

**ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH
SCIENCE SCHOOL OF MEDICINE DEPARTMENT OF
SURGERY CARDIO VASCULAR PERFUSION**



**ASSESSMENT OF CHARACTERISTICS AND
OUTCOME OF CARDIAC PATIENTS WHO UNDER WENT
OPEN-HEART SURGERY AT CARDIAC CENTER OF
ETHIOPIA, ADDIS ABABA, ETHIOPIA**

INVESTIGATOR: REKIYA AMDIHUN ESSA

JULY, 2021

ADDIS ABABA, ETHIOPIA

**A THESIS ON ASSESSING THE CHARACTERISTICS AND OUTCOME
OF CARDIAC PATIENTS WHO UNDERWENT OPEN-HEART SURGERY
AT CARDIAC CENTER OF ETHIOPIA, ADDIS ABABA, ETHIOPIA.**

**A THESIS SUBMITTED TO THE DEPARTMENT OF CARDIAC
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HEALTH SCIENCES, ADDIS ABABA UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER IN CLINICAL CARDIOVASCULAR PERFUSION.**

BY REKIYA AMDIHUN

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ASSURANCE OF PRINCIPAL INVESTIGATOR

This is to certify that the thesis prepared by Rekiya Amdihun, entitled: Assessment of characteristics and outcome of cardiac patients who underwent open-heart surgery at cardiac center of Ethiopia. And submitted in partial fulfillment of the requirements for the degree of master in clinical cardiovascular perfusion compliance with the regulation of the University and meets the accepted standards with respect to originality and quality. This thesis has not been presented for degree any other University, and that all sources of materials used for the thesis have been fully acknowledged.

Status

Score

Thesis

Candidate: Rekiya Amdihun.

Signature----- Date -----

Examiner: Dr. Dereje Gulilat

Signature----- Date -----

Principal Advisor: Dr. Abebe Bezabih.

Signature----- Date-----

Department Head: Dr.Nebyou Seyoum

Signature----- Date -----

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCE
SURGERY DEPARTMENT
CARDIOVASCULAR PERFUSION

Name of Investigator	REKIYA AMDIHUN (BSC, MSc science of cardiovascular perfusion student)
Name of advisor	DrAbebeBezabih (cardiothoracic surgeon)
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Address of investigator	TEL: +251-938-279624 E-mail: ruki9624@gmail.com

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ACRONYMES/ABBREVIATIONS

AAU:-Addis Ababa University

AS:-Aortic valve stenosis

ASD:-Atrial septal defect

AVSD:-Atrioventricular septal defect

BSC:-Bachelor of Science

CAD:-Coronary Artery Disease

CHD:-Congenital heart disease

CPB:-Cardiopulmonary bypass

CVD:-Cardiovascular Disease

HCT:-Hematocrit

ICU:-Intensive care unit

LA:-Left atrium

LVOTO:-Left ventricular outflow tract obstruction

MR:-Mitral valve regurgitation

MS:-Mitral valve stenosis

MSC:-Master of science

NGO:-Nongovernmental organization

RHD:-Rheumatic heart disease

SAM:-Sub aortic membrane

SPSS:-Statistical Package for Social Science

SSA:-Sub Saharan Africa

TAPVD:-Total anomalous pulmonary venous drainage.

TASH:-Tikur Anbessa Specialized Hospital

TOF:-Tetralogy of fallot

USA:-United states of America

VSD:-Ventricular septal defect

WHO:-World health organization

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ABSTRACT

Background: - The first successful open heart surgery using extracorporeal circulation technique was performed by John Gibbon in 1953 during an atrial septal defect closure. Cardiovascular diseases (CVD) are group of diseases and injuries that affect the cardiovascular system. As the main cause of death on the planet, cardiovascular disease (CVD) in all its forms is an important public health problem. Most commonly CVD affect the blood vessels of the heart and brain. In general they affect all people in both child and adulthood life.

Objective:-The objective of this study is to assess characteristics and outcomes of patients who underwent open heart surgery from FEB, 2009 to DEC, 2020at cardiac center of Ethiopia.

Method:-Institutional based cross-sectional study design was conducted.

Sampling and Sample size determination: The sample size for the study was determined using single population proportion formula. And Simple random sampling retrospective chart review technique was used.

RESULTS:-In this study a total of 320 patients were analyzed, from this 186 (58.1%)of the patients were female and 134(41.9%) were male. The majority of participants were found in the age group 6-18yrs 148(43.7%). The primary diagnosis from this study were ASD 54 (16.8%), VSD covered 42(13.1%), severe MR 40(12.5%). Only eight (2.5%) of patients had post-operative acute kidney injury and 5(1.6%) patients had post-operative bleeding. the immediate overall mortality were 3(0.9%).

Conclusion and Recommendation: The present study had identified that more than half 58.1% of the patients were female. It also identified ASD the commonest CHDs followed by VSD. This study report that MV replacements were the most common valve surgery. Open heart surgery can be performed with excellent outcome in cardiac center of Ethiopia. We recommend that doing further research on associated factor for this outcome. That may better to know which variable has association for good outcome .and also quality improvement and increase number of surgeons is good for doing all the surgeries by local team.

Key words: open heart surgery; cardiopulmonary bypass; outcome; cross sectional.

1:- INTRODUCTION

1.1. Background

Ethiopia is the 15th largest country in the world with a total population of about 115,000,000, with equal male to female ratio; children under 15 years accounting for 43.5% of the total population. Birth rate is 36.5/1000, with population growth rate of 2.9% annually. The Infant mortality rate is 49.6/1000. The GDP per capita USD is \$2,100 USD According to the latest WHO data published in 2018, total life expectancy is 65.5 years which gives Ethiopia a World Life Expectancy ranking of 141[1].

A clinical perfusionist takes over the artificial management of various cardiac, Pulmonary or circulatory functions during a surgical procedure or for a patient waiting for a heart transplant. Maintaining bodily functions is then made possible with specialized devices and circulatory supports that the clinical perfusionist chooses, organizes, assembles and operates.[2]

The first successful open heart surgery using extracorporeal circulation technique was performed by John Gibbon in 1953 during an atrial septal defect closure [3]. Currently, cardiovascular disease is the most important cause of mortality in middle and advanced age, accounting for 31.5% of all deaths and 45% of non-contagious deaths globally [4].

CVD is not only one disease, but a multiple of diseases and injuries that affect the cardiovascular system (the heart and blood vessels).As the main cause of death on the planet, cardiovascular disease (CVD) in all its forms is an important public health problem. These are most commonly diseases of the heart and of the blood vessels of the heart and brain. In general they affect people in later life (with incidence rising sharply after the 30-44 age range), although, according to a leading cardiologist, by around 35 years old, most who will get a form of CVD already have the beginnings of the disease [5].

Coronary heart disease, also called coronary artery disease (CAD) and atherosclerotic heart disease, is the end result of the accumulation of athermanous plaques within the walls of the arteries that supply the myocardium (the muscle of the heart). This disease is the most common cause of sudden death [5].

The human heart is a pumping organ that continuously and involuntarily pumps the blood to parts of the body. So that every muscle, every artery, and every cell in one's body can get the oxygen it requires. However, sometimes this process does not work as it should and the body does not adequately receive the blood, and consequently the oxygen, it needs.

This is oftentimes due to a blockage in one or more of the coronary arteries, the vessels carrying blood to the heart itself. If the heart is not getting enough blood, it is not getting enough oxygen. Therefore, the heart may infarct and portions of the heart may begin to die. When some of the heart tissue dies, the heart's pumping ability is decreased which further continues the cycle of inadequate blood supply [6].

Congenital heart diseases (CHD) is a broad term that can describe a number of different abnormalities affecting the heart, all of which are abnormalities of the heart's structure and function caused by abnormal or disordered heart development before birth [5].

And also congenital heart diseases are the most common birth defects; they are responsible for nearly one-third of all congenital birth defects and those acquired later in life (rheumatic heart disease, cardiomyopathies, pericardial diseases, and others). Approximately 240,000 children are born with CHD in India itself, while another 150,000 are born in China and only 32,000 are born in the United States (USA). Worldwide, 90% of newborns with CHD live where medical care is inadequate or unavailable. CHD constitutes the main reason of infant mortality across the globe [7].

