



**COLLEGE OF HEALTH SCIENCES  
SCHOOL OF MEDICINE  
DEPARTMENT OF SURGERY  
CARDIOVASCULAR PERFUSION**

**CHARACTERISTIC, OUTCOME AND ASSOCIATED  
FACTORS OF COVID 19 CASES ADMITTED TO ICU AND  
MECHANICALLY VENTILATED AT EKA KOTEBE  
GENERAL HOSPITAL, ADDIS ABABA, ETHIOPIA**

**INVESTIGATOR: SEMIRA MEDED BEREDA**

A RESEARCH PROPOSAL SUBMITTED TO THE  
DEPARTMENT OF CARDIAC SURGERY, SCHOOL OF  
MEDICINE, COLLEGE OF HEALTH SCIENCES, ADDIS ABABA  
UNIVERSITY IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF MASTER IN  
CLINICAL CARDIOVASCULAR PERFUSION.

**ADDIS ABABA ETHIOPIA  
FEBRUARY, 2021**

**ADDIS ABABA UNIVERSITY  
COLLEGE OF HEALTH SCIENCE  
SURGERY DEPARTMENT  
CARDIOVASCULAR PERFUSION**

<b>Name of Investigator</b>	<b>SEMIRA MEDED (BSC, MSc science of cardiovascular perfusion student )</b>
<b>Name of advisor and Co advisor</b>	<b>Dr Birhanu Nega (Associate professor) Abdulnasir Abagero (MPH, Resident Advisor Field Epidemiology program)</b>
<b>Full title of the research project</b>	<b>Characteristic, outcome and associated factors of COVID 19 cases admitted to ICU and mechanically ventilated at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2020: Retrospective Cross sectional study</b>
<b>Duration of project</b>	<b>November 01, 2020 – January 20, 2021</b>
<b>Study area</b>	<b>Eka Kotebe General Hospital</b>
<b>Total cost of the project</b>	<b>28,903.00 Birr</b>
<b>Address of investigator</b>	<b>TEL: +251-913-234245 E-mail: semira245@gmail.com</b>

## **ACKNOWLEDGEMENT**

I would like to express my heartfelt gratitude to my advisors Dr Birhanu Nega and Abdulnasir Abagero who were abundantly helpful and supportive starting from the development of this proposal. I would also like to extend my appreciation to Addis Ababa University for giving me this opportunity.

## **ABBREVIATIONS/ACRONYMS**

COVID- 19 Corona Virus Diseases of 2019

AKI Acute Kidney Injury

AOD Adjusted Odd Ratio

ARDS Acute Respiratory Distress Syndrome

COR Crude Odd Ratio

COPD Chronic Obstructive Pulmonary Disease

CKD Chronic Kidney Disease

CVD Cardiovascular Disease

CRP C - reactive protein

DM Diabetes Mellitus

DVT Deep Vein Thrombosis

HTN Hypertension

ICU Intensive Care Unit

IMV Invasive Mechanical Ventilation

LoS Length of Stay

RRT Renal Replacement Therapy

SARS Severe Acute Respiratory Syndrome

SPSS Statistical Package for Social Sciences

W H O World Health Organization

CI Confidence Interval

MMR Morbidity and Mortality Report

SARS- COV-2 Severe Acute Respiratory Syndrome Corona Viruse-2

## TABLE OF CONTENTS

ACKNOWLEDGEMENT .....	iii
ABBREVIATIONS/ACRONYMS .....	iv
TABLE OF CONTENTS .....	1
List of table.....	3
List of Figures .....	3
Abstract .....	4
1. Introduction .....	1
1.1. Background.....	1
1.2 STATEMENT OF THE PROBLEM .....	2
1.3 Justification of the study.....	3
2. Literature review .....	4
3 CONCEPTUAL FRAMEWORK.....	7
4. Objective.....	8
4.1 General Objective.....	8
4.2 Specific Objective .....	8
5. Methods and Materials .....	9
5.1. Study Area.....	9
5.2. Study design and Study period .....	9
5.3. Source Population.....	9
5.4. Study population.....	9
5.5. Inclusion criteria and Exclusion criteria .....	9
5.5.1. Inclusion criteria .....	9
5.5.2. Exclusion criteria .....	9
5.6. Sample size and sampling procedure.....	10
5.6.1. Sample size .....	10
5.6.2 Sampling procedures.....	10
5.7. Data collection.....	10
5.7.1. Data source, Data collection tools, procedure and personnel.....	10
5.8. Study variable .....	11
5.8.1. Dependent Variable .....	11
5.8.2. Independent Variable .....	11
5.9. Operational Definition.....	11
5.10. Data processing and analysis.....	12
5.11. Data quality assurance .....	12
5.12. Ethical consideration .....	12
6. Dissemination of the study .....	13

7. Results .....	14
7.1. Demographic characteristics of study participants .....	14
7.2 Characteristics and co morbidities of study participants .....	14
7.3. Clinical interventions done in the ICU .....	15
7.4. ICU complications .....	16
7.5. Initial symptoms of study participants .....	16
7.6. Factors associated with 30 days mortality rate .....	17
8. Discussion .....	18
9. Reference .....	20
10. Annex .....	23
Annex 1: Questioner .....	23

## List of table

<b>Table 1:</b> Demographic characteristics of patients.....	14
<b>Table 2:</b> Clinical interventions done in the ICU.....	16
<b>Table 3:</b> ICU complications.....	17
<b>Table 4:</b> Initial symptom of patients.....	18
<b>Table 5:</b> Factors associated with 30 days mortality rate.....	19

## List of Figures

<b>Figure 1:</b> Conceptual framework for factors affecting outcomes of COVID 19 cases admitted to ICU and mechanically ventilated patients.....	7
<b>Figure 2:</b> Co morbidities of the study participant.....	15
<b>Figure 3:</b> Mode of mechanical ventilation.....	15

## **Abstract**

**Introduction:** As the COVID-19 pandemic is rapidly spreading throughout the world it has taken millions of lives. Among the population the critically ill and those who have other co morbidities are largely affected by it. In order to accommodate the growing number of critically ill patients and those who require mechanical ventilation hospitals are constantly expanding and trying to meet the overwhelming demand. Therefore, identifying COVID-19 characteristics, outcomes and associated factors among patients requiring mechanical ventilation is crucial for resource planning and proper management. This study is mainly aimed to assess the characteristic and outcome of COVID 19 cases admitted to ICU and mechanically ventilated patients.

