JIMMA UNIVERSITY

INSTITUTE OF HEALTH FACULTY OF MEDICAL SCIENCE

DEPARTMENT OF ANESTHESIOLOGY

# PATTERNS OF ADMISSION AND OUTCOMES OF COVID-19 PATIENTS IN MICHU COVID-19 TREATMENT CENTER: ONE-YEAR RETROSPECTIVE STUDY, JIMMA UNIVERSITY MEDICAL CENTER, ETHIOPIA

BY: BIRUK ABERA (MD, ANESTHIOLOGY RESIDENT)

A RESEARCH PAPER TO BE SUBMITTED TO JIMMA UNIVERSITY, INSTITUTE OF HEALTH, FACULTY OF MEDICAL SCIENCE, DEPARTMENT OF ANESTHESIOLOGY, CRITICAL CARE AND PAIN MEDICINE IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE SPECIALTY CERTIFICATE IN ANESTHESIOLOGY, CRITICAL CARE AND PAIN MEDICINE.

JIMMA, ETHIOPIA

AUGUST 2021

JIMMA UNIVERSITY

INSTITUTE OF HEALTH FACULTY OF MEDICAL SCIENCE

DEPARTMENT OF ANESTHESIOLOGY

# PATTERNS OF ADMISSION AND OUTCOMES OF COVID-19 PATIENTS IN MICHU COVID-19 TREATMENT CENTER: ONE-YEAR RETROSPECTIVE STUDY, JIMMA UNIVERSITY MEDICAL CENTER, ETHIOPIA

BY: BIRUK ABERA (MD, ANESTHIOLOGY RESIDENT)

ADVISORS:

DR. LELISA SENA (PhD)

DR. YEMANE AYELE (MD, ASSISTANT PROFESSOR)

JIMMA TOWN, ETHIOPIA

AUGUST 2021

## Abstract

**Background:** Coronaviruses are significant diseases in both humans and animals. A novel coronavirus was discovered as the cause of a cluster of pneumonia cases in Wuhan, China's Hubei Province, at the end of 2019. It quickly spread across China, culminating in an epidemic, with a growing number of cases in other nations throughout the globe. Understanding the trends of admissions and outcomes of Covid-19 center is critical for improved resource planning and predicting prognosis in order to respond to the continued Covid-19 conditions.

**Objectives:** The main objective of the study was to assess the patterns of admission and outcomes of COVID-19 among patients admitted to Michu COVID-19 treatment center from June 8, 2020 to June 8, 2021 G.C

**Methods:** A one-year retrospective study was conducted in Michu COVID-19 treatment center from September 01 to 30, 2021. Socio-demographic and medical related data were collected by record review of patient cards using checklist which are developed in reference to the center register, medical record charts and other standardized tools from similar studies. The principal investigator was made follow-up of the data collection process on a daily basis to ensure that the data are accurate, consistent, ambiguous, and comprehensive. The data was edited, coded, and entered into Epidata version 4.6, and cleaned. Statistical Package for the Social Sciences (SPSS) version 26 was used for analysis and Statistical significance test was applied to see the association between disease outcome and predictor variables. The binary logistic regression and multiple logistic regression was used with Adjusted odds ratio (AOR) with a corresponding 95% confidence interval (CI) was used to assess the strength of the association between the dependent and independent variables at a P-value of ≤0.05 cut off point to declare the significance. The correlation between independent variables was checked for multi-collinearity by using variance inflation factor (VIF) and tolerance test.

**Result:** A total of 213 patients' medical records were included in this study. Majority (62%) of patients were male and 53.1% of the patients were between ages 31-60 years. Majority (95.8%) of patients admitted by PCR test were positive. This shows PCR test was used as admission criteria to the center. The overall mortality rate was 67(31.5%). Sex (AOR=3.14 (95% CI=1.25-7.89), COVID severity (AOR=16; 95% CI=3.4-75.1), Quick SOFA score upon admission (AOR=8.5 (95% CI=1.8-40.53), and duration of stay in the treatment center (AOR=8.5 (95% CI=3.27-22.09) were found to be significantly associated with patient outcome (P-value <0.05).