Congenital heart defects are a growing public health concern worldwide. Congenital heart disease or congenital heart defect is a problem of the heart's structure and function present at birth, affecting the heart or adjacent great blood vessels, detected either at the time of birth or detected later in life [8].

As the world population continues to rise, around 7.8 billion, so does the need for pediatric congenital heart surgery centers across the globe. Newly emerging centers in developing countries face a unique predicament; they encounter large numbers of uncorrected congenital heart disease in children alongside significant limitations in human and material resources, inadequate state funding, and a virtual absence of health insurance in addition to low incomes [9].

Rheumatic heart disease (RHD) is a condition in which the heart valves are damaged by rheumatic fever caused by streptococcal infection [5].

Worldwide there is a huge burden of death from cardiovascular disease. In more advanced environments surgical intervention by open heart procedures has significantly led to the reduction in the fatality of these conditions [10]. Blockages in the heart are often corrected with coronary artery bypass graft surgery while the heart is on the cardiopulmonary bypass (CPB) machine [6].

The cardiopulmonary bypass (CPB) machine has simplified cardiac surgery by allowing the heart to be stopped; the technology also causes adverse effects on a patient's body. These include complications of the inflammatory system, heart, lungs, kidneys, and brain. Using the CPB can not only cause physical harm, but it can also lead to cognitive decline that can affect the patient's quality of life. Throughout the United States, the use of the cardiopulmonary bypass (CPB) machine during cardiac surgery has become a widely employed practice [6].

Pioneering of cardiac surgery in north and sub-Saharan African regions began in the 1950s and 1960s[11].

Currently, 17 million people worldwide die of CVD each year [5]. Heart disease is a major health problem in the World, and heart surgery is now common for revascularization in coronary artery disease, heart valve repair and replacements, and heart and heart-lung transplantation. This includes surgery for adults with acquired heart disease and corrective and palliative surgery for both children (including neonates and infants) and adults with congenital heart conditions [12].

1.2. Statement of the problem

Cardiac surgery capacity in Africa was reviewed almost 15 years ago by Unger and Turina, and they reported 18 open heart operations per million and 1 cardiothoracic surgeon per 4 million people [13], [14]. In response to this alarming situation, several visiting cardiac teams went to Africa to establish humanitarian cardiac programs or to aid the local cardiothoracic surgical teams who had limited or no capability to perform open heart surgery [15].

As a result of continually improving surgical strategy and the technology which supports it, cardiac surgery is now possible in an increasingly high-risk population [16]. Collaborations between programs in countries of the developed and developing world and NGO capacity-building partnerships provide an invaluable opportunity to build sustainable quality driven cardiac surgery programs worldwide [11]. Open heart surgery is performed in low income countries mostly by foreign non-governmental institutions and charity organizations. It had been done in the campaign of surgical teams who visit the institution for a short period of time but they perform relatively many cases.

In addition to doing surgery, foreign surgical teams, teaches our surgical team and knowledge and skill transformations were possible. Furthermore, the foreign surgical teams follow the improvement of the local team. But the outcomes and patient characteristics of such surgeries done by the foreign and local teams were not assessed rigorously. Doing such complex surgery in a campaign may compromise proper patient evaluation and then may affect patients' outcomes.

1.3. Significances and justification of the study

Studies showed that severe postoperative complications of congenital heart disease (CHD) surgery were common, whereas others reported low mortality rates in this patient population. Although reoperations in CHD have become very frequent today [17].our knowledge regarding this growing patient population is limited. As the outcome data as well as evidence –based data to guide management of these patient populations are still limited [18].

In addition, most heart diseases such as congenital heart diseases and rheumatic heart diseases are expected to be high in prevalence and our patients are expected to high risk because of poor evaluations and poor preoperative managements. Our patients are expected to be late appearing for management. Due to absence of high level of care, patients are expected to develop complications. In addition, outcome data are even more limited for the African population .if not worst, the same is true in Ethiopia .for these reasons, I decided to review our experience at cardiac center of Ethiopia cardiac surgery department looking for the outcome and characteristics of patients with cardiovascular disease who underwent open heart surgery.

Knowing the characteristics and outcome of our patients help us to improve patients' profiles before surgery and it helps to decrease intraoperative and postoperative complications. It is also helpful for patient education and counseling.

And also used to develop system for the high quality of service for cardiac surgery in cardiac center Ethiopia .and it may help to create hypotheses for further study and based on the results we may propose interventions for better outcomes.

Therefore, the pre-operative, intraoperative characteristics and outcomes of our patients should be known.

2. LITERATURE REVIEW

Most centers in the developed world have reported excellent patient risk profiles and outcomes for neonatal cardiac surgery, with in-hospital mortality of less than 5%. This has become possible because of technologic refinements, improved multidisciplinary expertise, and advances in the understanding of the pathophysiology and natural history of CHD [19].

Surgical services are almost absent in poorer parts of the African continent. Cardiac surgery is even less accessible for patients in lesser developed countries because of its necessity for highly sophisticated infrastructure, and trained individuals with expertise [20].

Performing open heart surgery for congenital heart disease in resource limited countries are a major developmental challenge and in several Sub Saharan countries it is often unavailable [21].

A study done in Europe has shown that the incidence of common risk factors were as follows: hypertension 43.6%, diabetes 16.7%, extra-cardiac arteriopathy 2.9%, chronic renal failure 3.5%, chronic pulmonary disease 3.9%, previous cardiac surgery 7.3% and impaired left ventricular function 31.4%. Overall hospital mortality was 4.8%. Coronary surgery mortality was 3.4%. In the absence of any identifiable risk factors, mortality was 0.4% for coronary surgery, 1% for mitral valve surgery, 1.1% for aortic valve surgery and 0% for atrial septal defect repair. The following risk factors were associated with increased mortality: age ($P < 0.001$), female gender ($P < 0.001$), serum creatinine ($P < 0.001$), extra-cardiac arteriopathy ($P < 0.001$), chronic airway disease ($P < 0.006$), severe neurological dysfunction ($P < 0.001$), previous cardiac surgery ($P < 0.001$), and recent myocardial infarction ($P < 0.001$) [16].

Study from England between 1997-2015 showed that after evaluations of 57,293 patients (median age 11.9 years, 46.7% being adult, 56.7% female). There was a linear increase in the number of operations performed per year from 1,717 in 1997 to 5,299 performed in 2014. The most common intervention at the last surgical event was an aortic valve procedure (9,276; 16.2%), followed by repair of Atrial septal defect (9,154; 16.0%), ventricular septal defect (7,746; 13.5%), Tetralogy of Fallot (3,523; 6.1%) and atrioventricular septal defect (3,330; 5.8%) repair. Associated mortality remained raised up to six months following cardiac surgery. Several parameters were predictive of

postoperative mortality, including age, complexity of surgery, need for emergency surgery and socioeconomic status. The relationship of age with mortality was “U”-shaped, and mortality was highest amongst youngest children and adults above 60 years of age [22].

Retrospective study in Saudi Arabia king Feizal hospital in 2019 showed that Ninety-eight patients were included in this study. Fifty-two (53%) were females and 46 (47%) were males with a mean age of 26 ± 8.4 years and a mean weight of 62 ± 22.8 kg. Forty-nine patients (50%) required redo-surgery. Ten patients (10%) suffered from postoperative bleeding. Eight patients (8%) had postoperative arrhythmias, of which two patients required permanent pacemaker insertion. Three patients (3%) had postoperative acute kidney injury and seven patients (7%) suffered from neurological complications. The mean duration of ventilation was 1.3 ± 2 days, with a mean ICU and hospital stay of 3.7 ± 3 days, and 10 ± 7 days, respectively. The overall mortality rate in this series was 4% with a 1–5-year survival of 96% [17].

Of the total 330 operations, 208 (63%) were performed with cardiopulmonary bypass (CPB). There were 248 (75.2%) corrective procedures and 82 (24.8%) palliative procedures (eg, aorto pulmonary shunt or pulmonary artery banding). The mean duration of CPB was 236.2 ± 90.3 minutes. Total circulatory arrest was used in 93 (28.2%) of the patients. Modified ultra-filtration was performed in 115 (34.8%) of the patients before completing CPB. The sternum was electively left open after the operation in 143 (43.3%) patients. After the operation, 18(4.2%) patients required chest re-exploration, and 40 (9.3%) required reintubation in the ICU. Mean \pm standard deviation duration of mechanical ventilation was 3.6 ± 3.3 days, duration of inotropic use was 4.1 ± 3.3 days, ICU stay was 7.9 ± 5 days, and hospital stay was 15.4 ± 10.3 days.[19].