**Objectives:** The objective of this study is to assess characteristic, outcome and associated factors of COVID 19 cases admitted to ICU and mechanically ventilated at Eka Kotebe General Hospital.

Study design: hospital based prospective cross sectional study design was used.

**Results:** a total of 179 patients were included in this study and the 30 days mortality rate was 59.2 %. 77.1 % of the patients had comorbidities. Male gender, history of Diabetes, CKD and uses of vasopressor and laxatives were associated with 30 days patient mortality.

**Recommendation:** We recommend that Male patients, patients diagnosed with Diabetes Miletus, CKD and who are receiving vasopressor therapy should be given a higher priority and carefully followed in the ICU to decrease the mortality rate.

# 1. Introduction

## 1.1. Background

The global pandemic of novel corona virus disease 2019 (COVID-19) caused by severe acute respiratory syndrome corona virus (SARS-CoV-2) began in Wuhan, China, in December 2019, and has since spread worldwide. The infection primarily targets the human respiratory system and is mainly transmitted by respiratory droplets and close contact with an infected person (1).

Patients with Severe COVID-19 are characterized by the presence of co morbidities with diabetes, hypertension, asthma, chronic obstructive pulmonary disease (COPD), chronic kidney disease and a range of heart diseases being among the most encountered co morbidities (2). Epidemiological studies have shown that 6 to 10% of patients develop a more severe form of COVID-19 and will require admission to the intensive care unit (ICU) due to acute hypoxemic respiratory failure. Most of these patients admitted to ICU, will finally require invasive mechanical ventilation (MV) due to diffuse lung injury and acute respiratory distress syndrome (ARDS) (3).

Although experience with COVID-19 continues to grow, reported mortality rates range from 50 to 97% in those requiring mechanical ventilation(2). According to the international report, as of October 26, 2020, total of 42,766,185 cases were identified with 32,001,668 recovered and total deaths of 1,152,635 globally, 25,481 in Africa, and 1494 in Ethiopia as of November 3, 2020. (4).

The challenge of COVID-19 is very high globally due to a lack of proven treatment and the complexity of its transmission. Scarce Intensive Care Unit, a limited number of mechanical ventilators and prevalence of co-morbidities/infection along with malnutrition will be more catastrophic for low and middle-income countries. (5)

## **1.2 STATEMENT OF THE PROBLEM**

The clinical spectrum of COVID-19 ranges from mild to severe, while 5% of all symptomatic patients with COVID-19 were classified as critical cases (i.e. severe respiratory failure requiring mechanical ventilation, shock, and/or multiple organ dysfunction), with mortality of 49% (6).

Studies conducted till today, in a non-African setup, show that the outcome of COVID-19 varies based on individual characteristics and ranging from uneventful recovery to respiratory complications requiring invasive mechanical ventilation (7). Five to twenty percent of hospitalized patients with severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection are admitted to the intensive care unit (ICU), with mortality reported between 26% and 61.5% (8).

There are studies relating to various aspects of severe COVID-19 and its ICU management. One systematic review that analyzed 28 studies conducted in different countries shows that ICU admission rate was 21% and 69% of the cases needed IMV. The review also showed that ICU and IMV mortality were 28.3% and 43% respectively (9). Whereas ICU mortality rate was found to be 41.6% in another review that analyzed 24 studies on Outcomes of COVID-19 patients admitted to ICU (10).

Major correlates with ICU mortality were found to be invasive mechanical ventilation acute kidney injury and acute respiratory distress syndrome in the above systematic review that analyzed 28 studies (9).

Given the differences in the age distribution of the population, ICU capacity, lower availability of diagnostic testing for the new virus, difficulties in the implementation of public measures to mitigate virus spread in highly populated cities and delayed access to health care burden of COVID-19 tends to be higher in low and middle income countries than in high income countries (11).

Although the number of incident cases, severity of the disease, and fatality rate in Ethiopia is lower than the rest of the world, it might not continue like this considering the countries overburdened health care system among other things (5). Therefore, in this study we aimed to assess clinical characteristic and outcomes of ICU and mechanically ventilated COVID-19 patients admitted to Eka Kotebe General Hospital COVID-19 Care Center in Ethiopia.

### **1.3 Justification of the study**

The severe acute respiratory syndrome corona virus and the disease it causes COVID-19 has become a global health threat. Increased infection rate of the corona virus pandemic and the associated increase in ICU admission and mechanically ventilated patients has become a global concern. Internationally, the rapid spread of covid-19 has taxed hospital system resources, resulting in a shortage of ventilators and other medical equipment in many countries (12).

The global rate of ICU admission, the prevalence of mortality, co morbidities, complication, number of cases demanding mechanical ventilator, length of stay and independent risk factors for ICU mortality are very important variables to be determined to reduce patient mortality and morbidity(5).

Although in Africa the number of confirmed cases and mortality rate is reported to be lower than other parts of the world, it still become an additional burden on the already strained health care system as well as the economic front in general. In a sampling of some of the larger epidemiologic studies of patients with COVID-19 to date, rates of invasive mechanical ventilation among patients admitted to ICUs range from 29.1% in one Chinese study to 89.9% in a U.S. study and anywhere from 2.3% of patients admitted to the hospital up to 33.1% (13).

Therefore, conducting such a research will increase quality of care, reduce rate of mortality and burden on the already strained health care system. It will also add to the number of data available on critically ill COVID 19 patents which are scarce but are of great importance in our country and as a whole in Africa.

## 2. Literature review

Since its inception, the Corona virus 2019 (COVID-19) pandemic has placed unprecedented strain on healthcare globally with intensive care unit (ICU) care and ventilator availability being focal points of health resource allocation and planning. (9)

A fast inflow of new admissions in the ICU has critical consequences within a short time. For example, between March 19 and April 2 2020 in France, the number of ICU beds occupied by COVID-19 infected persons dramatically increased from 1002 to 6305,3 corresponding to an average daily increase of 14 % additional beds (14).

