesis for defense result

We hereby certify that we have examined this dissertation entitled **“Prevalence and Predictors of Adverse Maternal and Perinatal Outcomes In Twin Pregnancies At Tibebe Ghion Hospital, Bahirdar, Amhara region, Northwest Ethiopia, a Facility Based Cross Sectional, 2025”** by Dr. Nyichar Simon (MD, obstetrics and gynecology Resident) we recommend and approve the dissertation a degree of specialty certificate in obstetrics and gynecology.

Board of Examiners

External examiner name Signature Date

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Dr. Belaynet Kelebe 22/5/2018

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Abbreviation and acronym

ANC	Antenatal care
AOR	Adjusted Odd Ratio
APO	Adverse perinatal outcomes
BMI	Body mass index
EFW	Estimated Fetal Weight
GDM	Gestational Diabetes mellitus
GWG	Gestational weight gain
MD	Maternal death
MNM	Maternal Near Miss
NICU	Neonatal Intensive Care Unit
PE	Preeclampsia
PI	Pulsatility index
PLTC	Potentially Life-Threatening Conditions
PROM	Premature Rupture of Membrane
PTB	Preterm Birth
TGSH	Tibebe Ghion Specialized Hospitals
UA	Umbilical Artery
IRB	Institutional Revised Board

Abstract

Background: - Twin pregnancies are risks during pregnancy, labor, and delivery as well as during postnatal period as the result of preterm delivery, antepartum hemorrhage, chronic disease, and postpartum hemorrhage. The probable risk factors reported include chorionicity, maternal age, and body mass index, and smoking, use of assisted conception, gestational diabetes, and hypertensive disorders of pregnancy. Although several studies have reported adverse outcomes of twin pregnancies globally and in some parts of Ethiopia, there is limited and inconsistent local evidence regarding the prevalence and predictors of adverse maternal and perinatal outcomes among twin pregnancies at Tibebe Ghion Hospital. In particular, data specific to this referral setting are scarce. Therefore, this study aimed to assess the prevalence and predictors of adverse maternal and perinatal outcomes in twin pregnancies at Tibebe Ghion Specialized Hospital, Bahirdar, Ethiopia.

Objective: - To determine the prevalence and predictors of adverse maternal and perinatal outcomes among twin pregnancies managed at Tibebe Ghion Specialized Hospital, Bahirdar, Ethiopia.

Methods: - A retrospective hospital based cross-sectional study design was used to conduct the study on women admitted at obstetrics unit as twin pregnancy and who gave birth from August, 2024 to August, 2025. The questionnaires were used to collect information from patients' charts and hospital register. All the collected data were recorded by SPSS version 25.0 for analysis. Bivariate and multivariate analysis was also carried out to see and understand the effect of each independent variable on maternal and perinatal outcome.

Results: A total of 353 women with twin pregnancies were included in the study. The composite adverse maternal outcome was observed in 40% of participants, with anemia as the most common complication (78.7%). Cesarean section was performed in 51.8% of deliveries, and 53% of births occurred before 37 weeks gestation. Grand multiparity (parity ≥ 5) significantly increased the odds of adverse maternal outcomes (AOR=3.4; 95% CI: 1.37–8.62), along with a history of twin pregnancy (AOR=2.9; 95% CI: 1.08–8.04) and interpregnancy interval under 24 months (AOR=1.5; 95% CI: 1.27–3.16). Pregnancy complications were strongly associated with adverse perinatal outcomes (AOR=6.1; 95% CI: 2.96–12.43), whereas medication or supplement use during pregnancy was protective (AOR=0.45; 95% CI: 0.24–0.87).

Conclusions: This study revealed a high prevalence of adverse maternal and perinatal outcomes among twin pregnancies At Tibebe Ghion Hospital. The prevalence of composite adverse maternal outcomes was 40% while composite adverse perinatal outcomes were observed in 83% (high) of twin A and (high) 85% of twin B. Grandmultiparity, short interpregnancy interval, and previous history of twin pregnancy were significant predictors of adverse maternal outcomes, where pregnancy related complication and adverse maternal outcomes were strongly associated with adverse perinatal outcomes. Strengthening antenatal care, early identification of high risk twin pregnancies and timely obstetric interventions are essential to reduce adverse outcomes.

Keyword: - twin pregnancy, maternal outcome, perinatal outcome, Bahir Dar

1. Introduction

1.1 Background

Twin birth is a type of multiple births when the mother gives birth to two offspring from the same pregnancy. It can be either dizygotic or monozygotic. Twin births rates vary considerably around the world. Variations also exist according to race and ethnicity(1, 2). Twin pregnancy results from a complex interaction of different factors such as maternal age, parity, family history of multiple pregnancies, and others(3, 4). Twin pregnancy is a well-recognized high risk obstetric condition due to its strong association with adverse maternal and perinatal outcomes. Adverse maternal outcomes such as anemia, hypertensive disorders of pregnancy, postpartum hemorrhage and operative delivery, maternal ICU admission, reflect the physiological and obstetrical burden imposed by carrying multiple fetuses. Similarly adverse perinatal outcomes, including preterm birth, low birth weight, birth asphyxia, and NICU admission, and early neonatal death, represent compromised fetal and neonatal wellbeing.

In this study, these outcomes were measured using composite outcomes variables, where the presence of one or more predefined adverse event was classified as an adverse maternal or perinatal outcomes. This measurement approach is scientifically appropriate because maternal and perinatal morbidities often occur concurrently.

From a public health perspective, measuring maternal and perinatal outcomes in twin pregnancies is critically important, as these outcomes contribute substantially to maternal and perinatal morbidity, mortality, prolonged hospital stay, increased health care costs, and long term disability.

Twin pregnancy results from a complex interaction of different factors such as maternal age, parity, family history of multiple pregnancies, and others(22). A twin pregnancy is associated with various adverse perinatal outcomes and maternal obstetrics complications(14). More than one million of those babies die shortly after birth; countless others suffer from lifelong physical, neurological, or educational disabilities, often at great cost to families(23, 24). There are factors to increase the negative birth outcome of twin delivery; from these, some of them are associated with increased maternal age, primiparity, low birth weight, chronic disease, low ANC follow-up, and PROM(25, 26)

1.2 Statement of the problem

The incidence of multiple pregnancy has recently increased worldwide with a reported twin birth rate of 3.21% in the United States and 3.69% in China in 2019(27, 28). Twin pregnancy occurs in about 0.6% of all pregnancies in Asia, 1-2 % in Australia, Europe, and the United States of America, and about 4% in Africa(29, 30). Twin pregnancies are risks during pregnancy, labor, and delivery as well as during postnatal period as the result of preterm delivery, antepartum hemorrhage, chronic disease, and postpartum hemorrhage(5). Major morbidities include increased rates of hypertensive disorders, preeclampsia, proteinuria, gestational diabetes, and first and third trimester bleedings(6, 7).

Twin births have a negative impact on perinatal health indicators, since twins have a higher risk of perinatal mortality(8, 9), especially due to higher preterm birth rates(10). In low- and middle-income countries, early neonatal mortality is seven times higher among twins (11). Preterm birth, low birth weight, twin to twin transfusion syndrome, perinatal deaths, and admission to neonatal intensive care unit (NICU) are among many adverse perinatal outcomes associated with twin pregnancy(12, 13). For example, the rate of perinatal mortality among twin pregnancies could be up to six times higher compared to singleton pregnancies(14).

Adverse birth outcomes are the most important vital statistics used to assess maternal and child health program. They are indicators of the quality of antenatal care, medical services, and general health services to the mother and the children(15, 16). Maternal morbidity rates escalate with an increase in the incidence of twin gestation(17). Because of the inherited biological factors, higher rates of maternal morbidities are reported in multiple gestations compared to singletons(18).

Moreover, maternal mortality and morbidity are higher in cases of twin births when compared with single pregnancies(19, 20). A large study conducted mainly in low- and middle-income countries has found that mothers of twins were three times more at risk of maternal near miss. The same group of women were considered four times more at risk of maternal mortality, particularly due to postpartum hemorrhage and hypertensive disorder(21).

Multiple pregnancy is associated with adverse prenatal outcomes, as the singleton risk is multiplied by the number of fetuses(31). It accounts for 12.5% of prenatal mortality(30). Data

from 30 nations in Sub-Saharan Africa revealed that twin pregnancy has a five-fold greater infant mortality rate than singleton pregnancy(32, 33).