A study done in a developing country showed that; In-hospital mortality rate was 6.3%. Among sites reporting 30-day mortality data for at least 90% of surgical cases (7 sites in 2010, 12 sites in 2011, 19 sites in 2012) the 30-day mortality rate was 7.4%. Sites were unable to capture 30-day mortality data for 24.4% of cases. The surgical site infection rate was 2.1%, the bacterial sepsis rate was 5.5% and the rate of any major infection was 7.0%. In-hospital mortality was 1.5% [23].

A study done in southern India showed that Overall mortality was 8.8%. Mortality significantly decreased from 21.4% before 2002 to 4.3% after 2002 (3.2% for corrective operations, $P < 0.0001$). The prevalence of postoperative bloodstream infection remained

the same, whereas surgical site infection and hospital stay significantly increased after 2002 [19].

A study done in Uganda heart institute showed that congenital heart disease surgeries made up 96% (119/124) of the procedures. The commonest conditions were ventricular septal defects (VSD) in 35.5% (44/124), atrial septal defects (ASDs) in 34.7% (43/124) and TOF in 10.5% (13/124). Postoperative morbidity was low with arrhythmias, left ventricular dysfunction and re-operations being the commonest seen. Postoperative sepsis occurred in only 2 cases (1.6%). The overall mortality rate was 3.2 % [21].

A research done in a resource limited country in 2018 showed Postoperative complications including bleeding requiring transfusion in 11 patients (13%), reoperation 5 patients (6%), delayed sternal closure in 2 patients (2%) and surgical site infection in a single patient (1%). Additional complications included re intubation in 5 patients (6%), pulmonary hypertension in 5 patients (6%), temporary cardiac-pacing in 5 patients (6%) and junctional ectopic tachycardia in a single patient [24].

An estimate of 4.42 to 6 million children in SSA is born with CHD. Of these, an estimated 1.7 to 2.6 million children will require cardiac surgery in SSA. In East Africa, The Horn, and Ghana, 0.5 to 3.4% of the estimated number of children younger than 15 years of age requiring surgery had access to open heart surgery [11].

From our literature review there are few studies done in Ethiopia and almost all of them are studied on the prevalence of heart disease in selected tertiary hospitals. a study done in a referral hospital in Ethiopia on a total of 157 valve surgeries done from 1983 to 2013. Mean age at time of surgery was 26.7 years and females constituted 66% of the cases. Patients with rheumatic heart disease were younger, more likely to be female and have Atrial fibrillation, but less likely to have impaired left ventricular systolic function when compared to patients with non-rheumatic heart disease. More than 75% of the surgical procedures done were mechanical valve replacement [25].

A study done in Addis Ababa shows the prevalence of congenital heart defects among children diagnosed with congenital anomalies was estimated to be 35.8%. The most common congenital heart defect was VSD 30(30.9%), followed by ASD 23.7%. [26]. But there is no study done on assessment of outcome and characteristics of patients who underwent open heart surgery at the only cardiac center in Ethiopia. Therefore, in this study, the outcomes and characteristics of patients who underwent open heart surgeries at cardiac center Ethiopia will be assessed.

3:-CONCEPTUAL FRAMEWORK

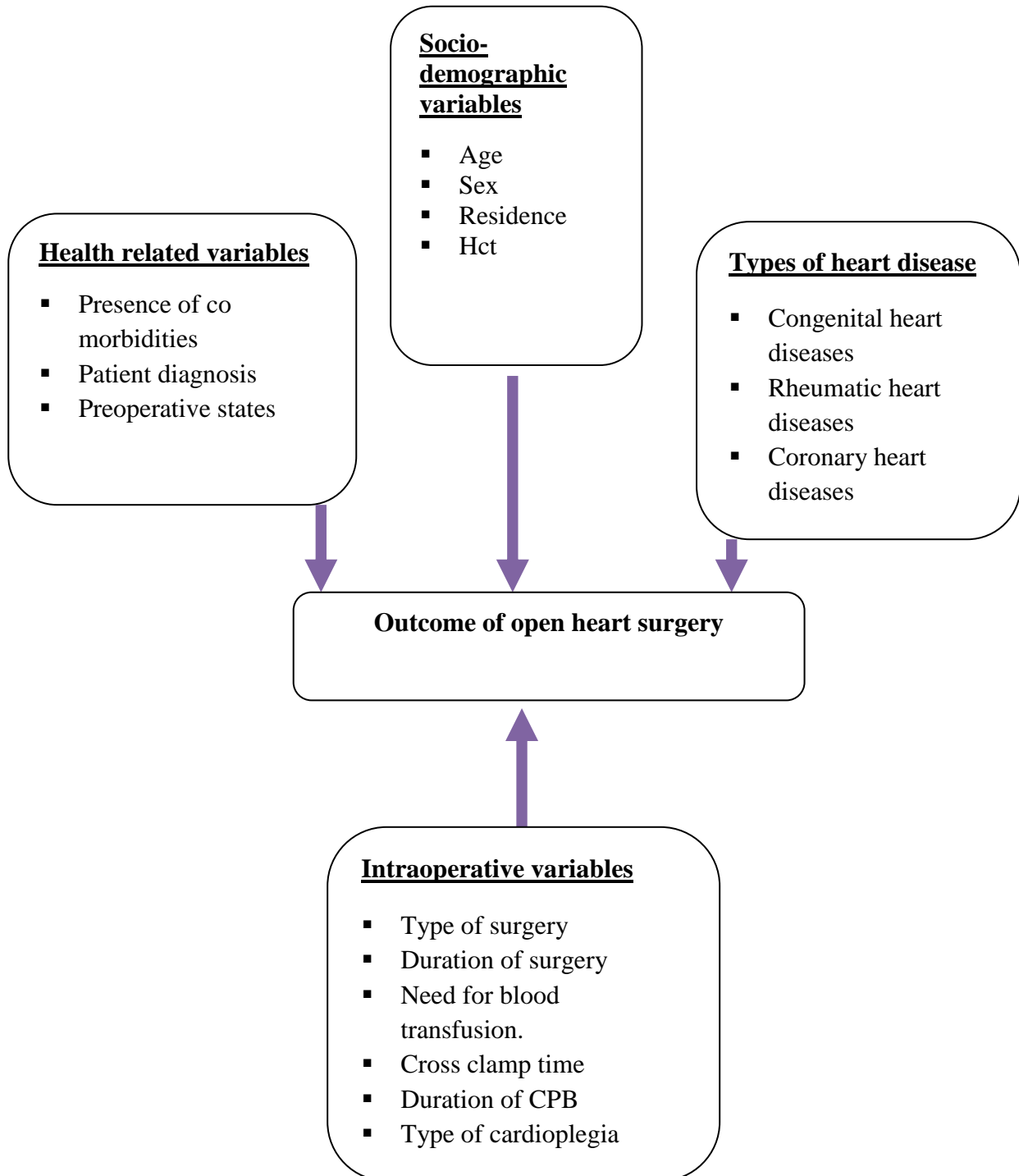


Figure 1: -Conceptual framework for characteristics and outcomes of patients who underwent open heart surgery at cardiac center of Ethiopia.

4:-OBJECTIVE

4.1:-General Objective

To assess the characteristics and outcomes of patients who underwent open heart surgery at cardiac center of Ethiopia.

4.2:-Specific Objective

- I. To describe patient characteristics who underwent open heart surgery at cardiac center of Ethiopia.
- II. .To determine patient outcome who underwent open heart surgery at cardiac center of Ethiopia.

5:-MATERIALES AND METHODES

5.1:-Study design and period

This institutional based cross-sectional study is drawn from a retrospective chart review of patients, who underwent open heart surgery between FEB, 2009 and DEC, 2020. The study was conducted immediately after ethical clearance is obtained.