**Conclusion:** The study demonstrated that there was a high mortality rate in Michu Covid-19 treatment center of JUMC and based on this study, concerned bodies such as JUMC administrators, Jimma zone health bureau must prepare trainings, avail equipment to prevent and treat the disease and to cope with this expected pattern of disease.

**Key words:** Admission, COVID-19, disease outcome, intensive care unit,

## Acknowledgements

I would like to thank Jimma University for providing me this opportunity to do a research on this topic. My greatest gratitude is extended to my advisors, Dr.Lelisa Sena and Dr.Yemane Ayele for their guidance and kindness, as well as their time to help me in this research. I also want to thank Michu Covid Treatment Center for allowing me to take the data and the staffs for this research was unimaginable without them.

# Table contents

**Table of Contents** **pages**


Abstract ..... III

Acknowledgements ..... IV

List of Abbreviation and Acronyms ..... VII

List of tables ..... VIII

List of annexes ..... VIII

1. Introduction ..... 1
   1.1. Background information ..... 1
   1.2. Statement of the problem ..... 3
   1.3. Significance of the study ..... 5
2. Literature review ..... 7
   2.1. Patterns of covid-19 patient admissions ..... 7
   2.2. Outcome of covid-19 among hospitalized pts. ..... 8
3. Objectives ..... 11
   3.1. General objectives ..... 11
   3.2. Specific objectives ..... 11
4. Methods and material ..... 12
   4.1. Study area and period ..... 12
   4.2. Study design ..... 12
   4.3. Population ..... 12
      4.3.1. Source of population ..... **Error! Bookmark not defined.**
      4.3.2. Study population ..... 12
   4.4. Inclusion and Exclusion criteria ..... 12
      4.4.1. Inclusion criteria ..... 12
      4.4.2. Exclusion criteria ..... 12
   4.5. Sample size determination and Sampling technique ..... 13
   4.6. Variables ..... 13
      4.6.1. Dependent variables ..... 13
      4.6.2. Independent variables ..... 13
   4.7. Data collection tool and procedures ..... 13
   4.8. Data processing and analysis ..... 13
   4.9. Data quality control ..... 14

4.10. Operational definitions ..... 14
4.11. Ethical considerations ..... 14
4.12. Dissemination plan ..... 14
5. Results ..... 15
5.1. Socio-demographics and clinical characteristics ..... 15
5.2. Treatment modality of Covid-19 patients ..... 18
5.3. Patient outcomes ..... 19
5.4. Factors affecting patient outcomes ..... 21
6. Discussion ..... 23
7. Conclusion and Recommendation ..... 25
7.1. Conclusion ..... 25
7.2. Recommendation ..... 25
Reference ..... 26
Annexes ..... 32
Annex 1: Information sheet & consent form ..... 32
Annex 2: Questionnaires ..... 33

