ARSI UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF PEDIATRICS AND CHILD HEALTH

THESIS ON CLINICAL PROFILE, SHORT-TERM OUTCOMES AND ASSOICITED FACTORS OF NON-SURGICALLY MANAGED CONGENITAL HEART DISEASES IN PEDIATRICS PATIENTS AT ASELLA TEACHING AND REFERRAL HOSPITAL, ETHIOPIA

By: Dr. Kasim Benka (MD, Pediatrics and Child Health Resident)

Advisors: Dr. Gemechu Edae (MD, Assistant professor of pediatrics and Child health)

Mr. Ashenafi Habtamu (MPH, Assistant professor)

A Research Thesis To Be Submitted To Arsi University College Of Health Science Department Of Pediatrics And Child Health, For Partial Fulfillment Of The Requirement For The Specialty Certificate In Pediatrics And Child Health

January, 2026

ASELLA, ETHIOPIA

ARSI UNIVERSITY COLLEGE OF HEALTH SCIENCES DEPARTMENT OF PEDIATRICS AND CHILD HEALTH

Investigator	Dr. Kasim Benka (MD. Pediatric and Child Health Resident)
Name of advisors	Dr. Gemechu Edae (MD, Assistant professor of pediatrics and Child health) Mr Ashenafi Habtamu (MPH-Assistant Prof. of Health System Management)
Title of the research project	Clinical Profile , Short-term Outcomes and associated Factors of Non surgically managed Congenital Heart Diseases in pediatrics at Asella Teaching And Referral Hospital from March 2020 to February 2025
Duration of the project	August to October 2025
Study area	Teaching and Referral Hospital, Arsi zone, Oromia, Ethiopia 2025.
Total cost of the project	24,870 Ethiopian Birr
Address of investigator	Phone: +251927914583 E-mail: kasimbenka4@gmail.com
Address of Advisors	Dr. Gemechu Edae Phone:+251938081988 E-mail: gemechise33@gmail.com Ashenafi Habtamu Phone: +251911911209 E-mail: imu.ashe@gmail.com

ACKNOWLEDGEMENTS

First and foremost, I would like to express my deepest gratitude to Almighty God for granting me the strength, health, and perseverance to successfully complete this thesis.

I am sincerely grateful to my Principal Advisor, Dr. Gemechu Edae (MD, Assistant Professor of Pediatrics and Child Health), for his invaluable guidance, continuous support, and constructive feedback throughout the research and writing process. His expertise and mentorship were instrumental in shaping this work.

I would also like to extend my heartfelt appreciation to my Co-Advisor, Mr. Ashenafi Habtamu (MPH, Assistant Professor of Health System Management), for his insightful advice, encouragement, and support in both the planning and analysis phases of this study.

I am deeply thankful to the staff of Asella Teaching and Referral Hospital, particularly the pediatric ward and medical records department, for their cooperation in providing access to patient data and facilitating the completion of this study.

I would also like to acknowledge my colleagues and friends who provided moral support, constructive discussions, and encouragement throughout my research journey.

Finally, I am profoundly grateful to my family, whose love, patience, and encouragement provided me with the motivation to overcome challenges and complete this thesis successfully.

To all who contributed, directly or indirectly, to this work, I extend my sincere appreciation and thanks.

`Abstract

Background: Congenital heart disease (CHD) is a leading cause of morbidity in children, particularly in low-resource settings where surgical intervention is limited. Understanding the clinical profile and short-term outcomes of non-surgically managed CHD is essential to guide care.

Methods: A retrospective cohort study was conducted at Asella Teaching and Referral Hospital, Ethiopia, from March 2020 to February 2025 among 156 pediatric patients with CHD. Data on demographs, clinical presentation, CHD types, comorbidities, anthropometric status, hospital admissions, medical management, and six-month clinical outcomes , further reclassified poor outcome(Death and / or DAMA) and good outcome (improved discharged and / or referred after stabilization) were collected from medical records. Descriptive statistics summarized the findings, and multivariable logistic regression identified factors associated with poor outcomes.

Results: The majority of patients were infants (<1 year, 46.8%) and from rural areas (69.2%), with slight male predominance (54.5%). Most were symptomatic (91.7%), presenting with fast breathing (75.2%) and feeding difficulties (55.9%). Acyanotic CHD predominated (82.1%), with ventricular septal defect most common (41.7%); cyanotic CHD accounted for 17.9%, predominantly Tetralogy of Fallot (15.4%). Moderate or severe malnutrition affected 50% of patients. Hospital admission occurred in 82.7%, mainly for heart failure (79.8%) and pneumonia (53.5%). Medical management, primarily furosemide (73%) and spironolactone (69.5%), was provided in 76.9% of cases. At six months, 76.9% had good outcomes, while 23.1% had poor outcomes. Down syndrome (AOR = 4.63, 95% CI: 1.15–18.61, p = 0.031, short (≤3 days) (AOR = 6.01, 95% CI: 1.02–35.54, p =0.049) or prolonged (>14 days) hospital stay (AOR = 7.41, 95% CI: 1.08–50.93, p = 0.042), and loss to follow-up (AOR = 0.13, 95% CI: 0.04–0.41, p = 0.001)were independent predictors of poor outcomes.

Conclusion: Pediatric CHD patients managed non-surgically are mostly infants with high rates of malnutrition. Continuous follow-up, nutritional support, and attention to comorbidities such as Down syndrome are essential to improve survival and functional outcomes.

ACRONYMS AND ABBREVIATION

CHD…….. Congenital Heart Disease

VSD……..Ventricular Septal Defect

ASD…….Atrial Septal Defect

TOF……..Tetralogy Of Fallot

ATRH…….Asella Teaching and Referral Hospital

WHO……World Health Organization

SPSS……..Statistical Package For The Social Sciences

LMIC's……Low and Middle Income Countries

AS…….Aortic Stenosis

AVSD……..Atrioventricular Septal Defect

PDA…….Patent Ductus Arteriosus

PS ……Pulmonic Stenosis

CoA……Coartication of Aorta

TGA……Transposition of Great Arteries

WFH…….weight for heaigt

WFA…….weight for age

HFA…….. height for age

MUAC…….mid-upper arm circunfirance

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

1. INTRODUCTION

1.1.Background

Congenital heart disease (CHD) defined as a structural abnormality of the heart or great vessels present at birth (1,2) representing almost 30% of all major birth defect (3).

Globally, CHD affects approximately 8–12 per 1,000 live births. In 2021, more than 4.18 million children under five years were living with CHD, representing a 3.4% increase since 1990. It's prevalent in 8–12 per 1,000 live births. The global prevalence of CHD in children under five years in 2021 was over 4.18 million, reflecting a 3.4% increase since 1990. Despite this rise in prevalence, global mortality from CHD has decreased from 28.63 per 100,000 in 1990 to 11.06 per 100,000 in 2021(3)(3). The prevalence and pattern of CHD vary across different regions, influenced by genetic, environmental, socioeconomic, and ethnic factors (4,5).

In sub-Saharan Africa, where most countries are classified as low- and middle-income, the burden of CHD is poorly documented. Many nations in this region lack national surveillance systems, have limited access to diagnostic tools, and face inadequate specialized care (6,7). As a result, the true prevalence, clinical profile, and outcomes of CHD remain unclear.

In Ethiopia, pediatric CHD remains a major public health concern, but data on its clinical spectrum and short-term outcomes are scarce. Understanding the local burden and clinical characteristics of CHD is essential to inform healthcare planning, improve early diagnosis, and guide management strategies(8,9). This study, therefore, aims to investigate the clinical profile and short-term outcomes of pediatric CHD in Ethiopia

.

1.2.Statement of the problem

Congenital heart disease (CHD) is one of the most common congenital conditions worldwide and a major cause of morbidity and mortality in children. Globally, while the prevalence of CHD has increased, advances in surgical care and medical management have contributed to a decline in mortality (10,11) . In Ethiopia, studies indicate that CHD remains a significant health concern. A retrospective follow-up study in Addis Ababa reported an overall survival rate of 84.8% among infants with CHD, with surgical intervention significantly reducing mortality risk (12). Similarly, studies in the Amhara region showed a neonatal mortality rate of 9.9%, with predictors including neonatal sepsis, cyanotic CHD, home delivery, maternal gestational diabetes, and additional congenital anomalies (13).

Despite this, the situation in many parts of Ethiopia, including the Arsi zone, remains poorly documented. Pediatric cardiac surgery is not available at Asella Teaching and Referral Hospital (ATRH), and referral options are limited. As a result, most children with CHD rely on non-surgical management and often present late with complications such as congestive heart failure, failure to thrive, and recurrent respiratory infections. Furthermore, the clinical profile, age at diagnosis, presenting symptoms, and short-term outcomes of children receiving non-surgical care at ATRH are largely unknown.

This lack of data limits the ability to optimize medical management, allocate resources effectively, and develop targeted interventions to improve outcomes. Therefore, understanding the clinical characteristics and short-term outcomes of non-surgically managed pediatric CHD at ATRH is crucial to inform healthcare strategies, guide evidence-based care, and improve the quality of cardiac services in resource-limited settings.

1.3. Objectives

1.3.1. General objective

To assess the clinical profile, and factors associated with short-term outcomes non-surgically managed congenital heart disease in pediatrics in Asella Teaching and Referral Hospita, Arsi zone, Oromia Region, Ethiopia, 2025.

1.3.2. Specific objective

To identify clinical characteristics of pediatrics patients diagnosed with congenital heart disease in Asella Teaching and Referral Hospital, Arsi zone, Oromia Region, Ethiopia, from March 2020 to February 2025.

To assess the short-term outcomes following non-surgical management of pediatrics patients diagnosed with congenital heart disease in Asella Teaching and Referral Hospital, Arsi zone, Oromia Region, Ethiopia, from March 2020 to February 2025.

To assess the factors associated with short-term outcomes of congenital heart diseases pediatrics patients in ATRH, Arsi zone, Oromia Region, Ethiopia, from March 2020 to February 2025

1.4. Significance of the study

Surgical correction of congenital heart diseases is still the gold standard for many types of congenital heart disease, and non-surgical management is still vital for stabilizing patients, controlling symptoms, and improving preoperative conditions. Over periods of time non-surgical intervention used for both cyanotic and acynotic CHD were includes medication therapy, fluid management, oxygen support, and nutritional optimization by accurately characterizing symptoms, anatomical defects, and hemodynamic status. (14,15)

Early detection and medical treatment can lower morbidity and mortality even before surgery is an option, which makes it relevant to public health. Understanding how CHD manifests and its complications in context with limited resources aids in modifying clinical procedures and customized treatment plans.

Knowing the clinical profile and nonsurgical management short-term outcome of CHD is crucial because it can direct risk assessment and customized treatment plans in study area where on-site

pediatrics cardiac surgeon not available and long waiting times for referral to Ethiopia cardiac center, where surgical management is available. For patients in situations where surgical options are limited or delayed or for those who are awaiting surgery, non-surgical management - temporary solutions- are essential.

Few studies have looked at CHD outcomes outside of major cities like Addis Ababa; regional hospitals are not well-represented in CHD research. At Asella teaching and referral hospital there was no any comparable studies.

Thus, the purpose of this research is to examine the clinical characteristics and short-term nonsurgical management results of congenital heart disease in pediatrics at Asella teaching and referral hospital. It will provide important information about the efficacy of conservative treatment methods by assessing short-term outcomes, such as symptom relief, length of hospital stay, and short term outcomes.. The findings could support evidence-based procedures in pediatric cardiology, highlight best practices for supportive care, and guide clinical decision-making. Furthermore, the results of this study could be used as a guide by healthcare systems in settings with limited resources, where surgical interventions are less accessible and medical management is more prevalent. Additionally, the results of this study can contribute to the body of literature already in existence and can be used as a foundation for further research.

1.5.Scope of the Study

This study focused on pediatric patients diagnosed with congenital heart disease (CHD) and managed non-surgically at Asella Teaching and Referral Hospital (ATRH) between March 2020 and February 2025. It examined the clinical profile, types of CHD, comorbidities, nutritional status, hospital admissions, management approaches, follow-up, and short-term outcomes.

The findings aim to inform pediatric healthcare providers, hospital administrators, and policymakers about early diagnosis, medical and nutritional management, and follow-up strategies for children with CHD in Ethiopia and similar low-resource settings(16,17).

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Congenital Heart Diseases (CHD)

Congenital heart diseases (CHD) are consistently identified as the most prevalent congenital anomalies worldwide. Global estimates place CHD prevalence at approximately 8–10 per 1,000 live births, although substantial variation is reported across regions and income groups (18). These differences are widely attributed to variability in diagnostic capacity, surveillance systems, and access to specialized healthcare rather than true epidemiological variation.

Comparative analyses across World Bank income categories demonstrate higher reported CHD prevalence in high-income countries compared with low- and middle-income settings. For instance, prevalence estimates of around 8 per 1,000 live births have been reported in high-income countries, whereas lower-middle-income countries report lower rates (6.9 per 1,000 live births), and population-based data from low-income countries remain scarce or absent (4). Similar trends have been documented across multiple global reviews, reinforcing the likelihood of under-detection in resource-limited settings.

