



School of Nursing

Determinants of Adverse Birth Outcomes among Mothers with Cardiovascular Problems in Addis Ababa Public Hospitals, Ethiopia, 2024: Unmatched Case-Control Study

By: -Selamawit Bekele

A Research Report Submitted to St Paul Hospital Millennium Medical College School of Nursing in partial fulfillment of The Requirements for a Master's Degree in Cardiovascular Nurse Practitioner.

August, 2024

Addis Ababa, Ethiopia

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1. Ababe Tamirat [Assistant professor, MSc, MA, BSc]

2. Fisseha Zeleke [MSc,BSc]

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Abstract

Introduction: - Adverse birth outcomes, such as low birth weight, preterm delivery, and fetal mortality are common in many regions including Ethiopia and sub-Saharan Africa, where pregnant women with cardiovascular disease are at risk for the condition. However, the adverse birth outcomes of women with cardiovascular diseases are have not yet studied in Ethiopia.

Objective: - This study aims to assess determinants of adverse birth outcomes among mothers with cardiovascular problems in Addis Ababa public hospitals, 2024.

Methods: -unmatched case-control study was conducted. The sample size was taken by simple random sampling & distributed in a 1:1 ratio to the case and control. Data was collected with a structured checklist by Kobo data collection software. Bivariate and unconditional logistic regression analysis was done, variables with a p-value less than 0.25 selected as a candidate variable. Using SPSS version 26, the analysis was utilized after checking the logistic regression model's fundamental assumptions. Variables with a P value <0.05 were considered statistically significant, and the odds ratio with a 95% confidence interval was used as a measure of association.

Result: - Mothers who had hemoglobin levels below 11 g/dl during admission for labor were almost four times more at risk to have an adverse birth outcome compared to those who had levels of 11 g/dl or higher (AOR = 3.70, 95% CI: 2.54–5. 38; p-value <0.001). Furthermore, Women who hadn't taken their medication or had stopped taking it before getting pregnant were 1.4 times at risk to have an adverse birth outcome than those who were taking it. (AOR = 1.43, 95% CI: 1.15–1.77; P-value 0.001). Mothers who received a new diagnosis during their current pregnancy were twice at risk to have an adverse birth outcome than who did not receive the new medical diagnosis. (AOR = 2.37, 95% CI: 1.67–3.37; P-value<0.001). Additionally, Mothers who did not receive ANC visits were by 1.7 times at risk to experience an adverse birth outcome than who did receive ANC visits (AOR = 1.73, 95% CI: 1.30–2.29; p-value<0.001)

Conclusion: -The study determined that not using or discontinuation of cardiovascular medications before pregnancy, hemoglobin level below 11g/dl, receiving a new diagnosis during the current pregnancy and not having ANC follow up were associated with determinants of adverse birth out comes among mothers with cardiovascular problems.

Key words: Addis Ababa, Adverse birth outcome, Cardiovascular disease, Ethiopia, Pregnancy.

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Abbreviation and Acronyms

AI-Aortic Insufficiency

AMA-Advanced Maternal Age

ANC-Ante Natal Care

ACE-I-Angiotensin Converting Enzyme Inhibitor

ACHD-Adult Congenital Heart Disease

ACS-Acute Coronary Syndrome

APGAR-Activity, Pulse, Grimace, Appearance, Respiration

AS-Aortic Stenosis

CAD-Coronary Artery Disease

CVD- Cardiovascular Disease

CHD-Congenital Heart Disease

CI-Confidence Interval

CS-Cesarean Section

COPD-Chronic Obstructive Lung Disease

ECHO-Echocardiography

ESC-European Society of Cardiology

HD-Heart Disease

Hgb-Hemoglobin

HCM-Hypertrophic Cardiomyopathy

HMIS-Health Management Information System

IUGR-Intra Uterine Growth Retardation

LVEF-Left Ventricular Ejection Fraction

LBW-Low Birth Weight

MACE-Maternal Adverse Cardiac Event

MI-Myocardial Infarction

MS-Mitral Stenosis

MR-Mitral Regurgitation

NACE-Neonatal Adverse Cardiac Event

NCD-Non-Communicable Disease

NYHA-New York Heart Association

OR-Odds Ratio

PH-Pulmonary Hypertension

PIH-Pregnancy Induced Hypertension

RHD-Rheumatic Heart Disease

SPHMMC-Saint Paul Hospital Millennium Medical College

SVD-Spontaneous Vaginal Delivery

TB-Tuberculosis

UTI-Urinary Tract Infection

VHD-Valvular Heart Disease

WHO-World Health Organization

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1. INTRODUCTION

1.1 Background

An adverse birth result is a prevalent health issue that encompasses various health consequences for the newborn child. Infants who have one or more adverse birth outcomes are more vulnerable to death as well as a range of medical and developmental issues(1).

The World Health Organization defines adverse birth outcomes as low birth weight, preterm birth, stillbirth, or perinatal mortality. With a pooled prevalence of 29.7% in sub-Saharan Africa, preterm births and abnormal infant sizes were the most common adverse birth outcomes. Pregnant women with cardiovascular disease are at risk for the problem (2).

Life-threatening problems are linked to pregnancy in women with heart disease. Despite advancements in the field, one of the main causes of newborn mortality and morbidity is still heart illness during pregnancy(3).

In western Kenya, the study on burden and spectrum of cardiac disease in pregnancy found that low birth weight (30.4% vs. 7.8%), preterm delivery (41.6 vs. 10.8%), and intrauterine fetal mortality (11.2% vs. 3.0%) were all common among cases and controls respectively. Cases had higher frequencies of vacuum-assisted deliveries (19.8% vs. 0%) and labor induction (37.0% vs. 10.3%) than controls(4).

Perinatal mortality was high, according to the 2016 Ethiopian Demographic and Health Survey. There were reported to be 33 deaths for every 1000 live births. It was linked to being an older mother, being prim parous, and having a pregnancy interval of fewer than 15 months(5).

Normally, numerous vascular, metabolic, and physiological changes occur in the mother during pregnancy, such as fat accumulation, hypercoagulability, heart remodeling, and lowered vascular resistance. These adjustments help the fetus grow and develop while also preparing the mother for the increased energy and dietary requirements of lactation, which support the postnatal growth of the infant but, this pregnancy's physiological strain may reveal adverse results for the fetus(6).

1.2 statement of the problem

Approximately 210 million women become pregnant globally, and over 135 million of them give birth to live children. The other 75 million pregnancies end in stillbirth, premature delivery, spontaneous or induced abortion, or both(7).

The study conducted in New York reveals neonatal outcomes in the children of mothers with four forms of HD and in comparison to women without HD, NACE was more prevalent in the offspring of those with cardiomyopathy and PH than in those with VHD and ACHD. Small-for-gestational-age, birth weight and higher rates of preterm were the main causes of this. Fetal mortality, intrauterine growth restriction, respiratory distress syndrome, intracranial or cerebral intraventricular hemorrhage were all more common in children whose mothers had HD. Prematurity and small-for-gestational-age birth weight were more common in women with HD who also had cardiomyopathy and PH(8).

The Los Angeles study on the consequences of heart disease on fetuses reveals in the heart failure group, Infants with low birth weights (less than 2,500 grams) and very low birth weights (less than 1,500 grams) were more common in the group with heart failure. There was a greater percentage of small-for-gestational-age infants born to mothers with heart failure, even after adjusting for gestational age. When comparing the heart failure group to the control group, there was a greater percentage of newborns with Apgar scores below 7 at 1 minute, 5 minutes, and 10 minutes after birth(9).

