

**ADDIS ABABA UNIVERSITY SCHOOL OF MEDICINE**  
**DEPARTMENT OF EMERGENCY MEDICINE**



**CLINICAL PROFILE OF PATIENTS PRESENTED WITH CARDIOGENIC SHOCK IN BLACK LION SPECIALIZED HOSPITAL ADULT EMERGENCY ROOM.**

**A RESEARCH THESIS TO BE SUBMITTED TO COLLEGE OF HEALTH SCIENCES, EMERGENCY DEPARTMENT, ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIRMENTS FOR SPECIALITY IN EMERGENCY MEDICINE AND CRITICAL CARE**

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## **Acronym's and abbreviations**

<b>ACS</b>	acute coronary syndrome
<b>AR</b>	aortic regurgitation
<b>CAD</b>	coronary arterial disease
<b>CCU</b>	cardiac care unit
<b>CHF</b>	congestive heart failure
<b>CI</b>	cardiac index
<b>ECG</b>	electrocardiogram
<b>ECMO</b>	extra corporeal membrane oxygenation
<b>EMCC</b>	emergency medicine and critical care
<b>ER</b>	emergency room
<b>GFR</b>	glomerular filtration rate
<b>ICCU</b>	intensive cardiac care unit
<b>MI</b>	myocardial infarction
<b>NSTEMI</b>	non st –elevation myocardial infarction
<b>PCWP</b>	pulmonary capillary wedge pressure
<b>PCI</b>	percutaneous coronary intervention
<b>SBP</b>	systolic blood pressure
<b>STEMI</b>	st- segment elevation myocardial infarction
<b>TASH</b>	Tikur Anbessa specialized hospital
<b>UOP</b>	Urine out put
<b>VSD</b>	ventricular septa defect
<b>VHD</b>	valvular heart disease

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## Abstract

**Background:** Cardiogenic shock is defined as a state of ineffective cardiac output caused by primarily cardiac disorder resulting in inadequate tissue hypo perfusion. Cardiogenic shock is one of the contemporary emergency room and cardiology challenges. The mortality rate is 39 % with range of 27-50%.It is also the leading cause of mortality in patents with myocardial infarction.

**Objective:** The main objective of the study was to determine the clinical characteristics of cardiogenic shock patients in Black line specialized hospital adult emergency room.

**Methods:** This study was conducted in Black lion specialized hospital located in Addis Ababa, Ethiopia. A cross-sectional study was conducted retrospectively on patients who visited Black Lion hospital adult emergency room from June 2019 to June 2021. All patients who were diagnosed to have cardiogenic shock on the mentioned study period were included .Data was collected from patients card by the researcher after structured questioner which was be adopted and modified from previous researches . After checking for clarity and completeness the data was entered in to SPSS version 26 for analysis.

**RESULT;** In this monocentric study which from 98 patients who were enrolled retrospectively 84 patients full fill the inclusion criteria. Out of them patients 39 (46 %) were male. The mean age of the patients was 40.2 years with 19.1 standard deviation. Regarding the residency 67.9% were from urban area. At admission the mean systolic blood pressure of the patients was 59.23 mmHg with standard deviation of 34. The mean heart rate of the patients was 111 beats per minute with 37 standard deviation. Ejection fraction of the patients was depressed with mean EF of 39.9% with 14.4 standard deviation. . Valvular heart disease was the most common underlying etiology accounting for 47.6% or 40 of the patients, followed by ischemic heart disease which accounts for 26.51 % of the cases .In hospital mortality was 38.1 %. Presence of deranged creatinine level was associated with death with p-value of 0.031 and 3.256 adjusted odds ratio [1.116-9.505] 95% confidence interval. Ischemic heart disease was also having association with death with p value of 0.004 and adjusted odds ratio of 7.184 with [1.874-27.543] 95 % confidence interval.

**CONCLUSION:** In this study the most common underlying etiology for cardiogenic shock was chronic rheumatic valvular heart disease .The other finding was the etiology ischemic heart disease and presence of deranged creatinine level were highly associated with in hospital mortality.

# 1. INTRODUCTION

## 1.1 BACKGROUND

Cardiogenic shock is a state of acute cardiac instability which may result from disorders that impair function of the myocardium, valves, conduction system, or pericardium, either in isolation or in combination. (1) Cardiogenic shock is defined as a state of ineffective cardiac output caused by a primary cardiac disorder results in both clinical and biochemical manifestations of inadequate tissue perfusion. The clinical presentation is typically characterized by persistent hypotension unresponsive to volume replacement and is accompanied by clinical features of end organ requiring intervention with pharmacological or mechanical support. (2)

Objective criteria for cardiogenic shock include systolic blood pressure  $<90$  mmHg for  $>30$  minute or need for catecholamine support to maintain systolic blood pressure  $>90$  mmHg and end organ hypo perfusion (urine output  $<30$  ml/h or cool extremities or lactate  $>2.0$  mmol/L). The other parameter is the hemodynamic criteria, which is cardiac index of  $\leq 2.2$  L/min /m<sup>2</sup> and pulmonary capillary wedge pressure of  $\geq 15$  mmHg. (3).