Twin pregnancy is associated with a number of obstetric complications, some of them with serious perinatal consequences, especially for the second twin(10). The rate of perinatal mortality can be up to six times higher in twin compared to singleton pregnancies, largely due to higher rates of preterm delivery and fetal growth restriction seen in twin pregnancies(34).

The risk of maternal mortality is approximately 2.5 times higher in twin than in singleton pregnancies(35). Maternal death (MD) is understood as the last stage of a continuum of increasingly severe morbidity, which may occur in pregnancy and is preceded by any potentially life-threatening conditions (PLTC) and by maternal near miss (MNM)(36).

Women with a twin pregnancy are at higher risk of adverse outcomes compared to women with a singleton pregnancy, including miscarriage, congenital abnormalities, intrauterine fetal death, hypertensive disorders, preterm delivery(37, 38). The probable risk factors reported include chorionicity, maternal age, body mass index (BMI), smoking, use of assisted conception, gestational diabetes, and hypertensive disorders of pregnancy (39-41). Preterm birth and birth weight are also significant determinants of morbidity and mortality into infancy and childhood(42)

At Tibebe Ghion Specialized Hospital in Bahirdar, which serves as a referral center for the Amhara region, the clinical management of twin pregnancies presents a critical public health challenge. Previous studies have often examined individual maternal or perinatal outcomes separately. However, single outcome approaches may underestimate the overall burden of morbidity in twin pregnancies. There is limited evidence using composite maternal and perinatal outcomes measure, particularly in low resource setting. This study addresses this gap by evaluating composite adverse outcomes to provide a more comprehensive assessment of risk.

1.3 Significance of the study

Identifying the prevalence and predictors of these adverse outcomes is critical in optimizing care for this vulnerable group. The study provides context-specific evidence that reflects the unique demographic, clinical, and healthcare challenges faced at Tibebe Ghion Specialized Hospital. Twin pregnancies carry a higher risk of adverse maternal and perinatal outcomes compared to singleton pregnancies. Understanding the prevalence and identifying predictors of these complications is important for improving maternal and neonatal health. It will help healthcare providers identify high-risk cases early. This knowledge can improve clinical management, guide timely interventions, and ultimately reduce maternal and neonatal morbidity and mortality. By identifying the determinant risk factors, the study supports early interventions and tailored care plans to reduce complications. Moreover, the findings can inform clinical guidelines and public health policies, ultimately contributing to better health outcomes for mothers and twins. The study can serve as a reference for future research in maternal and perinatal health of twin pregnancy.

2. Literature review

A systematic review and meta-analysis done on the prevalence of twin pregnancy in eastern Africa the prevalence of twin pregnancy was 3%. The adverse pregnancy outcomes like NICU admission (78%), low birth weight (44%), low APGAR score (33%), prematurity (32%), stillbirth (30%), neonatal mortality (12%) and maternal complications like hypertensive disorder of pregnancy (25%), postpartum hemorrhage (7%), Cesarean section (37%), premature rupture of membrane (12%) and maternal mortality are among twin pregnancy than singleton pregnancy(43).

The study done in India on twin pregnancies incidence and outcomes found that the frequency of twin pregnancy was found to be 1.9%. Pre-term labor (58.3%) was the most common complication followed by malpresentation (around 37%). Fifty-eight percent of the neonates were premature at birth and 83.4% had low birth weight(44). The study in South west Nigeria about Trends and Outcomes of Twin Births found that prevalence of twin gestations 21.7%(45).

The study done on Epidemiology and factors associated with preterm births in multiple pregnancy found that multiple pregnancies constituting approximately 1.99%. Over the ten-year period 65.1% resulted in preterm births. Of these, 173 (64.3%) were monochorionic twins, and 96 (35.7%) were dichorionic twins. Monochorionic twins had significant for preterm delivery (AOR, 2.06; 95%CI 1.29—3.30). In terms of neonatal outcomes, 160 infants (19.4%) weighed less than 1,500 g at birth, and there were 78 perinatal deaths (9.4%). Birth asphyxia was noted in 97 cases (20.2%) among monochorionic twins and in 28 cases (8.1%) for dichorionic twins(46).

A study done in Brazil on outcome of preterm twin delivery using a sample of 58 pregnancies, (4.5%) complicated by adverse perinatal outcomes. These associations remained significant after adjusting for maternal characteristics and gestational age. The best predictive model included EFW discordance and UA PI discordance, with an area under the curve of 0.90(13).

The study done in Dessie referral hospital on birth outcome of Twin Delivery among Newborns found that the prevalence of twin birth outcome accounts 23.4%. Low birth weight (9.1%), stillbirth (4.2%), Apgar score < 7 (9.1%), and neonatal death 1 % were the listed APO. Hypertension disorder, rural residence, PROM, and no ANC follow-up were significantly associated with adverse twin birth(47).

The study done on risk factor of adverse outcome of twin pregnancy revealed that chronicity, NICU admission, and preterm delivery in twin pregnancy. The impact of BMI, socioeconomic

inequalities, smoking, ART, and HDP on adverse outcomes appears to be lower in twin pregnancies than in singleton pregnancies. Some exposures, such as ART use and GDM, appear to be "protective" against perinatal mortality in twin pregnancies, despite being established risk factors for adverse outcomes in singleton pregnancies, potentially related to access to specialist care(48).

The study done on independent risk factors for twin pregnancy and adverse fetal outcomes before 28 gestational week revealed that the patients in the abnormal group were more likely to be monochorionicdiamniotic (13/29 vs 20/97, $P = 0.009$), with a higher mean pulsatility index (PI, 1.57 ± 0.55 vs 1.28 ± 0.42 , $P = 0.003$) or a higher mean resistance index (0.71 ± 0.11 vs 0.65 ± 0.11 , $P = 0.008$) or early diastolic notch of bilateral uterine arteries (10/29 vs 15/97, $P = 0.024$) or with abnormal ultrasound findings (13/29 vs 2/97, $P < 0.001$), compared with the control group. Monochorionicdiamniotic, higher mean PI of bilateral and abnormal ultrasound findings during first trimester screening were independent risk factors for adverse fetal outcomes ($P < 0.05$) (49)

WHO multicounty survey on perinatal outcomes in twin pregnancies found that the occurrence of severe maternal morbidity and maternal death was significantly higher among twin compared to singleton pregnancies in all regions. Twin deliveries were associated with higher rates of preterm delivery (37.1%), Apgar scores less than 7 at 5th minute (7.8 and 10.1% respectively for first and second twins), low birth weight (53.2% for the first and 61.1% for the second twin), stillbirth (3.6% for the first and 5.7% for the second twin), early neonatal death (3.5% for the first and 5.2% for the second twin), admission to NICU (23.6% for the first and 29.3% for the second twin) and any APO (67% for the first twin and 72.3% for the second). Outcomes were consistently worse for the second twin across all outcomes(50).

The study done in Maryland on risk factors for adverse outcomes found that the risk for preeclampsia, the risks for preterm premature rupture of membranes, low birth weight, very low birth weight, and slowed midge station fetal growth were increased(51).

Narrative review on risk factors for adverse outcomes in twin pregnancies found that Monochorionicity, NICU admission, and preterm delivery increase risk of preterm birth. The impact of BMI, socioeconomic inequalities, smoking, ART, and HDP on adverse outcomes appears to be lower in twin pregnancies than in singleton pregnancies(52).

Study done on Risk factors, prediction of preeclampsia in twin pregnancy revealed that 1250 twin pregnancies included in the analysis. 284 (22.72%) were monochorionic and 966 (77.28%) dichorionic]. Of these, 120 (9.6%) were complicated by PE. multivariable logistic regression analysis found that only BMI (AOR = 1.06), chronic hypertension (AOR = 3.13), and nulliparity (AOR = 1.85) were independent risk factors for PE in a twin gestation. PE were more likely to have a number of adverse pregnancy outcomes, emergency Caesarean delivery (38.3% vs 19.4%), greater blood loss at delivery (725 ml vs 600 ml), postpartum hemorrhage ≥ 500 ml (67.5% vs 54.5%), lower gestational age at delivery (35 + 6 weeks vs 36 + 5 weeks), neonatal unit admission (33.8% vs 26.1%) and lower birth weight (2245 g vs 2420 g)(53).