The Indonesian study revealed in terms of neonatal outcomes, preterm birth accounted for 34.8% of deliveries, whereas elective caesarean sections accounted for 44.9% of deliveries among pregnant women with heart disease. The majority of the infants had low birth weights (58.3%)(10).

The study on valvular heart disease in sub-Saharan African women suggests for 28.3% of babies' cesarean section was used for delivery. Miscarriages occurred in 23.5% of cases, and fetal abnormalities with warfarin embryopathy occurred in 14.8% of cases(11).

According to the South African study's findings, preterm delivery (32.3%), small-for-gestational age (16.1%), and 2.7% perinatal mortality were among the newborn problems. Preconception counseling, the modified WHO class, ANC follow-up, and heart failure symptoms were recommended as important variables to be tracked(12).

In Ethiopia, the total pooled prevalence of unfavorable fetal outcomes was 26.88%. At the national level, low birth weight (10.06%) and prematurity (8.76%) were the most prevalent adverse birth outcomes. The indicators linked to a poor birth outcome included living in a rural area of residency, not receiving prenatal care follow-up, pregnancy-induced hypertension, advanced maternal age (≥ 35), and having ongoing pregnancy complications(13).

In South West Ethiopia, the total prevalence of adverse birth outcomes was determined to be 18.6%. On the other hand, low birth weight (11.6%), macrosomia (4.5%), preterm birth (3.6%), congenital abnormality (1.0%), intrauterine growth restriction (0.5%), and perinatal death (2.7%) were the types and proportions of the specific abnormal birth result identified in this study(14).

According to a study in Addis Ababa, maternal height ≤ 155 cm, complications during pregnancy, gestational hypertension, incomplete ANC follow-up, and low maternal education level were identified as significant determinants for low birth weight in one of the adverse birth outcomes(15).

According to a study on the birth outcomes of mothers with diabetes in black lion hospital Addis Ababa, 17.9% of the neonates had preterm delivery, 17.6% had macrocosmic birth, 9.2% had respiratory distress, 10.1% had low birth weight, and 65% were admitted to the newborn

intensive care unit. 39% of the pregnancies resulted in spontaneous vaginal delivery, 57.8% in cesarean sections, and 26% in pregnancy-induced hypertension(16).

The risk of death, morbidity, and several short- and long-term physical, developmental, and psychological problems is increased by adverse birth outcomes, such as low birth weight (LBW) and early deliveries. Additionally, it has a significant negative direct and indirect emotional and financial impact on the infant's family as well as on society at large(17).

To improve adverse birth outcomes access to ANC, education and awareness ,community based interventions, improving infrastructure and health care system promotion of family planning ,addressing socioeconomic factors like education and poverty are the tried strategies(18).

As far as I'm aware, in the past studies on the many types of adverse birth outcomes, particularly in our country women with cardiovascular illness are not taken into consideration.

Even though our setting does not lend itself to the management of high-risk pregnant patients with cardiovascular disease, it is essential to conduct research on adverse birth outcomes in women with heart disease. Completing this study is essential for the overall improvement of child health and overall health care practices, especially in reducing burden of adverse birth outcomes in mothers with cardiovascular problems.

1.3 significance of the study

Pregnant women with cardiovascular problems, health care providers, policy makers, stakeholders, and researchers can all benefit from finding of this study on adverse birth outcomes in pregnant mothers with cardiovascular disease.

Pregnant mothers with cardiovascular disease: can be informed to have antenatal care, adhere to their medications before pregnancy, and closely check up their health status so as to reduce the risk of giving birth with adverse birth outcomes

Health care professionals- understanding the specific identified risks by pregnant mothers with cardiovascular disease to adverse birth outcomes will enable them to provide case specific care, and monitor their medical status closely and intervene promptly. Besides, the findings from the study can provide valuable insights for training health care professionals caring pregnant mothers with cardiovascular disease

Policy makers – use the finding to formulate evidence based policies aimed at improving neonatal health outcomes. It can also help them to make informed decisions regarding the development and improvement of health care infrastructure including specialized facilities and equipment to give care to pregnant mothers with cardiovascular disease.

Non-governmental organization-can use the research findings to advocate for better health care services and resources for cardiovascular pregnant mothers, which in turn can improve outcomes of newborns.

Researchers- -it contributes to the body of knowledge on maternal and child health, filling gaps in the subject matter, supporting as a literature and potentially leading to areas for additional studies.

2. LITERATURE REVIEW

Global continuous prospective registry, the Registry of Pregnancy and Cardiac Disease, reports that fetal events occurred in 23.7% of pregnancies(19).

2.2 Determinant factors

2.2.1 Sociodemographic factors

In a research conducted in northwest Ethiopia, Amhara region awi zone on women with advanced maternal age (AMA), the prevalence of poor perinatal outcomes was 19.4% Compared to adult aged women (4.1%), the proportion of preterm births among AMA women (12%) was significantly greater. Similar to adult-aged newborn babies, a considerable portion of newborns born to AMA mothers were LBW (6.7% vs. 14.3%, respectively). Perinatal mortality has been associated with asphyxia (36.4%) and premature birth (9.1%), the first-minute Apgar score was lower in a statistically significant proportion of children born to mothers who were older (18.9%) than in newborns born to adult women (10.4%)(20) .

According to a study conducted in Debre Tabor Town, there is a clear correlation between older mothers and increased risks of unfavorable pregnancy outcomes. Mothers between the ages of 35 and 44 had a 2.5 times higher chance of experiencing an adverse birth outcome, and mothers between the ages of 45 and 54 were substantially more likely to experience it. Additionally, there was a strong correlation between educational status and adverse birth outcomes. Mothers who had just received their primary education were 1.6 times more likely to experience an adverse birth result than those who had completed their higher education, while mothers who had no formal education were approximately twice likely to have it (18) .

2.2.2 Obstetric and medical related factors

According to the ESC recommendation in the management of cardiovascular disease, maternal reduction in cardiac output during pregnancy, poor oxygen saturation (<90%), and smoking during pregnancy were factors that predicts the occurrence of neonatal adverse birth outcomes(21).

Pregnant women with underlying cardiac disease are more likely to experience adverse outcomes for the fetus. Arrhythmia, hypertension, and cardiomyopathy were found to be independently associated with unfavorable clinical outcomes for the fetus. Compared to mothers with other cardiac conditions or no heart problems, mothers with cardiomyopathy are more likely to encounter fetal unfavorable clinical outcomes (22).

In comparison to 22% of preterm deliveries using other modalities (such as vaginal delivery and emergency caesarean sections), premature birth occurred in 50% of planned caesarean sections, according to a systematic review of individualized patient data of English, German, and Dutch women with preexisting ischemic heart disease. Due to maternal indication of cardiac ischemia, PIH, and pre-eclampsia, planned CS was carried out. 42% of the neonates had issues related to fetal or neonatal problem. Prematurity was evident in (32%). A planned cesarean section was performed on the mother in 15% of all pregnancies resulting in neonates with neonatal problems(23).

In Korean women, premature birth, LBW, and preeclampsia were all independently linked to women with CVD than without CVD. In terms of obstetric characteristics, the women with CVD had higher rates of adverse birth outcomes (preterm delivery, low birth weight, and preeclampsia) and were older at delivery(24).

The study conducted at North West Ethiopia, Amhara region referral hospitals revealed that worse delivery outcomes were substantially correlated with the presence of chronic illness, the lack of antenatal follow-up, the WHO clinical stage, and anemia(25).