Cardiogenic shock is the leading cause of death in acute myocardial infarction, with 50 % mortality rate in this setting. And the overall mortality rate for patients with cardiogenic shock is 39 %, with range of 27-50%. The overall incidence of cardiogenic shock has been higher in men than in women. Median age for cardiogenic shock is 65-66. (4)

Patients commonly present with shortness of breath, chest pain, or weakness. History should include preexisting valvular disease, congestive heart failure, reduced ejection fraction, recent illness, hypercoagulable state, substance abuse, and other risk factor. About 10% of cardiogenic shock after MI is caused by mechanical complication. Patients may also have acute mitral regurgitation, murmur of VSD, or murmur of aortic regurgitation may be found. (5)

Cardiogenic shock is a clinical diagnosis and no investigation should delay emergent management. ECG should be ordered within 10 min of presentation looking for acute coronary syndrome. On radiograph findings most patients will have pulmonary congestion, but absence of pulmonary congestion might not rule out cardiogenic shock. And routine initial investigation CBC, electrolyte, other metabolic panels

should be obtained every 12 to 24 hours .Troponins are typically checked every 6 hours starting from initial clinical suspicion .In cardiogenic shock raised levels of NT-proBNP are associate with increased mortality. Lactic acid level can also be associated with increased mortality, and should be followed to assess response to initial resuscitation'. Echocardiography may be beneficial especially if clinical there is concern for an MI related mechanical complication precipitating cardiogenic shock. (5, 6)

Initial emergency room treatment start from airway stability and improving myocardial pump function to maintain and definitive care. Correct any hypoxemia hypervolemia, rhythm disturbances electrolyte and acid-base disturbance. Give initial crystalloid bolus (250 to 500 ml repeat) if no improvement with the fluid bolus or and if there is pulmonary congestion use vasopressors or inotropes. Norepinephrine is the mainstay of initial pharmacological treatment. Dobutamine is better if the blood pressure is >90mmhg.Definitive management include early revascularization in ischemic heart disease related cardiogenic shock .Revascularization by per cutaneous intervention or coronary artery bypass grafting is the treatment of choice. Thrombolytic , intra-aortic balloon pump ,ventricular assist devices and ECMO are included in the treatment .(6, 7)

## **1.2 STATEMENT OF PROBLEM**

Cardiogenic shock remains a major challenge in current emergency and cardiology departments. Data regarding cardiogenic shock etiologies and their prognosis are limited ,and are from developed countries .Even in the developing countries where most of the definitive managements are available ,cardiogenic shock remain main challenge to contemporary cardiology with over all global mortality of 39 % .Cardiogenic shock is the leading cause of death in acute MI with mortality rate of 50% .In the absence of aggressive ,management mortality among cardiogenic shock patients are very high ,and can reach up to 70 -90%.(1, 8, 9)

## **1.3 .SIGNIFICANCE OF THE STUDY**

There is very limited data on the clinical characteristics and outcome of cardiogenic shock patients in Ethiopia, even though cardiogenic shock is encountered as one of the commonest emergency room

presentations. And most of the studies about cardiogenic shock are from developed countries with the most common etiology being acute coronary syndrome.

Since Black lion is the main referral hospital which receive patients from all over the country this study gave some picture of the clinical characteristics and outcome of cardiogenic shock in Ethiopian and even in most of other developing countries.

And finally this research may be used as an important tool for the stake holders to change their insight to wards non communicable diseases in Ethiopia.

## 2 LITREATURE REVIEW

### 2.1 GLOBAL

A prospective multi-centric observational survey was done in metropolitan France which was done by Delmas et al, between April and October 2016. They included 772 patients and 52 centers and 71.5% of the patients were men, with the mean age of  $65.9 \pm 14.9$ . They included patients based on 3 criteria. The first one is low cardiac output which is systolic blood pressure of  $<90$  mmHg or cardiac index  $<2.2$  l/min/m<sup>2</sup>. The other parameter was left and /or right sided fluid over load which is was assessed by clinical, radiologic, lab and echo evidences. And the last parameter was organ hypo perfusion which is manifested by urine output  $<0.5$  ml/kg/hr. Cold clammy skin, and lactate level  $> 2$  mmol/l and liver or renal insufficiency were also included. And for the diagnosis at least 1 criteria should be fulfilled. According to this paper 29.8% of the patients were having ischemic causes, and 14.3 % have dilated cardiomyopathy, 8.4% were valvular heart disease patients, 1.4 % have hypertrophic cardiomyopathies, 3.1 % were post hypertensive and the rest were grouped as other. The most common trigger identified was ischemic heart disease. These research included mostly older patients and was done in developed country so this might not tell the picture in developing countries like Ethiopia. But it was the largest multi-centric to date. They used cardiogenic shock definition which is available in a bed side. Regarding the disposition 70.2 % were managed in the intensive care cardiac unit and 29.8 were managed in the medical intensive care unit. (10)

Similar study was done in Japan by Yashusi Ueki et al, which was prospective multi-centric observational study between May 2012 and June 2016 and published on 2016 at circulation journal. Patients with systolic blood pressure  $<100$ mmhg, heart rate  $<60$  or  $>100$  beats per minute, and decrease in blood pressure from baseline by  $>30$  mmHg were included .The median age was 72.0 years and 65.9 % of the patients were men. And according to this study the main causes of shock was acute coronary syndrome accounting for 51 %, non-ischemic arrhythmia was the second most common cause accounting for 16.4 % the case , and aortic disease ranks the third most common which is 14.9 %. The 30 day mortality was 34.5%. They also analyzed the 30 day mortality predictor's .And according to this research consciousness

disturbance, estimated GFR and ischemic cause of shock predicted 30 day mortality with 1.15, 2.62 and 2.58 odds ratio respectively. In this study cardiogenic shock was not clearly defined and border were not made from other causes of shock.(11)

Bonelo et al, Did similar research in France Nord of Marseille hospital from January 2015 to January 2016 .It was prospective observational study which was published at cardiology research and practice in 2019. They included 152 patients with mean age  $71.9 \pm 12.7$  years and 73 % of them were male. Their definition and inclusion criteria for cardiogenic shock were consistent with European society of cardiology guideline. Up on admission the mean arterial pressure was  $62 \pm 11$  mmHg. All patients exhibited sign and symptom of peripheral hypo perfusion which is manifested by lactate level of  $4.3 \pm 3.5$  mmol/l. And according to them acute decompensated CHF was the most common etiology accounting 46.7 % of the cases. And ACS was the second most common etiology accounting or 34.8 % of the cardiogenic shock cases .Dilated cardiomyopathy was 3.92 % and valvular heart disease accounts for only 1.3 % of the cardiogenic shock cases. The survival rate was 60.5 % at first month and 46.7 % at 6 month .Dobutamine was used in almost all of the patients that is 90.8 % . Norepinephrine was used in 52.6 % and epinephrine was used less frequently that is 27 % .The mean duration of catecholamine use was  $7.8 \pm 6.8$  days. And patients stayed in the hospital  $18 \pm 15.4$  days.(11) This research was done in secondary hospital without surgical backups so this might represent most of our hospitals. But the patients enrolled in this research were old unlike our patients .(12)