The world is scrutinizing every cohort and every outcome for patients with COVID-19, particularly the most critically ill who are receiving mechanical ventilation (13). In a retrospective study that was conducted in New York in Characterization and clinical course of 1000 patients with Corona virus disease 2019 found that patients in hospital, particularly those treated in intensive care units, often had baseline co-morbidities including hypertension, diabetes, and obesity (12).

Study done in Seattle by Paval et al stated, Fourteen patients (58%) had diabetes mellitus and 5 (21%) had chronic kidney disease; 3 patients (14%) had asthma. Five patients (22%) were current or former smokers and 1 patient (4%) had chronic obstructive pulmonary disease; 8 patients (33%) had more than one coexisting condition (15).

Another study done in USA on Characteristics and Outcomes of 21 Critically ill Patients with COVID-19 found Co morbidities in 18 cases (86%), with chronic kidney disease and congestive heart failure being the most common (16). A study done in China by Zheng y et al on Clinical characteristics of 34 COVID-19 patients admitted to ICU, 24 (70.6%) patients had chronic diseases, including hypertension (64.7%), diabetes (23.5%), cardiovascular disease (11.8%), chronic obstructive pulmonary disease (5.9%), chronic liver disease (11.8%), and chronic kidney disease (5.9%) (17).

The role of sex in the severity of the disease or outcome is not clear yet but one study reported no difference in epidemiological characteristics with regard to sex and in another study, it was reported that sex might have an impact in the clinical presentation and prognosis showing worse prognosis among males (18).

A study done by Xie J et al in China on clinical characteristics and outcomes of critically ill COVID-19 patients, the median age was 65 years (IQR 56–73), and 477 (65.1%) were male (6).

Another study done in China by Xu Y et al on Clinical findings in critically ill patients infected with SARS-CoV-2, the mean age of the patients was 56.7 years (SD, 15.4); 29 (64.4%) were men. A total of 26 (57.8%) patients had at least one preexisting conditions, including hypertension (46.7%) and diabetes (28.9%) (19).

A study done in USA by Martin et al in a total of 85 patients on Characteristics and Outcomes of Mechanically Ventilated COVID-19 patients, deceased patients were more likely 60 years of age vs. younger (40.9% vs. 4.9% of these had died,  $p < 0.001$ ) (1).

An Observational cohort study done in the US on ICU and Ventilator Mortality Among Critically ill adults with COVID-19, the median patient age was 64 (interquartile range [IQR], 54–73), with 49 patients (22.6%) who were 75 years or older. There were 98 females (45.2%) and the majority of patients were black (153 [70.5%]) (20).

Another study done in China by Wang Y et al on Clinical Course and Outcomes of 344 Intensive Care Patients with COVID-19, of the 344 intensive care patients, non survivors are generally older than survivors, with a higher proportion aged over 60 years, and every 10-year increase in age was associated with a 58% additional risk (hazard ratio [HR], 1.58; 95% confidence interval [CI], 1.38–1.81;  $P, 0.001$ ) (21). Although experience with COVID-19 continues to grow, reported mortality rates range from 50 to 97% in those requiring mechanical ventilation. These high mortality rates have raised concerns as to whether invasive mechanical ventilation should be avoided in the context of COVID-19 (22).

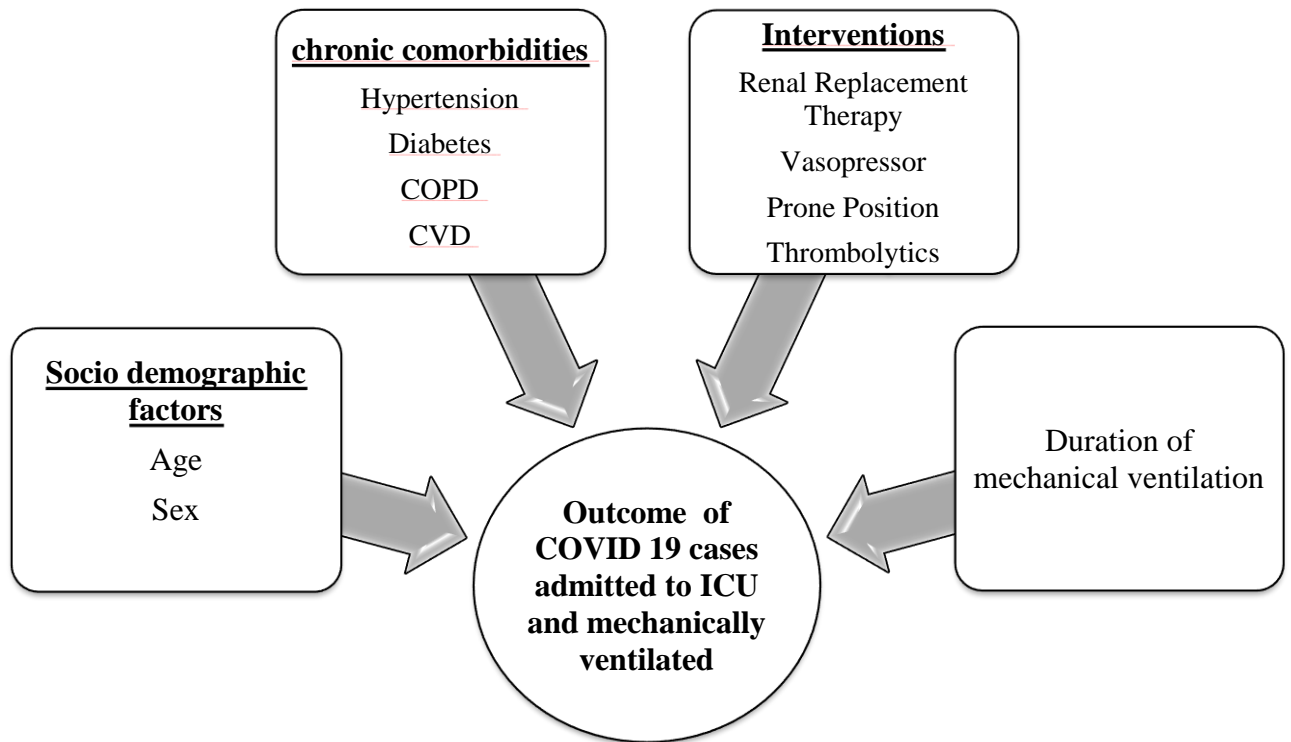
In a study done in Seattle with a mean ( $\pm$ SD) age of the patients was  $64 \pm 18$  years (range, 23 to 97), eighteen patients (75%) received invasive mechanical ventilation. Of the 24 patients, 12 (50%) had died, 4 (17%) had been discharged from the ICU but remained in the hospital, 3 (13%) were receiving mechanical ventilation and were still in the ICU, and 5 (21%) had been discharged from the hospital. A greater percentage of patients over 65 years of age had died than patients under 65 years of age (62% vs. 37%). The median duration of mechanical ventilation was 10 days (interquartile range, 7 to 12), and 6 patients (33%) had been extubated as of March 23, 2020 (23).