Across studies, diagnostic methodology emerges as a key determinant of reported prevalence. Earlier investigations frequently relied on clinical examination, autopsy findings, surgical records, or catheterization data, approaches that tend to miss less severe or asymptomatic defects. In contrast, studies incorporating echocardiography consistently report higher prevalence rates. Van der Linde et al. documented echocardiography use in approximately two-thirds of included studies, whereas Liu et al. reported its use in nearly all studies published after 2000 (4,19). These findings collectively suggest that the observed global increase in CHD prevalence over time largely reflects improvements in diagnostic sensitivity rather than a true rise in incidence.

Despite global advancements in diagnostic technology, evidence from African settings remains limited. While high-income countries and some middle-income regions have demonstrated improved detection and reporting of CHD, African data are often derived from hospital-based or small-scale studies, limiting generalizability. Consequently, the burden, spectrum, and outcomes

of CHD in Africa are likely underestimated, and comparisons with other regions remain constrained (19).

2.2. Clinical Profiles of CHD in Pediatrics

Congenital heart disease (CHD) presents with considerable variation in age at diagnosis, sex distribution, type of defect, and clinical manifestations across different regions. Studies indicate that children with CHD are diagnosed at variable ages, reflecting differences in healthcare access, diagnostic capacity, and referral patterns. In Brazil, a cross-sectional study including children and adolescents aged 6–18 years reported a mean age at diagnosis of 12.0 ± 3.7 years (20). In contrast, studies from South Asia and sub-Saharan Africa show that most children are diagnosed during infancy: in Pakistan, 32.3% of CHD cases were neonatal, and 7.2% occurred within the first year of life (21) ; in Nigeria, 62% of children were diagnosed between one month and one year, whereas only 9% were identified within the first month (22). Similarly, in Gambia, the median age at diagnosis was 1.4 years, with the majority of cases (65.2%) detected between 12 months and five years (23). In Ethiopia, the median age at diagnosis ranges from 5 months to 5 years depending on the study setting, with cyanotic lesions generally diagnosed later than acyanotic defects (24,25). These differences likely reflect variations in diagnostic infrastructure, referral systems, and survival bias, with children having severe cyanotic CHD less likely to survive undiagnosed in low-resource settings.

Sex distribution also varies regionally. Male predominance was reported in Brazil (80%), Tanzania (51.2%), Bangladesh (63.2%), and Pakistan (53.5%), whereas female predominance was observed in Gambia (57.3%) and at the Ethiopian corrective cardiac center (57.4%) ((20) (21) (23) (26)(27),(28)). Urban residence is more frequently reported among pediatric CHD cases in Ethiopia, suggesting that children from rural areas may face barriers to early diagnosis and referral ((27) (29)).

The types of CHD follow broadly consistent global patterns, although prevalence varies. Ventricular septal defect (VSD) is the most common acyanotic CHD, followed by atrial septal defect (ASD), patent ductus arteriosus (PDA), and pulmonic stenosis (PS), while tetralogy of Fallot (TOF) is the most frequent cyanotic lesion ( ). For instance, in Pakistan, VSD accounted for 20.5% of acyanotic CHD and TOF for 22.2% of cyanotic CHD (21). In Bangladesh, VSD (39.1%) and PDA (17.3%) were the most common acyanotic lesions, whereas TOF (15.5%)

predominated among cyanotic defects (39). Similar trends were reported across sub-Saharan Africa, with VSD and TOF being the most frequent acyanotic and cyanotic defects, respectively ((23),(26),(30)). Despite these similarities, the proportion of cyanotic versus acyanotic CHD varies across regions, reflecting differences in survival, referral, and detection rates.

Clinical presentations are also influenced by region and resource availability. Common signs and symptoms include recurrent chest infections, poor weight gain, respiratory distress, murmurs, and cyanosis ((21),(31),(32)). Malnutrition is a frequent complication, with wasting predominating in acyanotic CHD and stunting in cyanotic CHD ((33),(22),(34)). In high-resource settings such as Egypt, early diagnosis allows most children to be identified within the first year of life, reducing the prevalence of heart failure and growth retardation (31).

Collectively, the literature indicates that while CHD types are broadly consistent worldwide, there are notable regional differences in age at diagnosis, clinical severity, and nutritional status, largely driven by diagnostic capacity, referral pathways, and survival bias. Most studies are descriptive and single-centered, limiting comparative insights. The current study addresses these gaps by providing a regional comparison of CHD profiles in Ethiopia, focusing on age at diagnosis, type of lesion, and associated clinical outcomes

2.3. Non-Surgical Management in Pediatric with CHD

Non-surgical management is a cornerstone in the care of children with congenital heart disease (CHD), particularly for symptom control, stabilization, and improvement of growth while awaiting surgical or interventional correction. Evidence from multiple regions highlights variability in prescription patterns, reflecting differences in healthcare access, resource availability, and clinical practice.

A study conducted across six European regions from 2000 to 2014 reported that cardiovascular medications were prescribed in 13.3% of children under one year, 5.9% of those aged 1–4 years, and 3.7% of children aged 5–9 years. Diuretics were the most frequently used agents, prescribed in 10.8%, 4.1%, and 1.9% of patients in these respective age groups, underscoring their role in reducing pulmonary congestion and alleviating heart failure symptoms (32).

In Bangladesh, Moffett and Price (2015) reported even higher utilization of diuretics (90.1%, primarily furosemide in 98.4% of cases), along with beta-blockers (36.8%, mostly carvedilol) and ACE inhibitors (69.6%, primarily enalapril) at discharge. These therapies aim to optimize cardiac function, reduce afterload, and relieve clinical symptoms such as dyspnea and fatigue, thereby facilitating better nutritional status, growth, and reduced morbidity (35).

In sub-Saharan Africa, access to pharmacologic therapy varies. In Tanzania, 25% of children required admission on the first day of echocardiography, and 62% of admitted patients received medical stabilization, whereas only 5.7% of children received outpatient medications during their initial visit (26). In Nigeria, 40% of pediatric CHD patients experienced at least one hospital admission, reflecting the ongoing need for medical management to prevent decompensation (29). In The Gambia, retrospective data showed that the most frequently used medications were furosemide (68.5%), enalapril (13.5%), propranolol (13.5%), and spironolactone (10.1%), indicating a combined approach of diuretics, afterload reduction, and heart rate control to stabilize children with CHD (23).

Collectively, these studies demonstrate that non-surgical management is directly linked to anticipated outcomes: diuretics alleviate congestive symptoms, ACE inhibitors and beta-blockers optimize cardiac function, and together they contribute to improved growth, nutritional status, and survival, particularly in settings where surgical correction may be delayed. Regional differences in prescription patterns reflect variations in healthcare infrastructure, availability of medications, and local treatment guidelines ((22)(23) (32) (33)(33)(31)(43)(41)(40) (35)).

2.4. Short-Term Outcomes of Non-Surgical Treatment of CHD

Non-surgical management of pediatric CHD aims not only to stabilize cardiac function but also to prevent complications, improve nutritional status, and reduce mortality prior to definitive interventions. Several studies have reported common short-term outcomes and complications associated with non-surgical treatment.

A study by Damkjaer et al. reported that the most frequently observed complications in children with CHD were pneumonia (35%), growth failure (23%), heart failure (15%), and recurrent respiratory tract infections (14%). Other complications included the combination of pneumonia

with heart failure (10%) and cerebral abscess (4%) (32). In The Gambia, complications were similarly observed, with heart failure and failure to thrive each occurring in 14.6% of children, pneumonia in 8.9%, and 17.9% of cases having unspecified complications; notably, 43.8% of children experienced no complications (23).

Short-term survival under non-surgical management is generally favorable but varies across regions. In The Gambia, Nyang reported that 95.5% of children received non-surgical therapy, with 82.0% discharged for outpatient follow-up, 6.7% deaths, and 2.2% discharged against medical advice (DAMA) (23). In Nigeria, 3% of admitted CHD patients died, most commonly due to intractable heart failure or complications related to tetralogy of Fallot with cerebrovascular events (22) In Egypt, mortality was reported at 4.8% (36). Median hospital stay ranged from one to several days, with Moffett and Price reporting a median length of stay of nine days (35). Most children were not readmitted, with 87.6% having no readmission and 11.2% readmitted once; the majority of hospital stays lasted one or two days (23)..

Nutritional outcomes are closely tied to effective non-surgical management. A study across African children with CHD reported high rates of undernutrition, including underweight (45.76%), wasting (39.37%), and stunting (39.38%), with overall undernutrition affecting 65.14% of patients (37). In Ethiopia, a retrospective study at a cardiac corrective center showed significant improvements in anthropometric indices following medical stabilization and ongoing care. Pre-intervention prevalence of underweight, wasting, and stunting was 54%, 54.1%, and 59.5%, respectively. At three months post-intervention, these decreased to 40.7%, 39.2%, and 49.2%, and further declined at six months to 29.3%, 25.9%, and 34.8% (27). These findings highlight the role of non-surgical management in stabilizing heart failure, improving feeding tolerance, and supporting catch-up growth in pediatric CHD patients.

Collectively, the literature indicates that short-term outcomes of non-surgical treatment are generally favorable, with reductions in symptom burden, prevention of acute complications, improved nutritional status, and low mortality, especially when combined with close follow-up and early stabilization strategies. Variations across regions reflect differences in healthcare resources, patient severity, and access to medications ((22)(23), (27), (36) (32) (35) (37))

2.5.Conceptual frame work

This conceptual frame work developed by researcher based on the concepts of literature review.(4,8,13,19,21–26,28,31,32,35,36,38–42)

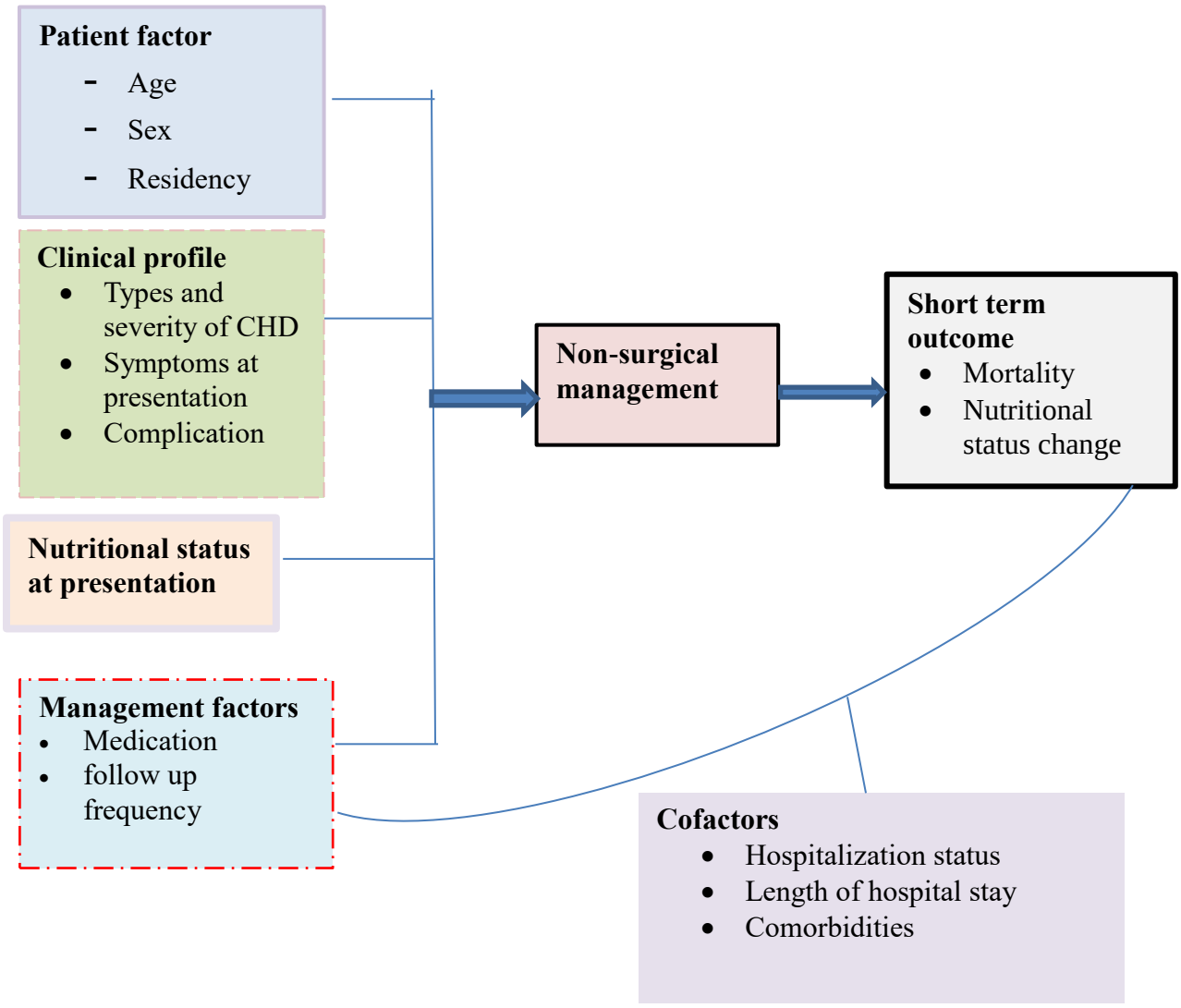

Figure 1: conceptual framework of clinical profiles and short term outcome and associated factors of non-surgically managed congenital heart disease in pediatric patients at Asella Teaching and Referral Hospital during March 2020 to February 2025

CHAPTER THREE

3. METHOD'S

3.1. Study Area

The study where conducted at Arsi University, College of health science (CoHS), Asella teaching and referral hospital which is located in the town of Asella. Asella is a town in central Ethiopia which is located in the Arsi Zone of the Oromia Region about 175 kilometers from Addis Ababa, the capital city of the country. Arsi University is one of the young universities in Ethiopia established in 2014. Since 1964 Asella teaching and referral hospital was serving populations in Arsi and the nearby zones with current catchment population of 3.8 million. The hospital has 321 beds with more than six departments (Internal Medicine, Surgery, Pediatrics, Gynecology and Obstetrics, Orthopedics and Oncology). The hospital has been involved in training undergraduate and postgraduates in different specialties in four major departments (Internal Medicine, Surgery, Pediatrics and Child Health and Gynecology and Obstetrics). The hospital has been improving its health service delivery, currently has modern investigation modalities like Digital X-rays, portable X-ray, different types of Ultrasound, Echocardiography, Computerized tomography scan and culture service. The Department of Pediatrics and Child Health has a separate ward, emergency service, follow clinic and regular outpatient department. The pediatrics department rests its services on 14 specialists, 23 residents, three General practioners and nurses

Study design and period

A **retrospective cohort study** design was employed to assess pediatric patients with congenital heart disease. The study was conducted at Asella Teaching and Referral Hospital (ATRH), Arsi Zone, Oromia, Ethiopia, covering the period from March 1, 2020, to February 28, 2025.