Horjola et al, conducted another study which is multicenter multinational observational study, conducted between Oct 2010 to dec2013 published at European journal of heart failure on May 2015.The inclusion criteria was systolic blood pressure  $<90$  mmHg for 30 min despite fluid resuscitation, need of vasopressor to maintain the SBP above 90mmHg. Signs of hypo perfusion and lactate level  $>2$  mmol/l .They include 219 patients with mean age of 67 years and 74% of them were men. The main comorbidities identified were hypertension 60%,coronary arterial disease 35 % , DM 26 ,previous myocardial infarction 25% and heart failure 16%.According to this study the most common etiology was ACS which accounts for 81 %.The majority of the ACS were STEMI which is 68 % of 148 patients. And non- ischemic

cause include chronic heart failure 11% , valvular heart disease 6% and stress induced cardiomyopathy and myocarditis accounts 2% each .in hospital mortality was 37%.(13)

Another study which was done on AMI patients complicating by cardiogenic shock done by Hashmi et al, at ahudry perviz elahi institute of cardiology found in Pakistan from January 2014 to Dec 2017 .It included 351 patients with mean age of  $65.41 \pm 7.78$  years and 70.1% of them were male. And among them 143 were diabetic, 231 were having HTN, 137 of them were obese. According to this study the in hospital mortality was 44.7%. and age was the major contributor for mortality that age greater than 75 was associated with higher risk of mortality.(7)

## **2.2 AFRICAN SETTING**

In retrospective, mono-centric study which was done in Tunisia, entitled clinical predicting factors of in hospital mortality in cardiogenic shock complicating aSTEMI by Ayoub Belfekih et al, they include 267 patients from the MRIAMI registry between 1995 and 2016. And according to this study the incidence of cardiogenic shock was 15%. Men accounted for 77.9 % of the study unit. The mean age of the patients was  $64.18 \pm 12.5$  years. Anterior wall MI was the most common form of MI resulting in cardiogenic shock which was 53.2 %. Half of the patients had multi -vessel disease left anterior descending artery was the culprit artery in 48.3 % of cases. In hospital mortality predicting factors were age >60 years ( $p=0.019$ ), diabetes ( $p=0.03$ ), hypertension ( $p<0.01$ ), left ventricular ejection fraction <30 % ( $p= 0.002$ ). Anemia, renal failure, and use of mechanical ventilator are also included in the predicting factors. This study was very descriptive African study regarding MI complicated with cardiogenic shock .Although it doesn't describe other cause of cardiogenic shock it may give as some picture of cardiogenic shock in Africa. (16)

## 2.3 ETHIOPIAN SETTING

. According to research done at Black lion emergency department by Tsegalem Hailemariam and et al, which was published in June 2014 cardiovascular emergencies account for 11% of cardiovascular emergencies .Valvular heart disease account for 54 % of the cases, and 26 % were due to hypertension ,15% were ischemic heart disease.(15)

Another research was also done in Ayder hospital from Aug. 2013 to July 2013 on treatment outcome of patients admitted to Ayder hospital among patients with AMI by Desta et al, which was published on 13-2-2020 at plos one. In this study 151 patients were included and 29.8 % of the patients were complicated by cardiogenic shock.(14)

And another shock study was done on outcome of all kind of shock patients in Black lion medical ICU by Neelima Navuri et al, on 2016. In this study average age of the patients was 39 years a 65% of them were female. Of those 66.3 % of them presented with cardiogenic shock. Rheumatic heart disease which accounts for 49%, was the most common cause of cardiogenic shock.

### **3. OBJECTIVE**

#### **3.1 GENERAL OBJECTIVE**

- To determine clinical characteristics and outcome of cardiogenic shock patients admitted in TASH from June 2020 to June 2021.

#### **3.2 SPECIFIC OBJECTIVE**

- To determine etiologies of cardiogenic shock in emergency department of TASH in AAU
- To determine prognostic factors for mortality in patients with cardiogenic shock in TASH adult ER
- To determine outcome of cardiogenic shock in TASH adult ER

## **4. METHODOLOGY**

### **4.1 STUDY SETTING**

The study was conducted in Addis Ababa Ethiopia which is the capital city and largest city with population size of 4794000 in 2020. It is a city where the African union is head quartered, and also UN economic commission of Africa is located. It is therefore referred to as 'political capital of Africa. Tikur Anbessa hospital (TASH) is located in Addis Ababa and is one of the largest tertiary hospital in Ethiopia opened in 1972. It serves as the main referral hospital in the country serving for more than 110 million people. It was the first hospital serving as a teaching hospital for medical doctors. Currently it is the main specialty and subspecialty teaching hospital. TASH emergency department was established in October 2010. Emergency medicine and critical care department was started in TASH 10 years back.

### **4.2 POPULATION SAMPLING**

#### **4.2.1 SOURCE POPULATION**

- All patients who visited Black lion specialized hospital emergency room from June 2019 to June 2021.

#### **4.2.1 STUDY UNIT**

- All patients who visited Black lion specialized hospital emergency room and diagnosed to have cardiogenic shock from June 2019-June 2021.

## 4.3 ELIGIBILITY

### 4.3.1 INCLUSION CRITERIA

- .All cardiogenic shock patients admitted to TASH adult emergency room from June 2019 to June 2021.