A study done by Wang Y et al showed that in a total of 134 (40.6%) patients who were treated with mechanical ventilation (either non-invasive or invasive), 34 received treatment of noninvasive ventilation only, and 27 (79.4%) died at or before 28 days, whereas invasive ventilation was given to 100 patients, with 97 (97%) deaths at or before 28 days (22).

Another study done in Washington State in critically ill patients infected with SARS-CoV-2 in the US showed that the patients had a high rate of ARDS and a high risk of death, similar to published data from China. However, this case series adds insight into the presentation and early outcomes in this population and demonstrates poor short-term outcomes among patients requiring mechanical ventilation (17).

On a study done by Pavan et al. on 24 critically ill COVID 19 patents half the patients (12) died between ICU day 1 and day 18, including 4 patients who had a do-not-resuscitate order on admission. Of the 12 surviving patients, 5 were discharged home, 4 were discharged from the ICU but remained in the hospital, and 3 continued to receive mechanical ventilation in the ICU (23).

### 3 CONCEPTUAL FRAMEWORK



**Figure 1** conceptual frame work of outcome of COVID 19 cases admitted to ICU and mechanically ventilated - from review of literature.

## **4. Objective**

### **4.1 General Objective**

To assess the characteristic, outcome and associated factors of COVID19 mechanically ventilated patients admitted to the ICU.

### **4.2 Specific Objective**

- To determine factors associated with 30 days' patient's mortality.
- To describe Characteristics of COVID 19 patients admitted to the ICU and mechanically ventilated.
- To determine Outcome of COVID 19 patients admitted to the ICU and mechanically ventilated.

## **5. Methods and Materials**

### **5.1. Study Area**

This study took place at Eka Kotebe General Hospital. Eka Kotebe General Hospital is found in Addis Ababa Yeka subcity. It has been providing services of mental health with 150 beds and general medical services with 200 beds since 2017 G.C. The hospital is the first COVID 19 treatment center in the country giving service for patients with confirmed COVID 19 infection. The hospital delivers service for mild, moderate and critically ill patients. Currently it has more than 600 beds and more than 1000 patients admitted and providing services for COVID-19 infection with different departments including Emergency service, Intensive care unit (ICU) service with 12 ICU beds and 10 functional mechanical ventilators. The intensive care unit is one of the many services the hospital is giving. The unit gives 24 hrs. Of comprehensive intensive care for patients since the outbreak started in Ethiopia.

### **5.2. Study design and Study period**

An institutional based Retrospective Cross Sectional study was conducted from November 01- January 20, 2021.

### **5.3. Source Population**

All COVID 19 patients who are admitted to the ICU and mechanically ventilated at Eka Kotebe General Hospital, Addis Ababa, Ethiopia

### **5.4. Study population**

All COVID 19 patients who are admitted to the ICU and mechanically ventilated and fulfill inclusion criteria at Eka Kotebe General Hospital; Addis Ababa, Ethiopia

### **5.5. Inclusion criteria and Exclusion criteria**

#### **5.5.1. Inclusion criteria**

All adult patients with COVID-19, who were admitted to the ICU and on mechanical ventilator from March, 17 to November, 30 2020 were included in this study.

#### **5.5.2. Exclusion criteria**

- Patients on mechanical ventilator for >30 days
- Incomplete data

## 5.6. Sample size and sampling procedure

### 5.6.1. Sample size

Total numbers of all adult COVID 19 patients admitted to the ICU during March 17 to November 30, 2020 are taken for the study.

### 5.6.2 Sampling procedures

All consecutive COVID 19 mechanically ventilated patients admitted in the ICU from March 17 to November 30, 2020 were included

## 5.7. Data collection

### 5.7.1. Data source, Data collection tools, procedure and personnel

Two BSC nurse were selected to collect data. Half day training was given regarding how to collect data, appropriate use of the data collection instruments and the confidentiality of the collected data

Data was collected a chart review from study participants using structured questionnaires prepared from January 1 to January 10 and this questionnaire were tested on 5% of the sample size at Millennium COVID 19 center on December 1<sup>st</sup> 2020.

In Eka Kotebe General Hospital, there are 12 ICU beds and 10 functional mechanical ventilators. Patients are admitted in the ICU when they have a critical medical condition which needs strict follow up and care, such as myocardial infarction and Diabetic ketoacidosis with Covid-19 infection.

The need for invasive mechanical ventilation generally is decided based on presence of respiratory failure and failure to maintain adequate respiratory effort with 10 litter of oxygen on CPAP. Data collected will include patient demographic information, co morbidities, initial laboratory tests, inpatient medications, treatments (including invasive mechanical ventilation and renal replacement therapy), and outcomes (including length of stay, discharge and mortality) from the hospitals' electronic database.

## 5.8. Study variable

### 5.8.1. Dependent Variable

- Outcome of patients within 30 days of ICU admission (Discharged from ICU and Death )

### 5.8.2. Independent Variable

- Socio-demographic (Age and Gender)
- Chronic co-morbidity (HTN, DM, COPD, CVD, CKD, Malignancy and Obesity)
- Interventions done for patients who are mechanically ventilated in the ICU
- Duration of mechanical ventilation

## 5.9. Operational Definition

**COVID-19 patient:** any patient who tested positive for COVID-19 antigen as reported by a laboratory given mandate to test such patients by the Ethiopian Federal Ministry of Health (17).