3.2. Source and study population

3.2.1. Source population

The source population for this study comprised all pediatric medical records evaluated at Asella Teaching and Referral Hospital (ATRH) between March 1, 2020, and February 28, 2025.

3.2.2. Study population

A total of 172 medical records of pediatric patients diagnosed with congenital heart disease (CHD) were identified and retrieved from hospital records at Asella Teaching and Referral Hospital during the study period from March 1, 2020, to February 28, 2025.

3.3. Sample Size and Sampling Technique

All, 172 retrieved records were reviewed for eligibility based on the predefined inclusion criteria. Medical records that did not fulfill the inclusion criteria were excluded from the study. Consequently, 156 eligible medical records that met the inclusion criteria and were complete for analysis were included in the final study using a census method. Inclusion and exclusion criteria

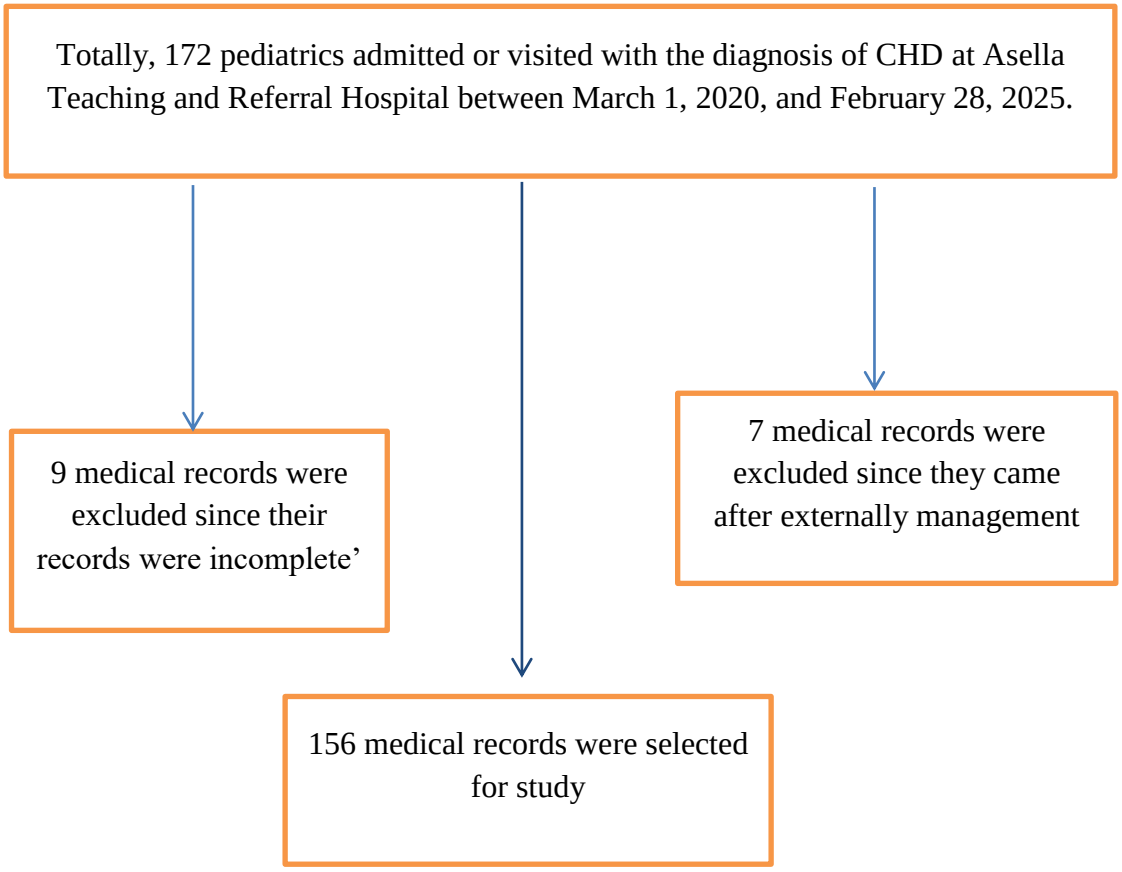

Figure 2:- Case selection flow diagram of clinical profile and factors associated with short term outcome of CHD at Asella teaching and referral hospital, from March 1, 2020, and February 28, 2025.

3.3.1. Inclusion criteria

All pediatric patients meeting the following criteria were included in the study:

Age between birth to 14 years.

Medical records with a diagnosis of congenital heart disease (CHD) from patients admitted to or visited the pediatric ward/department at Asella Teaching and Referral Hospital (ATRH) between March 2020 and February 2025.

CHD diagnosis confirmed by echocardiography.

3.3.2. Exclusion criteria:-

The following pediatric patients were excluded from the study:

Patients who underwent surgical correction or interventional cardiac catheterization.

Medical records that were incomplete or missing essential information.

Patients diagnosed with acquired (non-congenital) cardiac conditions.

Cases managed at healthcare facilities other than Asella Teaching and Referral Hospital (ATRH).

3.4.Study variables

3.4.1. Dependent variables

Primary outcome: short-term clinical outcome

Secondary outcomes: nutritional status changes,

3.4.2 Independent variables

Age at diagnosis

Sex

hospitalization patterns

Place of Residency

Type of CHDSymptoms at presentation

Comorbidities

Nutritional status at presentation

Non-surgical managed CHD

Reasons for admission

Frequency of hospitalization

Follow-up

3.5.Complication developmen Operational definitions

To ensure clarity and consistency, the following key terms are defined as they apply to this study:

Congenital Heart Disease (CHD):- refers to a collection of birth-related structural or functional heart or great vessel abnormalities brought on by improper fetal development. The severity of these defects varies, ranging from small lesions that go away on their own to complicated conditions that call for sophisticated medical or surgical treatment (43).

Non-Surgical Management:- entails treating CHD without surgery by using pharmacologic treatments (such as ACE inhibitors and diuretics), oxygen supplementation, nutritional support, and regular clinical monitoring. This strategy is particularly pertinent in low-resource environments where access to surgical care is restricted or nonexistent (44)

Short-Term Outcomes:- refer to clinical changes observed within a short period—typically from days to a few months—following the initiation of medical treatment. These may include , anthropometrics improvement , reduced hospitalizations, and survival status during the acute management phase (44)

Clinical Profile:- comprises demographic data, clinical signs and symptoms, and diagnostic findings that collectively describe a patient's disease presentation. It is used to assess disease severity and guide management strategies (45).

Resource-Limited Settings:- are healthcare environments with restricted access to trained healthcare professionals, diagnostic tools, and surgical services. These limitations necessitate a reliance on conservative, non-surgical approaches for managing conditions like CHD (World Health Organization [WHO], 2010).

Age at first diagnosis: Prenatal diagnosis or postnatal age at which CHD was diagnosed through appropriate echocardiography.

Heart Failure in CHD:- Heart failure in the context of CHD results from volume or pressure overload caused by structural cardiac defects. It is commonly manifested by symptoms such as rapid breathing, poor feeding, and failure to thrive.

Delayed Diagnosis: Definition for delay in diagnosis for cyanotic and acyanotic CHDs will be as follows.

Cyanotic heart diagnosis: newborns discharged from their birth clinic or hospital without a CHD diagnosis (33)(34) (32)(19)(20)(18)

Acyanotic heart diagnosis: delayed diagnosis is defined when the child was diagnosed when immediate treatment, intervention or cardiac surgery should have already been performed according to contemporary standards of pediatric cardiology (46–49).

Medical management includes the use of cardiac drugs like diuretics, ACEIs, inotropes, and supportive therapies(50)

Malnutrition (under nutrition): if the child has one of wasting, stunting and underweight

According to the World Health Organization (WHO), wasting, stunting, and underweight are defined as Z-scores less than ≤−2 standard deviations of weight for height (for <5 years), BMI (replacing weight for height for age 5–19 years), height for age, and weight for age (up to 10 years) as moderate malnutrition respectively and a z score of ≤−3 SD to define severe malnutrition. A z score of ≤−2 indicates that a child's WAZ, WHZ, BMI or HAZ is 2 SD below

the age- and gender-specific median for the normal population, and 3 SD below the median cut-off if the z score is ≤−3(51).

Good Outcome:-A pediatric patient who improved clinically and was discharged from the hospital, or was referred to a higher-level hospital for further care and investigation after stabilization

Poor Outcome::- A pediatric patient who experienced one of the following during the hospital stay: Death or Discharge Against Medical Advice (DAMA) before completion of treatment.(52,53)

Duration of hospital stay was defined as the total number of days from admission to discharge, referral, DAMA, or death. A short hospital stay was defined as < 3 days, while a long hospital stay was defined as > 14 days. Admissions lasting 3–14 days were considered intermediate and excluded from the short versus long hospital stay analysis.(54,55)

3.6. Data collection procedure

Secondary data, from patients medical record files were used for this study and it were obtained through structured checklist which will be filled by trained data collectors. The data were collected with Kobo Collect and then exported to excel then to SPSS. Researcher was prepared checklists and information recording formats by referring previous studies and literature's. Checklists were prepared in English. The researcher was recruited two medical Interns for data collection and they were oriented for data collection.

3.7. Data quality management

The adapted checklist was approved by the advisors, and data collectors received two days of training on the study's objectives and the eligibility criteria for the study population prior to data collection. Additionally, a pre-test was conducted with 18 pediatrics that were treated before March 2020, at ATRH pediatrics treated before the commencement of the study period). Further modifications were made to the sequence of questions and the content of the checklist. The principal investigator ensured the collected data was stored after verifying its completeness and consistency to minimize the risk of data loss. Furthermore, the pre-test data were excluded from the final analysis

3.8.Data analysis procedures

Data were collected using Kobo Collect and subsequently exported to Microsoft Excel for data cleaning, coding, and consistency checks. After cleaning, the data were transferred to SPSS version 27 for statistical analysis. Descriptive statistics were used to summarize socio-demographic, clinical, nutritional, and management-related characteristics of the study participants using frequencies, percentages, means, and standard deviations as appropriate. Multiple-response variables, such as types of medications administered and follow-up practices, were analyzed using the multiple-response procedure in SPSS and reported as frequencies and percentages. Prior to inferential analysis, collinearity among independent variables was assessed using variance inflation factor (VIF) and tolerance tests; variables with a VIF greater than 10 or tolerance less than 0.1 were considered collinear and excluded from the final model. Binary logistic regression was conducted to identify factors associated with clinical outcomes of pediatric patients with congenital heart disease, and variables with a p-value less than 0.25 in the bivariate analysis were entered into a multivariable logistic regression model to control for potential confounders. Adjusted odds ratios with 95% confidence intervals were used to measure the strength of associations, and a p-value of less than 0.05 was considered statistically significant.

3.9. Ethical consideration

Ethical clearance was obtained from Arsi University and Asella Teaching and Referral Hospital prior to the commencement of the study (attached at Annex). Permission to access patient medical records was secured from the concerned hospital authorities. To ensure confidentiality, data were collected anonymously and recorded using unique identification codes rather than personal identifiers. All information was kept strictly confidential and used solely for research purposes, ensuring that individual participants could not be identified at any stage of the study.

3.10. Dissemination plan

After research completion and finalizing report, this study will be presented to the department of pediatrics and child health and public health, as part of pediatrics and child health specialty thesis at Arsi University and submitted to post graduate programs coordinating office of college of

health sciences of Arsi University and other stake holders for possible application and publication of the study.