Study done in adverse feto-maternal outcome in twin pregnancy in women of advanced age revealed that the mean age of these study cases was noted to be 34.35 ± 2.41 years. Mean gestational age of our study cases was 34.67 ± 2.25 weeks. Mean BMI of our study cases was noted to be 22.45 ± 1.67 kg/m² and obesity was present in 27 (14.9 %) of our study cases. 126 (69.6%) delivered vaginally while 55 (30.4%) had to undergo cesarean section delivery. Mean hemoglobin level was noted to 8.67 ± 1.40 g/dl while anemia was seen in 126 (69.6%) of these study cases. Preterm labor was observed in 144 (79.6%), abruptio placentae in 19 (10.5%) and low birth weight in 123 (68 %) of our study cases(54).

The study done in China on Perinatal Outcomes and Risk Factors for Preterm Birth in Twin Pregnancies revealed that the rate of twin pregnancy was 3.3%, while the PTB rate before 37, 34, and 32 weeks among this population were 62.1, 18.8, and 10.4%, respectively. Logistic regression revealed that monochorionicity(OR 3.028), gestational weight gain (GWG) <10 kg (OR 2.285) and GWG between 10 and 15 kg (OR 1.478), preeclampsia (PE) (OR 3.067), and intrahepatic cholestasis of pregnancy (ICP) (OR 3.122) were the risk factors for PTB before 37 weeks. Monochorionicity (OR 2.865), age < 25 years (OR 1.888), and GWG <10 kg (OR 3.10) were risk factors for PTB before 34 weeks. Monochorionicity (OR 2.566), age younger than 25 years (OR 1.964), and GWG <10 kg (OR 4.319) were the risk factors for PTB before 32 weeks(55).

Study done in central Ethiopia on perinatal outcome of twin pregnancies from 322 of twins, 199(61.8%) had at least one APO in one or both twins. Low birth weight was the most common perinatal outcome followed by preterm birth. younger maternal age (AOR = 4.1) and not having

ultrasound scan during antenatal care (AOR = 2.0) were significantly associated with adverse perinatal outcomes(56).

2.1. Conceptual Framework

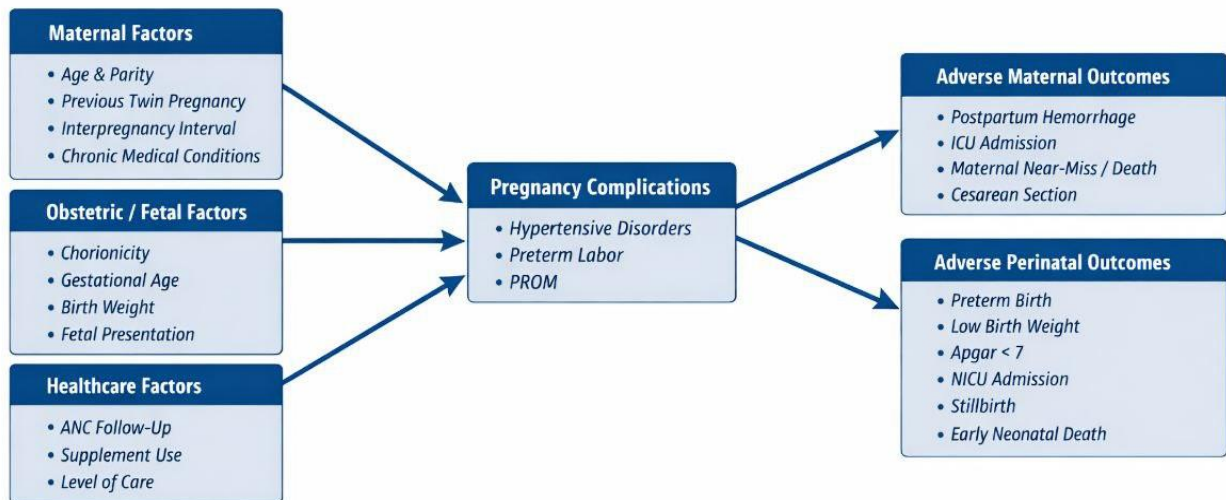


Figure 1. The conceptual framework adopted from the literature from the article done about outcome of twin pregnancy

3. Objective

3.1 General objective

To determine the prevalence and predictors of adverse maternal and perinatal outcomes among twin pregnancies managed at Tibebe Ghion Specialized Hospital, Bahirdar, Ethiopia.

3.2 Specific objective

- To assess the prevalence of adverse maternal outcomes among women with twin pregnancies at Tibebe Ghion Hospital.
- To determine the prevalence of adverse perinatal outcomes in twin pregnancies managed at Tibebe Ghion Hospital.
- To assess obstetric and medical factors associated with adverse maternal outcomes among women with twin pregnancies.
- To evaluate the association between antenatal care-related factors (such as timing, frequency and complication during ANC) and adverse maternal and perinatal outcomes.

4. Methods and Materials

4.1. Study setting

This study was conducted in the department of obstetrics and gynecology in Tibebe Ghion Specialized Hospitals (TGSH) which is affiliated with bahirdar university (BDU). Bahir Dar is the capital city of Amhara National Regional State, located 565 km Northwest of Addis Ababa with estimated population of 455,901 in 2022 world population review(56). TGSH is one of the biggest specialized university hospitals in Amhara region and in the country at large. It was established in (2011 E.C /2018 G.C). To primarily give service at a low cost or even free of charge to those that are unable to afford care elsewhere and at the time it was constructed to serve 2000 people per day. The hospital has more than 500 beds in all its wards and over 50 beds in gynecology ward. Labor and delivery including cesarean section activities is done 24 hours in all days, months and years. The department has its own major operation room with 2 tables for caesarean deliveries excluding gynecology procedures.

4.2. Study design

A retrospective cross-sectional study based on hospital records study was implemented.

4.3. Study area and Period

The chart was reviewed from November 15 up to January 15 2025 for two month duration among the charts of those managed. The study period from August 25, 2024 to August 25, 2025 in Bahir Dar city at Tibebe Ghion specialized hospital (TGSH).

4.4. Source population

Women who were admitted with a diagnosis of twin pregnancy and gave birth during admission.

4.5 study population

All twin pregnancy admitted with diagnosis of pregnancy related condition and gave birth in the study setting after 28 weeks of gestation

4.5. Inclusion criteria

- ✓ Twin deliveries recorded at Tibebe Ghion Hospital during the study period
- ✓ Available medical records where both twins' perinatal data are documented (i.e., "paired records" with complete perinatal information)
- ✓

4.6 Exclusion criteria

- ✓ Incomplete or missing perinatal data for one or both twins (e.g., missing birth weight, Apgar score, gestational age, birth sex).
- ✓ Unpaired or single-record twins—where records for only one twin are available

4.7 Sample size determination

The minimum number of samples required for this study was determined by using single population proportion formula.

$$n = \frac{(z_{\alpha/2})^2 \cdot pq}{d^2}, p=q=0.5$$

Where: n= minimum sample size required for the study

Z= standard normal distribution (Z=1.96), CI of 95% = 0.05

P= prevalence of APO was 61.5% taken from the study done central Ethiopia (56).

d=Absolute precision or tolerable margin of error

Sample size Sample size $n = \frac{(Z_{1/2})^2 \times p(1-p)}{d^2}$

$$n = 1.96^2 \times 0.615(1-0.615) / (0.05)^2 = 363.$$

The sample size for the second objective was determined using the double population proportion formula, assuming factors associated with adverse outcomes.

Assumptions

Confidence level = 95%

Power = 80%

Ratio of exposed to non-exposed = 1: 1

Margin of error = 5%

From a previous Ethiopian study on twin pregnancies:

Proportion of adverse outcomes among exposed group (P1) = 45%

Proportion of adverse outcomes among non-exposed group (P2) = 30%

Calculated sample size

Using Epi Info version 7 (StatCalc – cohort or cross-sectional):

Sample size per group = 135

Total sample size = 270

Adding 10% contingency for incomplete records = 297

Final sample size

The final calculated sample size for the second objective was 297 twin pregnancies.

4.8. Sample technique

A retrospective institution-based cross-sectional study was conducted using secondary data.