**Characteristics of patients:** Demographics and Co morbidities

**30-day patient outcome:** patients discharged from the ICU within 28 days of admission or patients who died within 30 days of ICU admission.

**Interventions done:** medical treatments done or given in the ICU

**COVID 19 therapy:** treatment regimens and or drugs for COVID 19 patients used per the hospital protocol.

**Co morbidity:** presence of one or more additional conditions often co- occurring with a primary condition.

**Mechanically ventilated :** patients who need artificial respiration using a mechanical ventilator to support the delivery of oxygen to the lungs either invasive or non-invasive.

**Duration of mechanical ventilation:** starting from the day of patient intubation to extubation.

### **5.10. Data processing and analysis**

Data was coded, edited and then entered to Statistical package for Social Sciences (SPSS) software version 25. Using SPSS Numeric data was described in terms of mean  $\pm$  SD for symmetric and median (Interquartile range) for asymmetric numeric data. Variables that demonstrated a significant relationship on bivariate analysis ( $p < 0.2$ ) will be included. Multivariable regression analysis was applied to evaluate independent variable relationships with a dependent variable that is continuous. Significance is determined at P value  $< 0.05$ . The finding of the study is presented using narratives, graphs, tables and charts.

### **5.11. Data quality assurance**

To assure the quality of data, training on the objectives and relevance of the study and brief Orientations on the assessment tool was provided for data collector. During data collection, each questioner was revised by the investigator for being complete and appropriate. The data collectors were instructed to write card number on the questionnaire during the data collection if further cross check is needed.

### **5.12. Ethical consideration**

The study was conducted after approval by Addis Ababa University Ethical review board. A legal letter was submitted to Eka Kotebe General Hospital, where the study took place. After taking formal letter from the hospital data collection was conducted.

## **6. Dissemination of the study**

The result of the study will be submitted to the college of health science, Addis Ababa University, to the Hospital administration office, Addis Ababa city health bureau and other responsible bodies. The result will be presented at college of health science in different seminars, meeting, conferences and workshops. Moreover, efforts will be made to publish the findings of the study and disseminated through journal and scientific publication.

## 7. Results

### 7.1. Demographic characteristics of study participants

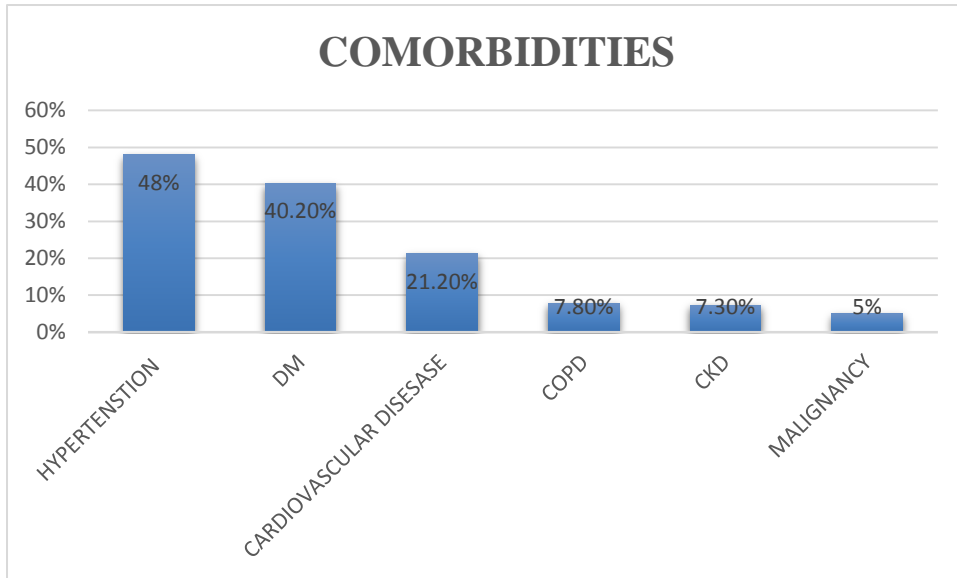
Samples of 179 COVID 19 patients who were admitted to the ICU and are mechanically ventilated at Eka Kotebe General Hospital were included in this study. From the total sample 115 (64.2%) were male and 64 (35.8 %) were female, age from 18-40 was (16.8 %), 41-60 (30.2%) and 61-100 (35.1%). (Table 1)

Table 1: Demographic characteristics of patients

Variables	Frequency (n)	Percent (%)
<b>Age</b>		
18-40	30	16.8
41-60	54	30.2
61-100	95	35.1
<b>Sex</b>		
Male	115	64.2
Female	64	35.8

### 7.2 Characteristics and co morbidities of study participants

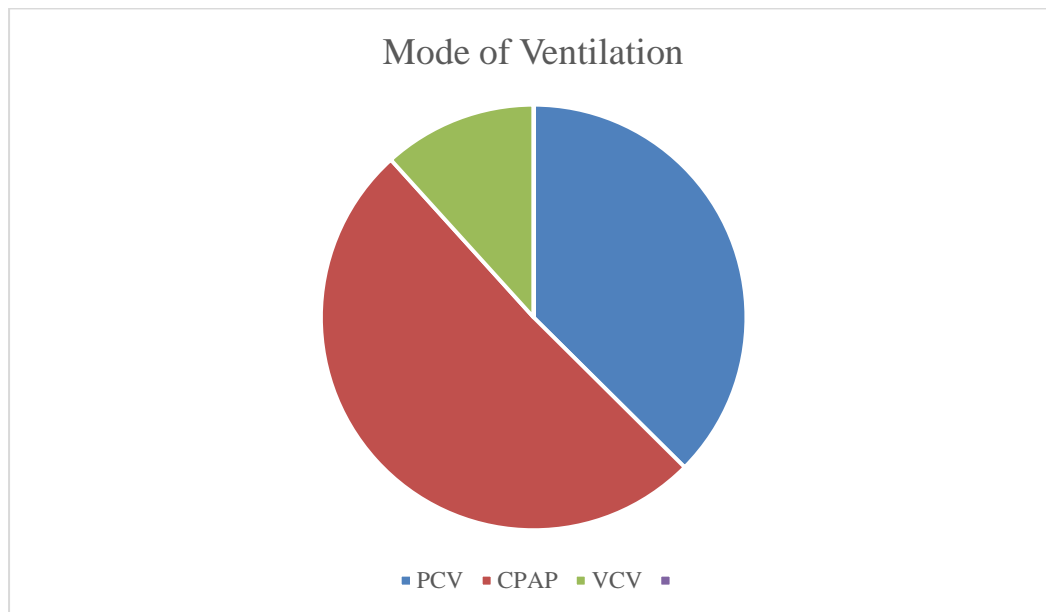
In this study, it was found that 77.1 % of the patients have co morbidities, 3.4 % of the patients were smokers and 7.3 % were obese. And we also categorized number of days on mechanical ventilation from 1-10 was (73.7%), 11-20 (22.3%) and 20-30 (3.9%).