CHAPTER FOUR:

4. RESULTS

Baseline Socio-Demographic and Clinical profiles of Pediatric Patients with Congenital Heart Disease

Of the 172 eligible pediatric congenital heart disease (CHD) records, 156 (90.7%) were complete and included in the final analysis. All included patients were diagnosed with CHD and managed non-surgically at Asella Teaching and Referral Hospital.

Regarding socio-demographic characteristics, 73 (46.8%) of the patients were aged less than one year, 57 (36.5%) were aged 1–4 years, and 26 (16.7%) were five years and above. Males accounted for 85 (54.5%) of the study population, while 71 (45.5%) were females. With respect

Table 1:- Profiles of pediatric patients with congenital heart disease managed non-surgically at Asella Teaching and Referral Hospital, Arsi Zone, Oromia Region, Ethiopia, March 2020–February 2025

Socio-Demographic Characteristics		Response Frequency	Percent
Age	<1 Year	73	46.8
	1 - 4 Years	57	36.5
	>/= 5 Year	26	16.7
	Total	156	100.0
Gender	Male	85	54.5
	Female	71	45.5
	Total	156	100.0
Residency	Rural	108	69.2
	Urban	48	30.8
	Total	156	100.0
Time Of First Diagnosis	Post Natal	156	100.0

to residence, the majority of patients, 108 (69.2%), were from rural areas, whereas 48 (30.8%) resided in urban areas. All study participants (100%) were diagnosed with CHD during the postnatal period.

At the time of diagnosis, 143 (91.7%) patients were symptomatic, while 13 (8.3%) were asymptomatic. The most frequently reported presenting symptom was fast breathing, observed in 109 (75.2%) patients. Other common symptoms included breastfeeding interruption in 81 (55.9%), diaphoresis in 69 (47.6%), easy fatigability in 46 (31.7%), and prolonged feeding in 44 (30.3%) patients. Additionally, cyanosis was reported in 18 (12.4%), generalized body swelling in 12 (8.3%), and other symptoms in 7 (4.8%) patients

Table 2: Clinical presentation and symptoms at diagnosis among pediatric patients with congenital heart disease managed non-surgically at Asella Teaching and Referral Hospital, Arsi Zone, Oromia Region, Ethiopia, March 2020–February 2025

		Frequency	percent
Symptoms	Asymptomatic at presentation	13	8.3
	symptomatic at presentation	143	91.7
	Total	156	100.0
Symptoms at presentation	Fast breathing	109	75.2
	Breast feeding interruption	81	55.9
	Diaphoresis	69	47.6
	Prolonged feeding	44	30.3
	Easy fatigability	46	31.7
	Generalized body swelling	12	8.3
	cyanosis	18	12.4
	other symptoms	7	4.8

In terms of disease classification, 128 (82.1%) patients were diagnosed with acyanotic congenital heart disease, while 28 (17.9%) had cyanotic congenital heart disease. Ventricular septal defect (VSD) was the most common specific diagnosis, accounting for 65 (41.7%) cases, followed by

atrial septal defect (ASD) in 19 (12.2%), atrioventricular septal defect (AVSD) in 18 (11.5%), and patent ductus arteriosus (PDA) in 14 (9.0%) patients. Less common acyanotic lesions included aortic stenosis, pulmonary stenosis, and other acyanotic CHDs, each observed in 3 (1.9%) patients. Among cyanotic CHDs, Tetralogy of Fallot (TOF) was the most frequently identified lesion, occurring in 24 (15.4%) patients, while transposition of the great arteries with associated defects, tricuspid atresia, truncus arteriosus, and other cyanotic CHDs accounted for smaller proportions.

Table 3: Classification and types of congenital heart disease among pediatric patients managed non-surgically at Asella Teaching and Referral Hospital, Arsi Zone, Oromia Region, Ethiopia, March 2020–February 2025

		Frequency	Percent
Classification	Acynotic CHD	128	82.1
	Cyanotic CHD	28	17.9
	Total	156	100.0
Types of CHD	VSD	65	41.7
	ASD	19	12.2
	PDA	14	9.0
	AS	3	1.9
	AVSD	18	11.5
	PS	3	1.9
	other acyanotic CHD	3	1.9
	TOF	24	15.4
	TGA with other defect	2	1.3
	tricuspid atresia	2	1.3
	Truncus arteriosus	1	.6
	other cyanotic CHD	2	1.3
	Total	156	100.0

At diagnosis, 116 (74.4%) patients had at least one comorbidity, whereas 40 (25.6%) had none. The most common comorbid conditions were anemia in 33 (21.2%), Down syndrome in 31

(19.9%), and pulmonary hypertension in 26 (16.7%) patients. Less frequent comorbidities included polycythemia in 12 (7.7%) and other conditions in 14 (9.0%) patients.

Table 4 :-Comorbidities at presentation among pediatric patients with congenital heart disease managed non-surgically at Asella Teaching and Referral Hospital, Arsi Zone, Oromia Region, Ethiopia, March 2020–February 2025

Status and each specific of comorbidities			
characters at presentation		N/ frequency	Percent/ %
No comorbidity		40	25.6%
with comorbidity		116	74.4%
Comorbidities	anemia	33	21.2%
	Pulmonary Hypertension	26	16.7%
	down syndrome	31	19.9%
	polycythemia	12	7.7%
	others	14	9.0%

Assessment of nutritional and anthropometric status at diagnosis showed that, based on weight-for-height/ weight for length (Body Mass Index-for-age for older than 5 year age) (WFH/ WFL/BMIA), 65 (41.7%) patients had normal nutritional status, 46 (29.5%) had moderate wasting, 32 (20.5%) had severe wasting, and 13 (8.3%) were not assessed. Using weight-for-age (WFA), 63 (40.4%) were normal, 29 (18.6%) were moderately underweight, 21 (13.5%) were severely underweight, and 43 (27.6%) were not assessed. Based on height-for-age (HFA), 57 (36.5%) had normal stature, 34 (21.8%) had moderate stunting, 22 (14.1%) had severe stunting, and 43 (27.6%) were not assessed. Mid-upper arm circumference (MUAC) measurements showed normal status in 67 (42.9%), moderate wasting in 36 (23.1%), severe wasting in 16 (10.3%), and were not measured in 37 (23.7%) patients

Table 5 Anthropometric and nutritional status at first diagnosis among pediatric patients with congenital heart disease managed non-surgically at Asella Teaching and Referral Hospital, Arsi Zone, Oromia Region, Ethiopia, March 2020–February 2025.

Anthropometry / nutritional status		At diagnosis		At six month	
		Frequency	Percent	Frequency	Percent
WFH/L or BMIA	Normal	65	41.7	26	45.6
	Moderate wasting	46	29.5	17	29.8
	Severe wasting	32	20.5	10	17.5
	Didn’t assessed	13	8.3	4	7.0
	Total	156	100.0	57	100.0
WFA	normal	63	40.4	26	45.6
	moderate under weight	29	18.6	17	29.8
	severe under weight	21	13.5	10	17.5
	didn't assessed	43	27.6	4	7.0
	Total	156	100.0	57	100.0
HFA	Normal	57	36.5	28	49.1
	Moderate stunting	34	21.8	17	29.8
	severe stunting	22	14.1	8	14.0
	Did not assessed	43	27.6	4	7.0
	Total	156	100.0	57	100.0
MUAC	not measured	37	23.7	4	7.0
	Severe wasting	16	10.3	8	14.0
	moderate wasting	36	23.1	17	29.8
	normal	67	42.9	28	49.1
	Total	156	100.0	57	100.0

Hospital Admission, Management, and Follow-Up Characteristics of Pediatric Patients with Congenital Heart Disease

Among the 156 pediatric patients, 129 (82.7%) required hospital admission, while 27 (17.3%) were managed without admission. Of those admitted, 97 (75.2%) were admitted once, whereas 32 (24.8%) had two or more admissions.

Table 6 : Hospital admission characteristics of pediatric patients with congenital heart disease managed non-surgically at Asella Teaching and Referral Hospital, Arsi Zone, Oromia Region, Ethiopia, March 2020–February 2025.

Characters of hospitalization		Response	
		N (frequency)	Percent (%)
Admission	No	27	17.3
	Yes	129	82.7
	Total	156	100.0
Admitted patients			
Frequency of admission	1x	97	75.2
	>/=2x	32	24.8
Length of hospital stay (days)	≤3	30	23.2
	4- 6	32	24.8
	7 -14	49	40
	>14	18	14
Reasons of admission	Heart failure	103	79.8
	Pneumonia	69	53.5
	Severe acute malnutrition	23	17.8
	Acute gastroenteritis	16	12.4
	Developmental delay	5	3.9
	Other	13	10.1

The duration of hospital stay varied, with 30 (23.2%) patients hospitalized for ≤3 days, 32 (24.8%) for 4–6 days, 49 (40.0%) for 7–14 days, and 18 (14.0%) for more than 14 days. The

most common reasons for admission were heart failure, observed in 103 (79.8%) patients, and pneumonia in 69 (53.5%) patients. Other indications for admission included severe acute malnutrition in 23 (17.8%), acute gastroenteritis in 16 (12.4%), developmental delay in 5 (3.9%), and other conditions in 13 (10.1%) patients.

All study participants received non-surgical management. Of these, 120 (76.9%) patients were treated with medical therapy, while 36 (23.1%) were managed through watchful waiting. Among patients receiving medical therapy, furosemide was the most commonly prescribed, administered to 103 (73.0%) patients, followed by spironolactone in 98 (69.5%) patients. Less frequently used medications included beta blockers in 11 (7.8%), sildenafil in 10 (7.1%), ACE inhibitors in 2 (1.4%), adrenaline in 3 (2.1%), noradrenaline in 1 (0.7%), and dopamine in 1 (0.7%) patient. Supportive care included oxygen therapy in 124 (87.9%) patients and nutritional support in 36 (25.5%) patients

Table 7: Types of treatment and supportive care provided to pediatric patients with congenital heart disease managed non-surgically at Asella Teaching and Referral Hospital,

Treatment		Response /N	Percent
Types of treatment given	watch full waiting	36	23.1
	medical therapy	120	76.9
	Total	156	100.0
medical therapy	Furosemide	103	73.0
	Spironolactone	98	69.5
	Sildenafil	10	7.1
	ACE inhibitors	2	1.4
	Beta blocker	11	7.8
	Adrenaline	3	2.1
	Noradrenaline	1	0.7
	Dopamine	1	0.7
	Nutritional support	36	25.5
	Oxygen therapy	124	87.9

At six months post-diagnosis, only 57 (36.5%) patients remained in follow-up, while 99 (63.5%) were lost to follow-up.

Table 8:- Follow-up status of pediatric patients with congenital heart disease, Asella Teaching and Referral Hospital, March 2020–February 2025.

Follow up to 6 month after first diagnosis		Frequency	Percent
	did not continued	99	63.5
	continued	57	36.5
	Total	156	100.0

4.3. Anthropometric Status and Short-Term Outcomes at Six Months in Pediatric Patients with Congenital Heart Disease

Among the 57 patients who continued follow-up at six months, anthropometric assessment revealed varying levels of nutritional status. Based on weight-for-height/Body Mass Index-for-age (WFH/BMIA), 26 (45.6%) patients had normal nutritional status, 17 (29.8%) had moderate wasting, 10 (17.5%) had severe wasting, and 4 (7.0%) were not assessed. Assessment using weight-for-age (WFA) showed 25 (43.9%) were normal, 17 (29.8%) moderately underweight, 8 (14.0%) severely underweight, and 7 (12.3%) were not assessed. Height-for-age (HFA) revealed normal stature in 28 (49.1%) patients, moderate stunting in 17 (29.8%), severe stunting in 8 (14.0%), and 4 (7.0%) were not assessed. Mid-upper arm circumference (MUAC) showed normal status in 33 (57.9%), moderate wasting in 11 (19.3%), severe wasting in 8 (14.0%), and 5 (8.8%) were not measured.

At six months post-diagnosis, short-term outcomes indicated that 82 (52.6%) patients improved and were discharged, 24 (15.4%) died, 12 (7.7%) left against medical advice, and 38 (24.4%) were referred to other facilities.

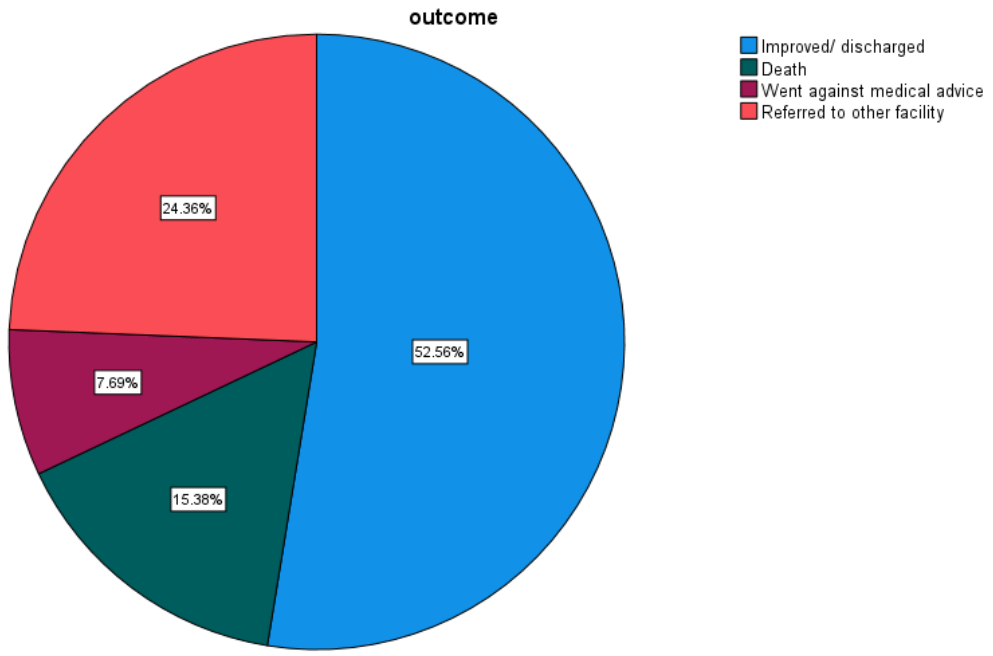

Figure 3 Short-term outcomes of pediatric patients with congenital heart disease. Asella Teaching and Referral Hospital, March 2020–February 2025.