5.2;-Study area

The study was conducted at the Cardiac Center of Ethiopia, an NGO-based center working in collaboration with department of pediatrics at TASH. The center Established in 1992 inside Zewditu Memorial Hospital. The Cardiac Center – Ethiopia is now located inside Tikur Anbessa Specialized Hospital (TASH) here in Addis Ababa. It has a new building initiated by Dr. Belay Abegaz started functioning in FEB, 2009. Before this center was established here, the center sends patients abroad for surgery. The Cardiac Center Ethiopia has two cardiac surgery tables, 10 ICU beds with functional cath-lab machine both for children and adults. The center invites overseas experts and gets children operated for congenital and rheumatic heart disease at a regular interval.

In June 2017, the first open heart surgery was performed in cardiac center of Ethiopia in Addis Ababa by young Ethiopian surgeons trained in India, using the same facilities as the foreign surgical teams. Currently as 2019 report shows there are more than 7000 people on the center's waiting list.

5.3:-population

5.3.1:- Source/target population

The source population were all patients who underwent open heart surgery from FEB, 2009 to DEC, 2020 in cardiac center of Ethiopia.

5.3.2:-Study population

The study population was patients who underwent open heart surgery from FEB, 2009 to 2020 and who fulfill all the inclusive criteria in cardiac center of Ethiopia.

5.4:-Sample size determination

The sample size for the study was determined using single population proportion formula based on the following assumptions. The prevalence of characteristics and outcome of patients who underwent open heart surgery is not known so, to get the sample size I took Prevalence: 50%. Marginal of error: 5% and Confidence interval: 95%. (d=0.05)

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

- Marginal of error: 5% and
- Confidence interval: 95% , where, ($Z_{\alpha/2}$)=1.96, p= 0.5, 1-p= 0.5

$$n1 = (1.96)^2 \times 0.5 (1-0.5) / (.05)^2$$

$$n1 = 3.84 \times 0.25 / 0.0025 = \mathbf{384}$$

N (target population) =1149, so b/c of N= <10,000 , N finite = $n1/1+n1/N=$

$$N_{\text{finite}} \text{ (correction formula) } = \frac{\mathbf{384}}{\mathbf{1+384/1149}}$$

$$\mathbf{288}$$

Adding 10% for those who, incomplete or lost charts, the sample size will be

$$N_{\text{final}} = n/1 - I C(\text{incomplete or lost}) = 288/1 - 0.1 = \mathbf{320}.$$

Final sample size is =320

5.5;-Sampling technique

Simple random sampling technique was used to select the sample in the study population until the intended sample size reached by using the random number function (RAND) in Microsoft Excel to generate random number.

5.6; -Eligibility criteria

5.6.1;-Inclusive criteria

All patients who underwent open cardiac surgery at cardiac center of Ethiopia from FEB, 2009 up to DEC, 2020. From those I was included only selected by simple random sampling technique until the intended sample size is reached.

5.6.2;-Exclusive criteria

The patients who have unclear or Unreadable and missed chart information and also the patient's chart which are not selected by simple random sampling technique.

5.7;-Variables of the study

5.7.1;-Dependent variables

Outcome of Patients who underwent Open heart surgery

5.7.2;-Independent variables

Background variables

- Age
- Sex
- Address (urban/rural)&Religion

Explanatory variables

- Hct
- Serum creatinine
- Duration of CPB
- Diagnosis
- Time of cross clamp
- Type of cardioplegia
- Type of surgery
- Frequency of surgery
- Duration of procedure
- Intraoperative bleeding
- Medical co-morbidities.
- Duration of follow-up.

5.8:-Operational definitions

Postoperative complications (poor outcome) =it is a composite complications of a patient after open cardiac surgery which include (Stroke, encephalopathy, seizure, myocardial infarction, cardiac arrest, reintubation, Acute kidney injury ,ventilation duration, post op bleeding, , re operation &death).

Co-morbidities=A diagnosis which is confirmed, but other than indication for open heart surgery.

Intra operational problem = patients had massive bleeding during surgery or death.

Outcomes= immediate and current outcomes which can be good or poor.

Immediate outcome= occurring from immediate post operation time until discharging from the hospital

Current outcome= patient condition at the time of data collection.(improvement ,not improved and death).put improved, if the patient said I am ok .and put not improved ,if the patient said not ok.

Death = All death regardless of the cause.

City= all regional cities including Addis Ababa.

WHO anemia classification, $\geq 33\%$ =normal,

27-33%= mild anemia, 21-27%=moderate anemia, & $<21\%$ =severe anemia

5.9;-Data collection tools, study materials and procedures

The data collection was carried out using specifically designed checklist. The checklist was prepared in English and Amharic version .In addition materials such as patient's charts, stationery materials, operation-room logbook, ICU registration books, laptop and reference books were used. Data was collected by trained BSc nurses. Using the checklist the chart was reviewed and patient communication by telephone was used to determine current situation. .

5. 10;-Data analysis

The collected data was cleaned, coded and entered into latest version of SPSS for analysis. Descriptive statistics was computed (in the form of tables, graphs) for most variables. Continuous data was described by mean and standard deviation.

5. 11;-Quality assurance

To ensure the quality of data, data collectors was trained for 1 days and pre-test of check list was tested on 5% samples to assess for clarity, length and completeness. Then after, some possible adjustment/correction was made. Daily meeting was held between the principal investigator, supervisor and the data collectors to discuss any problems in the data collection. The collected data was checked for completeness and consistency. The data entry was done weekly.

5.12:-Ethical considerations.

The study was submitted to the surgical department research ethics review committee for ethical clearance. All the information retrieved was kept in a way that cannot interfere in personal confidentiality and the data was anonymous by using code numbers. Since this is a retrospective chart review of cases, it does not require patient or guardian consent.

5.13;-Data dissemination

This study on completion could serve as a reference material to researchers, experts and policy makers for intervention. The finding of the study will be submitted to Addis Ababa University, college of health sciences, school of medicine, department of surgery. Furthermore effort will be made to present the finding of the study in different professional meetings/conference and the manuscript will be sent for peer reviewed journals for possible publication.

6-RESULTS

6.1-Socio demographic characteristics

In this study a total of 320 patients were analyzed, the mean age was 17.8 ± 14.5 years. (3month to 75 years).From this 186 (58.1%)of the patients were female and 134(41.9%) were male. And also the majority of participants were found in the age group 6-18yrs 148(43.7%).In the report 57.2% were from urban (cities) or big towns of the country, the rest 42.8%were from rural area.

Most of the participants were orthodox Christian religion follower 196(61%)followed by Islam 87(27%)and protestant 35(10.9%) the rest 2(0.6%) were others. (Table1)

Table 1: Socio demographic characteristics of patients who underwent open heart surgery at cardiac center of Ethiopia.

Variables	Frequency (n)	Percent (%)
Age		
≤ 5	62	19.4%
6-18	140	43.7%
>18	118	36.9%
Sex		
Female	186	58.1%
Male	134	41.9%
Religion		
Islam	87	27.2%
Orthodox	196	61.3%
Protestant	35	10.9%
Others	2	0.6 %
Address		
Urban	183	57.2%
Rural	137	42.8%

6.2 –Preoperative characteristics of patients

A total of 320 patients underwent either as the first or reoperation for open heart surgery during the study period, The primary diagnosis from this study were ASD 54(16.8%),VSD covered 42(13.1%),severe MR 40(12.5%),double valve problems 40(12.5%),TOF 30(9.4%),severe MS 22(6.9%), mitral & tricuspid problem 15(4.7%),severe AS 12(3.7%)(**Table 2**).Majority of patients 313(97.8%) included in this study had primary surgery. `In this study the overall congenital problems counts 155(48.5%), and also others acquired problems were 165(51.5%) (**Table3**).

In this report, Although the primary diagnosis is ASD, because of doing the surgery of severe MR and severe MS the primary surgical procedures of patients were MV replacement 57(17.8%), ASD closures 55(17.2%) and VSD closures 41(12.8%) (**Table 4**).Medical co morbidities found only on 21(6.6%) of patients. Gender proportions of surgical procedure were for ASD closure (55) female (31) and male (24) (**Table 5**). In our study only 31(9.7%) a follow up duration less than one month and relatively majority of patients 87(27.2%) had follow up time of 1-3 yrs (**Figure 2**). In this study the mean pre operation HCT were $38.4\% \pm 7.2\%$ and also mean pre operation creatinine were $0.64 \text{ mg/dl} \pm 0.25$.And also ,depending on WHO classification of anemia ,60(18.8%) had mild anemia and 8(2.5%) had moderate anemia.(**figure 3**).