**Figure.2** Co morbidities of study participants

### 7.3. Clinical interventions done in the ICU

For this study among patients in the ICU who needed mechanical ventilation 50.8% were put on CPAP, 37.4 % on PCV and 11.7 % on VCV mode of ventilation. (Figure 3)



**Figure 3:** mode of mechanical ventilation

In this study thrombolytic (81.6%), Antibiotics (75.4%) and laxatives (51.4%) were widely used for patients admitted to the ICU. (Table 2)

Table 2: clinical interventions done in the ICU

Clinical Intervention	Yes		No	
	(n)	(%)	(n)	(%)
Renal replacement therapy(dialysis)	13	(7.3)	166	92.7
Vasopressor use	33	(18.4)	146	81.6
Prone position	78	(43.6)	101	56.4
Thrombolytic	146	(81.6)	33	18.4
Laxative	92	(51.4)	87	48.6
Antibiotics	135	(75.4)	44	24.6
GI ulcer prophylactic	60	(33.5)	119	66.5
Other medications	56	(31.3)	122	68.2

#### 7.4. ICU complications

In this study 44.1 % of the patients had electrolyte imbalance while there was no incidence of self extubation. (Table 3)

Table 3: ICU complications

ICU Complication	Yes		No	
	(n)	(%)	(n)	(%)
DVT	11	6.1	168	93.9
Pneumothorax	25	14	134	86
Self extubation	0	0	179	100
Decubitus ulcer	14	7.8	165	92.2
Chest focus sepsis	25	14	134	86
Renal problem	52	29.1	127	70.9
Electrolyte imbalance	79	44.1	100	55.9
Hospital acquired pneumonia	21	11.7	158	88.3
Hospital acquired infection	16	8.9	163	9.1
others	33	18.4	146	81.6

#### 7.5. Initial symptoms of study participants

In this study the majority of the study participants had shortness of breath (78.8 %) and cough (68.2 %) (Table 4). Patients on admission had initial Temperature (36.49\*

$\pm 1.140^{\#}$ ), pulse rate of ( $99.36^* \pm 79.028^{\#}$ ), respiratory rate ( $27.32^* \pm 9.371^{\#}$ ) and oxygen saturation of ( $88.53^* \pm 9.289^{\#}$ ), expressed as  $*$ = Mean,  $\#$  Standard deviation

Table 4: Initial symptoms of patients

Initial symptoms	Yes		No	
	(n)	(%)	(n)	(%)
Loss of smell	4	2.2	175	97.8
Loss of taste	2	1.1	177	98.9
Loss of appetite	50	27.9	129	72.1
fatigue	98	54.7	81	75.3
headache	42	23.5	137	76.5
diarrhea	7	3.9	172	96.1
Altered level of consciousness	19	10.6	160	89.4
Shortness of breath	141	78.8	38	21.2
Sore throat	11	6.1	168	93.9
Fever	62	34.6	117	65.4
Myalgia	18	10.1	161	89.9
Cough	122	68.2	57	31.8
Chest pain	22	15.1	152	84.9

### 7.6. Factors associated with 30 days mortality rate

When adjusted for other variables **Sex** AOR=3.003, 95%CI, 1.177,7.665, P=0.021; **Diabetis mellitus** AOR=3.170, 95%CI, 1.424, 7.056, P=0.005; **CKD** AOR=6.515, 95%CI, 2.002, 21.204, P=0.002; **vassopressor use** AOR= 4.923, 95%CI, 1.490, 16.270, P=0.009; **laxative use** AOR=0.316, 95%CI, 0.147, 0.679,P=0.003 were found to be associated factors of 30 days mortality (Table 5).

Table 5: Factors associated with 30 days mortality rate

Variables	30 days mortality		COR(95%CI)	AOR(95%CI)	P-value
	Yes	No			
<b>Sex-</b> M	88	48	0.432	3.003	0.021

				(1.153,4.650)	(1.177,7.665)	
	<b>F</b>	19	24	1	1	
<b>DM-</b>	<b>yes</b>	81	31	0.243 (2.167,7.834)	3.170 (1.424, 7.056)	0.005
	<b>No</b>	26	41	1	1	
<b>CKD-</b>	<b>yes</b>	43	4	11.42 (3.879,33.631)	6.515 (2.002, 21.204)	0.002
	<b>No</b>	64	68	1	1	
<b>Malignancies-</b>	<b>yes</b>	11	1	8.135 (1.027,64.470)	9.465 (0.997, 89.882)	0.05
	<b>No</b>	96	71	1	1	
<b>Vasopressor -</b>	<b>Yes</b>	28	5	4.749 (1.737,12.984)	4.923 (1.490, 16.270)	0.009
	<b>No</b>	79	67	1	1	
<b>Laxative -</b>	<b>yes</b>	64	28	0.428 (0.232,0.788)	0.316 (0.147, 0.679)	0.003
	<b>No</b>	43	44	1	1	

## 8. Discussion

In our study we found the mortality rate of COVID 19 patient in the ICU who are mechanically ventilated at Eka Kotebe General Hospital to be 59.2%, which is substantially higher than the 20– 30% reported in other published literature to date (22 ,1, 24, 25 ). This might be explained by the high prevalence of patients with associated comorbidities.