## List of Abbreviation and Acronyms

**AKI** Acute Kidney Injury

**ARDS** Acute Respiratory Distress Syndrome

**BMI** Body Mass Index

**CDC** Centers for Disease Control and Prevention

**CPAP** Continuous Positive Airway Pressure

**EUA** Emergency Use Authorization

**FDA** United States Food and Drug Administration

**HIV/AIDS** Human Immunodeficiency Virus, Acquired Immunodeficiency Syndrome

**HCU** High Care Unit

**ICU** Intensive Care Unit

**IQR** Interquartile Range

**IMV** Invasive Mechanical Ventilation

**MV** Mechanical Ventilation

**NIH** National Institutes of Health

**NIMV** Noninvasive Mechanical Ventilation

**PaO2/FiO2** ratio of arterial oxygen partial pressure (mmHg) to fractional inspired oxygen (%)

**RT-PCR** Real-Time Reverse Transcription-Polymerase Chain Reaction

**SARS** COVID-2- Severe Acute Respiratory Syndrome Coronavirus 2

**USA** United States of America

**WHO** World Health Organization

**SOFA** Sequential Organ Failure Assessment score

# List of tables

Table 1 Socio-demographic and clinical characteristics of patients admitted to Michu Covid-19 treatment center of JUMC, southwestern Ethiopia, 2021 (n=213)..... **Error! Bookmark not defined.**
Table 2 Distribution of Treatment given to patients admitted to Michu Covid-19 treatment center of JUMC, southwestern Ethiopia, 2021 (n=213) ..... **Error! Bookmark not defined.**
Table 3 Distribution of patient outcomes admitted to Michu Covid-19 treatment center of JUMC, southwestern Ethiopia, 2021 (n=213) ..... **Error! Bookmark not defined.**
Table 4 Distribution of factor affecting the outcomes of patients admitted to Michu Covid-19 treatment center of JUMC, southwestern Ethiopia, 2021 (n=213)..... **Error! Bookmark not defined.**
Patterns of admission and outcomes of covid-19 patients in Michu Covid-19 treatment center June 8, 2020-June 8, 2021, Jimma town, Ethiopia. ..... 32

# List of annexes

Annex 1: Information sheet & consent form ..... 32
Annex 2: Questionnaires..... 33

# 1. Introduction

## 1.1. Background information

Coronaviruses are significant diseases in both humans and animals. A novel coronavirus was discovered as the cause of a cluster of pneumonia cases in Wuhan, China's Hubei Province, at the end of 2019. It quickly spread across China, culminating in an epidemic, with a growing number of cases in other nations throughout the globe. The World Health Organization named the illness COVID-19, which stands for coronavirus disease 2019, in February 2020 (1). The signs and symptoms of COVID-19 vary depending on when the sickness begins, however many individuals with COVID-19 will experience the symptoms throughout the duration of the disease. Symptoms may vary depending on the severity of the illness. Shortness of breath, for example, is more frequent reported among individuals hospitalized with COVID-19 than among people with milder illness (non-hospitalized patients) (2).

The range of associated symptoms was illustrated in a report of over 370,000 confirmed COVID-19 cases with known symptom status reported to the CDC in the United States (5) shows that cough (50%), fever (43%), myalgia (36%), headache(34%), dyspnea(29%), sore throat(20%), diarrhea(19%), nausea/vomiting(12%) (3). Only around 10% of them had loss of smell or taste, stomach discomfort, or rhinorrhea. Other cohort studies of patients with confirmed COVID-19 reported a similar range of clinical findings (4,5). Fever is not a universal finding on presentation, even among hospitalized patients. Fever was observed in nearly all patients in one research, although around 20% of them had a very low grade fever (less than 100.4°F/38°C) (6).

The severity of covid-19 ranges from mild to critical; most infections are not severe. Specifically, in a report from the Chinese Center for Disease Control and Prevention revealed that Mild disease was reported in 81 percent followed by Severe disease was reported in 14 percent and Critical disease was reported in 5 percent (7). To diagnose the illness, many diagnostic techniques have been established. The standard diagnostic was detection of virus nucleic acid by real-time reverse transcription-polymerase chain reaction (RT-PCR) and Antigen tests are immunoassays that detect the presence of a particular (8). Apart from that, chest CT scans may assist detect COVID-19 in those who have a strong clinical suspicion of infection, but they are not suggested for regular screening (9).

Physical or social distancing, quarantining, and ventilation of indoor spaces, covering coughs and sneezes, hand washing with soap and water or sanitizer if soap and water are not available, and keeping unwashed hands away from the face are all examples of preventive methods. In public places, wearing a mask that covers the nose and mouth is advised to reduce the risk of transmission (10). Many nations have developed Covid-19 vaccine phased distribution programs that prioritize individuals at greatest risk of problems, such as the elderly, as well as those at high risk of exposure and transmission, such as healthcare professionals (11). According to official data from national health agencies, 2.3 billion doses of COVID19 vaccination have been given globally as of June 15, 202 (12).

The illness produced by the SARS-CoV-2 virus, coronavirus disease 2019 (COVID-19), has no specific, effective therapy or cure. Supportive care is the cornerstone of COVID-19 management, which includes treatment to alleviate symptoms, fluid therapy, oxygen support, and prone positioning when required, as well as medicines or devices to assist other affected vital organs. The COVID-19 treatment is being researched and developed by scientists all around the globe. According to the findings of the WHO's Solidarity Trial, remdesivir, hydroxychloroquine, lopinavir/ritonavir, and interferon regimens had little or no impact on 28-day mortality or COVID-19 in-hospital course among hospitalized patients (13).