From the overall intervention reported in this study, more than half 202 (63.1%) performed in the age group ≤ 18 years and 62(19.3%) were less than 5years old. The majority (63.6%) of ASD closures, almost all TOF repair and all VSD closures done on the age ≤ 18 years. But, more than half (59.7%) of MV replacement were done on the age group >18 yrs (**Table 6**).

Table 2: Diagnosis of patients who underwent open heart surgery at cardiac center of Ethiopia.

Types of diagnosis	Frequency (n)	Percent (%)
ASD	54	16.8%
VSD	42	13.1%
Severe MR	40	12.5%
Double valve Problem	40	12.5%
TOF	30	9.4%
Severe MS	22	6.9%
Sever AS	14	4.4%
MR	10	3.1%
Mitral & tricuspid Problem	10	3.1%
Triple valve Problem	10	3.1%
SAM	8	2.5%
Severe AR	7	2.2%
Others (AVSD, LA myxoma, PDA, tricuspid Valveregurgitation. CAD, TAPVD, LVOTO & cortriatriatum.	33	10.3%

Table 3: Proportion of congenital and acquired problems

Problems	Diagnosis	Frequency(n)	Percent (%)	Total
Congenital (CHD)	ASD,VSD,TOF& AVSD, cor Triatriatum,SAM,TAPVD.	155	48.5%	48.5%
Acquired (Valve problems& Others)	SINGLE valve	95	29.7%	51.5%
	DOUBLE valve	40	12.5%	
	MITRAL& TRICUSPID PROBLEM	10	3.1%	
	TRIPLE valve &	10	3.1%	
	CAD,LA myxoma	10	3.1%	
Total		100		100%

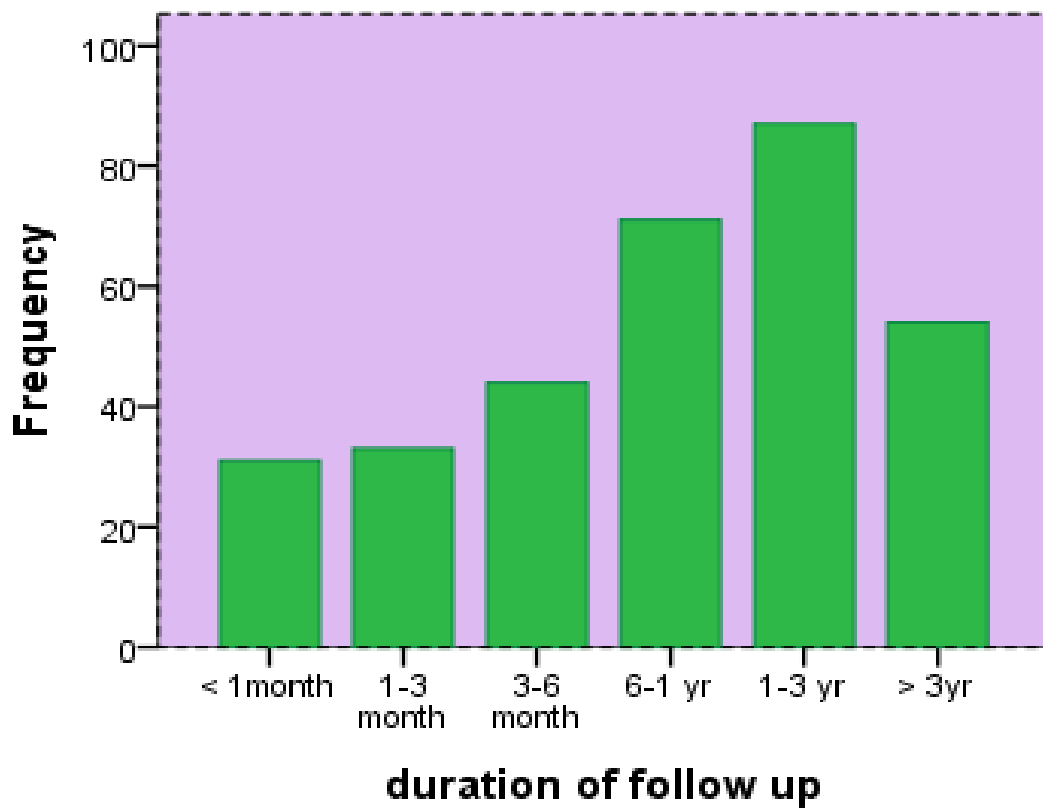


Figure 2: Patients duration of follow up.

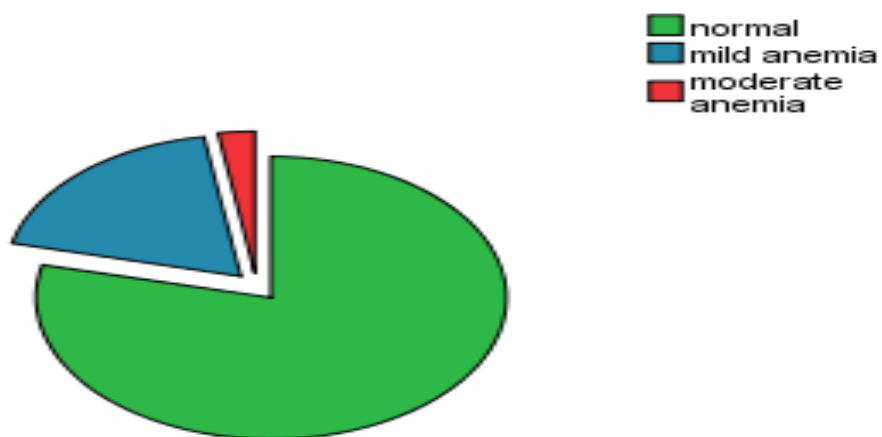


Figure 3: preoperative anemia for patients who underwent open-heart surgery at cardiac center of Ethiopia.

Table 4: Major Surgical procedures for all 320 patients

Types of procedures	Frequency (n)	Percent (%)
MV replacement	57	17.8
ASD closure	55	17.2
VSD closure	41	12.8
TOF repair	30	9.4
DV replacement	29	9.1
MV repair	24	7.5
AV replacement	21	6.6
DV repair	11	3.4
SAM excision	8	2.5
Others(CABG,LVOTO relief,triplevolverepair/replacement,AVSD closure & conjugated surgeries).	44	13.75
Total	320	100%

Table 5: Gender proportion for major surgical procedure.

Variable	Surgical procedures			
Sex	ASD closure	MVreplacement	TOF	VSDclosure
Female	31	41	12	22
Male	24	16	18	19
Total	55	57	30	41

Table 6: Age proportion with major surgical procedures.

Variable	Major Surgical procedures				
	MV replacement (n)	ASD closures (n)	VSD closures (n)	TOF repair (n)	From All procedures(n)
≤5	0	13(23.6%)	26(62%)	13(43.3%)	62(19.3%)
6-18	23(40.3%)	24(43.6%)	16(38%)	16(53.3%)	140(43.75%)
>18	34(59.7%)	18(32.7%)	0	1(3.4%)	118(36.9%)
Total	57(100%)	55	42	30	320

6.3: Intra operation characteristics

In this study among all surgical procedures 187(58.1%) were done by local team (Ethiopian) surgeons. the rest were by foreign surgeons. The mean CPB duration and cross clamp time were 107 ±51.7 minute and 69.3± 41 minuet respectively. More than half of patients who underwent surgery 187(58.4%) were used St Thomas cardioplegia, 132(41.3%) were used delnido (Table 6). In the time of surgery 45(14.1%) of patients were needed blood transfusion.

Table 7: Intra operational characteristics of patients

Variables	Frequency (n)	Percents (%)
Surgeon		
Ethiopian	187	58.4%
Foreign	133	41.6%
Cardioplegia type		
Del nido	132	41.3%
St Thomas	187	58.4%
Others	1	-----
Need of transfusion		
Yes	45	14.1%
No	275	85.9%
Intraoperation problem		
Yes	2	-----
No	318	99.4%

6.4:- Immediate outcomes and current situation of patients underwent open heart surgery

In this study, the mean postoperative HCT and post-operative creatinine of patients were 32.1 ± 5.3 % and 0.72 ± 0.28 mg/dl respectively. So, postoperatively 142(44.4%) develop mild anemia and 50(15.6%) develop moderate anemia (**Figure 4**). And also the mean duration of ventilation was $6\text{hr} \pm 5.2\text{hr}$, minimum and maximum ventilation duration was 42min and 1.7day respectively. Only eight (2.5%) of patients had post-operative acute kidney injury and 5(1.6%) patients had post-operative bleeding (**Table 8**). the immediate overall mortality were 3(0.9%).