### 4.3.2 EXCLUSION CRITERIA

- Cardiogenic shock patients less than 13 years of age
- Patient charts with incomplete records and missing cards

## 4.5 SAMPLE SIZE DETERMINATION

For sample size determination we use the single population formula. Since there were no data regarding prevalence of cardiogenic shock, we have used the infinite number of population. The incidence will be 50 %, level of confidence will be 95 %, margin of error 5%

And  $n = \frac{[z]^2 \times p(1-p)}{d^2}$

$d^2$

Where

$n$  = minimum sample size for a statistically significant survey

$z$  = normal deviant at apportion of 95 % confidence interval

$p$  = prevalence and taken as 50 %

$q = 1-p$

$d$  = margin of error

With this formula n (sample size) will be 384

And we used the correction formula for total shock population and the final sample size was 200.

In the study period we get 84 patients so we preferred the non-probability sampling, and we included every patient with the diagnosis of cardiogenic shock in the study period.

## **4.6 VARIABLES OF THE STUDY**

### **4.6.1 Dependent variables**

- ✓ Outcome of the patient with cardiogenic shock
  - Dead
  - Improved

### **4.6.2 Independent variables**

- ✓ Socio demographic characteristics
- ✓ Cause of cardiogenic shock
- ✓ Comorbidities
- ✓ Initial clinical status of the patient ( SBP ,UOP)
- ✓ Diagnostic modalities ECHO ,ECG ,RFT, cardiac biomarkers
- ✓ Treatment given : fluid ,vasopressor ,
- ✓ Disposition

## **4.7 OPERATIONAL TERMS**

- ✓ Shock =refers to SBP <90 mmHg
- ✓ Low urine output = UOP < 0.5 ml /kg/min
- ✓ Slow capillary refill = capillary refill slower than 3 sec
- ✓ Adult =age > 13
- ✓ Myocardial infarction=Acute coronary syndrome with elevated cardiac biomarkers
- ✓ STEMI=MI with ECG changes that fulfill STEMI
- ✓ NSTEMI= MI that doesn't fulfill the STEMI criteria

## **4.8 DATA COLLECTION TECHNIQUE AND PROCEDURE**

### **4.8.1 DATA COLLECTION TOOLS**

Pretested Structured checklist was prepared after it was adopted from previous studies with few adjustments. It was prepared in English language. The checklist include demographic character such as sex, age, residences, the clinical status, underlying etiologies, treatment given and outcome.

### **4.8.2 DATA COLLECTION PROCEDURE**

After getting permission from the responsible authorities, the chart numbers of Cardiogenic shock patients was collected from registries in the ED registry book. After getting the charts the questioner check list were filled by the investigator and experienced clinical nurse who were hired for this purpose. And the predetermined amount of charts with Cardiogenic Shock were enrolled.

### **4.8.3 DATA QUALITY MANAGEMENT**

Non probability sampling procedure were used for the sampling of the patients. Checklist were filled by an experienced or trained data collector whose background is health professional. Prior to data collection the health professionals were trained on the data collection on the method, importance and confidentiality. The checklist were pretested in 5 % of the sample size and were modified according to the outcome. After checking for completeness and clarity by the supervisor for completeness the data were entered to SPSS version 26 for statistical analysis.

### **4.8.4 DATA ANALYSIS**

A Continuous variables such as age, vital sign, and ejection fraction were summarized using medians, modes, standard deviations. Categorical data like etiologies, ECG features, and echo were also described using frequencies, chi-square and correlation coefficient. Independent and dependent variable with significant correlation coefficient of  $<0.25$  were eligible for the binary logistic regression analysis. Independent variables which had correlation with the outcome were analyzed using binary logistic regression model.

Sub group analysis was also done after stratifying them as ischemic vs non-ischemic. The other subgroup analysis was done on patients with double pressor compared to single pressor.

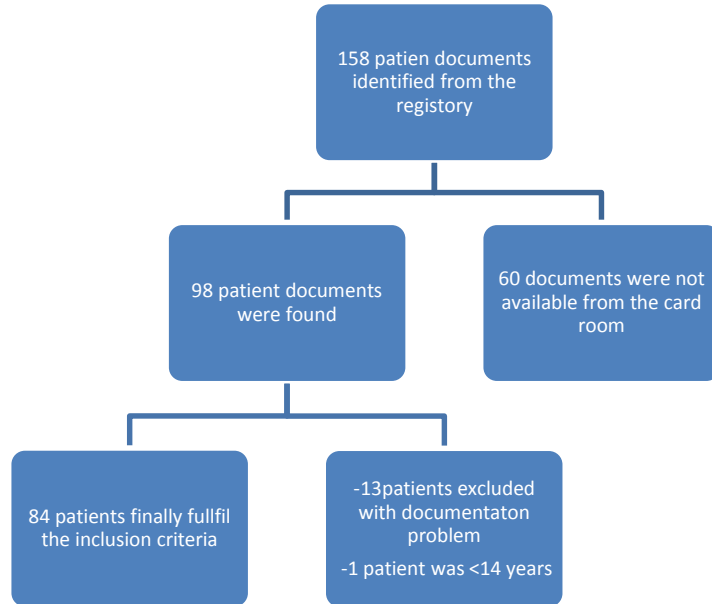
And p-value of 5% were consider as statically significant. The binary logistic regression results were described with odds ratio and adjusted odds ratio after adjusting for the cofounders.

#### **4.9 RESULT DISSEMINATION PLAN**

The study result was submitted to Emergency Medicine Department of Addis Ababa University. And it will be submitted to cardiology department and, FMOH subsequently, in hard and soft copy. It may also be presented on meetings and conferences. Finally will be submitted to national and international journal publication sites for possible publication.

#### **4.10 ETHICAL CONSIDERATION**

After submission of this research proposal to Addis Ababa university emergency medicine department it was revised by Ethics Review Committee of emergency medicine department and other responsible bodies for ethical approval. And after revision permission was granted. Data collection process were started then after. Since, the card includes the name of the patients confidentiality were maintained by using the card identification number only for the data entry.



**Figure 1 excluded patients**

## 5 .RESULT

### 5.1 Baseline clinical characteristics

In this cross-sectional monocentric study which was held at Tikur Anbessa specialized hospital 98 patients were included retrospectively from June 2019 to June 2021. Among 98 patients enrolled 14 patient cards were excluded, and 84 patients fulfilled the inclusion criteria. The exclusion process is described in figure 1.