All twin pregnancies delivered at Tibebe Ghion Specialized Hospital during the study period (August 25, 2024 to August 25, 2025) were first identified from the delivery registration logbook.

Because the total number of twin deliveries during the study period was manageable, all eligible twin pregnancy records were included in the study. Therefore, a census sampling technique was employed.

4.9. Study variable

4.10.1. Dependent variables

Adverse Maternal and Perinatal Outcomes

Adverse maternal outcomes: adverse maternal outcomes refer to the occurrence of one or more of the following complications among mothers with twin pregnancies during pregnancy, labor, or the immediate postpartum.

Perinatal adverse Outcomes: adverse perinatal outcomes refer to the occurrence of one or more of the following outcomes among newborns from twin pregnancies.

For maternal

- ✓ Mode of delivery: vaginal vs. cesarean section
- ✓ Postpartum hemorrhage
- ✓ Premature rupture of membranes
- ✓ Admission to intensive care (ICU/MICU)
- ✓ Maternal near-miss events or mortality

For the perinatal

- ✓ Low birth weight (<2500 g)
- ✓ Preterm birth (<37 weeks gestation)
- ✓ Stillbirth (intrauterine death)
- ✓ Low Apgar scores (commonly <7 at 1 or 5 minutes)
- ✓ NICU admission

- ✓ Early neonatal death (within first 7 days)

4.10.2 Independent Variables

1. Socio-demographic characteristics

Maternal age

Residence (urban / rural)

Marital status

Educational status

Occupation

2. Obstetric and reproductive factors

Gravidity

Parity

History of previous cesarean section

History of abortion

Interpregnancy interval

Gestational age at delivery

Chorionicity (if documented: dichorionic / monochorionic)

3. Antenatal and medical-related factors

Antenatal care (ANC) follow-up (yes / no)

Number of ANC visits

Anemia during pregnancy

Hypertensive disorders of pregnancy

Gestational diabetes mellitus

Premature rupture of membranes

Antepartum hemorrhage

Other documented maternal medical illnesses

4. Intrapartum and delivery-related factors

Onset of labor (spontaneous / induced)

Mode of delivery (vaginal / cesarean section)

Presentation of the first twin

Place of delivery (referral / direct admission)

Duration of labor

4.10. Data collection procedure and tool

Data were collected using a structured data extraction checklist developed by the investigator after reviewing relevant literature and similar studies. The checklist was adapted from WHO obstetric and neonatal indicators and modified to fit the local context and available medical records at Tibebe Ghion Hospital.

Content of the checklist

The checklist included sections on:

Socio-demographic characteristics

Obstetric and reproductive history

Antenatal and medical-related factors

Intrapartum and delivery-related factors

Maternal outcomes

Perinatal outcomes

Data extraction process

Data were extracted from delivery logbooks, maternal charts, and neonatal records using the structured data extraction checklist.

4.11 operational definitions

Twin pregnancy: - A pregnancy involving two fetuses confirmed by ultrasound or clinical records, regardless of chorionicity or amnionicity.

Adverse maternal outcome: Any maternal health complication occurring during labor, delivery, or postpartum period specific to twin pregnancies at least one of complications. This includes CS delivery, postpartum hemorrhage, PROM, preterm labor, tears, blood transfusion, SSI, Maternal ICU admission, and maternal death

Adverse Perinatal Outcomes: Any unfavorable condition affecting the newborns (from 28 weeks gestation to 7 days postpartum) at least one of complications. This may be Preterm birth (<37 weeks of gestation), Low birth weight (<2500 grams), Stillbirth (fetal death ≥ 28 weeks gestation), Early neonatal death (death within 7 days of birth), NICU admission and Birth asphyxia (Apgar score <7 at 5 minutes)

4.12 Data Quality Control

The Checklist was prepared in English. Two-day training was given for data collectors on how to fill the checklist and overall data collection process before the actual time of data collection. Pretest (Pilot) of the Data Extraction Checklist before the actual data collection, the structured data extraction checklist was pretested on 5% of twin pregnancy records from Tibebe Ghion Hospital during a different year outside the study period.

The pretest aimed to check the clarity, completeness, and consistency of the checklist and to identify any challenges in extracting the required information from medical records. Based on the pretest, minor modifications were made to the checklist to ensure that all variables could be accurately collected and recorded during the main study.

4.13. Data Processing and analysis

Data were coded, entered and cleaned using Epi-data version 3.1 and exported for further analysis using SPSS windows version 25. Categorical variables were summarized as numbers and percentages, whereas normally distributed continuous variable was presented as means and standard deviations by descriptive statistics. To identify factors associated with the outcome variable (adverse outcome of the maternal and perinatal), a bivariate logistic regression analysis was performed for each independent variable and crude odds ratio (COR) with 95% confidence intervals will be obtained. The strength of statistical association was measured by adjusted odds ratios (AOR) and 95% confidence intervals. P-Value <0.05 was considered statistically significant. Finally, the result was presented using tables and graph. Binary and multiple logistic regressions was used to assess the association between outcome and explanatory variables.

4.14. Ethical clearance

Ethical clearance was obtained from the IRB (4334/2024) of BDU research ethics committee of health science collage. Written informed consent was obtained from the head of outpatient to receive charts of the study participants from the card class. Then the card was received from the card class members after getting permission from the card office head. Confidentiality was ensured from all the data collectors and investigators by avoiding personal identification on the questionnaire and keeping questionnaires locked. Each questionnaire was coded which was now by only the principal investigator and his advisor.

4.15. Dissemination

The finding of this study will be presented as one of the partial fulfillments of specialty certificate in the department of obstetrics and gynecology, Bahir Dar University in addition presentation to research conference and to hospital team and published upon approval in accessible journals. Attempts will be made to share the findings with other stakeholders through publication and through presentation at conferences.

5. Result

5.1 Sociodemographic characteristics of the study participants

A total of 353 mothers with twin pregnancies were included in the study.

Nearly half of the study participants were aged 26–34 years (49.3%). The majority of the women were rural residents (79.9%), indicating that most participants came from non-urban settings. Concerning marital status, an overwhelming majority of the participants were married (94.9%).

Table 1. The sociodemographic characteristics of the study participants among twin Pregnancies at Tibebe Ghion Hospital, Bahirdar, Ethiopia, 25 august 2024 to 25 August 2025

Variable	Frequency	Percentage
Age in years		
18-25	80	22.7
26-34	174	49.3
>=35	99	28
Residency		
Urban	71	20.1
Rural	282	79.9
marital status		
Single	12	3.4
Married	335	94.9
Divorced	2	.6
Widowed	4	1.1

5.2 Health related characteristics of the study participants

More than half of the study participants used at least one medication (recommended) or supplement (iron) during pregnancy (58.4%), with ferrous sulphate being the most commonly used medication (92.2% of users). Only a small proportion of the mothers had a preexisting medical condition (4%), the most common being chronic hypertension (84.6%) among those affected. About one-quarter of the women developed anemia during pregnancy (25.5%). Infections during pregnancy were reported in 11% of participants, with urinary tract infection (41%) being the most frequently identified type of infection.

Table 2. Health related characteristics of the study participants among twin pregnancies at Tibebe Ghion Hospital, Bahirdar, Ethiopia

Variable	Frequency	Percent
Use of any medication or supplements during pregnancy		
• Yes	206	58.4
• No	147	41.6
Types of medication (=226):		
Ferrous sulphate	190	92.2
Aspirin	32	15.5
Nifedipines	4	1.9%
Preexisting medical condition:		
• Yes	13	4
• No	340	96
Types of preexisting disease(n=13):		
Chronic hypertensive	11	84.6
Simple multinodular goiter	1	7.7
Chronic valvular heart disease	1	7.7
Anemia during pregnancy		
• Yes	90	25.5
• No	263	74.5
Infections during pregnancy:		
• Yes	39	11
• No	314	89
Types of infection(n=39):		
• Chorioamnionitis(triple I)	6	15.4
• HAI	3	7.7
• Malaria	15	38.5
• UTI	16	41
• Metritis with pelvic cellulitis	1	2.6

5.3 Reproductive and obstetric related characteristics of the participants

More than half of the participants had a parity of two to three (53.8%). The majority had no history of previous twin pregnancy (91.2%), and most had no history of adverse pregnancy outcomes (71.4%). Regarding birth spacing, over half of the women had an interpregnancy interval of 24 months or more (59.2%). Slightly more than half of the participants had at least one ANC visit (55.8%), with most initiating care during the second trimester (46.2%). Almost all women had fewer than eight ANC visits (96.4%). Twin pregnancy was confirmed by ultrasound in 94.1% of cases, and the most common type was dichorionic twins (72.5%). Nearly half of the

participants experienced complications during pregnancy (49.3%), with hypertensive disorders being the most frequent complication (66.1%).