In this study to know current condition of the patients who had open heart surgery, we try to asked telephone question for all 320 patients, from those 253(79%) gave respond to us. When we called them did not found the rest 67 (21%) of patients. Two hundred forty-two (75.6%) of patients had improvement, 10(3.1%) had not improvement and only one participant is died (**figure 5**).

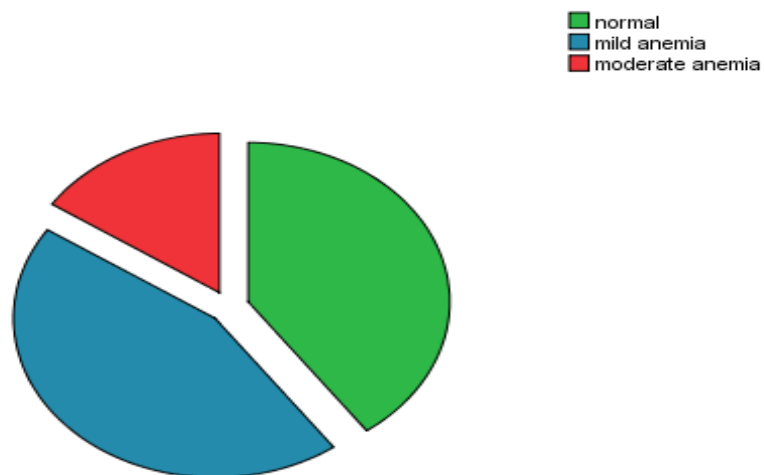


Figure 4: postoperative anemia for patients who underwent open-heart surgery at cardiac center of Ethiopia.

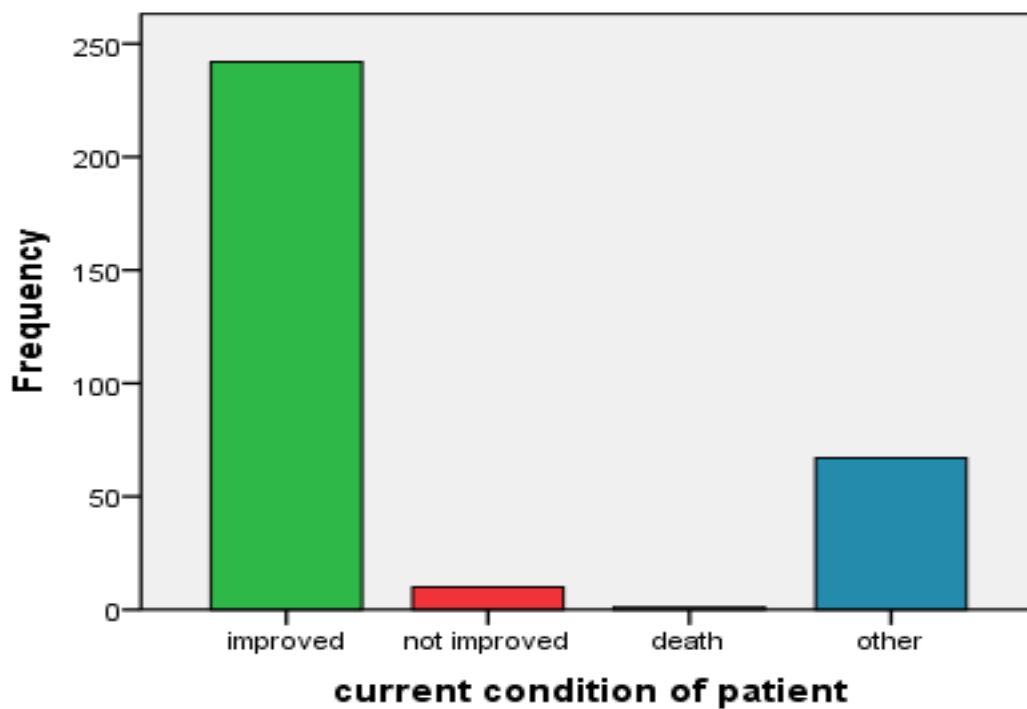


Figure 5: Current condition of patients who underwent open-heart surgery at cardiac center of Ethiopia.

Table 8: Complication or Immediate outcome of patients.

Variables	Frequency (n)	Percent's (%)
Post-operative stroke		
Yes	2	-----
No	318	99.4%
Post-operative seizure		
Yes	1	-----
No	319	99.7%
Post-operative Myocardial infarction		
Yes	1	-----
No	319	99.7%
Post-acute kidney Injury		
Yes	8	2.5%
No	312	97.5%
Post-operative bleeding		
Yes	5	1.6%
No	315	98.4%
Re operation		
Yes	2	-----
No	318	99.4%
Re intubation		
Yes	1	-----
No	319	99.7%
Death		
Yes	3	0.9%
No	317	99.1%

7-DISCUSSION

This is the first report on the profile of outcomes and characteristics of patients who underwent open heart surgery in cardiac center of Ethiopia. We observed female sex predominant in this study. In the current study, primary operation accounts for the large proportion (97.8%). In the opposite of this report, the report found in other study, half of the operations were redo [19].

This study has showed that the range of the age is between (3month -75 years).this age group was relatively equal with compare to Retrospective study in cote d'Ivoire 2016 which was (9month-69yrs) [27].Most of the participants were orthodox Christian religion follower (61%).it was almost equal with the study done in Ethiopia Addis Ababa (60%) [26].in this study pre operatively patients 18.8% mild and 2.5% moderate anemia but post operatively mild anemia increased by 2.4=(44.4%) and moderate anemia by 6.2=(15.6%) ,it may be due to intra operative blood loss.

From a total of 320 patients underwent open heart surgery either as the first or reoperation, the primary diagnosis were ASD (16.8%), followed by VSD (13.1%),double valve problem (12.5%),severe MR (12.5%), and TOF (9.1),but the study in Uganda the most commonest condition were VSD (35.5%),ASD (34.7%) and TOF (10.5%) [21]. And the study done in cote d'ivoire in 2016 [27] shows that 56.5% of patients had rheumatic valvulopathies, VSD counts (9,2%),ASD (7.7%) and TOF (8.4%). Similar to study done in vote d'ivoire ,in this study the most commonest heart disease were includes valve problems in addition to ASD and VSD .but most study reported that the most commonest problem were VSD followed by ASD.

In this study the overall congenital problems counts (48.5%), this report was less with compare to the study reported in Uganda (96%) [21] ,and higher than study done in Addis Ababa 35.8%[26],and study done in Cote d'ivoire (28.4%)[27]. Also Acquired problems counts (51.5%). It also less with compare with study in Cote d'ivoire (71.6%) [27].This study showed that the proportion of congenital and acquired problems almost equal.

From the overall intervention in the present study (41.6%) surgeries done by foreign surgeons.

The study participant had the mean pre operation HCT of 38.4%. Only (6.6%) had co morbidities. In this study we found that unlike other studies the most common surgical procedures was MV replacement (17.8%). From the overall intervention reported in this,

more than half (63.1%) performed in the age group ≤ 18 years old and (19.4%) were <5 years old. This is less with compare to study reported in other [24], which were (90%) of surgeries for <18 years old and (55%) for <5 years old.

In this study, to compare the mean post and pre-operative HCT and creatinine of patients were 32.1 % & 38.4% and 0.72mg/dl & 0.64 mg/dl respectively. As expected, this result showed that decrease the Hematocrit and increase creatinine. And also in this study we found that the mean duration of ventilation were 6hr it was very short with compare to study in Saudi Arabia 1.3 day [17]. And in developing country 3.6days [19]. The mean duration of CPB were 107 minute. This was also short with compare to the report found in developing country 236.2minutes. [19].

The incidence of post-operative AKI in this study was comparable with the study in Saudi Arabia, which was (2.5%) and (3%) respectively. Only 1.6% of patients of this study were suffered from post-operative bleeding it also less comparable with other studies in research limited countries which was (13%). Similar to the study reported by AouellellaRJ, et al. [17], in this study, none of patients have re exploration for bleeding.