Out of 84 patients 39 or 46 % were male. The mean age of the patients was 40.2 years with 19.1 standard deviation. The residency data showed that 67.9% were from urban area. And 45 or 53.6 % of them were from Addis Ababa and 24 or 28.6 % of them were from Oromia.

At admission the mean systolic blood pressure of the patients was 59.23 mmHg  $\pm$  34 standard deviation. The mean heart rate of the patients was 111 bpm with 37 standard deviation. Ejection fraction of the patients was depressed, that their mean ejection fraction was 39.9 % with 14.4 standard deviation. Regarding comorbidities 56% of the patients had comorbidities that 14 of them had previous HTN and 7 were Diabetic patients. The detailed baseline characteristics of the patients is presented in table 1.

Table 1

Baseline clinical characteristics		Pvalue
Age	Mean $\pm$ sd = 40 $\pm$ 19years Median= 37 years	0.102
Male	n =39 (40%)	0.88
SBP	Mean $\pm$ sd=59.23 $\pm$ 34.5mmHg Median = 70 mmHg	0.479
DBP	Mean $\pm$ sd= 34.1 $\pm$ 20 mmHg Median=40 mmHg	0.741
Heart rate	Mean $\pm$ sd=111 $\pm$ 37 bpm Median =110bpm	0.418
Spo2	Mean $\pm$ sd =86 $\pm$ 14 % Median=92 %	0.955
RR	Mean $\pm$ sd = 29.1 $\pm$ 7bpm Median = 28	0.316
LVEF	Mean $\pm$ sd =39.96 $\pm$ 14.2 % Median = 40 %	0.543

Table 1 baseline clinical character of the patients

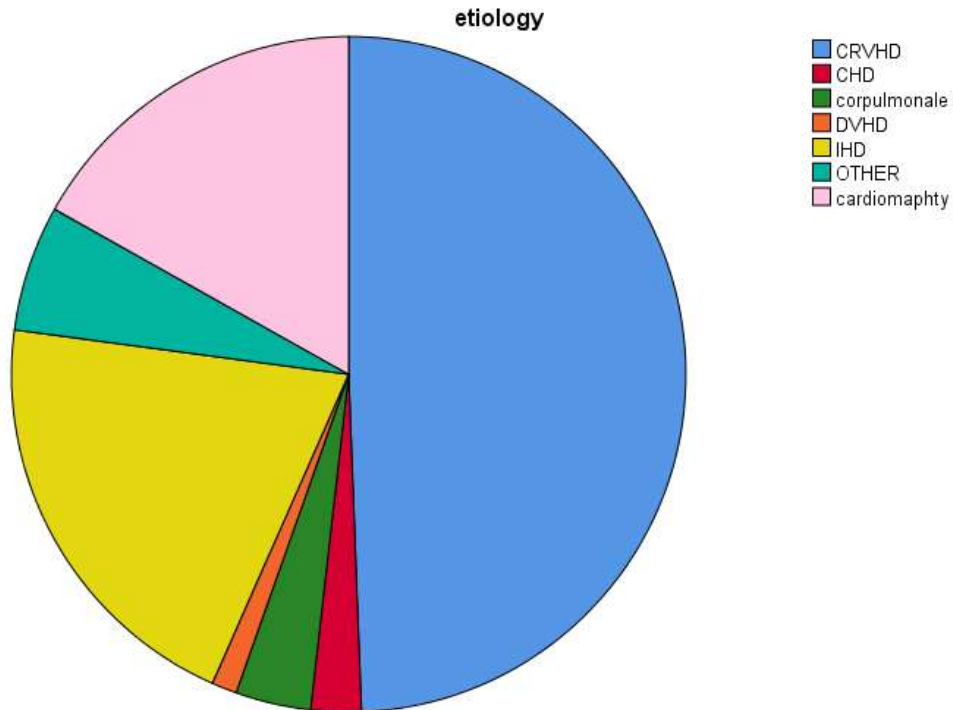
**Table 2 ECG, echo and chest x-ray findings**

<b>ECG features</b>		Frequency (n=)	Percentage
	Sinus tachycardia	31	36.9 %
	STEMI	15	17.9%
	Atrial fibrillation	14	16.7%
	Bradycardia	1	1.2%
	Ventricular tachycardia	3	3.6%
	SVT	4	4.8%
	Normal	11	13%
<b>Echo feature</b>			
	Normal	4	4.8%
	Valvular heart disease	40	47.6%
	Degenerative valvular heart disease	4	4.8%
	Hypertensive heart disease	3	3.6%
	Ischemic heart disease	15	17.9%
	PERICARDIAL EFFUSION	1	1.2%
	Pulmonary hypertension	5	6%
	Other	2	2.4%
<b>Chest x –ray feature</b>			
	Dilated cardiac chamber	9	10.7%
	Pulmonary edema	18	21.4%
	Pneumonia	8	9.5%
	Pneumonia & pulmonary edema	15	17.9%
	Pleural effusion	5	6.8%
	Dilated chamber & pulmonary edema	7	8.3%
	Normal	14	16.7%