It was found that patients admitted to the ICU of the study hospital were mostly male, aged over 60 years and with a high prevalence of comorbidities. The associated factors for 30 days mortality rate in our study were male gender, history of Diabetes mellitus, CKD and use of vasopressor and laxatives.

On the bivariate analysis; Sex, diabetes mellitus, CKD, malignancies, vasopressor use, and laxatives were found to be significantly associated with 30 days mortality showing that these factors significantly contribute to disease outcome independently.

On further analysis after controlling for other covariates, using a multivariable binary logistic regression, Sex, diabetes mellities, CKD, vasopressor use, and laxatives factors were found to be significant predictors of death.

Patients of male gender were 3 times more likely to die than females in our study, unlike other studies which found that male gender was not associated with increased mortality in critically ill patients with COVID-19 (6).

Being diabetic was found to be an important predictor of disease outcome. The odds that those who died had a history of diabetes were 3 times compared with those who do not have the disease. This results in any diabetic patient to be vulnerable to develop symptomatic infection and complications from any infectious disease that could result in worse disease prognosis (26).

The result of the study found that having CKD at admission is one of the significant factors that predict having a death outcome. The odds that those who died had a history of CKD at presentation were 6.515 times than those who didn't have the disease.

On the other hand, the other risk factors identified in most studies like old age and hypertension didn't show any significant effect on patient mortality in the final regression model. (21, 27). Age group and hypertension didn't show a significant association on the bivariate binary logistic regression or any predictive effect on the multivariable binary logistic regression.

In this study it was also observed that patients who received vasopressors were 4.923 times more likely to die than who didn't receive vasopressors. Similar to our results, initial reports from other studies showed that those who died in the ICU were more likely to have shock requiring vasopressors (92.3% vs. 50.4%, p-value <0.001) (22). Whereas patients who were put on laxatives were associated with having a favorable outcome of being discharged alive.

In line with these study findings, another study found that patients with chronic kidney disease, and cardiovascular disease among other factors were more likely to receive mechanical ventilation and were implicated in the risk of death during hospitalization. Treatment and control measures for patients with these co morbidities are, therefore, warranted.

**Limitations:** the basic limitation for this study is the lack of other study in similar set up in Africa. Generally there are limited researches done concerning characteristics and outcome of COVID 19 mechanically ventilated patients admitted in the ICU in

developing country. So we could not compare the result of this study with studies done on similar setup. And we suggest further multicenter study.

**Conclusion:** we had found the 30 day mortality rate of COVID 19 mechanically ventilated patients admitted in the ICU to be 59.2 %. This is higher than other studies done at other countries. Patients diagnosed with Diabetes Miletus, CKD and who are receiving vasopressor was found to be associated factors for 30 days mortality.

**Recommendation:** we recommend that Male patients, patients diagnosed with Diabetes Miletus, CKD and who are receiving vasopressor therapy should be given a higher priority and carefully followed in the ICU to decrease the mortality rate.

## 9. Reference

1. Krause M, David J, Douin, et al. Characteristics and Outcomes of Mechanically Ventilated COVID-19 Patients. *Journal of Intensive Care Medicine*. 2020; XX(X):1-6
2. Kirenga B, Muttamba W, Kayongo A, *et al*. Characteristics and outcomes of admitted patients infected with SARS-CoV-In Uganda. *BMJ Open Resp Res* 2020;7:e000646.
3. Oliveira E1, Parikh A. et al. ICU Outcomes and Survival in Patients with Severe COVID-19 in the Largest Health Care System in Central Florida. <https://doi.org/10.1101/2020.08.25.20181909>
4. World Health Organization. Coronavirus disease (COVID-19) pandemic. Available: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> [Accessed 21 Apr 2020].
5. Abate SM, Ahmed Ali S, Mantfardo B, Basu B (2020) Rate of Intensive Care Unit admission and outcomes among patients with coronavirus: A systematic review and Metaanalysis. *PLoS ONE* 15(7): e0235653

6. Xie J, Wu W, et al. Clinical characteristics and outcomes of critically ill patients with novel coronavirus infectious disease (COVID-19) in China. *Critical Care Medicine*. 2020;
7. Richardson S, Hirsch J, Narasimhan M, et al. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. *J A M A*. 2020 April 22.
8. Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, Cereda D, Coluccello A, Foti G, Fumagalli R, Iotti G, Latronico N, Lorini L, Merler S, Natalini G, Piatti A, Ranieri MV, Scandroglio AM, Storti E, Cecconi M, Pesenti A, CLI Network. Baseline Characteristics and Outcomes of 1591 Patients Infected With SARS-CoV-2 Admitted to ICUs of the Lombardy Region, Italy. *JAMA* 2020.
9. Chang R, Elhousseiny K M, Yeh Y C, COVID-19 ICU and Mechanical Ventilation Patient Characteristics and Outcomes- A Systematic Review and Meta-analysis <https://doi.org/10.21203/rs.3.rs-66766/v1>
10. R. A. Armstrong, A. D. Kane and T. M. Cook, Outcomes from intensive care in patients with COVID-19: asystematic review and meta-analysis of observational studies. *Anaesthesia* 2020, 75, 1340–1349
11. Ferreira J.C, Hoy.L.etal.characterstics and outcomes of patients with COVID-19 admitted to the ICU in a university of Sao paulo, Brazil. <https://doi.org/10.6061/clinics/2020/e2294>
12. Michael G Argenziano,1,2 Samuel L Bruce,1,2 Cody L Slater,1,2 Jonathan R Tiao,1,2 Matthew R Baldwin,3 R Graham Barr. Characterization and clinical course of 1000 patients with coronavirus disease 2019 in New York. : *BMJ* 2020;369:m1996
13. Am J. Mechanical Ventilation in COVID-19: Interpreting the Current Epidemiology. *American Journal of Respiratory and Critical Care Medicine*.2020;202(1):1-4
14. Lapidus N, Zhou X, Carrat F, Riou B, Zhao Y, Hejblum G. BIASED AND UNBIASED ESTIMATION OF THE AVERAGE LENGTH OF STAY IN INTENSIVE CARE UNITS IN THE COVID-19 PANDEMIC. <https://doi.org/10.1101/2020.04.21.20073916>.