Table 3. Reproductive and obstetric related characteristics of the participants among twin pregnancies at Tibebe Ghion Hospital, Bahirdar, Ethiopia

Variable	frequency	Percentage
Parity:		
One	89	25.2
Two-Three	190	53.8
Five and above	74	21.0
History of previous twin pregnancies:		
• Yes	31	8.8
• No	322	91.2
History of adverse pregnancy outcomes		
• Yes	101	28.6
• No	252	71.4
Interpregnancy interval:		
<24	107	40.8
>=24	155	59.2
Is there ANC visit:		
• Yes	197	55.8
• No	156	44.2
Gestational age at first visit :		
First trimester	26	13.2
Second trimester	91	46.2
Third trimester	80	40.6
Number of ANC visits:		
• <8 times	190	96.4
• >=8 times	7	3.6
Diagnosis of twin pregnancy confirmed by ultrasound:		
• Yes	332	94.1
• No	21	5.9
Types of twin pregnancy:		
• Dichorionic	256	72.5
• Monochorionic	55	15.6
• Unknown	42	11.9
Complication during pregnancy		
• Yes	174	49.3
• No	179	50.7
Types of complication (n=174):		
APH	17	9.8
Preterm labor	44	25.3
Hypertensive disorder	115	66.1
GDM	2	11.5

5.4 Labor and delivery related characteristics of the study participants

Outcome variables: Labor and delivery–related characteristics

1. Mode of delivery

Definition:

The method by which the pregnancy was terminated.

Categories:

- ✓ Vaginal delivery
- ✓ Cesarean section (elective or emergency)

Measurement:

Recorded from delivery notes in the maternal chart.

2. Onset of labor

Definition:

The manner in which labor started.

Categories:

- ✓ Spontaneous labor
- ✓ Induced labor
- ✓ No labor (direct cesarean section)

Measurement:

Extracted from obstetric records.

3. Duration of labor

Definition:

The total time from the onset of active labor to delivery of the last twin.

Categories (example):

- ✓ ≤ 12 hours
- ✓ >12 hours

Measurement:

Calculated from partograph and delivery records.

4. Premature rupture of membranes (PROM)

Definition:

Rupture of fetal membranes before the onset of labor.

Categories:

- ✓ Yes
- ✓ No

Measurement:

Documented diagnosis in the maternal chart.

5. Indication for cesarean section

Definition:

The primary clinical reason for performing a cesarean delivery.

Categories (example):

- ✓ Malpresentation
- ✓ Fetal distress
- ✓ Previous cesarean section
- ✓ Failure to progress
- ✓ Others (specified)

Measurement:

Recorded from operation notes.

6. Postpartum hemorrhage (PPH)

Definition:

Blood loss of ≥ 500 ml after vaginal delivery or ≥ 1000 ml after cesarean section, or any blood loss causing hemodynamic instability.

Categories:

- ✓ Yes
- ✓ No

Measurement:

Based on clinical diagnosis documented in the chart.

7. Maternal infection

Definition:

Any documented infection occurring during labor or within the immediate postpartum period.

Includes:

- Chorioamnionitis
- Puerperal sepsis
- Urinary tract infection

Categories:

- ✓ Yes
- ✓ No

Measurement:

Extracted from maternal records.

8. Adverse maternal outcome

Definition:

The occurrence of at least one maternal complication during labor or delivery.

Includes (composite outcome):

- Postpartum hemorrhage
- Maternal infection
- Uterine rupture
- ICU admission
- Maternal death

Categories:

- Yes
- No

Measurement:

Created as a composite variable during data analysis.

The composite adverse maternal outcome was observed in 40% (141) of women with twin pregnancies, while the remaining 60% (212) experienced no adverse maternal outcome.

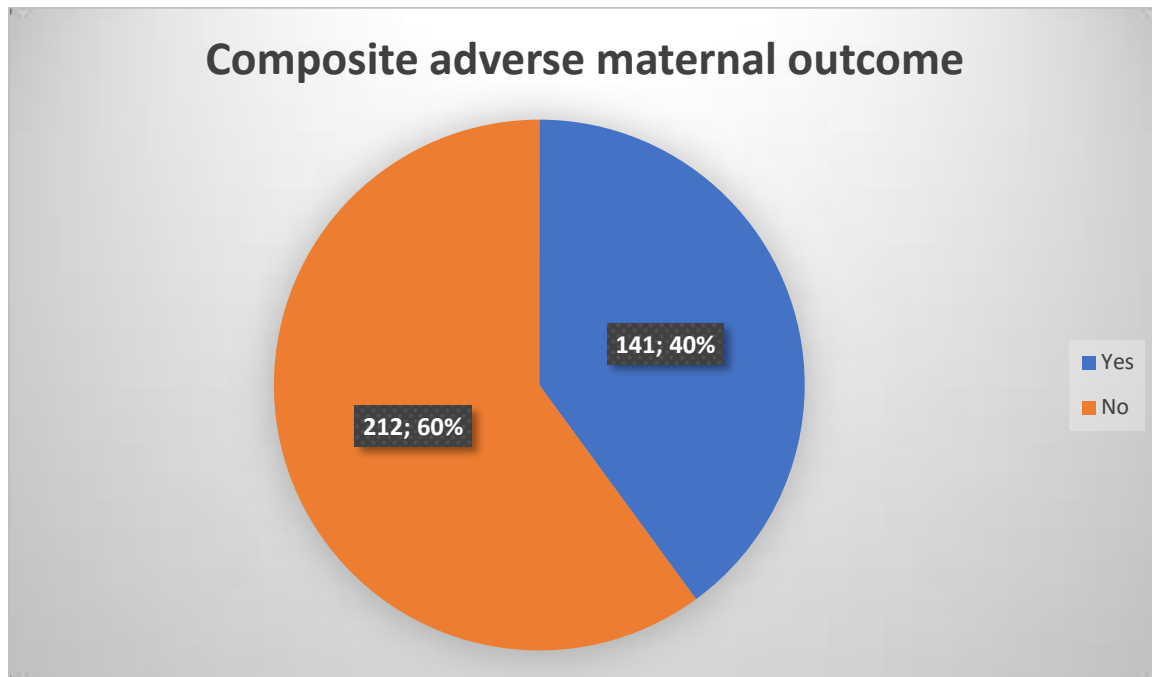


Figure 2. Composite maternal outcome of among twin pregnancies at Tibebe Ghion Hospital, Bahirdar, Ethiopia

Slightly more than half of the twin pregnancies were delivered by cesarean section (51.8%). More than half of the deliveries occurred at a gestational age of less than 37 weeks (53%). Adverse maternal outcomes were observed in 39.9% of the participants, with anemia being the most common adverse outcome (78.7%). Only a small proportion of mothers required blood transfusion (6.5%), and all of those transfused received at least one unit of blood (100%). Admission to the intensive care unit was uncommon (2%). Most mothers stayed in the hospital for 2–4 days after delivery (88.4%).

Table 4. Labor and delivery related characteristics of twin pregnancies at Tibebe Ghion Hospital, Bahirdar, Ethiopia

Variable	frequency	Percent
Mode of delivery		
• SVD	170	48.2
• CS	183	51.8
Gestational age at delivery		
• <37	187	53
• ≥37	165	47
Adverse maternal outcome		
• Yes	141	39.9
• No	212	60.1
Types of adverse outcome (n=141)		
• PPH	30	21.3
• Anemia	111	78.7
• DIC	1	0.6
• Death	2	1.1
Cause of death:		
Renal failure	2	100
Indication of transfusion		
• Yes	23	6.5
• No	330	93.5
Transfused at list one unit (n=23):		
Yes	23	100
Admitted to ICU:		
• Yes	7	2
• No	346	98
Hospital stay after delivery in days:		
• <2	12	3.4
• 2-4	312	88.4
• >4	29	8.2

5.5 The determinant factors of adverse maternal outcome

In the bivariate logistic regression analysis, maternal age, parity, history of twin pregnancy, and interpregnancy interval were associated with adverse maternal outcomes. In the multivariable logistic regression analysis, women with parity five and above were more than three times more likely to develop adverse maternal outcomes compared with primiparous women (AOR = 3.4; 95% CI: 1.37–8.62; $p = 0.008$). Mothers with a history of twin pregnancy had nearly threefold increased odds of adverse maternal outcomes (AOR = 2.9; 95% CI: 1.08–8.04; $p = 0.036$).