Significant determinants of a poor birth outcome included hemoglobin levels below 11 gm/dl, lack of prenatal care follow-up, chronic medical illnesses, current pregnancy complications, and labor lasting longer than 24 hours. Compared to mothers who attended antenatal care follow-up, mothers who skipped out on prenatal care were four times as likely to experience a poor delivery result. In a comparable manner, mothers who had hemoglobin levels below 11 mg/dl had three times as many poor delivery outcomes as mothers whose levels were at or above 11 mg/dl. Any type of pregnancy issue increased the risk of an unfavorable delivery outcome by three times during the current pregnancy. Moreover, those with long-term health conditions were three times

more likely to result in adverse birth outcomes was reported from study conducted in north east Ethiopia (26).

According to a study on poor birth outcomes among mothers with diabetes, illiteracy, gestational age <37 completed weeks, no ANC follow-up, and a history of prior poor outcomes were all linked to adverse birth outcomes(27).

2.2.3 other clinical factors

Another study performed by ESC by registry of pregnancy and cardiac disease adverse fetal outcomes were linked independently, to severe mitral stenosis (MS). When comparing pregnant women who had undergone cardiac intervention (Percutaneous balloon mitral commissurotomy) 14% versus 66% to those who had not, a substantial reduction in adverse outcomes was seen. Compared to 3.4% of women with MR, 5.1% of women with MS reported experiencing a miscarriage or fetal death. Small-for-gestational-age babies were born to more mothers with MS than to women with MR (14.0% versus 3.5%) respectively. Babies delivered earlier and with lower birth weights were born to mothers with severe MS(28).

The USA study to ascertain the prognosis in pregnant mothers with coronary artery disease (CAD) or acute coronary syndrome (ACS), which includes myocardial infarction (MI), The most often prescribed prescription for heart problems was aspirin (54%), which was followed by anticoagulants (24%), β -blockers (19%), and statins (4.8%). ACE inhibitors were also utilized. In 14% of pregnancies, preterm delivery occurred, and low birth weight was the recorded adverse birth result(29).

The research carried out in the Tigray region, the number of prenatal care visits, ever use of family planning methods in the past, the lack of nutrition counseling during follow-up prenatal care visits, the short inter pregnancy interval, low hemoglobin level, and were found to be independent predictors of poor birth outcomes(30).

2.3 conceptual frame work

This conceptual framework shows relationship between dependent and independent variable of adverse birth outcomes. It was developed after reviewing different literatures (1,7,14,16,18,20,21,23,26,27).

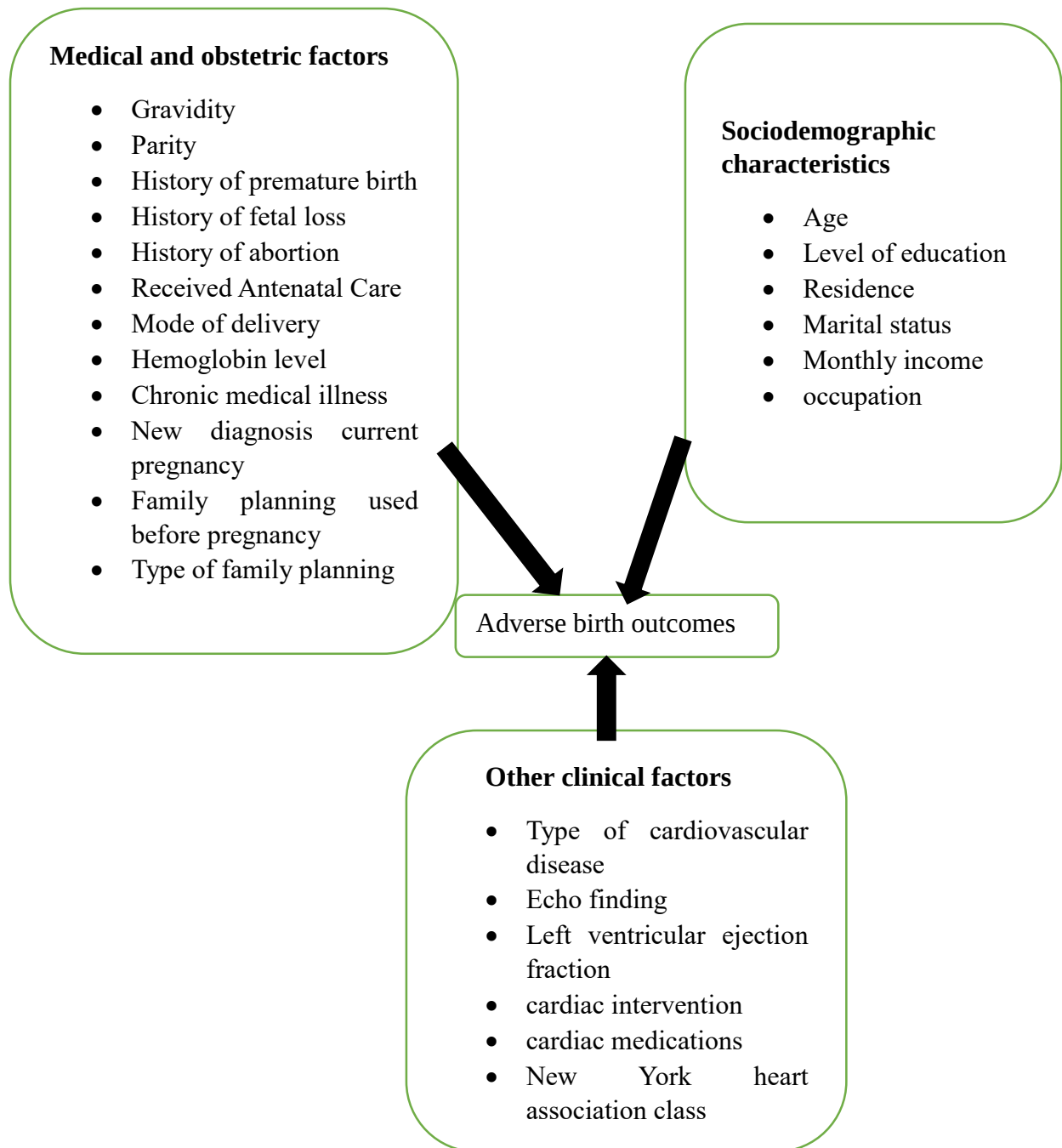


Figure 2.1conceptual frame work for adverse birth out comes and determinant factors among mothers with cardiovascular problems (1,3,27,7,14,16,18,20,21,23,26).

3. OBJECTIVES

3.1 General Objectives

To assess determinants of adverse birth outcomes among mothers with cardiovascular problems in Addis Ababa public hospitals, 2024.

3.2 Specific Objectives

To identify determinants of adverse birth outcomes among mothers with cardiovascular problems in Addis Ababa public hospitals, 2024.

4. METHODS

4.1. Study Setting

Addis Ababa is the capital and largest city of Ethiopia. There are 13 public hospitals. According to Central Statistical Agency (CSA) of Ethiopia, the Addis Ababa Region has an estimated total population of 3,686,068 consisting of 1,389,817 males and 1,527,478 females.

SPHMMC is located in in Addis Ababa Ethiopia Gullele sub city. The college has more than 2800 clinical, academic and administrative staffs that provide medical specialty services to patients who are referred from all over the country, teaching medicine and nursing students and doing basic and applied researches. While the inpatient capacity is more than 700 beds, the college sees an average of 1200 emergency and outpatient clients daily. The gynecology and obstetrics department at Saint Paul's hospital provides a wide range of specialized care. The department has antenatal care service, labor and delivery, family planning, reproductive, endocrinology & infertility and comprehensive abortion care(31).