When outcomes were categorized into good outcomes (improved/discharged or referred) and poor outcomes (died or left against medical advice), 120 (76.9%) patients experienced good outcomes, while 36 (23.1%) had poor outcomes.

Table 9: Short-term outcomes of of pediatric congenital heart disease managed non-surgically at As ella Teaching and Referral Hospital

		Response	
		Frequency	Percent
Outcome	Good Outcome (Improved-Discharged, Referred To Other Facility)	120	76.9
	Poor Outcome (Died, Discharged Against Medical Advice)	36	23.1
	Total	156	100.0

4.4.Factors Associated with Short-Term Outcomes of Congenital Heart Disease

Bivariable and multivariable logistic regression analyses were performed to identify factors associated with short-term outcomes among pediatric patients with congenital heart disease managed non-surgically at Asella Teaching and Referral Hospital. Short-term outcome was dichotomized as good outcome (improved/discharged or referred) and poor outcome (death or discharge against medical advice). Variables with a p-value less than 0.25 in the bivariable analysis were entered into the multivariable logistic regression model. Statistical significance was declared at $p < 0.05$.

After adjusting for potential confounders in the multivariable logistic regression analysis, Down syndrome, length of hospital stay, and follow-up status at six months were found to be independently associated with short-term outcomes.

Pediatric patients with Down syndrome had a significantly higher likelihood of experiencing poor short-term outcomes compared to those without comorbidity (AOR = 4.63, 95% CI: 1.15–18.61, p = 0.031).

Length of hospital stay was also significantly associated with short-term outcomes. Patients who stayed in the hospital for 1–3 days were six times more likely to have poor outcomes compared to those who were not admitted (AOR = 6.01, 95% CI: 1.02–35.54, p =0.049). Similarly, those with a hospital stay of more than 14 days had a significantly increased likelihood of poor outcomes (AOR = 7.41, 95% CI: 1.08–50.93, p = 0.042). However, hospital stays of 4–6 days and 7–14 days were not statistically significant after adjustment.

Follow-up status at six months showed a strong protective effect. Pediatric patients who continued follow-up were 87% less likely to experience poor short-term outcomes compared to those who did not continue follow-up (AOR = 0.13, 95% CI: 0.04–0.41, p = 0.001).

Other factors, including sex, residence, presentation status, anemia, pulmonary hypertension, and polycythemia, were not significantly associated with short-term outcomes in the multivariable analysis. .

Table 10: Bivariable and multivariable logistic regression analysis of factors associated with short-term outcomes of pediatric congenital heart disease managed non-surgically at Asella Teaching and Referral Hospital, Arsi Zone, Oromia Region, Ethiopia

Factors	value	Outcome		COR	AOR	P-value
		Good outcome	Poor outcome			
Gender	Female	51	20			
	Male	69	16	0.591(0.279 – 1.252)	0.689(0.280- 1.698)	0.419
Residency	Urban	33	7			
	Rural	87	29	1.571 (0.628 – 3.933)	2.163(0.728 – 6.428)	0.165
Presentation status	Asymptomatic	12	1			
	Symptomatic	108	35	3.889(0.488 – 30.983)	2.098(0.207 - 21.282)	0.531
Comorbidities	No comorbidity	33	7		1	
	Anemia	26	7	0.778 (0.171– 3.538)	1.353(0.364 – 5.032)	0.652
	Pulmonary Hypertension	21	5	0.987 (0.215 – 4.537)	1.213 (0.291 – 5.053)	0.791
	Down syndrome	17	14	0.873 (0.175 – 4.352)	4.633(1.153 – 18.608)	0.031
	Polycythemia	12	0	3.020 (0.702 –	0.000(0.001	0.999

				12.995)		
	Others	11	3	0.000(0.000 – 0.000)	2.182 (0.325 14.662)	0.422
Length of hospital stay (in days)	Not admitted	25	2		1	
	1-3	23	7	0.100(0.018 – 0.555)	6.013(1.017_35.536)	0.049
	4-6	25	7	0.380(0.108 – 1.337)	4.009 (0.656 _ 24.479)	0.133
	7-14	37	12	0.350 (0.100 – 1.224)	4.513 (0.840 - 24.241)	0.079
	>14	10	8	0.405 (0.130 – 1.261)	7.413(1.079 – 50.931)	0.042
Follow up (at 6month)	Did not continued	68	31			
	Continued	52	5	0.211 (0.077– 0.580)	0.132 (0.042 -0.414)	0.001

CHAPTER FIVE

5. DISCUSSION

In this study, the majority of pediatric patients with congenital heart disease (CHD) were aged less than one year (46.8%), followed by 1–4 years (36.5%), and ≥5 years (16.7%). This indicates that a large proportion of patients were diagnosed in infancy, consistent with studies in Tanzania (median age 1 year) (26)(26) and Gambia (median age 1.4 years) (23)(23). Similarly, in Nigeria, 62% of children were aged 1 month to 1 year (22)

However, our findings differ from studies in Brazil (mean age 12 ± 3.7 years) (20) and some centers in Ethiopia's corrective cardiac centers (mean age 5 years) (27), where older children were more frequently diagnosed. The difference may reflect early detection practices, referral patterns, and access to pediatric cardiology services in Asella Teaching and Referral Hospital (ATRH), as compared to other regions where CHD diagnosis may be delayed. Early diagnosis is crucial, especially for cyanotic CHD, to prevent complications such as heart failure and growth retardation (4) (19) (25.

Regarding sex distribution, this study found males accounted for 54.5% and females 45.5%, showing a slight male predominance. This pattern aligns with studies in Tanzania (51.2%), Pakistan (53.5%), and Bangladesh (63.2%) (21) (26) (28) , but contrasts with Gambia (57.3% female predominance) (23) and other Ethiopian studies at corrective cardiac centers (27). The variability may be influenced by genetic, cultural, or referral biases, as male children in some settings may be preferentially brought to hospital earlier than females.

Concerning residency, the majority of patients (69.2%) were from rural areas, while 30.8% were urban. This is different from corrective cardiac centers in Ethiopia, where most patients were from urban areas (27). This may reflect Asella Hospital's role as a referral center for rural populations in Arsi Zone, highlighting the hospital's critical access to underserved regions. Rural residence may contribute to delayed presentation, limited access to echocardiography, and higher risk of complications, as observed in LMICs (56) (19)

Summary: The socio-demographic profile suggests early diagnosis of CHD in infants, a slight male predominance, and predominance of rural patients, reflecting local referral patterns and healthcare accessibility. Early recognition in rural settings remains a challenge that needs targeted intervention

In this study, 91.7% of patients were symptomatic at presentation, while only 8.3% were asymptomatic. Among symptomatic patients, the most frequent presenting symptom was fast breathing (75.2%), followed by breastfeeding interruption (55.9%), diaphoresis (47.6%), easy fatigability (31.7%), prolonged feeding (30.3%), and cyanosis (12.4%). Less common presentations included generalized body swelling (8.3%) and other symptoms (4.8%).

These findings are broadly consistent with studies in Bangladesh, where respiratory distress, poor weight gain, and feeding difficulties were commonly reported among pediatric CHD patients (32).. Similarly, in Nigeria, fast breathing, failure to thrive, and murmur were the most common clinical indications for echocardiography (22). In Egypt, a majority of CHD patients were diagnosed within the first year of life, with heart failure in 44% and audible murmurs in 74.4% (31)..

The predominance of respiratory and feeding-related symptoms can be explained by the high proportion of acyanotic CHD (82.1%) in this study, as left-to-right shunt lesions such as VSD, ASD, and PDA frequently present with heart failure, tachypnea, and feeding difficulties in infants (4)(4) (20)(20) (26)(26). Cyanotic presentations, such as cyanosis and clubbing, were less frequent, consistent with the lower proportion of cyanotic CHD (17.9%) in this cohort. Tetralogy of Fallot (TOF) was the most common cyanotic lesion (15.4%), reflecting patterns observed in both Bangladesh and African studies(23) (32).

The high rate of symptomatic presentation highlights the clinical burden of CHD at diagnosis, suggesting that most patients are referred after symptoms develop, rather than being identified through routine screening. In resource-limited settings like Ethiopia, late diagnosis can increase morbidity, particularly in cyanotic CHD and complex acyanotic lesions, which may progress to heart failure and growth retardation if untreated (27) (25).

Summary: The clinical presentation of CHD in ATRH pediatrics is dominated by fast breathing, feeding difficulties, and diaphoresis, reflecting predominantly acyanotic CHD, and is consistent with other LMICs where diagnosis is often symptom-driven rather than through early detection programs. Early recognition and referral for echocardiography could reduce morbidity and improve nutritional outcomes.

In this study, the majority of pediatric patients (82.1%) had acyanotic CHD, while 17.9% had cyanotic CHD. Among acyanotic lesions, ventricular septal defect (VSD) was most common (41.7%), followed by atrial septal defect (ASD, 12.2%), atrioventricular septal defect (AVSD, 11.5%), and patent ductus arteriosus (PDA, 9%). Less frequent acyanotic lesions included aortic stenosis (AS), pulmonary stenosis (PS), and other acyanotic CHD (each 1.9%). Among cyanotic CHD, Tetralogy of Fallot (TOF) was predominant (15.4%), while TGA, tricuspid atresia, truncus arteriosus, and other cyanotic lesions were rare (<2% each).

These findings align with global and African trends, where acyanotic CHD predominates. Systematic reviews and meta-analyses report VSD, ASD, PDA, and PS as the four most common CHD globally, with prevalence of 34%, 13%, 10%, and 8%, respectively (4)(4).. Similar distributions were observed in Bangladesh (VSD 39.1%, PDA 17.3%, TOF 15.5%, ASD 11.8%) (32)(32) and Nigeria (VSD 27.1%, PDA 14.5%, ASD 2.5%, TOF 8.4%) (22). .

The predominance of acyanotic lesions in ATRH likely explains the high rate of heart failure, fast breathing, and feeding difficulties noted in the clinical presentation section. Cyanotic lesions, although less frequent, (23) (26). TOF as the most common cyanotic lesion is consistent with findings in Bangladesh, Gambia, and Tanzania, suggesting a stable pattern across LMICs (32) (23) (26).

Compared to other Ethiopian centers, the pattern is similar: at Bahir Dar Tibebe-Ghion Specialized Hospital, acyanotic CHD accounted for 77% of cases, with VSD being the most frequent, and TOF the most common cyanotic lesion (1). Hawassa University Hospital also reported VSD, PDA, and AVSD as common CHD among pediatric patients admitted with heart failure (33).

The high prevalence of VSD, ASD, AVSD, and PDA indicates a pattern consistent with global trends, but the proportion of cyanotic lesions is relatively lower, which may reflect referral patterns, diagnostic accessibility, or early mortality before diagnosis. These findings emphasize the need for strengthening echocardiography services and early detection programs to identify cyanotic CHD early, allowing timely interventions to prevent complications.

The classification and types of CHD at ATRH reflect predominantly acyanotic lesions, with VSD as the leading defect. Cyanotic CHD, particularly TOF, although less frequent, remains clinically significant. These results are aligned with African and Ethiopian hospital-based studies, highlighting the importance of regional epidemiological data for planning pediatric cardiac care and non-surgical management strategies

In this study, 74.4% of pediatric patients had at least one comorbidity at diagnosis. The most frequent comorbidities were anemia (21.2%), Down syndrome (19.9%), and pulmonary hypertension (16.7%), while polycythemia and other conditions were less common. Only 25.6% of patients had no comorbidities.

These findings are consistent with prior studies indicating that CHD is often accompanied by comorbidities, which contribute to increased morbidity and may affect outcomes (32) (33) (34).Anemia is frequently reported in children with CHD due to chronic hypoxia, hemolysis, or nutritional deficiencies, particularly in low-resource settings (32). Similarly, Down syndrome is strongly associated with atrioventricular septal defects (AVSD) and contributes to poorer outcomes due to complex cardiac anatomy and potential immune compromise (22)(22) (27)(27).Pulmonary hypertension is a known complication of unrepaired left-to-right shunts and increases the risk of heart failure and hospitalization (23) (33).