Similarly, an interpregnancy interval of less than 24 months was significantly associated with adverse maternal outcomes (AOR = 1.5; 95% CI: 1.27–3.16; $p = 0.019$).

Table 5. The bivariate and multivariable logistic regression of association between maternal outcome and independent variable among twin pregnancies at Tibebe Ghion Hospital, Bahirdar, Ethiopia

Variable	Adverse maternal outcome		p-value	COR with 95%CI	P-value	AOR with 95%CI
	Yes	no				
Age in years						
• 15-25	22	58	1		1	
• 26-34	74	100	0.05	1.9(1.09, 3.47)	0.139	3.5(0.67, 17.89)
• ≥ 35	45	54	0.014	0.52(1.17, 4.13)	0.215	2.9(0.53, 16.81)
parity						
• one	19	70	1		1	
• Two-four	73	117	0.005	2.3(1.28, 4.13)	0.124	2.1(0.36, 4.65)
• Five and above	49	25	0.000	7.2(3.59, 14.53)	0.008	3.4(1.37, 8.62)
History of twin pregnancy						
• Yes	19	12	0.014	2.6(1.22, 5.53)	0.036	2.9(1.08, 8.04)
• No	122	200	1		1	
Interpregnancy interval						
• < 24	57	50	0.057	1.6(0.98, 2.66)	0.019	1.5(1.27, 3.16)
• ≥ 24	64	91	1		1	
First ANC visit:						
• First trimester	5	21	1		1	
• Second trimester	36	55	0.062	2.7(0.95, 7.95)	0.768	1.3(0.22, 7.83)
• Third trimester	30	50	0.092	2.5(0.86, 7.39)	0.923	1.1(0.18, 6.47)

5.6 Twin A perinatal outcome

Adverse perinatal outcome

An adverse perinatal outcome was defined as the occurrence of at least one of the following conditions in either twin:

- Stillbirth (fetal death at ≥ 28 completed weeks of gestation)
- Early neonatal death (death within the first 7 days of life)
- Low birth weight (birth weight < 2500 g)
- Preterm birth (delivery before 37 completed weeks of gestation)

- Low fifth-minute Apgar score (<7 at 5 minutes)
- Admission to neonatal intensive care unit (NICU)

Newborns without any of the above conditions were classified as having a good perinatal outcome.

Measurement

Perinatal outcomes were assessed using delivery records, neonatal charts, and NICU admission logs documented in the medical records

The composite perinatal outcome of Twin A was poor in 83% (292) of cases, while only 17% (61) of Twin A had a good composite perinatal outcome.

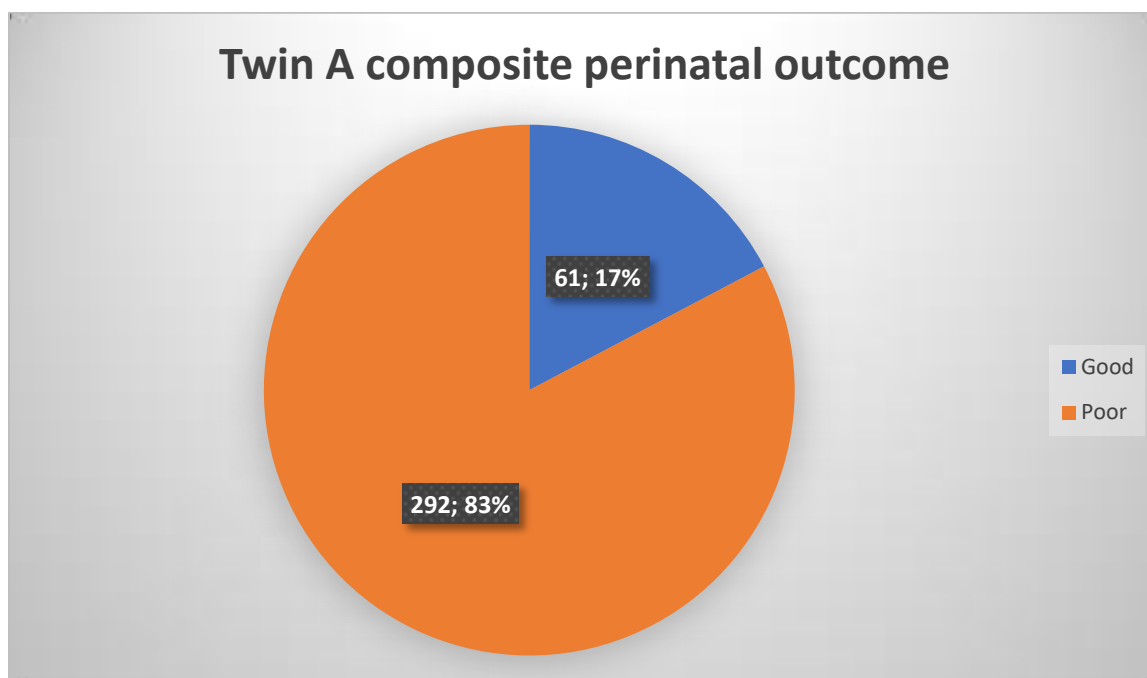


Figure 3. The composite perinatal outcome of twin A.

Among Twin A, male neonates accounted for 55.5% of births. The vast majority of Twin A were born alive (96.0%). Almost all neonates had a fifth-minute APGAR score ≥ 7 (97.3%). More than half of Twin A had a birth weight between 1500–2499 g (58.4%). A high proportion of live-born Twin A were admitted to the NICU (82%), mainly due to prematurity (87.7%). Among those admitted to the NICU, 78.7% were discharged alive, while the leading cause of death was respiratory failure (88.7%).

Table 6. The characteristics of twin A outcome among twin Pregnancies at Tibebe Ghion Hospital, Bahirdar, Ethiopia, 25 august 2024 to 25 August 2025

Variable	frequency	Percent
Sex twin A		
• male	196	55.5
• Female	157	44.5
Birth outcome of twin A:		
• Alive	339	96.0
• died	14	4.0
Fifth minute APGAR:		
• <7	9	2.7
• ≥7	330	97.3
Birth weight of twin A:		
• <1000	10	2.8
• 1000-1499	42	11.9
•		
• 1500-2499	206	58.4
• 2500-3999	95	26.9
Twin A admitted to NICU (n=339):		
• Yes	278	82
• No	61	18
Admission indication (n=278):		
• Low birth weight	34	12.3
• prematurity	244	87.7
Neonatal outcome from NICU (n=278)		
• Died	62	22.3
• Discharge	216	78.7
Cause of death (n=62)		
• Neonatal sepsis	7	11.3
• Respiratory failure	55	88.7

5.7 Twin B perinatal outcome

The composite perinatal outcome of Twin B was poor in 85% (300) of cases, while only 15% (53) had a good composite perinatal outcome.