St. Peter's Specialized Hospital was established in 1953, by the time the clinical TB service has been provided. It is managed by Ethiopia's Federal Ministry of Health. The hospital is the country's first TB referral hospital for more than decades and now expanding from a single-disease hospital into service service-specialized hospital, by serving with more than 14 specialties and excellence centers. St. Peter Hospital expanded its services to include Cesarean section (C/S) surgery in 2008 EC. The new complex has a capacity of 300 inpatient beds, including 12 ICU beds, six operation rooms, adult and pediatric emergency departments, as well as a Cath Lab for cardiac patients(32).

Yekatit 12 Hospital Medical College is one of Ethiopia's oldest hospitals, having opened its doors in 1923. The hospital was originally known as "Bete Saida Be Tefferi Mekonnen Hospital," but after the Derg Regime took control in the 1970s, it was renamed Yekatit 12 Hospital. Yekatit 12 Hospital is a public hospital that sees more than 150,000 patients annually. It is situated in Ethiopia's capital city of Addis Ababa around 6killo(33).

The gynecology and obstetrics department is moved to Abebech Gobena Mothers and Childrens health Hospital which named for the Mother Theresa of Africa, who founded and oversaw one

of the oldest orphanages in Ethiopia. The hospital specializes in providing treatment to mothers and their children.

Zewditu Hospital is located in the city center of Addis Ababa. Originally constructed, owned, and run by the Seventh-day Adventist Church, it was nationalized in 1976 during the Derg government. The hospital has the name of Empress Zewditu, Emperor Haile Selassie's cousin and predecessor. The Ministry of Health currently oversees the operation of Zewditu Hospital(34).

4.2. Study Period

The study was conducted from May 1, 2024 –June 15 2024

4.3. Study Design

An unmatched Case-Control study was conducted.

4.4. Source Population

All charts of mothers with cardiovascular disease giving birth in Addis Ababa Public Hospitals.

4.5. Study Population

Cases: All charts of mothers with cardiovascular illness who gave birth in selected public hospitals in Addis Ababa from January 1 2019 –December 30, 2023, who had adverse birth out comes.

Controls: All charts of mothers with cardiovascular illness who gave birth in selected public hospitals in Addis Ababa from January 1 2019 –December 30, 2023, who hadn't adverse birth out comes.

4.6. Study unit

Cases: randomly selected medical records of mothers with cardiovascular illness who gave birth in selected public hospitals in Addis Ababa from January 1 2019 –December 30, 2023, who had adverse birth out comes.

Controls: randomly selected medical records of mothers with cardiovascular illness who gave birth in selected public hospitals in Addis Ababa from January 1 2019 –December 30, 2023, who hadn't adverse birth out comes.

4.6 Eligibility criteria

4.6.1 Inclusion criteria

All medical record in the past five years from January 1, 2019 to December 30, 2023 was used and data of 2024 was used to conduct pretest. Mothers with known cardiovascular disorders who gave birth in the designated hospitals was included.

4.6.2 Exclusion criteria

Medical numbers written on a patient chart that is not eligible.

4.7 Sample Size

4.7.1. Sample Size with factors

Epi Info version 7.2 was used to compute the sample size, using assumptions of a 95% confidence level, 80% power, and a 1:1 case-to-control ratio. According to the study done on factors related to maternal adverse outcomes in pregnant women with cardiac disease. The three identified significantly linked factors were arrhythmia, mode of delivery, and pregnancy termination(3).

Table 4.1 Sample size calculation of mothers with cardiovascular problems in Addis Ababa public hospitals from December 2019 to December 2023 (n = 430; Cases: 215 and controls: 215)

Factors	Percent of controls exposed	Percent of cases exposed	margin of error (d)	Adjusted odds ratio	Standard normal distribution at 95% $z\alpha/2$	Result	Total result with a design effect of 1.5
Mode of delivery	18.5%	28.0%	0.05	2.2(0.6-7.5)	1.96	300	450
Termination of pregnancy	3.1%	24.0%	0.05	20.6(2.9-143)	1.96	48	72
Arrhythmia	9.2%	32.0%	0.05	16.9(2.5-143)	1.96	30	45

4.8 Sampling Procedure

Thirteen public hospitals are located in Addis Ababa. 10 were selected purposively by availability of cardiologists, then four of them were chosen by simple random sampling, the sampling rate was then distributed among the selected sample using the corresponding distribution for the population, through a proportional allocation formula to all selected hospitals and finally, the sample size was taken by simple random sampling and distributed in a 1:1 ratio to the case and control.

4.8.1 Selection of cases and control

The sample was distributed in a 1:1 ratio to the case and control, as indicated below.

Cases: those charts of mothers with cardiovascular disease with adverse birth outcomes.

Controls: those charts of mothers with cardiovascular disease without adverse birth outcomes

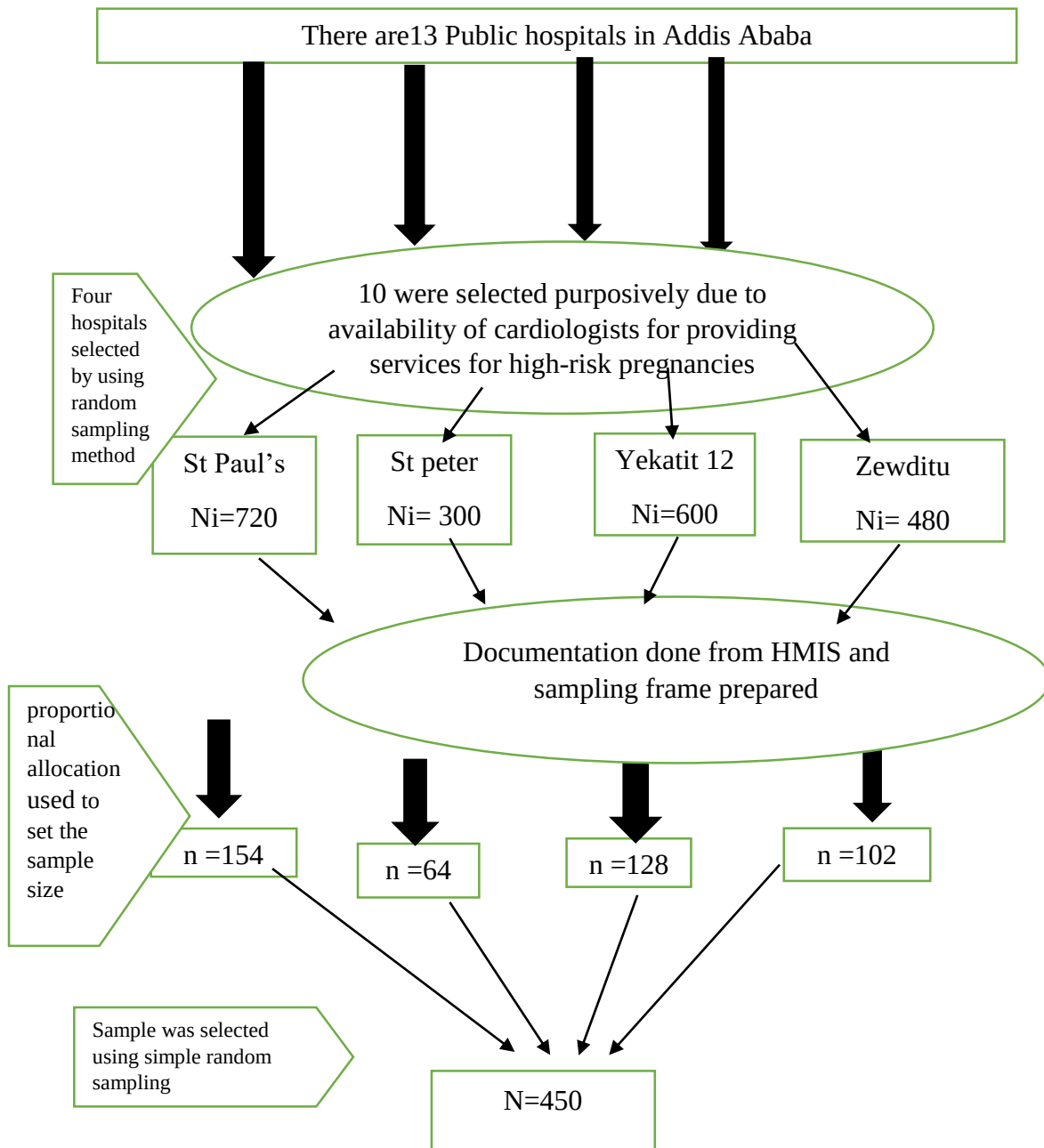


Figure 4.1 schematic presentation of sampling procedure used to select study subjects

4.9. Measurement

4.9.1. Study Variables

Dependent variable adverse birth out come

Independent variable

1. Sociodemographic characteristics: - maternal age, educational status, residence, monthly income, occupation, marital status.