Anti-SARS-CoV-2 monoclonal antibodies, which target the SARS-CoV-2 spike protein and prevent viral entrance into cells, are now being tested for COVID-19 therapy. The Food and Drug Administration (FDA) issued an Emergency Use Authorization (EUA) for sotrovimab (previously VIR-7831), an anti-SARS-CoV-2 monoclonal antibody, on May 26, 2021, for the treatment of non-hospitalized patients with mild to moderate COVID-19 who are at high risk of progressing to severe COVID-19. This Panel statement has been updated to include recommendations for sotrovimab usage as well as information on the extended EUA criteria for using approved anti-SARS-CoV-2 monoclonal antibodies (14).

The majority of COVID-19 cases are mild. They need supportive care rather than hospitalization in these cases. People with more serious cases may need hospitalization. The glucocorticoid dexamethasone is highly advised for individuals with low oxygen levels, since it may decrease the risk of mortality (15). To assist breathing, noninvasive ventilation and, eventually, admission to an intensive care unit for mechanical ventilation may be needed (16). Coronavirus disease-

2019 (COVID-19) mortality rates are continuing to increase throughout the globe. COVID-19 has been verified in 177,885,850 people across the globe, with 3,850,529 fatalities, according to WHO data as of June 17, 2021 (16).

## 1.2. Statement of the problem

The novel coronavirus disease (now known as COVID-19) is a deadly and highly contagious respiratory illness caused by a novel coronavirus now known as SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) (17).

It has now become a global health hazard and a public health emergency on a worldwide scale. COVID-19 has now spread to practically every country in the world, causing widespread public health concerns. Since the epidemic began, the worldwide pandemic has hit 177 million confirmed cases and 3.85 million deaths as of June 17, 2021. Since March 13, 2020 (the first known case in Ethiopia), the overall number of confirmed cases has risen rapidly to 274,601, with 4,260 deaths as of June 17, 2021 (16).

In 81 percent of cases, minor illness (no or mild pneumonia) was noted. In 14% of the cases, severe illness (dyspnea, hypoxia, or >50 percent lung involvement on imaging within 24 to 48 hours) was noted. In 5% of cases, critical illness (such as respiratory failure, shock, or multi-organ dysfunction) was described. There were no deaths among noncritical cases, and the overall case fatality rate was 2.3 percent_(7). The proportion of hospitalized patients with critical or deadly disease is higher. In a study of 2741 COVID-19 patients hospitalized in a New York City health care system, 665 patients (24 percent) died or were discharged to hospice (18).

By the end of the study, 60 percent of the 647 patients who had invasive mechanical ventilation had died, 13 percent were still ventilated, and 16 percent had been discharged. COVID-19 is related with a higher percentage of in-hospital fatalities than influenza. Patients with COVID-19, for example, were five times more likely than patients with influenza to die during their hospitalization, according to a study of hospital data from the United States Veterans Health Administration (21 versus 3.8 percent) (19).

Some patients who have mild symptoms at first may develop over the course of a week. Dyspnea developed after a median of five days from the onset of symptoms in one study of 138 patients hospitalized in Wuhan for pneumonia caused by the severe acute respiratory syndrome

coronavirus 2 (SARS-CoV-2), and hospital admission occurred after a median of seven days of symptoms (20).

Pneumonia, acute respiratory distress syndrome, cardiac injury, arrhythmia, septic shock, liver dysfunction, acute renal injury, and multi-organ failure have all been reported as COVID-19 complications. Approximately 5% of COVID-19 patients, and 20% of those who are hospitalized, have severe symptoms that necessitate intensive care. Case mortality rates in intensive care units have been reported to be as high as 40%. Pneumonia (75 percent), ARDS (15 percent), AKI (9 percent), and acute liver injury are the most prevalent consequences among hospitalized patients (19 percent). Troponin rise, abrupt heart failure, dysrhythmias, and myocarditis are all symptoms of cardiac damage. Prothrombotic coagulopathy affects 10 to 25% of COVID-19 patients who are hospitalized, resulting in venous and arterial thromboembolic events. Impairment of consciousness and stroke are two neurologic symptoms (21).