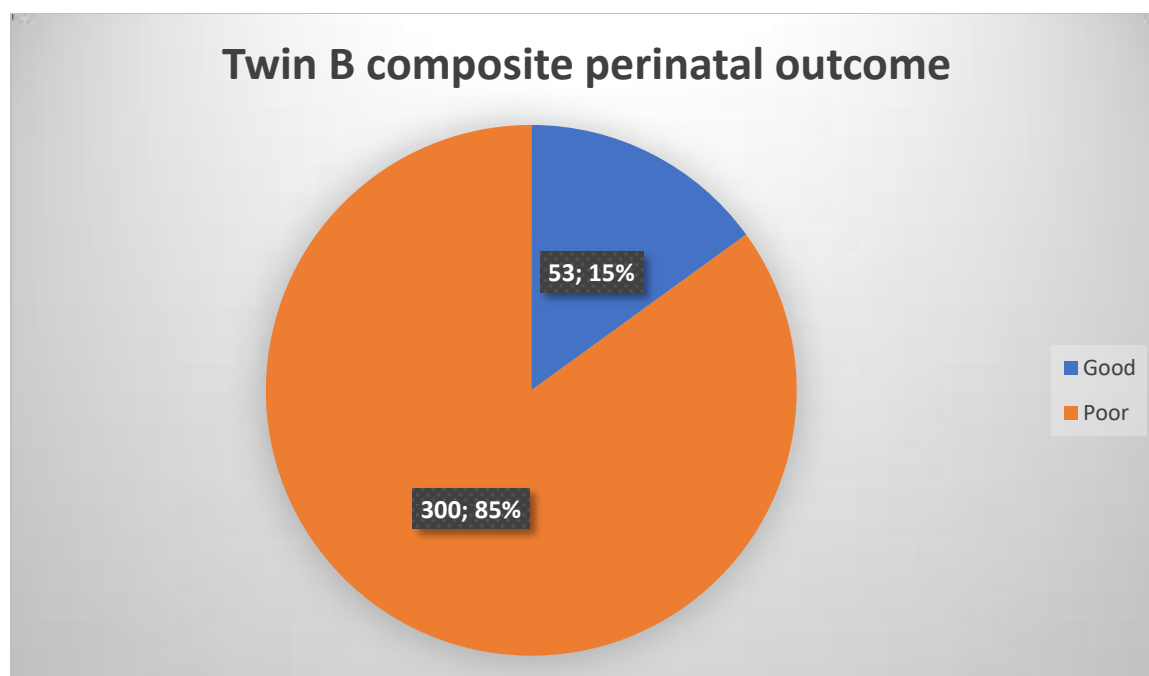


Figure 4. The composite perinatal outcome of twin B.

Among Twin B, female neonates slightly predominated (50.7%). The majority of Twin B were born alive (91.5%). Most live-born Twin B had a fifth-minute APGAR score ≥ 7 (96.3%). The largest proportion had a birth weight of 1500–2499 g (60.3%). A high proportion of live-born Twin B were admitted to the NICU (83.6%), mainly due to prematurity (51.5%). Among those admitted to the NICU, 60.8% were discharged alive, and the leading cause of death was respiratory failure (87.7%).

Table 7. The outcome related characteristics of twin B.

Variable	Frequency	Percent
Sex twin B:		
• male	174	49.3
• Female	179	50.7
Birth outcome of twin B:		
• alive	323	91.5
• died	30	8.5
Fifth minute APGAR (n=323):		
• <7	12	3.7
• ≥ 7	311	96.3
Birth weight of twin B:		
• <1000	8	2.3
• 1000-1499	67	19

• 1500-2499	213	60.3
• 2500-3999	65	18.4
Twin B admitted to NICU (N=323):		
• Yes	270	83.6
• No	53	16.4
Admission indication (n=270):		
• Low birth weight	131	48.5
• prematurity	139	51.5
Neonatal outcome from NICU (n=270)		
• Died	106	39.2
• Improved and discharge	164	60.8
Cause of death (n=106):		
• Neonatal sepsis	13	12.3
• Respiratory failure	93	87.7

5.8 The determinant factors of adverse perinatal outcome

In the bivariate analysis, several factors were significantly associated with adverse perinatal outcomes in Twin. Mothers with a history of twin pregnancy (COR = 0.39; 95% CI: 0.18–0.89; $p = 0.025$), the presence of pregnancy complications (COR = 5.7; 95% CI: 2.87–11.47; $p < 0.001$), use of medication or supplements during pregnancy (COR = 0.53; 95% CI: 0.29–0.96; $p = 0.036$) and the occurrence of adverse maternal outcomes increased the likelihood of adverse perinatal outcomes in Twin (COR = 2.1; 95% CI: 1.14–3.89; $p = 0.018$). After adjusting for confounders, the presence of pregnancy complications remained a strong independent predictor of adverse perinatal outcomes, with mothers experiencing complications having over six times the odds of adverse outcomes (AOR = 6.1; 95% CI: 2.96–12.43; $p < 0.001$). The use of medication or supplements during pregnancy was significantly protective (AOR = 0.45; 95% CI: 0.24–0.87; $p = 0.017$). Adverse maternal outcome also remained an independent risk factor (AOR = 1.8; 95% CI: 1.19–3.52; $p = 0.046$). Although having a history of twin pregnancy appeared to reduce the odds of adverse perinatal outcome (AOR = 0.41).

Table 8. The bivariate and multivariable logistic regression of association between perinatal outcome and independent variable among twin pregnancies at Tibebe Ghion Hospital, Bahirdar, Ethiopia

Variable	Adverse twin perinatal outcome		p-value	COR with 95%CI	p-value	AOR with 95%CI
	Yes	No				
Twin history						
• Yes	21	10	0.025	0.39(0.18, 0.89)	0.064	0.41(0.16, 1.05)
• No	271	51	1		1	
Pregnancy complication						
• Yes	163	11	0.000	5.7(2.87, 11.47)	0.000	6.1(2.96, 12.43)
• No	129	50	1		1	
Medication supplement use during pregnancy						
• Yes	163	43	0.036	0.53(0.29, 0.96)	0.017	0.45(0.24, 0.87)
• No	129	18	1		1	
Adverse maternal outcome						
• No	167	45	1		1	
• Yes	125	16	0.018	2.1(1.14, 3.89)	0.046	1.8(1.19, 3.52)

6. Discussion

1. Maternal socio-demographic factors and outcomes

In this study, maternal age, residence, and number of antenatal care (ANC) visits were assessed for their association with adverse maternal outcomes. Maternal age ≥ 35 years was found to have a protective effect in the bivariate analysis (COR = 0.52), although it was not statistically significant in the multivariable model. This finding is consistent with previous studies that have reported that younger maternal age may be associated with higher risk of obstetric complications, potentially due to inadequate birth preparedness and limited obstetric experience (43,44).

Mothers with fewer than four ANC visits were more likely to experience adverse maternal outcomes, in line with WHO recommendations emphasizing the importance of regular antenatal visits for early detection and management of maternal complications (45). This emphasizes the need to strengthen ANC services, particularly for women with twin pregnancies who are at higher risk of complications.

2. Labor and delivery characteristics

Premature rupture of membranes (PROM) was significantly associated with adverse maternal outcomes, which aligns with findings from studies in Ethiopia and other low-resource settings (46, 47). PROM increases the risk of maternal infections, including chorioamnionitis and puerperal sepsis, which may contribute to postpartum hemorrhage and other complications.

Mode of delivery also influenced maternal outcomes, with cesarean section associated with higher rates of adverse outcomes in the bivariate analysis. This finding is supported by similar studies indicating that cesarean delivery in twin pregnancies, while sometimes lifesaving, carries increased maternal risks such as hemorrhage, infection, and longer hospital stay (48, 49).

3. Perinatal outcomes

Adverse perinatal outcomes were common in twin pregnancies. Preterm birth (<37 weeks) and low birth weight (<2500 g) were the most frequent adverse outcomes, consistent with prior literature demonstrating the inherent risks associated with multiple gestations (50, 51). PROM and inadequate ANC attendance were significantly associated with adverse perinatal outcomes in the multivariable analysis. This is in line with global evidence showing that early identification

of maternal and obstetric complications through regular ANC can improve perinatal survival (52, 45).

Cesarean section was associated with adverse perinatal outcomes in bivariate analysis but lost significance in multivariable analysis, suggesting that the effect may be confounded by gestational age, birth weight, and other clinical factors.

4. Implications for clinical practice

These findings highlight the need for enhanced monitoring of twin pregnancies, particularly among mothers with limited ANC attendance and those presenting with PROM. Strengthening ANC coverage, timely identification of high-risk pregnancies, and preparation for skilled obstetric management may reduce adverse maternal and perinatal outcomes in this high-risk group.

5. Strengths and limitations

This study used hospital-based data and included all twin deliveries within the study period, providing a comprehensive overview of maternal and perinatal outcomes in this population. However, limitations include the retrospective design, which may be prone to incomplete documentation and missing data. Additionally, some maternal and neonatal complications may have been underreported.