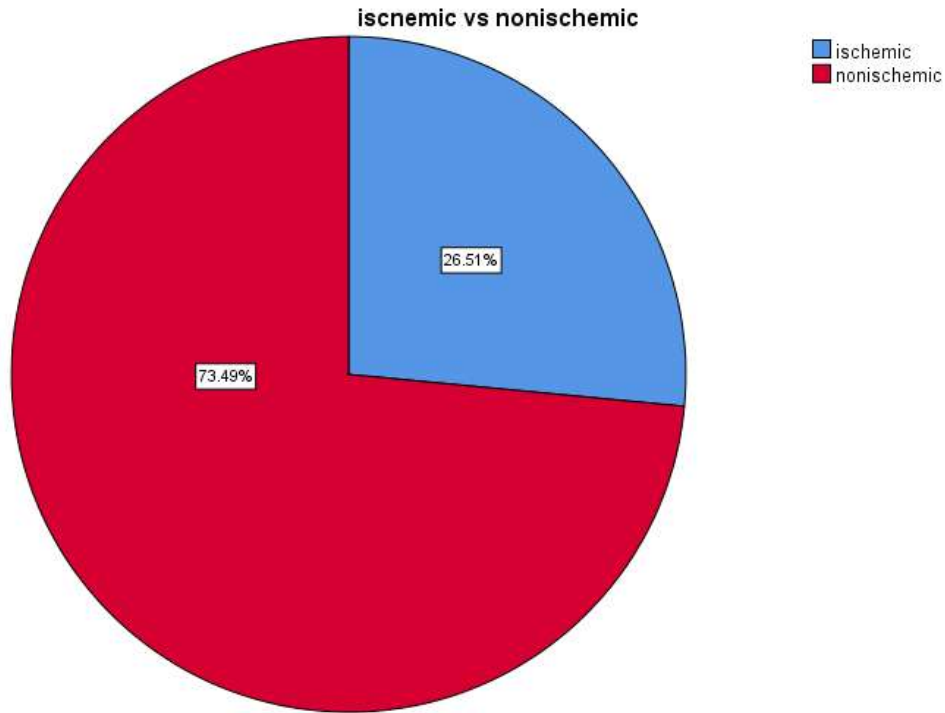
Sinus tachycardia was the most common ECG features in which 31 patients were having it. And it was followed by atrial fibrillation which was found in 18 of the patients .pulmonary edema was the most common chest x-ray finding.

## 5.2 Etiologies

In this study valvular heart disease was the most common underlying etiology for cardiogenic shock accounting for 47.6% or 40 of the patients. Ischemic heart disease was the second most common which accounts for 26.51 % of the cases. Details of the etiology is described in figure 2 and 3.



**Figure 2 etiologies of cardiogenic shock**



**Figure 3 ischemic vs non ischemic**

## **5.3 management**

### **5.3.1 Disposition**

Regarding the disposition 36 patients were managed in the emergency room. 32 patients were managed in the cardiac care unit, and 7 patients were disposed to ward, and the rest of them were transferred to medical ICU.

### **5.3.2 Medication used**

Epinephrine was the most common vasopressor used in which 53% of the patients were on it. Noradrenaline was used in 45% of the patients. And 51 patients' required double pressor, norepinephrine and epinephrine being the most common combination .Details of vasopressor used is presented in table 2.

**Table 3 medication used**

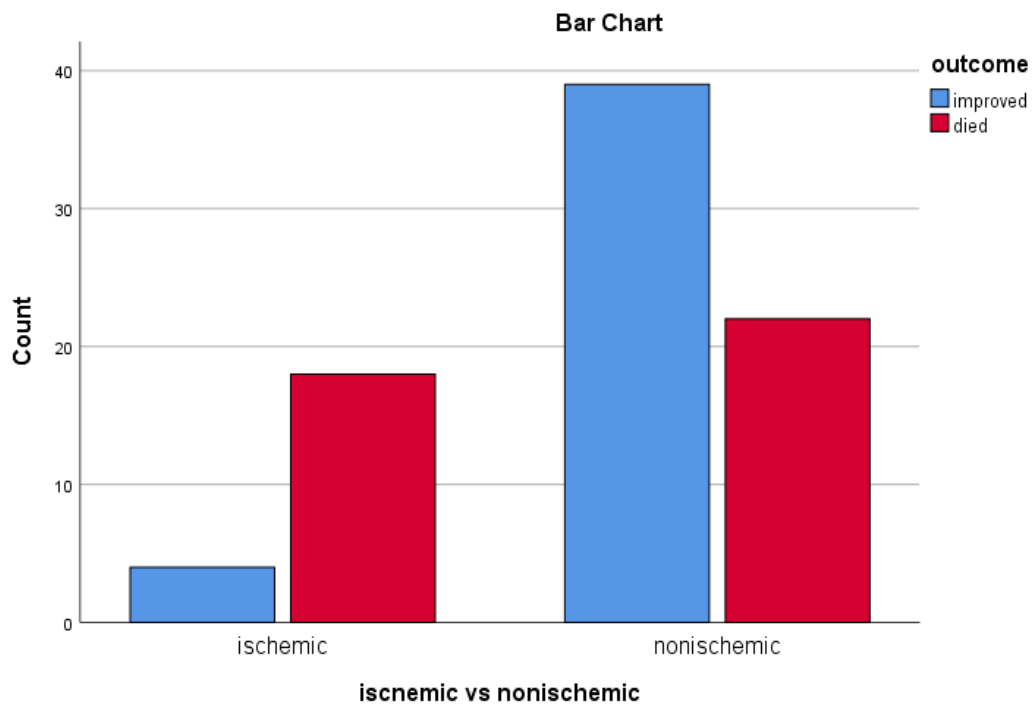
Medication	Frequency	Percent
Epinephrine	45	53.6%
Dopamine	10	11.9%
Norepinephrine	38	45.2%
Dobutamine	3	3.6%
Amiodarone	2	2.4%
Adenosine	4	4.8%
Digoxin	2	2.4%

#### **5.4 outcome**

In hospital mortality was 38.1 % .The result showed significant association with in hospital mortality in patients having deranged creatinine level and if the etiology was ischemic heart disease. presence of deranged creatinine level in which 1.2mg/dl was taken as normal, was associated with death with p-value of 0.031 and adjusted odds ratio of 3.256 with [1.116-9.505] 95% confidence interval .Ischemic heart disease was also having association with death with p value of 0.004 and adjusted odds ratio of 7.184 with [1.874-27.543] 95 % confidence interval .The detail is described in table 4.