Postoperative morbidity was low with stroke (0.6%), seizure (0.3%) and myocardial infarction (0.3%).

After the operation, this study showed that much less finding of re operation (0.3%) and re intubation (0.3%) than what reported in resource limited countries operation (6%) and re intubation (6%). [24]. and also as the report found in developing countries shows higher report 9.3% than the present report about re intubation [19].

In this study the overall complication was (6.5%). it was less comparable with compare to the study reported in Saudi Arabia (18%).

Unlike other study done in developing country (6.3%) and Uganda (3.2%), the overall mortality of patients in this study were (0.9%). From this study majority of patients who gave respond by telephone had improvement currently and only one patient is died, but 21% of patients not found during telephone calling it may be due to change address or they may be died.

8-CONCLUSION AND RECOMMENDATION

Conclusion

The present study had identified that proportion of females is higher. This study also reported that less surgery was done in the age group <5 (19.4%). The current study identified that ASD, VSD and severe MR were more common in females than males, while TOF was common in males. It also identified ASD the commonest CHDs followed by VSD. This study report that MV replacements were the most common surgery done. Although Studies showed that severe postoperative complications of congenital heart disease (CHD) surgery were common, and we expected the complication of Cardiovascular diseases (CVD) surgery were high, Open heart surgery can be performed in cardiac center of Ethiopia was done successfully for majority of patients with good outcome by available number of cardiac surgeon and instruments. In this study postoperative complication accounts for less morbidity and mortality. After discharged from hospital majority of patients current condition had improvement, only one patient is died. But we don't know what about current condition for 21% of participants..

Recommendation

- ❖ We recommended that early surgical intervention for CHD, because this study shows less proportion for surgeries done in age <5 years.
- ❖ We recommend decrease the follow up time of patients to get the surgery (Most have follow up time of from 1 yr. to 3 yrs).
- ❖ We recommend for researchers doing on associated factor for this outcome. Because it is better to know which variable has association for good outcome?
- ❖ Because of we could not compare the result of study with study done on similar setup in Ethiopia. So, we suggest further study at other centers in Ethiopia.
- ❖ Also quality improvement and increase number of surgeons is good for doing all the surgeries by local team.
- ❖ To provide safely open heart surgery in this center with better outcome, we recommend our government to assist cardiac center of Ethiopia.

9-STRENGTH AND LIMITATION

Limitation:

- ✓ This study is limited by being a single center observation.
- ✓ Inherent limitations resulting from the retrospective nature of our study.
- ✓ Also we don't get 21% of patient's current outcome.

Strength: -we got the samples from all the surgeries done in the institution. Also used simple random sampling methods.

10:-REFERENCES

1. UNDP. [Human Development Indices and Indicators: 2018 Statistical Update](#). 2019. Accessed on 13 April, 2019. [Reference for Ethiopia].
2. Special perfu.the specialist in cardiac, pulmonary and circulatory support: figsante.qc.ca/fiqp vol 8. No.2 Dec 2018.
3. 1 Örer A, Oto Ö: Dündenbugünekalpcerrahisi. GKDC Dergisi1999;7:153-60.
4. Townsend N, Wilson L, Bhatnagar P, Wickramasinghe K, Rayner M, Nichols M. Cardiovascular disease in Europe: epidemiological update 2016. *Eur Heart J*.2016;37(42):3232-45.
5. Nason E, An overview ofcardiovasculariseaseand research, *RAND Europe working paper series*, <http://www.rand.org/about/standards>, January 2007.
6. Shannon Steidl, The Adverse Effects of the Cardiopulmonary Bypass Machine, *The Annals of Thoracic Surgery*, 76(6), 2220-2223, Spring 2011.
7. Anita Saxena, Status of Pediatric Cardiac Care in Developing Countries, *Children* 2019, 6, 34; doi:10.3390/children6020034,www.mdpi.com/journal/children.
8. TankeuAT,Bigna JJR, NansseuJRN,Leopold N.A, Celestin D, Mazou N.T, Jean J.N.N. Prevalence and patterns of congenital heart diseases in Africa: a systematic review and meta-analysis protocol. *BMJ Open* 2017;7:e015633.doi:10.1136/bmjopen-2016- 015633.
9. Sen AC, Morrow DF, BalachandranR,Du X , Gauvreau K; Jagannath BR, KumarRK,KupiecJK,Melgar ML, Chau NT, Potter-Bynoe G, Tamariz-Cruz O, Jenkins KJ. Postoperative Infection in Developing World Congenital Heart Surgery Programs Data From the International Quality Improvement Collaborative. *CardiovascQual Outcomes*. 2017;10:e002935. DOI: 10.1161/CIRCOUTCOMES. 116.002935.available at <http://circoutcomes.ahajournals.org>.
10. Oludara MA, Nwiloh J, Fabamwo A, Adebola P. Commencing open heart surgery in resource limited countries: lessons from the LASUTH experience,*Pan African Medical Journal*. 2014; 19:105 doi:10.11604/pamj.2014.19.105.4848, <http://www.panafrican-med-journal.com/content/article/19/105/full>.
11. Yankah C, Fynn-Thompson F, Antunes M, Edwin F, Yuko-Jowi C, Mendis S, Thameur H, Urban A, Ralph Bolman R. Cardiac Surgery Capacity in Sub-Saharan

- Africa: Quo Vadis? *Thoracic and Cardiovascular Surgeon* Vol. 62 No. 5/2014:393-401.
12. Punjabi PP, Taylor KM. The science and practice of cardiopulmonary bypass: From cross circulation to ECMO and SIRS, *Global Cardiology Science and Practice* 2013;32 <http://dx.doi.org/10.5339/gcsp.2013.32>.
 13. Unger F. Worldwide survey on cardiac interventions 1995. *CorEuropeum*1999;7:128–146.
 14. Turina MI. European Association for Cardio-Thoracic Surgery:carrying the torch. *Eur J CardiothoracSurg* 2002;22(6):857–863.
 15. Yacoub MH. Establishing pediatric cardiovascular services in the developing world: a wake-up call. *Circulation* 2007;116(17):1876–1878.
 16. F. Roques, S.A.M. Nashef, P. Michel, E. Gauducheau, C. de Vincentiis, E. Baudet, J. Cortina,M. David, A. Faichney, F. Gabrielle, E. Gams, A. Harjula, M.T. Jones, P. Pinna Pintor,R. Salamon, L. Thulin. Risk factors and outcome in European cardiac surgery: analysis of the EuroSCORE multinational database of 19030 patients. *European Journal of Cardio-thoracic Surgery* 15 (1999) 816±823.
 17. Abouelella RJ, Habib EA, AlHaleesZY,Alanazi MN, Ibhais ME, Alwadai AH. Outcome of cardiac surgery in adults with congenital heart disease: A single center experience. *Journal of the Saudi Heart Association Volume 31, Issue 3, July 2019, Pages 145-150*.
 18. Padalino MA, Speggorin S, Rizzoli G, Crupi G, Vida VL Bernabei M, et al.. Midterm results of surgical intervention for congenital heart disease in adults: an Italian multicenter study. *J ThoracCardiovascSurg*2007;134:106–13. 113.e1–9.
 19. Bakshi KD, Vaidyanathan B, Sundaram KR, Roth SJ, ShivaprakashaK,Rao SG, Nair SG,ChengodeS,Kumar RK, Determinants of early outcome after neonatal cardiacsurgery in a developing country.*The Journal of Thoracic and Cardiovascular Surgery Volume 134, Number 3, 2007;134:765-71*.
 20. LEE KB, pediatric cardiac surgery in developing countries of africa: current state and future direction.2014,<https://utswmed-ir.tdl.org>.
 21. Aliku TO, Lubega S, Lwabi P, Oketcho M, Omagino JO, MwambuT.Outcome of patients undergoing open heart surgery at the Uganda heartinstitute, Mulago hospital complex.*African Health Sciences Vol 14 Issue 4, December 2014*.
 22. Kempny A, Dimopoulos K, UebingA,Diller G-P, Rosendahl U, Belitsis G, et al. (2017) Outcome of cardiac surgery in patients with congenital heart disease in