2. Medical and obstetric characteristics: - gravidity, parity, history of premature birth, history of fetal loss, history of abortion, received ANC, Mode of delivery, hgb level, family planning used before pregnancy, type of family planning, chronic medical illness, new diagnosis during current pregnancy.

3. Other clinical factors: - type of cardiovascular disease, Echo finding, LVEF, cardiac medication used before pregnancy, NYHA classification and cardiac intervention.

4.9.2 Data Collection tool

A structured checklist taken from other relevant literatures (1,7,14,16,18,20,21,23,26,27) used to collect data from mothers' chart who gave birth from January 1,2019 and December 30, 2023 in the study area. Data collected by 3 B.Sc. degree nurses and 1 supervisor after getting training for 1 day on how to fill and handle the documents by using kobo data collection software, in accordance with the objective of the study. The data collected for 1 and half month.

4.9.3 Data processing and Analysis

After data collection, it was checked for completeness based on the code given during data collection. The data collected and then exported to be analyzed using SPSS version 26. Descriptive statistics used to describe the independent variable. Bivariate and unconditional logistic regression analysis done to see the adverse birth outcomes. Bivariate logistic regressions utilized to select candidate variables for unconditional logistic regression with a p value less than 0.25. Independent variables with a selected as a candidate for unconditional logistic regression, these associations analyzed to control the effect of confounding variables. The different variables

in relation to adverse birth outcomes measured using odds ratios (OR). A confidence limit of 95% and p- value less than 0.05 was considered to declare statistical significance.

4.9.4 Data Quality Assurance

In order to guarantee the quality of the data training was given, pretesting was carried out on eleven cases and eleven controls at Saint Paul Hospital Millennium Medical College. The results were utilized to modify the data, primarily through substituting more appropriate terms. Completeness and consistency of the questionnaires were examined by reviewing charts of mothers with cardiovascular problems who gave birth in 2024. The supervisor provided supportive supervision to the data collector to make sure that it is performed according to the protocol. Each day the collected data checked for accuracy and completeness. The participant's names not stated and the data identified after the checklist is completed. The collected data stored in a secure location and only the lead investigator have access to this location.

4.10 Operational Definitions

Adverse birth outcome: - In this study, the presence of one or more of the following conditions during the index (recent or current) pregnancy is indicative of an adverse birth outcome. Thus, if the medical record stated as the women who were brought to the labor and delivery unit gave birth to had a baby with a congenital defect, low birth weight, preterm baby, small for the gestational age, perinatal death, macrosomia and fetal loss; it considered as adverse birth outcomes.

Left Ventricle Ejection fraction: -is a measurement, expressed as a percentage, of how much blood the left ventricle pumps out with each contraction (50%-70% is the normal).

Echocardiogram (echo) finding: - in this study it is a result that can show abnormal blood flow through the heart and heart valves (mitral regurgitation, mitral stenosis, aortic stenosis, aortic regurgitation, tricuspid regurgitation, tricuspid stenosis, pulmonary hypertension)

Cardiac intervention: - Cardiac intervention is the clinical term for a variety of procedures used to treat cardiovascular issues in this study it includes percutaneous balloon mitral commissurotomy, device closure and pacemaker implantation.

Cardiac medication: -drugs used to treat several cardiovascular conditions for this study the usage of the following drug classes was assessed (antiplatelet, β -blocker Ca-channel blockers, diuretics, ACE inhibitors & Bezantine Pencillin.

New diagnosis in current pregnancy: -if the following diagnosis is stated in the medical record (pregnancy induced hypertension, gestational diabetes mellitus, urinary tract infection)

Chronic medical illness: - is a long term health problem that may not have a cures.in this study (diabetes mellitus, kidney disease, asthma, chronic obstructive lung disease, thyroid disease) included.

NYHA (New York heart Association) Classification is an approach that divides patients with heart failure into four groups based on the severity of their symptoms, for this study, a recorded classification by physicians was utilized.

4.11. Ethical Consideration

The proposal submitted and approved by the Institutional Review Board of Saint Paul's Hospital Millennium Medical College and the study institutions received an official letter of cooperation for the purpose of collecting data. The proposal was also submitted for Addis Ababa health bureau research directorate and clearance obtained. Complete adherence to data confidentiality maintained by using the patients' medical registration number and the information on the chart only, without mentioning their names.

4.12. Dissemination of Result

After the data is analyzed, the results of the research were submitted and presented to SPHMMC School of Nursing. Copy of findings will be submitted to the study areas and also it will be sent for publication on relevant scientific journals and disseminated online so that they can be of use for other academic researchers and clinical practitioners.

5. RESULT

A total of 450 eligible participants were involved as 225 cases and 225 control yielding a 95.6% response rate.

5.1 Sociodemographic characteristics of the respondents

The mother's age was ranged from 18 to 43 years old, with a mean of 29.02 and standard deviation ± 5.126 . Majority of mothers, 141(54.4%) of the cases and 118(45.5%) of the controls were out of Addis Ababa.