**Table 4 binary logistic relation analysis result**

Independent variable	Crude odds ratio with 95%CI	p-value	Adjusted odds ratio	P - value
Age in years				
14-29		0.999		0.999
30-44	0.974(0.316-2.998)	0.963	0.803(0.21-3.022)	0.763
45-64	0.797(0.21-3)	0.586	0.797 (0.21-3.002)	0.739
≥65	4.773(0.826-27)	0,081	2.694(0.343-21.3)	0.346
Deranged creatinine level	2.803 (1.146-6.856)	0.024	<b>3.256 (1.116-9.505)</b>	<b>0.031</b>
Ischemic heart disease	7.97(2.39-26)	0.001	<b>7.184 (1.874-27.543)</b>	<b>0.004</b>
Systolic BP	0.999(0.977-1)	0.129	0.987 (0.966-1.008)	0.222
Male gender	0.258(0.109-1.448)	0.351	2.044(0.668-6.809)	0.214
Residency	0.563(0.218-0.642)	0.233	0.564(0.174-1.836)	0.342



**Figure 3 ischemic vs non-ischemic**

## 6. DISSCUSION

In this monocentric cross-sectional study the diagnosis of cardiogenic shock were made by clinical parameters that are available in the bed side. The aim of this study was to determine the clinical Characteristics and outcome of patients with cardiogenic shock. And the specific objective was to identify the etiologies, prognostic factors for mortality, and determine outcome.

The result suggest that most of the patients were relatively younger age as compared to previous studies on cardiogenic shock. And the most common etiology was acute decompensated heart failure secondary to CRVHD .Renal function derangement and the etiology of ischemic heart disease were associated with the mortality.

The demographic characteristics of cardiogenic shock patients in this study may vary from most of the studies. For instance according to prospective multi-centric observational survey which was done in metropolitan France by Delmas et al, between April and October 2016 the mean age of the patients was  $65.9 \pm 14.9$  years. Similar study was done in japan by Yashusi ueki et al, which was prospective multi-centric observational study between May 2012 and June 2016.The median age was 72.0 yrs. (11) This showed that there study units were older than the study unit in this research. This can affect the etiologies and out come to be different. And this may be explained by the lower life span of study populations in this study. The other possible explanation is the wide prevalence of chronic rheumatic valvular heart disease resulting in acute decompensated left sided heart failure in the study population.

In this study most of the patients were females which was similar to a study conducted by Tsegalem Haile Mariam and et al, which was published in June 2014 on prevalence of cardiovascular emergencies. According to their study 55.6% cardiovascular emergency patients visiting black lion emergency room were females. But it was different from most of the studies published in developed countries that most of the patients were male. This may be due to the fact that women have low awareness about prevention, treatment and follow up of cardiovascular diseases due to low socioeconomic status in our set up. (10)

The result also showed that the most common underlying etiology resulting in cardiogenic shock was non ischemic unlike most of the previous studies, in which cardiogenic shock was caused by ischemic heart disease. In this study the main etiology was acute decompensated heart failure

secondary to chronic rheumatic valvular heart disease, accounting for 48.81 % of the patients'. Acute coronary syndrome was the second most common etiology which accounts for 26.51% of the patients. This result was similar to research done by Bonelo et al a prospective observational study which was published in by cardiology research and practice in 2019. According to this study decompensated CHF was the most common etiology accounting 46.7 % of the cases. And ACS was the second most common etiology accounting or 34.8 % of the cardiogenic shock cases. But it was different from most of the studies conducted that the most common etiology for cardiogenic shock was ACS. And this may be explained by the relative younger age of study unit. And also the wide spread prevalence of CRVHD of the study population.

This study also identified that patients who developed cardiogenic shock secondary to myocardial infarction have very high mortality rate, that it was 81 %. And almost all of them didn't get the definitive treatment like early reperfusion therapy and thrombolytic. This can be explained by the fact that all of the patients didn't receive definitive management options like PCI. The main stay of management was only vasopressors, and the other routine MI management. In one study which was done in Pakistan on acute myocardial infarction patients complicated by cardiogenic shock by Hashmi et al, from January 2014 to Dec 2017 that included 351 patients, the in hospital mortality was 44.7%. This result is low as compared to findings in our study. (8)

Deranged creatinine level and the etiology ischemic heart disease were the identified predictors for in hospital mortality with p-value of 0.031 and 0.004, and adjusted odds ratio of 3.256 and 7.184 respectively. This result was the same with a result which was published in the Japanese CVS registry that was mentioned before that estimated GFR decrease of 10ml/min/1.73 m<sup>2</sup> was one of the predictors of mortality with p value of < 0.001 and adjusted odds ratio of 1.2 with (1.1-1.3) 95 % confidence interval. Decreased systolic blood pressure by 10mmhg, change in mentation, out of hospital cardiac arrest were the other mentioned associated predictors. (11)

Out of 84 patients who were enrolled in this study 36 of them were managed in the ED and only 32 of the patients were disposed to cardiac care unit (CCU) which will be the best place to manage patients of such a kind. And most of the deaths were entertained in the ED without appropriate disposition. And actually after disposition to the CCU almost all of the patients didn't get the definitive treatment modalities, and the main stay of modalities were vasopressors and inotropes. This is possibly is due to availability of small number of beds in CCU.

Regarding vasopressor use adrenaline was the most common single vasopressor, though it is currently not recommended as the first line pressor of choice. And 53% of the patients were on double pressor. The most common vasopressor combination was norepinephrine and epinephrine. But the choice of vasopressor didn't show association with the outcome which is death. Sub group analysis were also done after stratifying patients taking double pressor and single pressor, but it doesn't show significant association. In one prospective observational study which was done by Bonelo et al, in France Nord of Marseille hospital from January 2015 to January that included 152 patients, 90.8% of the patients used Dobutamine .Norepinephrine was used in 52.6 %, and epinephrine was used less frequently that it was 27%.The more frequent use of adrenaline rather than Dobutamine may be due to availability issue of Dobutamine i. And the other possible explanation is the relatively higher mean arterial pressure of the patients enrolled in the mentioned above research ,that it was 61mmHg.And in patients included in this study mean SBP was 59.1 mmHg which is relatively lower, which made the clinicians to choose vasopressors other than Dobutamine.(12)

During the analysis after doing chi-square test for the categorical independent variables and correlation coefficient for continuous variables binary logistic regression was done since the outcome was dichotomous. P- Value of 0.05 was taken as statistically significant for association. And the etiology ischemic heart disease and deranged creatinine were associated with the outcome which is death. And after that the crude odds ratio was adjusted for the cofounders like age, ischemic etiology, systolic BP, deranged creatinine, and gender.