More patients have suffered long-term, post-infection consequences as the COVID-19 epidemic has progressed. The majority of patients recover completely, but those who do not experience fatigue, dyspnea, cough, anxiety, depression, difficulty to focus (i.e. "brain fog"), gastrointestinal problems, sleep difficulties, joint pain, and chest pain that last weeks to months after the acute illness. Long-term studies is being conducted to better understand the nature of these problems (22).

There are a growing number of reports of long-term consequences from acute COVID-19. Post-acute COVID-19 is a syndrome marked by persistent symptoms and/or delayed or long-term consequences that last more than 4 weeks after beginning of symptoms. Early reports on COVID-19's post-acute infectious implications have begun to appear, with research from the United States, Europe, and China reporting results for patients who survived acute COVID-19 hospitalization. The outcomes of 1,250 patients released alive after 60 days were analyzed in an observational cohort study from 38 hospitals in Michigan, United States, using medical record abstraction and telephone surveys. About 6.7 percent of patients died throughout the research period, while 15.1 percent required re-admission. In this study, 32.6 percent of the 488 patients who completed the telephone survey had persistent symptoms, with 18.9 percent reporting new or exacerbated symptoms. The most prevalent symptom was dyspnea while walking up the stairs

(22.9 percent), followed by cough (15.4 percent) and prolonged loss of taste and/or smell (13.1 percent) (23,24).

Similar findings have been observed from European studies. At a mean follow-up of 60 days from the onset of the first symptom, 87.4 percent of 143 patients discharged from hospital who recovered from acute COVID-19 had persistent symptoms, according to a post-acute outpatient service established in Italy. The most commonly reported symptoms were fatigue (53.1%), dyspnea (43.4%), joint pain (27.3%), and chest pain (21.7%), with 55 percent of patients continuing to experience three or more symptoms (25) . A decline in quality of life, as measured by the EuroQol visual analog scale, was noted in 44.1% of patients in this study (26).

A study of 150 non-critical COVID-19 survivors in France found that two-thirds of those who were followed for 60 days had persistent symptoms, with one-third saying that they were feeling worse than when they first got sick with COVID-19 (27).

However, a number of small studies are showing strikingly identical results, calling that premise into question. A team from Italy, one of the first countries to be affected, found that 87 percent of people discharged from a Rome hospital had at least one symptom 60 days after the onset of Covid19, and that 55 percent had three or more symptoms, including fatigue (53 percent), difficulty breathing (43 percent), joint pain (27 percent), and chest pain (22 percent), with 40 percent saying they had no symptoms at all (26).

Overall, nationally there were no organized data and system of reporting on COVID-19 admission pattern and patient outcome. Therefore, due to the scarcity of data on outcome of COVID-19 patients in the study setup, there is a great need to conduct an extensive study, particularly COVID-19 treatment center basis to obtain reliable information on this area.

### 1.3. Significance of the study

In order to respond to the more frequent present situations in the Covid 19 treatment facility among customers, it is crucial to understand the patterns of the admission to the Covid-19 center. It is necessary to assess the admissions and outcomes of Covid-19 treatment centers in order to ascertain the level of quality provided by the facility. This research will provide insight on the patterns and results of Covid-19 patients in Michu's Covid-19 treatment facility.

The research would provide the groundwork for where we should focus and invest money in terms of medical infrastructure development in order to get the most out of the existing treatment facility and to identify and close the gap we had with it. Understanding the mortality rate, length of stay, and improvement/deterioration of patients in treatment centers can help us analyze the disease's progression as well as the quality and efficiency of the care we provide.

This study findings will be utilized to enhance human resource planning, treatment center service arrangement, and preparedness. To improve service quality standards, it is necessary to identify the critical determinants of admissions and their results. The findings of this study were used by hospital administrators, Covid-19 treatment center personnel, and policymakers to focus on the most vulnerable populations or the most prevalent causes of mortality at the center in order to plan and alter services.

It will also serve as a baseline for future research in the region, and will be used by various governmental and non-governmental groups working on Covid-19.