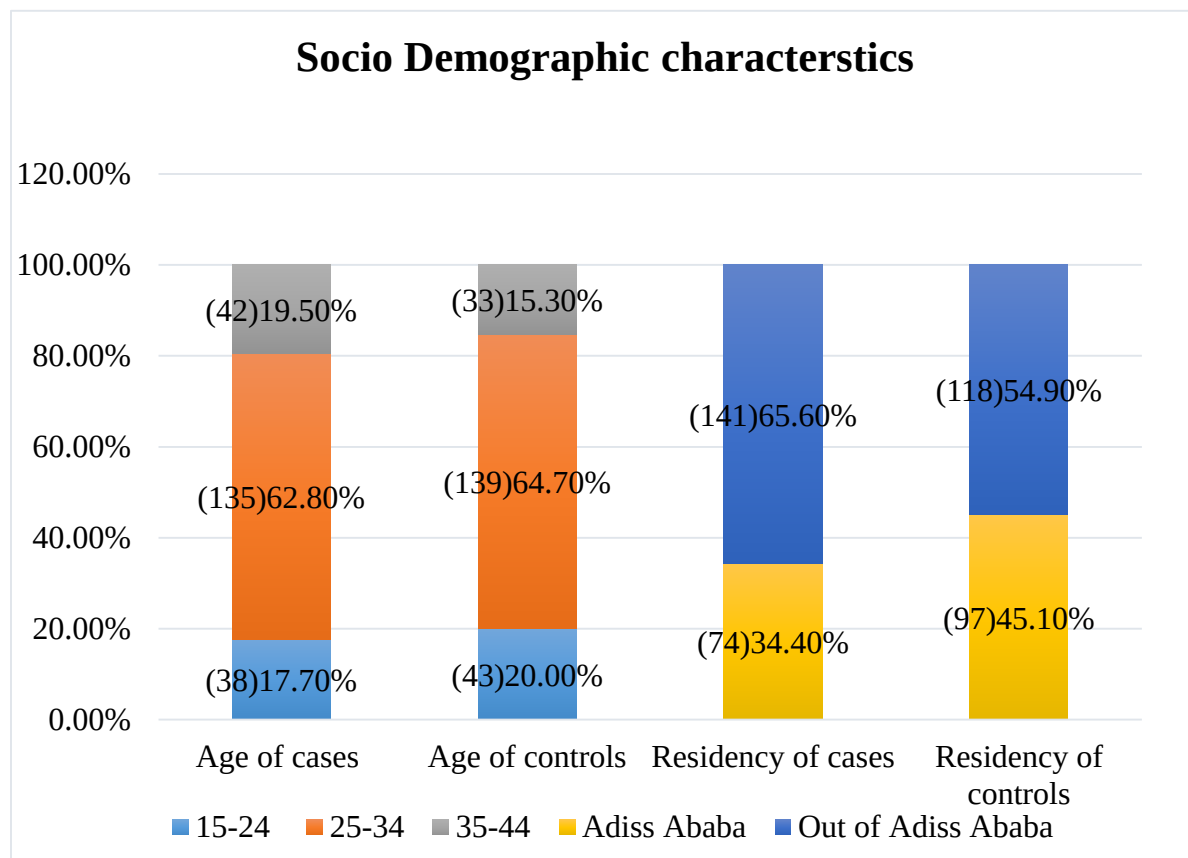


Figure 5.1 Socio-demographic characteristics of mothers with cardiovascular problems in Addis Ababa public hospitals from December 2019 to December 2023 (n = 430; Cases: 215 and controls: 215)

5.2 Adverse Birth outcomes

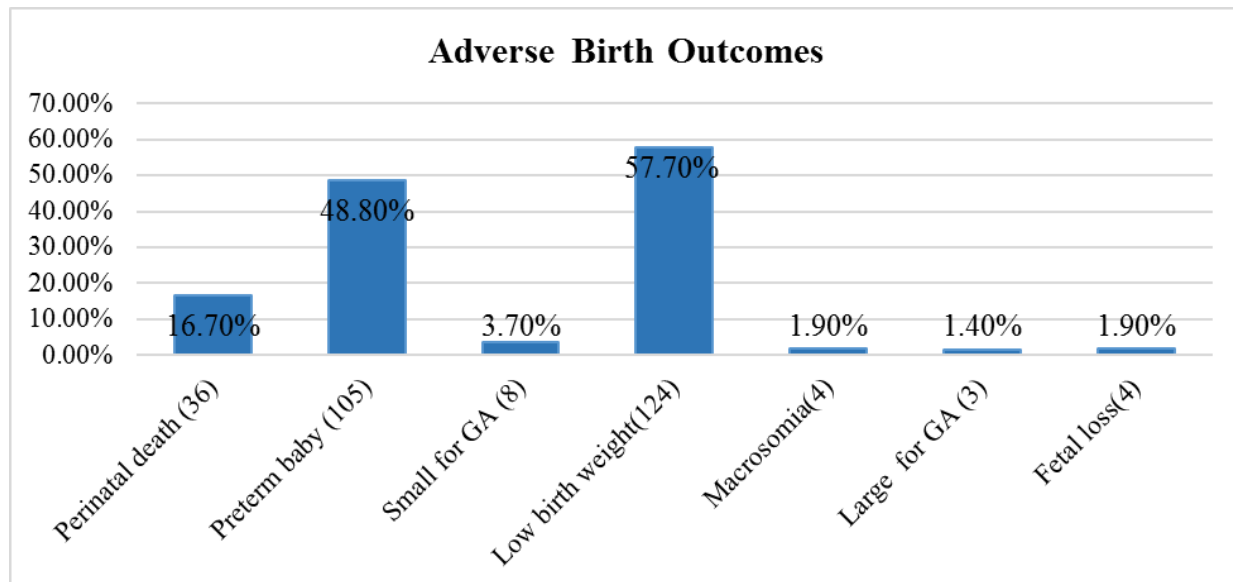


Figure 5.2 Adverse birth outcomes of mothers with cardiovascular problems in Addis Ababa public hospitals from December 2019 to December 2023 (n = 430; Cases: 215 and controls: 215)

5.3 Medical and obstetric characteristics

A majority of the subjects, comprising 170 (79.1%) cases and 196 (91.2%), controls had a gravidity of less than four. Prim parity was presented in 154 (62.3%) cases and 153 (73.5%) controls. One hundred twenty-five (58.1%) cases and 107(49.8%) controls of the study participants had a history of premature birth.

The majority 100 (46.5%) cases and 77 (33.5%) controls had history of abortion where, 75% were spontaneous, 19% were induced because of a cardiovascular condition, and 6% had previously experienced both spontaneous and induced abortions. History of fetal loss occurred in 21 (9.8%) of the controls and 49 (22.8%) of the cases.

Hemoglobin levels <11 g/dl were presented in 32.6 (70%) of the control and 160 (74.4%) of the cases among the total mothers involved in the study. Of the mothers in the study, 29(13.5%) of the controls and 108(50.2%) of the cases had no ANC follow-up.

New diagnosis during their current pregnancy recorded in 69(32.1%) of the cases and 48(22.3%) controls from this pregnancy-induced hypertension was identified in 64 (29.8%) cases and 44 (20.5%) controls. The other 4(1.9%) of cases and 4(1.9%) of controls were had gestational diabetes mellitus.

The majority 38 (17.7%) of cases and 53(24.7%) of controls were delivered by elective c/s, 86 (40.0%) cases and 39(18.1%) of controls by emergency c/s, the other 10(4.7%) of cases and 14(6.5%) of controls delivered by vacuum assisted method while the remaining 62(20.8%) cases and 91(42.3%) controls were delivered by SVD and forceps delivery was used in 12(5.6%)of cases and 12(5.6%) of controls.

Chronic medical illnesses were reported in 16(7.4%) of cases and 5(2.3%) of controls, including kidney disease in 3(1.4%) of cases, diabetes mellitus in 4(1.9%) of cases and 1(0.5%) of controls, asthma 2(0.9%) of cases and thyroid disease in 8(3.7%) of cases and 3(1.4%) of controls.