## **6.1 LIMITATION**

The limitations starts from the nature of the study that it was retrospective. The other limitation was the clear cut definition of cardiogenic shock to differentiate it from other forms of shock. And missing cards were the other main obstacles. In the beginning of the study it was planned to analyze the length of stay, immediate cause of death and risk factors like smoking, socioeconomic status but, it was difficult to get them from the patient cards because of documentation problem.

## **6.2 CONCLUSION**

In this study the most common underlying etiology for cardiogenic shock was CRVHD .The other finding was that if the underlying etiology for cardiogenic shock is ischemic heart disease and if

they have deranged creatinine level it is highly associated with mortality. Regarding disposition most of the patients were not disposed from emergency room, that less than half of the patient were transferred to cardiac care unit. The most common vasopressor used was adrenaline. And the mortality rate of the patients was 38.1%.

## **6.2 RECOMMENDATION**

The other recommendation is for cardiology department, we might improve the outcome of cardiogenic shock patients secondary to IHD if definitive management options like PCI, coronary angiography were available.

And in patients having deranged creatinine level close follow up is needed.so it is recommended to follow such patients with close renal function monitoring.

And in the subsequent researches on cardiogenic shock it will be better if it is done in prospective manner, longer duration and involving multiple centers.

## 7. ANNEX

### 7.1 Reference

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## 7.2 Check list

### Section I: Socio-demographic Characteristics

Data collection date \_\_\_/\_\_\_/\_\_\_\_\_ Card No \_\_\_\_\_ Client ID: Age  
\_\_\_\_\_ (yrs) Address \_\_\_\_\_ (region)

Residency \_\_\_\_\_

-  1. Urban

-  2. Rural

Gender

-  0. Male

-  1. Female

### Section II: Clinical Characteristics at Admission

#### Vital signs at admission

Systolic blood pressure \_\_\_\_\_  
(mmHg)

Diastolic blood pressure \_\_\_\_\_ (mmHg)

Pulse rate \_\_\_\_\_ (bpm)

Respiration rate \_\_\_\_\_ (bpm)

Body temperature \_\_\_\_\_ (°C)

Oxygen saturation \_\_\_\_\_ (%)

Urine output \_\_\_\_\_ (mL/kg/hr)

#### Imaging studies

##### Chest X-ray finding

Normal

Cor pulmonale

Pleural effusion

Pneumonia

Pulmonary edema

Other

##### ECG finding

Normal

Acute coronary syndrome

Atrial fibrillation

Bradycardia

Sinus tachycardia

Ventricular fibrillation

Ventricular tachycardia

other

**ECHO finding**

- Normal
- valvular heart disease

- Degenerative heart disease
- other

- Ischemic heart disease
- Pericardial effusion
- Pulmonary hypertension / Cor pulmonale

- Left ventricular ejection fraction \_\_\_\_\_ (%)

**Laboratory values**

- Serum Na<sup>+</sup> \_\_\_\_\_ (mEq/L)
- Serum K<sup>+</sup> \_\_\_\_\_ (mEq/L)
- Hemoglobin \_\_\_\_\_ (g/dL)
- Serum creatinine \_\_\_\_\_ (mg/dL)

- Blood urea nitrogen \_\_\_\_\_ (mg/dL)
- Troponin  elevated  
 Normal

**Precipitating Factors at Admission**

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Acute coronary syndrome | <input type="checkbox"/> Beta blockers            | <input checked="" type="checkbox"/> Infective endocarditis |
| <input type="checkbox"/> Anemia                  | <input type="checkbox"/> Calcium channel blockers | <input type="checkbox"/> Pregnancy                         |
| <input type="checkbox"/> Arrhythmia              | <input type="checkbox"/> Drug discontinuation     | <input type="checkbox"/> Pulmonary thromboembolism         |
| <input type="checkbox"/> Atrial fibrillation     | <input type="checkbox"/> Infection                | <input type="checkbox"/> Uncontrolled hypertension         |
| <input type="checkbox"/> Drugs                   | <input type="checkbox"/> Pneumonia                |  |

**Etiology Underlying Clinical Diseases at Admission**

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Chronic rheumatic heart disease | <input type="checkbox"/> Degenerative valvular heart disease | <input type="checkbox"/> Hypertensive heart disease |
| <input type="checkbox"/> Congenital heart disease        | <input type="checkbox"/> Dilated cardiomyopathy              | <input type="checkbox"/> Ischemic heart disease     |
| <input type="checkbox"/> Cor pulmonale                   |  | <input type="checkbox"/> Others                     |

**Co-morbidity**

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Asthma                                | <input type="checkbox"/> Coronary artery disease | <input type="checkbox"/> Diabetes mellitus |
| <input type="checkbox"/> Cardiomyopathy                        | <input type="checkbox"/> Dyslipidemia            |  |
| <input type="checkbox"/> Cancer                                | <input type="checkbox"/> HIV/AIDS                |  |
| <input type="checkbox"/> Chronic kidney disease                | <input type="checkbox"/> Hypothyroidism          |  |
| <input type="checkbox"/> Chronic obstructive pulmonary disease | <input type="checkbox"/> Hyperthyroidism         |  |
| <input type="checkbox"/> Congenital heart disease              | <input type="checkbox"/> Hypertension            |  |

## **Outcomes**

- 1  Improved

- 2.  Died

Readmission

- 1.  Yes

- 2.  No

Length of hospital stay \_\_\_\_\_

Medications used

Epinephrine

Norepinephrine

Dobutamine  Adenosine  Amiodarone

Digoxin  Dopamine

Fluid bolus given

Yes

no

Disposition

ccu

icu

ward

Discharged from or died in the ED