# 2. Literature review

## 2.1. Patterns of covid-19 patient admissions

According to National Institutes of Health (NIH) COVID-19 Treatment Guidelines Panel recommendation for hospitalization Spo2< 94% on room air, RR>30 breaths/minute, PaO2/FiO2 <300 mmHg or lung infiltrates of more than 50 percent. However, there are no standard criteria for hospital admission of COVID-19 patients, and criteria may vary by area and facility. Patients with severe disease are frequently hospitalized, however due to high infection rates and limited hospital resources, some patients may not be admitted (14). According to reports, up to 20% of SARS-CoV-2 infected individuals develop severe disease requiring hospitalization (20,28,29).

Depending on the hospital, up to 25% of patients require intensive care unit (ICU) admission, representing 5%-8% of the entire infected population. Culture-based discrepancies in intensive care unit practice and admission criteria, as well as differences in predisposing characteristics such as age and comorbidities, as well as differences in testing availability in the populations treated, could all contribute to variations in ICU admission rates. The Chinese cohorts' Intensive Care Unit hospitalization rates ranged from 7% to 26% (7,20).

According to preliminary estimates from Italy, the proportion of ICU admissions was between 5% and 12% of total positive SARS-CoV-2 cases, and 16% of all hospitalized patients (30). Out of the 5700 patients hospitalized with COVID-19 in New York, 1151 (20%) required mechanical ventilation (31). About 81% of patients with COVID-19 pneumonia were brought to the ICU and 71% were mechanically ventilated in an early investigation of 21 critically sick patients in Washington State, USA (32). A larger analysis of 2449 patients founded that hospitalization rates of 20% to 31% and ICU admission rates of 4.9% to 11.5% (33).

In a study of a second surge in Houston, Texas, a lesser number of patients were admitted to the ICU (20% vs 38%) than in the initial surge (34). Lower ICU admission rates might be attributed to a younger cohort of patients with fewer comorbidities or a growing comfort level with care for COVID-19 patients outside of the ICU. According to data from China, older adults, particularly those with substantial underlying health problems, are more likely than younger people to develop severe COVID-19–related illness and mortality. Although the majority of COVID-19

cases recorded in China, almost 80% of deaths occurred in people over the age of 60; just one (0.1%) death occurred in <19 years old (35).

COVID-19 cases in the United States from February 12 to March 16, the Centers for Disease Control and Prevention (CDC) had received reports of 4,226 COVID-19 infections in the United States, individuals aged 65 years and older accounted for 31% of cases, 45 percent of hospitalizations, 53 percent of ICU admissions, and 80% of deaths related with COVID-19, with those aged 85 years and older having the highest rate of severe outcomes. In contrast, no ICU hospitalizations or fatalities among people under the age of 19 were reported (33).

## 2.2. Outcome of covid-19 among hospitalized pts.

In June 17, 2021, an estimated 177 million confirmed cases of COVID-19 were reported worldwide, with an estimated 162 million recovered from covers, 3.85 million deaths, and roughly 82,796 serious/critical sick cases_(16). According to a research done in Tokyo, 2 (8%) of the 24 individuals in the study died and 18 patients were discharged. The median durations of stay in the ICU and the hospital were 6 and 22 days, respectively. The median length of stay on ventilator was seven days. In the ICU, 71% of patients were intubated (36).

In a Wuhan research, 114 individuals were identified with severe COVID-19 and treated. In 94 and 20 patients, respectively, favorable and poor outcomes were found 28 days after a diagnosis of severe COVID-19. About 51 (45%) of the patients were alive and discharged, nine (8%) had died. Antibiotics and a high-flow nasal cannula were used to for all patients, with 25 (21.9%) receiving non-invasive mechanical ventilation and 22 (19.3%) receiving invasive mechanical ventilation. Antiviral therapy was given to almost all [113 (99.1%)] patients via the oral method, including arbidol hydrochloride, lopinavir, and ribavirin. Furthermore, glucocorticoid treatment was administered to 41.2% of patients. Sixty-four patients (56.1%) got immunoglobulin therapy (37).