Interpretation: The high prevalence of comorbidities highlights the need for comprehensive assessment and multidisciplinary care for pediatric CHD patients, including screening for hematologic abnormalities, genetic syndromes, and pulmonary complications. The association of Down syndrome with poor short-term outcomes in this study (AOR = 4.63, p = 0.031) reinforces its clinical significance, consistent with prior literature (22) (27).

In this study, anthropometric assessment at diagnosis revealed that a substantial proportion of pediatric patients with congenital heart disease (CHD) had evidence of malnutrition. Based on weight-for-height/Body Mass Index-for-age (WFH/BMIA), 46.0% of patients were moderately or severely wasted, with 29.5% moderately wasted and 20.5% severely wasted. Weight-for-age (WFA) assessment indicated that 32.1% were moderately or severely underweight (18.6% moderate, 13.5% severe), while height-for-age (HFA) revealed 35.9% of patients had moderate or severe stunting (21.8% moderate, 14.1% severe). Mid-upper arm circumference (MUAC) also highlighted malnutrition, with 33.4% of patients moderately or severely wasted (23.1% moderate, 10.3% severe). These findings indicate that undernutrition is a significant comorbidity in pediatric CHD patients at presentation.

The prevalence of moderate and severe malnutrition in this cohort aligns with findings from other studies in Ethiopia and Africa. For instance, a study conducted at Hawassa University Hospital reported severe acute malnutrition in 52.8% of children with heart failure secondary to CHD, which is slightly higher than our study (33) (23). Similarly, a case-control study in Nigeria observed that 41.1% of CHD patients were wasted and 28.8% were stunted, highlighting the substantial burden of undernutrition among pediatric CHD populations in low-resource settings (34). Comparable findings were reported in Bangladesh, where failure to thrive and poor weight gain were common clinical presentations among children with CHD, affecting approximately 51.8% of patients (32) .

The observed malnutrition in our study may be attributed to multiple factors. Prolonged feeding difficulties, fast breathing, and diaphoresis — reported in 75.2%, 55.9%, and 47.6% of patients, respectively — can increase metabolic demand and decrease caloric intake, predisposing children to wasting and underweight. Chronic hypoxemia in cyanotic CHD and recurrent infections, such as pneumonia (53.5% in our cohort), further exacerbate nutritional deficits. The proportion of moderate and severe malnutrition was also higher among patients with comorbidities like Down syndrome and pulmonary hypertension, consistent with prior studies indicating that comorbid conditions can worsen growth outcomes in CHD. (27) (33).

Compared with global data, the prevalence of malnutrition in our cohort is consistent with studies from other low- and middle-income countries (LMICs), where undernutrition remains a

critical challenge in children with CHD due to late diagnosis, limited access to nutritional support, and delayed surgical interventions (37) (23) (34). In contrast, studies from high-income settings report lower rates of moderate or severe malnutrition in pediatric CHD patients, reflecting earlier diagnosis and comprehensive nutritional and medical management (19)(19).

The high burden of moderate and severe malnutrition has important clinical implications. Under nutrition in pediatric CHD is associated with increased morbidity, poor tolerance to medical therapy, prolonged hospital stay, and adverse short-term outcomes, including higher mortality. In our study, malnutrition may have contributed to the 23.1% poor short-term outcomes observed, underscoring the need for early nutritional assessment and intervention as an integral component of CHD management.

Overall, these findings highlight that malnutrition is a prevalent and clinically significant problem among pediatric CHD patients in Asella Teaching and Referral Hospital. This emphasizes the importance of routine anthropometric monitoring, targeted nutritional support, and integrated management strategies to improve both growth and clinical outcomes in this vulnerable population.

In this study, 82.7% of pediatric patients with congenital heart disease (CHD) were admitted to the hospital, with 75.2% having a single admission and 24.8% experiencing two or more admissions during the study period. The length of hospital stay varied, with 23.2% staying ≤3 days, 24.8% staying 4–6 days, 40% staying 7–14 days, and 14% staying longer than 14 days. The most common reasons for admission were heart failure (79.8%) and pneumonia (53.5%), followed by severe acute malnutrition (17.8%) and acute gastroenteritis (12.4%).

The high admission rate observed in this study is consistent with reports from other LMICs, where children with CHD frequently require hospital care due to symptomatic heart failure, recurrent respiratory infections, or complications related to malnutrition. For example, a study in Tanzania reported that 62% of children with CHD required admission for medical stabilization on their first presentation, while in Nigeria, approximately 40% of pediatric CHD patients had at least one hospital admission during follow-up (22) (26)

Heart failure as the leading cause of hospitalization in this study aligns with findings from Ethiopia and other African countries, reflecting the delayed diagnosis and presentation of CHD. In a study conducted at Hawassa University Hospital, heart failure accounted for 44% of admissions among children with CHD, with VSD and PDA as common underlying lesions (37). Similarly, in Bangladesh, recurrent chest infections and heart failure were predominant reasons for admission in children with CHD (32).

The prolonged hospital stay observed in some patients (>14 days in 14%) may reflect the severity of illness, presence of comorbidities, and complications such as severe malnutrition, pulmonary hypertension, or Down syndrome. Extended hospitalization has also been reported in other African studies; for instance, in Nigeria and Gambia, some pediatric CHD patients experienced prolonged stays due to complications, highlighting the clinical burden of non-surgically managed CHD in resource-limited settings (22) (23).

Recurrent admissions were observed in nearly one-fourth of admitted patients, indicating that a significant proportion of pediatric CHD patients experience ongoing morbidity, possibly due to inadequate outpatient follow-up, suboptimal medical therapy, or progression of heart failure. This finding emphasizes the importance of structured follow-up and timely medical intervention to reduce the risk of repeated hospitalization, as also highlighted by Nyang et al. in Gambia, where readmission rates were reported at 11.2% (23).

Overall, these findings demonstrate that hospitalization is a common and critical aspect of the clinical course for pediatric CHD patients in Asella Teaching and Referral Hospital. The high burden of admissions due to heart failure and respiratory complications underscores the need for early diagnosis, optimized medical therapy, nutritional support, and continuous monitoring to reduce morbidity, hospital stay, and adverse short-term outcomes.

In this study, all 156 pediatric patients with congenital heart disease (CHD) were managed non-surgically. The majority, 76.9% (120/156), received medical therapy, while 23.1% (36/156) were managed with watchful waiting. Among those receiving medical therapy, furosemide was prescribed in 73.0% and spironolactone in 69.5% of patients. Less frequently used medications included beta-blockers (7.8%), sildenafil (7.1%), ACE inhibitors (1.4%), and vasoactive agents

such as adrenaline, noradrenaline, and dopamine in small proportions. Supportive care measures included oxygen therapy in 87.9% of patients and nutritional support in 25.5% of cases.

These findings are consistent with previous studies in Africa and Bangladesh. In Nigeria, the most frequently used medications in pediatric CHD were furosemide (68.5%), followed by enalapril (13.5%), propranolol (13.5%), and spironolactone (10.1%) (23)(23). Similarly, in Bangladesh, furosemide was used in 98.4% of patients receiving diuretics, and beta-blockers were prescribed to 36.8% of patients, while ACE inhibitors were used in 69.6% (39). These studies indicate that diuretics remain the mainstay of non-surgical management in pediatric CHD, particularly for patients with acyanotic lesions such as VSD, ASD, and PDA.

Watchful waiting was applied in 23.1% of patients in this study, which is in line with findings from Tanzania where 5.7% of pediatric CHD patients received outpatient observation only during their first visit (26)(26). This approach is generally reserved for patients with small or asymptomatic defects, reflecting the heterogeneity of lesion severity in non-surgically managed cohorts.

Supportive care, including oxygen therapy and nutritional interventions, was also emphasized. In the present cohort, 87.9% received oxygen therapy, and 25.5% received nutritional support. These interventions are critical given the high prevalence of malnutrition in children with CHD. Previous studies in Africa reported undernutrition, underweight, wasting, and stunting in children with CHD at 65.14%, 45.76%, 39.37%, and 39.38%, respectively (37)(37), while a study in Ethiopia showed underweight, wasting, and stunting decreased from 54%, 54.1%, and 59.5% pre-intervention to 29.3%, 25.9%, and 34.8% at six months post-intervention (27)(27). This highlights the importance of nutrition-focused supportive care as part of non-surgical management to improve outcomes.

Overall, the management pattern observed in this study—combining medical therapy, watchful waiting, and supportive care—aligns with reported practices in similar low-resource settings and underscores the importance of context-specific strategies to optimize short-term outcomes in pediatric CHD

In the present study, only 36.5% (57/156) of pediatric patients continued follow-up for six months post-diagnosis, while 63.5% (99/156) were lost to follow-up. This substantial loss to follow-up highlights the challenges of long-term monitoring in resource-limited settings, consistent with findings in Ethiopia where adherence to post-intervention follow-up declined over time, with 76.4% attending at six months (27).

Anthropometric assessment at six months revealed improvements in nutritional status among those who continued follow-up. For weight-for-height/Body Mass Index-for-age (WFH/BMIA), 45.6% of patients were normal, 29.8% had moderate wasting, and 17.5% had severe wasting. Weight-for-age (WFA) showed 43.9% normal, 29.8% moderately underweight, and 14.0% severely underweight. Height-for-age (HFA) indicated 49.1% normal, 29.8% moderately stunted, and 14.0% severely stunted, while mid-upper arm circumference (MUAC) demonstrated 57.9% normal, 19.3% moderate wasting, and 14.0% severe wasting.

These findings reflect a high prevalence of persistent moderate and severe malnutrition despite medical management, emphasizing the need for nutritional interventions in this population. Comparable studies in Africa reported undernutrition, underweight, wasting, and stunting in children with CHD at 65.14%, 45.76%, 39.37%, and 39.38%, respectively (37)(37). In Ethiopia, at a cardiac corrective center, underweight, wasting, and stunting decreased from 54%, 54.1%, and 59.5% pre-intervention to 29.3%, 25.9%, and 34.8% at six months post-intervention (27)(27). The pattern observed in this study is similar, showing improvement among patients who continued follow-up, although moderate and severe forms of malnutrition remain clinically significant.

Moderate and severe anthropometric deficits are particularly concerning because they are associated with poorer outcomes in children with CHD. Malnutrition contributes to reduced immunity, increased risk of infection, and impaired recovery from cardiac complications (32) (33) (34). In this study, targeted medical management combined with follow-up monitoring appears to have improved nutritional status in some patients; however, the high proportion lost to follow-up (63.5%) limits the overall impact. This finding underscores the importance of structured nutritional support programs and strengthened follow-up systems for pediatric patients with CHD in low-resource settings.

In summary, while six-month follow-up demonstrates partial improvement in anthropometric status, a substantial proportion of children remain moderately or severely undernourished. This aligns with the literature from Africa and Ethiopia, reinforcing the critical role of nutritional assessment and intervention alongside medical management in optimizing outcomes for non-surgically managed pediatric CHD patients.

In this study, the short-term outcomes of pediatric patients with non-surgically managed congenital heart disease (CHD) at Asella Teaching and Referral Hospital showed that 52.6% (82/156) improved and were discharged, 15.4% (24/156) died, 7.7% (12/156) left against medical advice, and 24.4% (38/156) were referred to other facilities. When categorized into good (improved/discharged or referred) and poor outcomes (death or discharge against medical advice), 76.9% (120/156) experienced good outcomes, while 23.1% (36/156) had poor outcomes.

These findings are consistent with data from Gambia, where 82.0% of children with CHD who received non-surgical management were discharged and followed up in the clinic, 6.7% died, and 2.2% left against medical advice (23). Similarly, in Nigeria, the in-hospital mortality for pediatric CHD patients was reported at 3% (22) , while Egypt reported 4.8% mortality .(36)(36). Compared to these studies, the current study shows a slightly higher mortality (15.4%), which may be attributed to higher prevalence of comorbidities, late presentation, or limited access to specialized pediatric cardiac care.

Multivariable logistic regression identified Down syndrome, length of hospital stay, and follow-up status at six months as independent predictors of short-term outcomes. Pediatric patients with Down syndrome had 4.63 times higher odds of poor outcomes (AOR = 4.63, 95% CI: 1.15–18.61, p = 0.031), reflecting the increased vulnerability associated with genetic syndromes. This finding aligns with literature indicating that comorbidities, particularly chromosomal abnormalities, contribute to poorer prognosis in CHD due to associated cardiac and systemic complications (32) (33).

Length of hospital stay was another significant factor. Children admitted for 1–3 days had six times higher odds of poor outcomes (AOR = 6.01, 95% CI: 1.02–35.54, p = 0.049), and those admitted for >14 days had 7.41 times higher odds (AOR = 7.41, 95% CI: 1.08–50.93, p = 0.042).

Short and prolonged hospital stays may reflect severity at presentation or delayed access to care, as children with mild disease might require minimal hospitalization, whereas those with severe complications require prolonged admission, increasing risk for adverse outcomes. Comparable findings were reported in Nigeria and Tanzania, where length of hospital stay was associated with disease severity and outcome (22) (26).

Follow-up status at six months had a protective effect. Patients who continued follow-up were 87% less likely to experience poor outcomes (AOR = 0.13, 95% CI: 0.04–0.41, p = 0.001). This underscores the importance of continuous monitoring, medical therapy adherence, and early detection of complications in improving short-term outcomes. Retrospective studies in Ethiopia reported similar trends, with follow-up at three and six months leading to significant improvement in anthropometric and clinical outcomes (27).