5.4 Other clinical factors

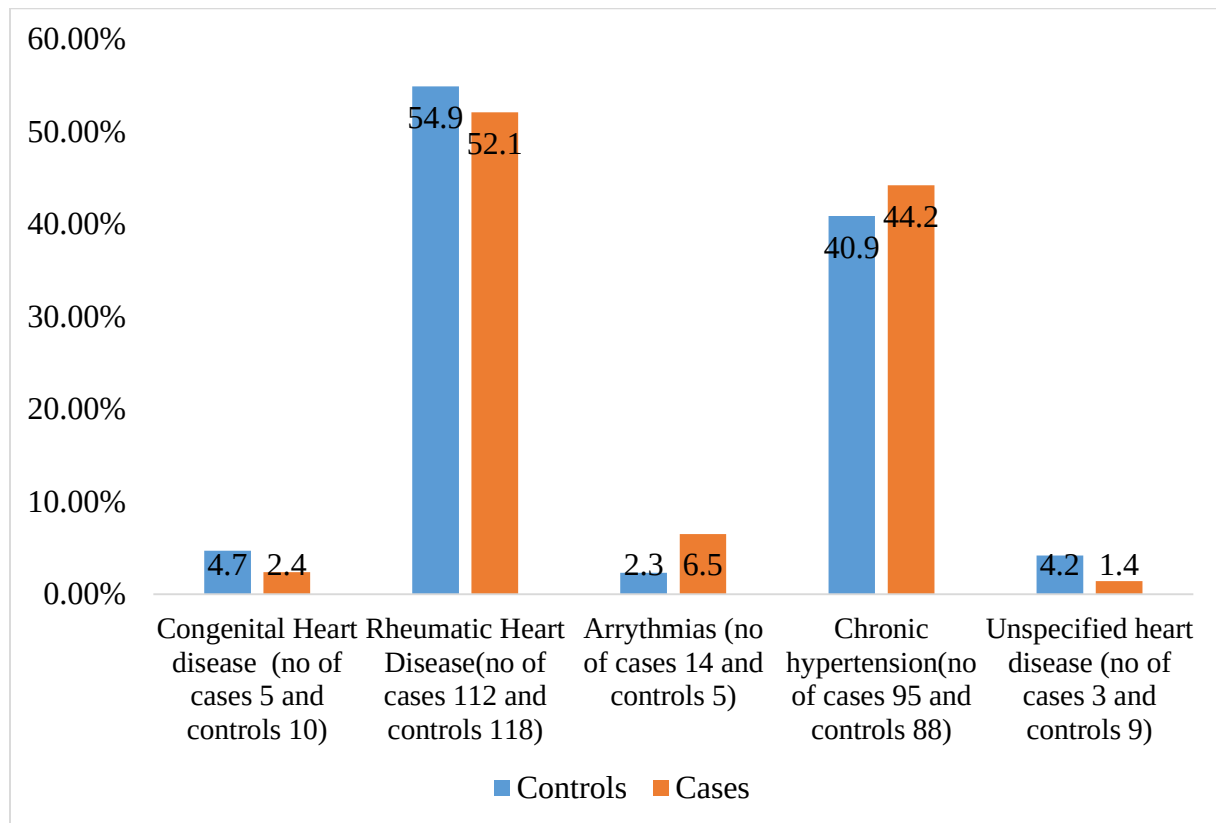


Figure 5.3 Types of cardiovascular disease of mothers with cardiovascular problems in Addis Ababa public hospitals, 2024. Hospitals from December 2019 to December 2023 (n = 430; Cases: 215 and controls: 215)

NYHA class 1 comprised 139 (64.7%) controls and 62 (20.8%) cases, whereas class 2 were recorded in 138 (64.2%) cases and 25 (11.6%) controls. NYHA class 3 also observed in 42 (19.5%) of controls, 11 (5.1%) of cases, and NYHA class 4 in 4 (1.9%) of cases, and 9 (4.2%) of

controls. Regarding medication use before pregnancy 125(58.1%) of controls and 197(91.6%) of cases were either discontinued or not taking their medication. Furthermore 35(16.3%) of controls and 1(0.5%) cases got cardiac intervention to resolve their cardiovascular problems.

Table 5.1 Other clinical factors among mothers with CVD in Addis Ababa public hospitals, 2024 (N=430 Cases; 215 and Controls; 215)

Variables	category	Controls #(%)	Cases #(%)	Total #(%)
Cardiovascular medication usage before pregnancy	Yes	90(41.9%)	18(8.4%)	108(25.1%)
	No/discontinued	125(58.1%)	197(91.6%)	322(74.8%)
Anti-platelets	No	215(100%)	213(99.1%)	428(99.5%)
	Yes	0(0.0%)	2(0.9%)	2(0.5%)
B-blockers	No	202(94.0%)	210(97.7%)	412(95.8%)
	Yes	13(6.0%)	5(2.3%)	18(4.2%)
Ca-channel blockers	No	198(92.1%)	209(97.2%)	407(94.7%)
	Yes	17(7.9%)	6(2.8%)	23(2.3%)
Diuretics	No	183(85.1%)	210(97.7%)	393(91.4%)
	Yes	32(14.9%)	5(2.3%)	37(8.6%)
Anti-coagulant	No	209(97.2%)	214(99.5%)	423(98.4%)
	Yes	6(2.8%)	1(0.5%)	7(1.6%)
ACE-inhibitors	No	209(97.2%)	212(98.6%)	421(97.9%)
	Yes	6(2.8%)	3(1.4%)	9(2.1%)
Byzantine penicillin	No	157(73%)	206(95.8%)	363(84.4%)
	Yes	58(27%)	9(4.2%)	67(15.6%)

5.5. Determinants of adverse birth outcome

In bivariate logistic regression analysis, gravidity, history of premature birth, Hemoglobin level, history of fetal loss, ANC follow-up, cardiovascular medication used prior to pregnancy, NYHA class, cardiac intervention, new diagnosis during current pregnancy, and having a chronic illness were identified with p value < 0.25 . Finally, unconditional logistic regression analysis was undertaken to identify the determinants of adverse birth outcomes accordingly.

Not having ANC follow-up, discontinuation or not using cardiovascular medication prior to pregnancy, hgb level < 11 g/dl and having new diagnosis during current pregnancy were found to be independent determinant factors of adverse birth outcome after controlling for confounders.

Mothers who did not receive ANC visits were by 1.7 times at risk to experience an adverse birth outcome than mothers who did receive ANC visits (AOR = 1.73, 95% CI: 1.30–2.29; p -value < 0.001). Moreover, mothers who had hemoglobin levels below 11 g/dl were almost four times more at risk to have an adverse birth outcome compared to those who had levels of 11 g/dl or higher (AOR = 3.70, 95% CI: 2.54–5.38; p -value 0.001). Furthermore, Mothers who received a new diagnosis during their current pregnancy were twice at risk to have an adverse birth outcome than mothers who did not receive the new medical diagnosis. (AOR = 2.37, 95% CI: 1.67–3.37; p -value < 0.001). Women who hadn't taken their medication or had stopped taking it before getting pregnant were by 1.4 times at risk to have adverse birth outcomes than those who were taking it. (AOR = 1.43, 95% CI: 1.15–1.77; p -value < 0.001).

Table 5.3 Determinants of adverse birth outcomes in women with cardiovascular problems in Addis Ababa public hospitals, 2024 (N=430 Cases; 215 and Controls; 215)

Variables	Categories	Controls #(%)	Cases #(%)	COR(95 % CI)	AOR (95% CI)	p- value
Gravidity	<4	196(91.2%)	170(79.1%)	0.40(0.16 -0.99)	0.86(0.6 -1.21)	0.49
	>=4	19(8.8%)	45(20.9%)			
History of prematurity	No	108(50.2%)	90(41.9%)	1.44(0.82 -2.51)	1.02(0.77-1.35)	0.86
	Yes	107(49.8%)	125(58.1%)			
History of fetal loss	No	194(90.2%)	166(77.2%)	1.85(0.88 -3.89)	1.02(0.78-1.49)	0.64
	Yes	21(9.8%)	49(22.8%)			
Hgb level	<11	70(32.6%)	160(74.4%)	36.4(13.1 -100.6)	1	<0.001
	>=11	145(67.4%)	55(25.6%)		3.70(2.54-5.38)*	
Received ANC	No	29(13.5%)	108(50.2%)	0.06(0.30 -0.14)	1	<0.001
	Yes	186(86.5%)	107(49.8%)		1.73(1.30 -2.29)*	
Cardiovascular medication used before pregnancy	No or D/c	125(58.1%)	197(91.6%)	0.26(0.12 -0.59)	1	0.001
	Yes	90(41.9%)	18(8.4%)		1.43(1.15 -1.77)*	
Cardiac intervention	No	180(83.7%)	214(99.5%)	0.05(0.00 6-0.45)	8.14(1.54 -59.4)	0.39
	Yes	35(16.3%)	1(0.5%)			
New diagnosis during Current pregnancy	No	167(77.7%)	146(67.9%)	7.39(2.73 -19.9)	2.37(1.67–3.37)*	<0.001
	Yes	48(22.3%)	69(32.1%)		1	
Chronic medical illness	No	210(97.7%)	199(92.6%)	2.82(0.59 -13.4)	1.21(0.72 – 2.02)	0.46
	Yes	5(2.3%)	16(7.4%)			

*significant with p-value <0.05 and 1= reference category D/c=discontinue

6. DISCUSSION

This study was carried out to determine the factors that contribute to adverse birth outcomes among mothers with cardiovascular diseases at public hospitals in Addis Ababa. Accordingly, having a new diagnosis during current pregnancy, discontinuation or not using cardiovascular medication before being pregnant, not having ANC follow-up, and hgb level <11g/dl were independent determinants of adverse birth outcomes.