7. Conclusion

Twin pregnancies at Tibebe Ghion Hospital were associated with a high burden of adverse maternal and perinatal outcomes. Nearly 40% of women experienced composite maternal complications, with anemia being the most common. More than half of twin deliveries occurred preterm (<37 weeks), and cesarean delivery was common. Grand multiparity, a history of twin pregnancy, and short interpregnancy intervals were significant predictors of adverse maternal outcomes. The majority of neonates from both twins experienced poor perinatal outcomes, with high rates of NICU admission due to prematurity, low birth weight, and respiratory complications. Pregnancy complications and adverse maternal outcomes independently increased the risk of poor neonatal outcomes, while antenatal medication or supplement use was protective.

This study assessed the prevalence, predictors, and outcomes of adverse maternal and perinatal outcomes among twin pregnancies at Tibebe Ghion Hospital. The findings highlight the high-risk nature of twin pregnancies and the critical need for targeted interventions to improve maternal and neonatal health in this population.

1. Maternal outcomes

The study revealed that a considerable proportion of mothers experienced adverse maternal outcomes, including postpartum hemorrhage, maternal infections, and complications related to cesarean delivery. Factors significantly associated with adverse maternal outcomes included premature rupture of membranes (PROM) and inadequate antenatal care (fewer than four ANC visits). These findings underscore the importance of early identification and monitoring of high-risk mothers, strengthening ANC coverage, and providing timely and skilled obstetric care.

2. Perinatal outcomes

Adverse perinatal outcomes were common among twins, with preterm birth, low birth weight, low Apgar scores, and NICU admissions being the most frequent complications. PROM and inadequate ANC attendance were significantly associated with adverse perinatal outcomes. These findings confirm that twin pregnancies inherently carry a higher risk for perinatal morbidity and mortality. The results highlight the need for specialized care for twin pregnancies, including close fetal monitoring, timely delivery planning, and preparation for neonatal resuscitation and intensive care.

3. Implications for clinical practice

The study emphasizes that twin pregnancies require enhanced clinical attention, especially in settings with limited resources. Interventions such as increasing ANC utilization, educating mothers about warning signs, prompt management of PROM, and preparing for preterm delivery can substantially reduce both maternal and neonatal complications. Healthcare providers should prioritize risk stratification and individualized management plans for twin pregnancies to optimize outcomes.

4. Policy and research implications

These findings provide evidence for hospital-level and national policies to improve maternal and neonatal outcomes in multiple gestations. Policies should focus on ensuring adequate ANC coverage, improving access to emergency obstetric care, and strengthening neonatal intensive care capacity. Furthermore, the study identifies gaps for future research, including prospective studies on twin pregnancies and interventions to reduce adverse outcomes.

5. Final statement

In conclusion, twin pregnancies are associated with significant maternal and perinatal risks. PROM, inadequate ANC visits, and preterm delivery were the most important predictors of adverse outcomes. Interventions targeting these risk factors, along with comprehensive and timely obstetric and neonatal care, are critical to improving the health of mothers and their twins in Ethiopia and similar low-resource settings.

8. Recommendations

- Encourage early and regular ANC visits, particularly for women with previous twin pregnancies or high parity
- Ensure routine monitoring for maternal anemia and pregnancy complications.
- Women with short interpregnancy intervals or grand multiparity should be identified as high-risk and provided intensive monitoring and counseling.
- Develop individualized care plans for mothers with known pregnancy complications to prevent adverse maternal and perinatal outcomes.

- Enhance NICU capacity and neonatal support, particularly for preterm and low birth weight twins.
- Educate women on optimal birth spacing and family planning to reduce risks associated with short interpregnancy intervals.
- Conduct prospective studies to explore the long-term outcomes of twins and the effectiveness of targeted interventions in improving maternal and neonatal outcomes.

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AnnexI: - Questionnaire

Part I. Socio-Demographic Information

1. Age of mother: _____ years
2. Residence
 - I. Urban
 - II. Rural
3. Educational level:
 - I. No formal education
 - II. Primary school
 - III. Secondary school
 - IV. Higher education
4. Occupation:
 - I. Housewife
 - II. Employed
 - III. Student
 - IV. Other: _____
5. Marital status:
 - I. Married
 - II. Single
 - III. Divorced
 - IV. Widowed
6. House hold monthly oncome in birr_____

Part II. Obstetric History

6. Gravidity _____
7. Parity _____
8. History of previous twin pregnancies
 - I. Yes
 - II. No
9. History of adverse pregnancy outcomes (e.g., miscarriage, stillbirth):

- I. Yes
- II. No

10. If yes, specify: _____

11. Interval between pregnancies the mother is multiparous _____ months/years

Part III. Current Pregnancy

11. Gestational age at first antenatal visit _____ weeks

12. Antenatal care visit

- I. Yes
- II. No

13. Number of antenatal care visits during this pregnancy _____

14. Diagnosis of twin pregnancy confirmed by ultrasound

- I. Yes
- II. No

14. Type of twin pregnancy (if known)

- I. Dichorionic
- II. Monochorionic
- III. Unknown

15. Complications during current pregnancy (check all that apply)

- I. Hypertensive disorders (preeclampsia/eclampsia)
- II. Gestational diabetes
- III. Antepartum hemorrhage
- IV. Preterm labor
- V. Other: _____

16. Use of any medication or supplements during pregnancy

- I. Yes (specify) _____
- II. No

Part IV. Maternal Health Status

17. Pre-existing medical conditions

- I. Yes (specify): _____
- II. No

18. Body mass index (BMI) before pregnancy: _____ kg/m²

19. Anemia during pregnancy:

- I. Yes
- II. No

20. Infections during pregnancy (e.g., urinary tract infection, malaria):

- I. Yes
- II. No

21. If yes, specify: _____

Part V. Management course

22. Was she admitted to maternity ward:

- I. yes
- II. no

23. If yes, for how many weeks she was admitted

- I. <1 week
- II. 1-2weeks
- III. 3-4 weeks
- IV. >4 weeks

24. If she was admitted, what measures taken

- I. Corticosteroids
- II. tocolytics
- III. other specify.....

25. What is the mode of delivery

- I. Vaginal delivery
- II. Caesarian delivery
- III. Both

Part VII. Maternal outcome

26. Is there is any adverse Maternal outcome

- I. YES
- II. NO

27. If yes for the above question, what was the adverse out come?

- I. Death
- II. PPH
- III. Anemia
- IV. DIC
- V. Hemorrhagic shock
- VI. other, specify.....

28. If dead what was the cause of death?

- I. Hypovolemia shock
- II. Renal failure,
- III. DIC
- IV. respiratory failure
- V. other specify.....

29. Did the mother indicate for transfusion?

- I. Yes
- II. no

30. If yes, did the mother transfused with at least one unit of blood?

- I. Yes
- II. no

31. Was she admitted to ICU

- I. Yes
- II. No

32. Hospital stays after delivery in days? _____

33. What was the condition of the mother at discharge?

- I. Improved
- II. died

Part VIII. Fetal outcome

34. Gestational age at delivery in weeks _____

For twin A

35. Sex of neonate delivered

- I. male
- II. female

36. Perinatal outcome

- I. alive birth
- II. died (IUFD/still birth and early neonatal death)

37. if alive APGAR score at 1minute_____

38. Apgar Scor at five-minute_____

39. Birth weight in grams_____

40. Did the neonate admit to NICU?

I. yes

II. no

41. If yes, what was the indication of admission?

- I. Birth Asphyxia
- II. low birth weight
- III. Prematurity
- IV. other specify---

42. What was the condition of neonate at discharge?

I. improved

II. died

43. If died, what was the cause of death?

- I. Respiratory failure
- II. neonatal sepsis
- III. otherspecify_____

for neonate twin B

44. Sex of twin B

- I. male
- II. female

45. Perinatal outcome

- I. alive birth
- II. died (IUFD/still birth and early neonatal death)

46. if alive APGAR score at one-minute _____

47. APGAR score at five-minute_____

48. Birth weight in grams_____

49. Did the neonate admit to NICU?

I. Yes

II. no

50. If yes, what was the indication of admission?

I. Birth Asphyxia

II. low birthWeight

III. prematurity

IV. other specify

51. What was the condition of neonate at discharge?

I. Improved

II. died

52. If died, what was the cause of death?

I. Respiratory failure

II. neonatal sepsis

III. other specify_____