Other variables, including sex, residence, presentation status, anemia, pulmonary hypertension, and polycythemia, were not significantly associated with short-term outcomes in the multivariable analysis, suggesting that comorbidity profile, severity at admission, and follow-up adherence are more critical determinants of short-term prognosis in this setting.

Overall, the study highlights that while the majority of pediatric CHD patients achieve good short-term outcomes with non-surgical management, a significant minority remain at risk, particularly those with Down syndrome, prolonged or early hospitalization, and poor follow-up adherence. These findings emphasize the need for targeted interventions, including enhanced monitoring of high-risk groups, nutritional support, and strategies to reduce loss to follow-up, to improve overall outcomes

CHAPTER SIX

6 STRENGTH AND LIMITATIONS OF THE STUDY

6.1. Strength

Sample size were searched with census, study included all eligible 156 CHD pediatrics available at the Asella teaching and referral hospital during the study period; thus, we took all eligible populations because it was manageable.

Collected detailed data on demographics, clinical features, CHD types, comorbidities, nutrition, and outcomes.

Focused on a low-resource, rural setting, providing locally relevant insights.

Reflected real-world non-surgical management practices.

Identified key factors linked to poor outcomes for targeted care.

Included follow-up data to assess short-term improvement.

6.2. Limitations of the study

The retrospective cohort design relied on existing medical records, which may have incomplete data and accuracy of existing clinical.

There was a substantial loss to follow-up, with nearly two-thirds of patients lacking documented six-month outcome data.

The use of regression analysis may have influenced the study results; therefore, the finding should be interpreted with caution.

The study period overlapped with the covid-19 pandemic, which likely affected healthcare access, referral patterns, follow-up attendance, and hospital admissions. However, the specific impact of the pandemic on patient outcomes could not be separately analyzed due to limitations in the available data Despite these limitations, the study provides valuable baseline data on the clinical characteristics and short-term outcomes of non-surgically managed pediatric CHD, highlighting areas for improvement in management and follow-up care.

CHAPTER SEVEN

7. CONCLUSION AND RECOMMENDATIONS

7.1. Conclusion

This study assessed the clinical profile and short-term outcomes of non-surgically managed congenital heart disease (CHD) in pediatric patients at Asella Teaching and Referral Hospital from March 2020 to February 2025. Based on the findings:

1. Socio-demographic profile: CHD predominantly affected infants (<1 year, 46.8%), with a slight male predominance (54.5%) and most patients residing in rural areas (69.2%). All were diagnosed postnatally.
2. Clinical presentation: The majority (91.7%) were symptomatic, with fast breathing (75.2%), breastfeeding interruption (55.9%), and diaphoresis (47.6%) as the most common presenting features.
3. Types of CHD: Acyanotic CHD was the most frequent (82.1%), with VSD accounting for 41.7% of cases. Cyanotic CHD comprised 17.9%, with TOF as the predominant lesion (15.4%).
4. Comorbidities: Most patients (74.4%) had comorbidities, notably anemia (21.2%), Down syndrome (19.9%), and pulmonary hypertension (16.7%).
5. Nutritional status: Moderate and severe malnutrition were highly prevalent at diagnosis: 50% had moderate/severe wasting, and 35.9% had moderate/severe stunting. Partial improvement was observed at six months among patients who continued follow-up.
6. Hospital admission: 82.7% of patients were admitted, primarily for heart failure (79.8%) and pneumonia (53.5%), with hospital stays ranging from ≤3 to >14 days.
7. Management: All patients received non-surgical care, including medical therapy (76.9%) and watchful waiting (23.1%). Furosemide (73%) and spironolactone (69.5%) were the most commonly administered medications.
8. Short-term outcomes: Overall, 76.9% of patients experienced good outcomes (improved/discharged or referred), while 23.1% had poor outcomes (death or discharge against medical advice).

9. Factors associated with outcomes: Down syndrome, hospital stay of ≤3 or >14 days, and loss to follow-up at six months were independently associated with poor short-term outcomes. Continued follow-up was protective against poor outcomes.

7.2. Recommendations

7.2.1. For Clinical Practice

Give additional attention and closer monitoring to children with Down syndrome or other high-risk comorbidities, as they are more likely to experience poor outcomes.

Ensure consistent follow-up for children with CHD, as continued follow-up was associated with better short-term outcomes.

Prioritize medical therapy for symptomatic patients and optimize dosing and adherence to medications like furosemide and spironolactone.

Provide nutritional support and regular anthropometric monitoring for all pediatric CHD patients.

Develop strategies to reduce the risk of poor outcomes associated with very short (≤3 days) or prolonged (>14 days) hospital stays.

7.2.2. For Hospital Administration

Develop strategies to reduce loss to follow-up, including patient tracking and community outreach.

Increase awareness among healthcare workers and caregivers about the early signs of CHD, such as fast breathing, feeding difficulties, and diaphoresis

Enhance diagnostic capacity and training for early recognition of CHD and comorbidities.

Improve record-keeping and data management to support clinical decision-making and research.

7.2.3. For Future Research

Conduct multicenter prospective studies to assess long-term outcomes of non-surgical CHD management.

Investigate the impact of early nutritional interventions on growth and clinical outcomes in CHD patients.

Explore cost-effective interventions for improving follow-up and adherence in resource-limited settings.

REFERENCES

1. Gelaw TT, Yimer YA, Gesesse AA, Firew BS, Ayalew MA, Belay YG. Intervention needs assessment in children with heart diseases presenting to Tibebe-Ghion Specialized Teaching Hospital, Bahir Dar, North West Ethiopia – Tip of the iceberg of the intervention gap in Low-and-middle-income Countries (LMICs). Int J Cardiol [Internet]. 2024;412:132324. Available from: https://www.sciencedirect.com/science/article/pii/S016752732400946X

2. Ayfokru A, Shewasinad S, Ahmed F, Tefera M, Nigusie G, Getaneh E. Incidence and Predictors of Mortality among Neonates Admitted for Congenital Heart Disease in Public Comprehensives Specialized Hospitals, Amhara Region, Ethiopia 2023. medRxiv. 2023;2009–23.

3. Biomedicine A. Congenital heart disease : magnitude of problem and possible interventions. 2021;15(6):251–2.

4. Van Der Linde D, Konings EEM, Slager MA, Witsenburg M, Helbing WA, Takkenberg JJM, et al. Birth prevalence of congenital heart disease worldwide: A systematic review and meta-analysis. Vol. 58, Journal of the American College of Cardiology. 2011. p. 2241–7.

5. Xu J, Li Q, Deng L, Xiong J. Global , regional , and national epidemiology of congenital heart disease in children from 1990 to 2021. 2025;(May).

6. Zimmerman M, Sable C. Congenital heart disease in low-and-middle-income countries: Focus on sub-Saharan Africa. Am J Med Genet Part C Semin Med Genet. 2020 Feb 6;184.

7. Eshetu MA, Goshu DY, Kebede MA, Negate HM, Habtezghi AB, Gregory PM, et al. Patterns and Complications of Congenital Heart Disease in Adolescents and Adults in Ethiopia. J Cardiovasc Dev Dis. 2024;11(8):11–8.

8. Ayfokru A, Shewasinad S, Ahmed F, Tefera M, Nigussie G, Getaneh E, et al. Incidence and predictors of mortality among neonates with congenital heart disease in Ethiopia: a retrospective cohort study. BMC Pediatr [Internet]. 2024;24(1):559. Available from:

https://doi.org/10.1186/s12887-024-05023-3

9. Tsega T, Tesfaye T, Dessie A, Teshome T. Nutritional assessment and associated factors in children with congenital heart disease - Ethiopia. PLoS One [Internet]. 2022;17(9 September):1–12. Available from: http://dx.doi.org/10.1371/journal.pone.0269518

10. Deng L, Li Q, Cheng Z. Evaluating the global , regional , and national burden of congenital heart disease in infants younger than 1 year : a 1990 – 2021 systematic analysis for the GBD study 2021. 2025;(March):1–13. Available from: https://doi.org/10.3389/fped.2025.1467914

11. Xu J, Li Q, Xiong J, Cheng Z. Time trends in mortality of congenital heart disease in children aged – years : a global , regional , and national cohort analysis from to using the global burden of disease study. (1).

12. Jaleta DS, Teshome GS, Nega YB, Radie YT. Survival Status and Associated Factors among Under-Five Children Managed with Congenital Heart Diseases in Addis Ababa Ethiopia : A Retrospective Follow-up Study. 2024;7(2):192–203.

13. Ayfokru A, Shewasinad S, Ahmed F, Tefera M, Nigusie G, Getaneh E. Incidence and Predictors of Mortality among Neonates Admitted for Congenital Heart Disease in Public Comprehensives Specialized Hospitals, Amhara Region, Ethiopia 2023. medRxiv [Internet]. 2023;2023.09.24.23296057. Available from: http://medrxiv.org/content/early/2023/09/25/2023.09.24.23296057.abstract

14. Rao PS. Management of Congenital Heart Disease: State of the Art; Part I-ACYANOTIC Heart Defects. Child (Basel, Switzerland). 2019 Mar;6(3).

15. Rao PS. Management of Congenital Heart Disease: State of the Art-Part II-Cyanotic Heart Defects. Child (Basel, Switzerland). 2019 Apr;6(4).

16. Gelaw TT, Engida HB, Alebachew BZ, Melesse WS, Tilahun SF, Workie YK. Pattern , Relative Frequency and morbidity of Pediatric Heart diseases at Tibebe-Ghion Specialized Teaching Hospital , Bahir Dar , North West Ethiopia. 2025;1(0):1–12.

17. Woldesenbet R, Murugan R, Mulugeta F, Moges T. Nutritional status and associated

factors among children with congenital heart disease in selected governmental hospitals and cardiac center,Addis Ababa Ethiopia. BMC Pediatr [Internet]. 2021;21(1):1–9. Available from: https://doi.org/10.1186/s12887-021-03023-1

18. Van Der Linde D, Konings EEM, Slager MA, Witsenburg M, Helbing WA, Takkenberg JJM, et al. Birth prevalence of congenital heart disease worldwide: a systematic review and meta-analysis. J Am Coll Cardiol. 2011;58(21):2241–7.

19. Liu Y, Chen S, Zu L, Black GC, Choy M kit, Li N, et al. Early Childhood Global birth prevalence of congenital heart defects 1970 – 2017 : updated systematic review and meta-analysis of 260 studies. 2019;(February):455–63.

20. Wohlgemuth C, Feltez G, Agord BD. FUNCTIONAL CAPACITY IN CHILDREN AND Capacidade funcional em crianças e adolescentes com. 2019;1–8.

21. Disease H, Children A. Journal of Population Therapeutics & Clinical Pharmacology. 2021;28(02):244–9.

22. Otaigbe BE, Tabansi PN. Congenital heart disease in the Niger Delta region of Nigeria: A four-year prospective echocardiographic analysis. Cardiovasc J Afr. 2014;25(6):265–8.

23. Nyang M. A Retrospective Study on the Prevalence , Management , and Outcomes of Congenital Heart Diseases in Children at Edward Francis Small Teaching Hospital , Banjul , The Gambia . 2025;1–18.

24. Tesfaye K, Tsega T. Short-Term Impact of Cardiac Intervention on the Nutritional Status of Malnourished Children with Congenital Heart Disease – A Report from a Developing African Country, Ethiopia. Pediatr Heal Med Ther. 2023;Volume 14(December):465–75.

25. Eticha T. Addis Ababa University , College of Health Sciences , School of Medicine , Department of Pediatrics and Child Health Delayed diagnosis of Congenital Heart Diseases and associated factors in Tikur Anbessa Specialized Hospital : cross-sectional study ; Addi. 2023;

26. Kalezi ZE. Spectrum of Heart Diseases in Children in a National Cardiac Referral Center Tanzania , Eastern Africa : A Six-Year Overview. 2024;19(1).

27. Tesfaye K, Tsega T. Short-Term Impact of Cardiac Intervention on the Nutritional Status of Malnourished Children with Congenital Heart Disease–A Report from a Developing African Country, Ethiopia. Pediatr Heal Med Ther. 2023;465–75.

28. Sen SS, Barua T, Dey D, Chowdhury MA, Nessa L. Pattern of Congenital Heart Disease in Children Presenting at Paediatric Cardiology Unit in Chattagram Maa Shishu-O-General Hospital, Chittagong. Chattagram Maa-O-Shishu Hosp Med Coll J. 2018;16(2):40–3.

29. Gedamu S, Sendo EG, Daba W. Congenital Anomalies and Associated Factors among Newborns in Bishoftu General Hospital , Oromia , Ethiopia : A Retrospective Study. 2021;2021.

30. Danso KA, Appah G, Akuaku RS, Karikari YS, Ansong AK, Edwin F, et al. Prevalence of Congenital Heart Disease in Children and Adolescents Under 18 in Africa: A Systematic Review and Meta-Analysis. World J Pediatr Congenit Hear Surg. 2025;16(3):357–67.

31. Al-Fahham MM, Ali YA. Pattern of congenital heart disease among Egyptian children: a 3-year retrospective study. Egypt Hear J. 2021;73(1).