Having no ANC was significant to develop adverse birth outcomes. Similarly, the same finding was documented in investigations carried out in South Africa and several regions of Ethiopia. (12,15,27). This might be explained by the fact that maternal information about different pregnancy and disease conditions will be available to women who attend ANC checkups and this might enable the mother to tackle other risk factors for the adverse birth outcomes. On the other hand, an African study has demonstrated that ANC alone does not lead to better birth outcomes(35). Additionally, Nepal's study also reveals Adverse birth outcomes were common in the inadequate ANC and no ANC groups(36). This may be due to the difference in study design and their objective was the quality of antenatal care and the time of visit.

Pregnancy with a haemoglobin (hgb) level less than 11g/dl is associated with adverse birth outcomes. Numerous investigations done in Central Africa, Nigeria, India and Ethiopia also support these findings(7,12,26,30,37,38). This can be explained by the burden of anemia and its impact on the placental site's ability to carry oxygen and transfer it to the fetus is impacted and results in adverse birth outcomes(26).

Another significant factor in this study was the usage of cardiovascular drugs prior to pregnancy. Women who stopped taking their medication or didn't use it at all before getting pregnant were more likely to have unfavorable delivery outcomes. The study in Kenya also support this finding (3).This may be linked to delay in seeking medical care and deciding without consulting health care provider so symptoms may not be controlled and result in adverse birth outcome.

Additionally, this finding is supported by the ESC guideline that delimits women who had stopped taking their medication or hadn't used it at all before becoming pregnant were at increased risk of having negative delivery outcome(21).

Getting a new diagnosis during index/current pregnancy is another significant factor that this study found to be significant statistical association with adverse birth outcomes. The studies performed in Ethiopia also support this finding(15,18). This might be due to illness's symptoms that impede placental blood flow and can cause placental ischemia which results in adverse birth outcomes.

7. CONCLUSION

In this study stopping or not using cardiovascular medications before pregnancy, hemoglobin level <11gm, having a new Medical diagnosis during the current pregnancy, and not having antenatal care (ANC) were associated with determinants of adverse birth outcomes.

8. RECOMENDATION

Ethiopian Federal Ministry of health

The FMOH shall support the cardio-obstetrics program that pave the wave to get antenatal care for mothers with cardiovascular problems under a composite of specialized health care teams as close as possible to their living area to reduce the burden of adverse birth outcomes.

For health professionals

Health professionals ought to be aware that not discontinuing medications without expert recommendations plays a critical role in minimizing the risk of adverse birth outcomes for mothers with cardiovascular problems.

They shall closely monitor and care mothers with cardiovascular problems who had new medical diagnosis during their pregnancy to timely intervene with the incidence of adverse birth outcomes.

It is better if they adhere to the utilization of iron supplementation and iron rich diets to alleviate the risk of anemia which in turn can overcome the risk of adverse birth outcomes.

For researchers

Researchers better to conduct prospectively by employing primary data and addressing socioeconomic factors connected to adverse birth outcomes.

9. LIMITATION

Due to the use of secondary data, incompleteness resulted in gap for assessing additional factors

Annexes

Annex I Declaration

I declare that this research thesis entitled “Determinants of adverse birth outcomes among mothers with cardiovascular problems in Addis Ababa public hospitals, 2024” is my own work that have not been addressed in the study area as far as my knowledge touched and all the sources I used have been indicated and acknowledged as complete reference.

Name of investigator

Signature

Date

Name of advisor/s

1. _____

2. _____

Name of invigilators

1. _____

2. _____

Annex II Questionnaires

Questionnaire

Category of sample 1. Case 2. Control

Part I Sociodemographic Characteristics			
S.no	Variables/questions	Responses	Skip to
101	Age in years	_____	
102	Level of education	1.No formal education 2.Only read and write 3. Primary 4.Secondary 5. Diploma 6.Degree&above_____	
103	Marital status	1.Married 2. Single 3, Divorced 4.Widowed 5.others	
104	Residence	1.Addis Ababa 2.Out of Addis Ababa	
105	Occupation	1.Housewife 3. Private 2.government employee 4. Daily laborer 5.Self employed	
107	Monthly income	-----ETB	
Part II Medical and obstetric related factors			
201	Gravidity	-----	

202	Parity	-----	
203	History of premature birth	1.Yes 2.No	
204	History of fetal loss	1.Yes 2.No	
205	History of abortion	1.Yes 2.No	
206	Hgb level	-----	
207	Received ANC	1.Yes 2.No	If “No” to 29
208	If yes to Q 207, How many times?	-----	
209	Family planning used before pregnancy	1.Yes 2.No	If “No” to 211
210	Type of family planning used	1. OCP 2. Injectable 3. Implanon 4.IUCD 5.Others	
211	Mode of delivery	1.SVD 2. Emergency C/S 3.Elective C/s 4.Induction of labour 5.Vaccum assisted delivery	
212	Type of cardiovascular disorder	1.Patent ductus arteriosus 2.Atrial septal defect 3.Ventricular septal defect 4.Rheumatic heart disease 5.Arrhythmias 6.Cardiomyopathy 7.Chronic hypertension 8.Unspecified	
213	Cardiac medication used before pregnancy	1.Antipalletelets 2.β-blocker	

		3.Ca-channel blockers 4.Diuretics 5.ACE inhibitor 6.Bezantine Pencillin	
214	Echo finding	1.Mitral Regurgitation 2.Mitral Stenosis 3.Aortic Stenosis 4.Aortic Regurgitation 5.Tricuspid Regurgitation 6.Tricuspid stenosis 7.pulmonary hypertension	
215	LVEF	-----%	
216	NYHA class	1.class I 2.classII 3.class III 4. Class IV	
217	Cardiac intervention	1.Yes 2.No	
218	If yes to Q.216 specify it	-----	
219	Is there new diagnosis during the current pregnancy?	1.Yes 2.No	If “No” to 221
220	If “Yes” to the above question, what was the diagnosis?	1.Pregnancy induced Hypertension 2. Gestational DM 3. UTI	
221	Has she been diagnosed with any other chronic medical illness?	1.Yes 2. No	If “Yes” skip to 222

222	Which chronic illness is it?	1. Diabetes mellitus 2. Kidney disease 3. Atshma 4. COPD 5. Thyroid disease	
Part III Birth Outcomes			
301	Normal	1. Yes 2. No	If “No” skip to 302
302	Adverse birth outcomes	1. Perinatal Death 2. Preterm Baby 3. Congenital Anomaly 4. Small for GA 5. Low Birth Weight 6. Macrosomia 7. Fetal loss	

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