15. Bhatraju P K, Ghassemieh B J, Nichols M, Kim R, Jerome K R, Nalla A K, Greninger A L, Covid-19 in Critically Ill Patients in the Seattle Region — Case Series. *The new england journal of medicine*. 2020;1-4
16. Arentz M, Yim E, Klaff L, Lokhandwala L, Riedo F X, Chong M, Lee M. Characteristics and Outcomes of 21 Critically Ill Patients With COVID-19 in Washington State. Doi:10.1001/jama.2020.4326
17. Zheng Y, Sun L, Xu M, Pan J, Zhang Y. Clinical characteristics of 34 COVID 19 patients admitted to ICU. : <https://doi.org/10.1101/2020.04.12.20062604>
18. Leulseged T W, Hassen I S, Maru E H, Zewde W C, Determinants of Time to Convalescence among COVID-19 Patients at Millennium COVID19 Care Center in Ethiopia. <https://doi.org/10.1101/2020.10.07.20208413>.
19. Xu Y, Xu Z, Liu X, Cai L, Zheng H, Huang Y, Clinical findings in critically ill patients infected with SARS-CoV-2 in Guangdong Province, China. <https://doi.org/10.1101/2020.03.03.20030668>
20. Auld S C, Caridi-Scheible M, Blum J M, Robichaux C, Kraft C, Jacob J T, Jabaley C S, Carpenter D. ICU and ventilator mortality among critically ill adults with COVID-19. <https://doi.org/10.1101/2020.04.23.20076737>
21. Wang Y, Lu X, Li Y, Chen H, Chen T, Su N, Zhou J, Zhang B, Yan F, Wang J. Clinical Course and Outcomes of 344 Intensive Care Patients with COVID-19. *American Journal of Respiratory and Critical Care Medicine* 2020; 201 (11): 1430-34
22. Sara C. Auld, et al. ICU and Ventilator Mortality Among Critically Ill Adults With Coronavirus Disease 2019. *Critical Care Medicine*.2020;48(9):799-804
23. Pavan K. Bhatraju ., Bijan J. Ghassemieh, Nichols M, Kim R, Keith R. Jerome, Arun K. Nalla, Alexander L. Greninger, Pipavath S. Covid-19 in Critically Ill Patients in the Seattle Region — Case Series. *The new england journal of medicine*.1-14
24. Larsson E, Brattström O, AgvaldÖhman C, et al;. Characteristics and outcomes of patients with COVID-19 admitted to ICU in a tertiary hospital in Stockholm, Sweden. *Acta Anaesthesiol Scand*. 2021;65:76–81. <https://doi.org/10.1111/aas.13694>
25. Thomson RJ, Hunter J, Dutton J, Schneider J, Khosravi M, Casement A, et al. (2020) Clinical characteristics and outcomes of critically ill patients with

COVID-19 admitted to an intensive care unit in London: A prospective observational cohort study. PLoS ONE 15(12): e0243710. <https://doi.org/10.1371/journal.pone.0243710>

- 26.** Maru E. H, Leulseged T.W, et al. Predictors of Death in Severe COVID-19 Patients at Millennium COVID-19 Care Center in Ethiopia: A Case-Control Study. <https://doi.org/10.1101/2020.10.07.20205575>
- 27.** Zhou F, Yu T, Du R, Fan G, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China. Lancet 2020; 395: 1054–62.

## 10. Annex

### *Annex 1: Questioner*

**Addis Ababa University**

**College of Health Sciences**

**Data abstraction tool**

#### **Section I: Socio Demographic Data**

<b>Card number:</b>		<b>Bed no:</b>	<b>Code</b>
<b>Ser. no</b>	<b>Question</b>	<b>Response</b>	
101	Age		
102	Sex (M/F)	1. Male 2. Female	
103	Does the patient have any Coexisting disease?	1. Yes 2. No	
104	If yes specify	1. Hypertension 2. Diabetes	

		<ul style="list-style-type: none"> <li>3. CVD</li> <li>4. COPD</li> <li>5. CKD</li> <li>6. Malignancies</li> <li>7. Obesity</li> </ul>	
105	Does the patient have history of smoking?	<ul style="list-style-type: none"> <li>1. Yes</li> <li>2. No</li> </ul>	
106	Initial Symptoms	<ul style="list-style-type: none"> <li>1. Loss of smell</li> <li>2. lose of taste</li> <li>3. loss of appetite</li> <li>4. Fatigue</li> <li>5. Headaches</li> <li>6. Altered level of consciousness</li> <li>7. Diarrhoea</li> <li>8. Shortness of breath</li> <li>9. Sore throat</li> <li>10. Fever</li> <li>11. Myalgia</li> <li>12. Cough</li> <li>13. Chest pain</li> <li>14. other_____</li> </ul>	
107	Initial Vital Signs	<ul style="list-style-type: none"> <li>1. Temperature ____</li> <li>2. Oxygen Saturation____</li> <li>3. Respiratory Rate _</li> <li>4. HeartRate_____</li> <li>5. Systolic Blood Pressure (SBP)_____</li> </ul>	
108	Interventions given or done during patient stay	<ul style="list-style-type: none"> <li>1. Renal</li> </ul>	

		Replacement Therapy 2. Vasopressor Use 3. Prone positioning 4. Thrombolytic 5. Laxative 6. Antibiotic 7. GI ulcer prophylactic 8. Others	
109	Mode of mechanical ventilation used	1. PCV 2. VCV 3. CPAP	
110	COVID-19 Therapy	1. Corticosteroids 2. Others	
111	ICU Complications	1. Deep Venous Thrombosis 2. Pneumothorax 3. Self-Extubation 4. Decubitus Ulcer 5. AKI 6. Electrolyte imbalance 7. HAP 8. HAI 9. Other	

112	Clinical outcome	<ol style="list-style-type: none"> <li>1. Delirium</li> <li>2. Thrombotic phenomena</li> <li>3. Ventilator-associated pneumonia</li> <li>4. Cardiac arrhythmias</li> <li>5. Tracheotomy</li> </ol>	
113	ICU - LOS (days)		
114	Number of days on mechanical ventilation		
115	Patient Disposition	<ol style="list-style-type: none"> <li>1. Discharged from ICU</li> <li>2. Death</li> </ol>	