32. Damkjaer M, Urhoj SK, Tan J, Briggs G, Loane M, Given JE, et al. Prescription of cardiovascular medication in children with congenital heart defects across six European Regions from 2000 to 2014: data from the EUROlinkCAT population-based cohort study. BMJ Open. 2022;12(4):1–9.

33. Nigussie B, Tadele H. Heart failure in Ethiopian children: mirroring the unmet cardiac services. Ethiop J Health Sci. 2019;29(1).

34. Okoromah CAN, Ekure EN, Lesi FEA, Okunowo WO, Tijani BO, Okeiyi JC. Prevalence, profile and predictors of malnutrition in children with congenital heart defects: a case-control observational study. Arch Dis Child. 2011 Apr;96(4):354–60.

35. Moffett BS, Price JF. National prescribing trends for heart failure medications in children. Congenit Heart Dis. 2015;10(1):78–85.

36. Atwa ZT, Safar HH. Outcome of congenital heart diseases in Egyptian children: Is there

gender disparity? Egypt Pediatr Assoc Gaz [Internet]. 2014;62(2):35–40. Available from: http://dx.doi.org/10.1016/j.epag.2014.03.001

37. Akele MA, Dagnaw TE, Mehari MG, Delie AM. Prevalence of undernutrition and associated factors among children with congenital heart disease in Africa : a systemic review and meta - analysis. J Transl Med [Internet]. 2025;8. Available from: https://doi.org/10.1186/s12967-024-05952-8

38. Baroopal A, Mathur R, Sanghvi S, Soni JP. Pattern of congenital heart diseases in Western Rajasthan: an echocardiographic study. Vol. 8, International Journal of Research in Medical Sciences. 2020. p. 1385.

39. Ejigu YM, Amare H. Pediatric Cardiac Surgery in Ethiopia: A Single Center Experience in a Developing Country. Ethiop J Health Sci. 2023 Jan;33(1):73–80.

40. Geleta B, Seyoum G. Prevalence and Patterns of Congenital Heart Defects and Other Major Non-Syndromic Congenital Anomalies Among Down Syndrome Patients: A Retrospective Study. Int J Gen Med. 2024;Volume 17(March):1337–47.

41. Okoromah, C. A. N., Ekure, E. N., Lesi, F. E. A., Okunowo, W. O., Tijani, B. O., & Okeiyi JC. Prevalence, profile and outcomes in children with congenital heart defects: A cross-sectional study of 4,000 Nigerian children. BMC Pediatr [Internet]. 2011;11:1–7. Available from: https://doi.org/10.1186/1471-2431-11-1

42. Lawrenson J. The prevalence of congenital heart disease: we need to work towards getting more data. Cardiovasc J Afr. 2020;31(5):225–6.

43. Hoffman JIE, Kaplan S. The incidence of congenital heart disease. J Am Coll Cardiol [Internet]. 2002;39(12):1890–900. Available from: http://dx.doi.org/10.1016/S0735-1097(02)01886-7

44. Geme JWS. Nelson textbook of pediatrics. Elsevier; 2020.

45. McDonald, I. G., & Daly M. Clinical reasoning and the formation of a clinical profile. Med J Aust. 2019;210(6):263–266.

46. Saxena A, Relan J, Agarwal R, Awasthy N, Azad S, Chakrabarty M, et al. Indian guidelines for indications and timing of intervention for common congenital heart diseases: Revised and updated consensus statement of the Working group on management of congenital heart diseases. Ann Pediatr Cardiol. 2019;12(3):254–86.

47. Rao PS. Consensus on timing of intervention for common congenital heart diseases: part I-acyanotic heart defects. Indian J Pediatr. 2013;80:32–8.

48. Massin MM, Dessy H. Delayed recognition of congenital heart disease. Postgrad Med J. 2006;82(969):468–70.

49. Rashid U, Qureshi AU, Hyder SN, Sadiq M. Pattern of congenital heart disease in a developing country tertiary care center: Factors associated with delayed diagnosis. Ann Pediatr Cardiol. 2016;9(3):210–5.

50. Shaddy, R. E., & George AT. Heart failure in children with congenital heart disease. Circ Res [Internet]. 2016;118(3):597–610. Available from: https://doi.org/10.1161/CIRCRESAHA.115.306339

51. Surgery PC, Elamakkara PO, Associate C, Lane A. Malnutrition in Children with Congenital Heart Disease (CHD): Determinants and Short-term Impact of Corrective Intervention. 2008;

52. Libe TT, Keery YA, Tegene SA, Giday FK, Eshetie BD, Nidaw MM. Caregivers' reasons and health professionals' perceptions of pediatric discharge against medical advice in Eastern Ethiopia: a mixed-methods study. BMC Pediatr. 2026;26(1).

53. Sadler K, Alwali M, Nancarrow L, Albalawi M, Khan S, Alyami HH. Discharge against medical advice in pediatrics: A review and recommendation of a five-component approach. Int J Pediatr Adolesc Med [Internet]. 2023;10(3). Available from: https://journals.lww.com/ijpam/fulltext/2023/10030/discharge_against_medical_advice_in_pediatrics__a.1.aspx

54. Stanley CC, Zulu M, Msuku H, Phiri VS, Kazembe LN, Chinkhumba J, et al. Competing risks modeling of length of hospital stay enhances risk-stratification of patient care:

application to under-five children hospitalized in Malawi. Front Epidemiol [Internet]. 2023;3(November):1–9. Available from: https://doi.org/10.3389/fepid.2023.1274776

55. Schneuer FJ, Demetriou E, Bond D, Lain SJ, Guastella AJ, Nassar N. Child characteristics and health conditions associated with paediatric hospitalisations and length of stay: a population-based study. Lancet Reg Heal - West Pacific [Internet]. 2023;32:100706. Available from: https://doi.org/10.1016/j.lanwpc.2023.100706

56. Ayfokru A, Shewasinad S, Ahmed F, Tefera M, Nigussie G, Getaneh E, et al. Incidence and predictors of mortality among neonates with congenital heart disease in Ethiopia: a retrospective cohort study. BMC Pediatr. 2024;24(1):559.

ANNEXES

1 Data Extraction form

ARSI UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF PEDIATRICS AND CHILD HEALTH

A questionnaire on clinical profile and short term outcomes nonsurgical management of congenital heart diseases (CHD) of in pediatrics patients in Asella Teaching and Referral hospital

Dear Sir/Madam,

The purpose of this study is to find out clinical profiles and short term outcome of non-surgically managed pediatrics with congenital heart diseases in hospital. This study is conducted as requirement for partial fulfillment of the requirement for the specialty degree in pediatrics and child health at Arsi University College of Health Sciences department of pediatrics and child health. All answers will be kept confidential and your assistance in completing this questionnaire is greatly appreciated.

Please read each questions thoroughly and answers by reviewing source of data. This data extraction form has four parts: Part one (Demographic information) , Part two (clinical profiles) part 3 (management) and part four (short outcome of CHD).

Sr no.	Questions	Option	Skip / remark
Part one: Demographic Information			
1	Patient folder ID	_____	
2	Age of the patient at diagnosis	< 1 year 1 yr to < 5 year 5 year and above	
3	Gender the patient	Male Female	
4	Place of residency	Rural Urban	
Part 2: Clinical Profile Of The Patient			
5	Symptomatic patient	Yes No	
5.1	What was/ were symptoms	Fast breathing breast feeding interruption diaphoresis prolonged feeding easy fatigability generalized body swelling cyanosis cough	Skip if sr no, 5 choice is " No" more than one answer is possible
6	Acyanotic CHD	Ventricular Septal Defect Atrial Septal Defect	more than one answer

		Patent Ductus Arteriosus Aortic Stenosis Atrioventricular Septal Defect Pulmonic Stenosis Other acyanotic CHD	is possible
7	Cyanotic CHD	Tetralogy Of Fallot TGA with other defect Tricuspid atressia Truncus arthriosus Other cyanotic CHD	more than one answer is possible
8	has/ have comorbidities at diagnosis and/ or on follow up period	Yes NO	
8.1	What is/are comorbidities?	anemia pulmonary Hypertension arrhythmia developmental delay down syndromes infective endocarditis meningitis and CNS infection pediatrics stroke septic shock	If no.8 is 'yes'
9	Weight for age (WFA) at first diagnosis of CHD?	> 2 Z- score ≥-3 to < -2 Z-score ≤ -3 Z-score did not assessed	
10	Height for age (HFA) at	> 2 Z- score ≥-3 to < -2 Z-score	

	diagnosis of CHD?	≤ -3 Z-score did not assessed	
11	Weight for height (WFH) at diagnosis? (BMI for age >5 years)	> 2 Z- score ≥-3 to < -2 Z-score ≤ -3 Z-score did not assessed	
12	Mid upper arm circumference (MUAC) at presentation	1.< 11.5cm 2. >/=11.5 to < 12.5 cm 3. >/=12.5cm	
13	patient was hospitalized	Yes No	
13.1	If hospitalized, how many times?	1x 2x 3x ≥ 4x	Skip if no 13 is 'No'
13.2	If hospitalized reason for admission	Heart failure pneumonia Severe acute malnutrition Acute gastroenteritis Developmental delay other	more than one answer is possible Skip if no 13 is 'No'
14	how long stayed in hospital (answer in days)	≤3 4-6 7-14 >14	
Part 3: Management			

15	strategy used to treat the patient	Watch full waiting / observation Medical therapy	more than one answer is possible
16	If medical management where given?	Furosemide spironolactone sildenafil ACE inhibitors Beta blocker Adrenaline Noradrenaline Dopamine Nutritional support . oxygen therapy . Respiratory support	more than one answer is possible
Part 4:- Short-Term Outcome			
18	patients' outcome	Improved/ discharged Died Went against medical advice Referred to other facility after stabilization	
19	Did the patient continued follow up at 6 month?	Yes No	
19.1	what was WFA at 6th moths of diagnosis of CHD	- 2 Z- score ≥-3 to < -2 Z-score ≤ -3 Z-score did not assessed	Skip if answer of 19 is NO
19.2	what was HFA at 6th moths of	- 2 Z- score ≥-3 to < -2 Z-score	Skip if answer of 17

	diagnosis of CHD?	≤ -3 Z-score did not assessed	is NO
19.3	what was WFH at 6th months of diagnosis of CHD? BMI for >5 year age	- 2 Z- score ≥-3 to < -2 Z-score ≤ -3 Z-score did not assessed	Skip if answer of 17 is NO
20	Mid upper arm circumference (MUAC) on follow up	1.< 11.5cm 2. >/=11.5 to < 12.5 cm 3. >/=12.5cm 4 did not assessed	

2 Ethical clearance latter

Arsi University

Research & Community Service Directorate Office, College of Health Science

Date 06/03/2016

Ref No [illegible]

Dr Melese Gezahegn (MD, Associate Professor)
Corporate Director for Research & Community Service

TO: DR Kasim Benka

Subject: Providing Ethical Clearance Approval Letter

Title of Project:

Clinical profile and factors associated with short term outcomes of non-surgically managed congenital heart diseases in pediatrics patients at ATRH, Ethiopia.

Project Protocol No CoHS/R/223/2025

Recommendation of College of Health Science Arsi University Ethical Review Committee

The request for an initial review on the above mentioned research project was duly considered and approved by **Arsi University College of Health Science IRERC** during its meeting held on **November 13, 2025**. The investigators should submit final report upon completion. The investigators should also notify the IRERC ahead of any amendments or modifications in the protocol or premature suspension or termination of the study.

Regards!

Arsi University College Of Health Science

C/C

- Corporate Director for Research & Community Service

Use the above ref No to reply. Email: get.melese@arsiun.edu.et

3 Declarations

Declaration of instigators

I, Dr Kasim Benka (MD. Pediatric and Child Health Resident), hereby declare that the thesis entitled "Clinical Profile and Short-term Outcomes and associated factors of Non-Surgically Managed Congenital Heart Diseases in Pediatrics at Asella Teaching and Referral Hospital from March 2020 to February 2025 is my original work, carried out under the supervision of:

Dr. Gemechu Edae (MD, Assistant professor of pediatrics and Child health

Mr Ashenafi Habtamu (MPH-Assistant Prof. of Health System Management. PhD fellow)

This thesis has not been submitted previously, either in part or in full, to any other university or institution for the award of any degree or diploma.

All sources of information used in this thesis have been properly acknowledged, and any data, ideas, or findings from other works have been duly cited according to accepted academic standards.

I also declare that this research was conducted in accordance with ethical principles and institutional requirements, and that the work presented is honest and free from fabrication, falsification, or plagiarism.

Name of instigator: Dr Kasim Benka (MD. Pediatric and Child Health Resident)

Signature:_____

Date:_____

Declaration of Advisors

We, the undersigned Advisors, declare that this Thesis is the investigator original work in partial fulfillment of the requirement for the Specialty certificate in Pediatrics and Child Health. We confirmed that this Thesis is ready for defense with our approval as the university Advisors.

Name :- Dr. Gemechu Edae (MD, Assistant professor of pediatrics and Child health)

Signature: _____

Date: _____

Name: Mr Ashenafi Habtamu (MPH-Assistant Prof. of Health System Management.)

Signature: _____

Date: _____