- England between 1997 and 2015. PLoS ONE 12(6): e0178963. <https://doi.org/10.1371/journal>.
23. Kathy J. Jenkins, Aldo R. Castañeda, K.M. Cherian, Chris A. Couser, Emily, K. Dale, KimberleeGauvreau, Patricia A. Hickey, Jennifer Koch Kupiec, Debra Forbes Morrow, William M. Novick, Shawn J. Rangel, BistraZheleva,Jan T. Christenson.Reducing Mortality and Infections afterCongenitalHeart Surgery in the Developing World.*PEDIATRICS* Volume 134, Number 5, November 2014.www.aappublications.org/news
 24. Wallen T, Fults M, Blenden R, SeepersaudM,Vesel T, et al. (2018) Surgical Outcomes After Two Yearsof Establishing a Congenital Heart Disease Program in aResource Limited Country Using a “Single Charity Center”Approach. *J CardiovasDisea Medic 1:1* (24-28).
 25. SenbetaGuteta, DejumaYadeta, AkliluAzazh, DuferaMekonnen; CARDIAC SURGERY FOR VALVULAR HEART DISEASE AT A REFERRAL HOSPITAL IN ETHIOPIA: A REVIEW OF CASES OPERATED IN THE LAST 30 YEARS *Ethiop Med J*, 2016, Vol. 54, No. 2 49-55.
 26. TalargiaF,Magnitude of Congenital Heart Defects and Associated Factors among Children Diagnosed With Congenital Anomalies in Addis Ababa Governmental Hospitals, Ethiopia, January, 2018, www.google.com.etd,aaU,edu.et
 27. Yangni-Angate et al.open heart surgery in Africa :review of 35 years surgical experience in cote d’ivoire.*Cardiovasc Diagn Ther* 2016;vol 6(suppl 1):s44-s63.

11:-ANNEX: - ENGLISH VERSION CHECKLIST FOR DATA COLLECTION

ASSESSING THE OUTCOMES AND CHARACTERISTICS OF CARDIAC PATIENTES WHO UNDERWENT OPEN HEART SURGERY AT THE ONLY CARDIAC CENTER IN ETHIOPIA.

No.	Checklist	Code	Escape	Remark
I / SOCIODEMOGRAPHIC CHECKLIST				
1	Age of the patient			
2	Sex of the patient	1/female 2/male		
3	Address of patient	1/urban 2/rural 3/unknown(not listed)		
4	Religion	1/Islam 2/Orthodox 3/Protestant 4/ others		
5	Marital status	1/ married 2/unmarried 3/divorce 4/ widowed		
II/ PREOPERATION CHECKLIST				
7	Hct of the patient			
8	Serum creatinine			
9	Diagnosis			
10	Type of procedure			
11	Frequency of surgery	1/1 st time 2/Redo		

12	Medical co morbidity	1/ yes 2/ no>if yes, list	
13	duration of follow up			
III/ INTRA OPERATION CHECKLIST				
14	Surgeon	1/Ethiopian 2/ foreign		
15	Duration of CPB			
16	Time of cross clamp			
17	Type of cardioplegia	1/del nido 2/st Thomas 3/other		
18	Root of cardioplegia	1/anti-grade 2/retrograde 3/ compound		
19	Duration of procedure			
20	Need of blood transfusion			
21	Any intra op problem	1/yes----->if yes 2/no	----list here	
IV/ POST OPERATION CHECKLIST				
22	Postop stroke	1/yes 2/no		
23	Seizure (encephalopathy)	1/yes 2/no		
24	Myocardial infarctions	1/yes 2/no		
25	Acute kidney injury	1/yes 2/no		
26	Post serum creatinine level			

27	Post Hct level			
28	Ventilation duration			
29	Post operation bleeding	1/yes 2/no	if yes, transfused or not	
30	Re operation	1/ yes 2/ no		
31	Re intubation	1/ yes 2/ no		
32	Death	1/yes 2/no		
V/TELEPHONE QUESTION				
33	Current condition of patient	1/improved 2/not improved 3/death 4/other	If other, List.....	

የመረጃመጠየቂያቅጽ (Amharic version)

I/ማህበራዊሁኔታዎች

1/የታካሚው እድሜ.....

2/የታካሚው ፆታ 1/ሴት

2/ ወንድ

3/የታካሚው አድራሻ 1/ከተማ 2/ገጠር 3/የማይታወቅ (ያልተገለፀ)

4/ሀይማኖት 1/ኢስላም 2/ኦርቶዶክስ 3/ፕሮቴስታንት 4/ሌላ

5/የትዳርሁኔታ 1/ያገባ 2/ያላገባ 3/የተፋታ 4/የሞተባት/በት/

II/ ቅድመ ቀዶ ጥገና መጠይቅ

6/ የቀይ ደምህዋስ መጠን በመቶኛ-----

7/በደም ውስጥ የክሪያቲኒን መጠን-----

8/ቀዶ ህክምናው የሚያስፈልግበት የምርመራ ውጤት-----

19/ የቀዶ ጥገናው አይነት-----

10/ለስንተኛ ጊዜ ነው ቀዶ ጥገና የተደረገው? 1/ለመጀመሪያጊዜ 2/ድጋሜ

11/ተጓዳኝ በሽታ አለ? 1አወ 2/የለም--- ካለ ይጠቀስ-----

12/ለምን ያክል ጊዜ ክትትል ነበረዎት?-----

III/በቀዶ ጥገናው ወቅት የሚወሰድ መጠይቅ

13/ ቀዶ ጥገና ሀኪሙ 1/ኢትዮጵያዊ 2/የውጭዜጋ

14/ ልብን እና ሳንባን በሚተካማሽን ላይ ለምን ያክል ጊዜ ቆየ?

15/ለምን ያክልጊዜ ወደልብ የሚወስደው የደምዘውውር ተቋርጧል?

16/የልብን ምት ለማቆም የተጠቀምንበት መድሀኒት ምንድንነው?

1/ዴልኒዶ

2/ሴንት-ቶማስ

3/ሌላ

17/የልብን ምት ለማቆም የተጠቀምነውን መድሀኒት የሰጠንበት መንገድ(ሩት)

1/በቀጥታ

2/በተዘዋዋሪ

3/በሁሉም

18/ቀዶ ጥገናው የወሰደው ጊዜ-----

19/በቀዶ ጥገናው ሰዓት ደም አስፈልጎ ነበር?

20/በቀዶ ጥገናው ሰዓት ያጋጠመ ችግር 1/አወ 2/የለም ካለይጠቀስ -----

IV/ ከቀዶ ጥገና በኋላ የሚወሰድ መጠይቅ

21/ ከቀዶጥገና በኋላ ለስጦታ ነበር? 1/አወ 2/የለም

22/ከቀዶጥገና በኋላ የሰውነት መንቀጥቀጥ 1/አወ 2/የለም

23/ከቀዶጥገና በኋላ ወደ ልብ ጠንቻዎች የሚገባ ደም ተቋርጧል(ኤምኤይ)

1/አወ

2/የለም

24/ከቀዶ ጥገና በኋላ አጣዳፊ የኩላሊት ችግር ነበር?

1/አወ

2/የለም

25/ ከቀዶጥገና በኋላ የክሪያቲኒን መጠን በደም ውስጥ ስንት ነው?-----

26/ ከቀዶ ጥገና በኋላ የቀይ የደም ህዋስ መጠን በመቶኛ ስንት ነው?-----

27/ከቀዶ ጥገና በኋላ የመተንፈሻ መርጃ ማሽን ላይ ለምን ያክልጊዜ ቆዩ?-----

28/ ከቀዶ ጥገና በኋላ የደም መፍሰስ 1/አወ 2/የለም

ከሆነ ደም ወስደዋል (አልወሰዱም)

29/ከቀዶ ጥገና በኋላ እንደገና ቀዶ ጥገና ነበር? 1/አወ 2/የለም

30/የመተንፈሻ ማሽን ከወጣ በኋላ በድጋሜ ተደርጎ ነበር? 1/አወ 2/የለም

31/ ሞት 1/አወ 2/የለም

V/የስልክ መጠይቅ

32/ቀዶ ጥገና የተደረገለት ታካሚ አሁንም ሁኔታ

1/ተሻሎታል ከበፊቱ

2/አልተሻለውም ከበፊቱ

3/ሞት

4ሌላ ካለ ይጠቀስ -----