According to a research done in the United States, the average age of COVID-19 hospitalized patients was 63 years old, with 51.0% being male. The most frequent coexisting illnesses were cardiovascular disease (73.5%), hypertension (64.8%), diabetes (40.7%), obesity (27.0%), and chronic renal disease (24.2%). Approximately one-fifth (21.9%) of COVID-19 patients needed ICU hospitalization, and 16.9% required IMV; the majority (73.6%) did not, while 12.4%

required both. In-hospital mortality was 13.6%, with a 5-day median hospital stay. Hospital LOS and mortality rose with ICU and/or IMV usage, and with age. This group had the longest median hospital stay (15 days) and the highest in-hospital mortality (53.8%) (38).

According to Chang, Raymond, et al., the pooled ICU admission rate was 21% (95% CI 0.12–0.34), and the pooled ICU mortality rate was 28.3% (95% CI 0.27–0.36). The average length of stay in the ICU was 7.78 (7.05–8.51) days. IMV prevalence and mortality were found to be 69% (95% CI 0.61–0.75) and 43% (95% CI 0.29–0.58), respectively, with worst-case mortality of 74% (95% CI 0.54–0.87). The average duration of invasive mechanical ventilation was 10.12 days (95% CI 7.08–13.16). The most common comorbidities and symptoms were hypertension (HTN) (51%), obesity (BMI>30kg/m2) (35%), diabetes (DM) (30%), and fever (81%), cough (76%), and dyspnea (75%) (39).

In Central Florida, 131 (10.2%) qualified for ICU admission (median age: 61 years, 35.1% female). Comorbidities included hypertension (64%) and diabetes (2%). (41.2%). Non-survivors show higher oxygen saturation (0.006), RR (0.003), and SBP (0.008) at baseline. 109 got MV (83 percent). In the ICU, the longer MV (14 (IQR 8–22) and the hospital (21 (IQR 13–31) compared to 9.5 (IQR 6–11) < 0.001. Overall hospital mortality was 19.8%, including 23.8 % from MVs. Both the hospital and MV fatality rates were 21.6. The non-survivors (92.3%) needed more vasopressors than the survivors (67.6%). Around 80.2% survived. Patients under 55 age had the greatest ($p = 0.003$) whereas those over 75 had the worst ($p = 0.008$) survival (40).

A research done in the state of Washington (mean age, 70 years [range, 43-92 years]; 52% male). The most frequent comorbidities were chronic renal disease and congestive heart failure, which were found in 86%. As of March 17, 2020, the death rate was 67%, with 24% of patients being critically ill and 9.5% being discharged from the ICU. Refractory respiratory failure was the main cause of mortality in the ICU, accounting for 45% of death. In all, 10 (14%) and 6 (8%), respectively, patients died immediately from a thrombotic or hemorrhagic event (32).

In southwest Nigeria, 22.5% had at least one COVID-19 co-morbidity. Comorbidities such as hypertension (74.2%), diabetes (30.3%), and asthma (10.2%). Patients with 2 or more comorbidities were more likely to be 60 or older (56.4%), male (73%) and had severe (16.7%) or critical (13.5%) illnesses. A comorbidity was four times as likely to cause death. Age (50–59 years and >60 years), male sex, and moderate to critical conditions were shown to be death risk

factors. In diabetes, the risk of death was 3.69 times higher (1.99–6.85). Those aged 40–59 years died 3 times more often (95 percent CI: 1.23–7.32), and those aged 60 and beyond died 6.87 times more likely (95 percent CI: 2.98–15.85) from COVID-19 than those aged 40–39 years (41).

A study conducted in Millennium COVID-19 Care Center in Ethiopia revealed that about 71 (5.3%) died, 72 (5.4%) were transferred and the rest 1202 (89.4%) were discharged improved. The overall median time to clinical improvement was 14 days. Around 34.2% of the patients had a history of one or more pre-existing co-morbid illness. The major co-morbid illness among the participants was hypertension (19.9%), diabetes (13.7%), cardiac disease (4.2%) and asthma (4.1%). Chronic kidney disease, chronic liver disease, neurologic disorder and chronic pulmonary diseases constitute only 2.6 % altogether (42).

Patients with hypertension (34.7%), HIV/AIDS (32.1%), diabetes mellitus (28.2%) and asthma (15.2%) were more likely to have preexisting medical problems, according to a research at Boru Meda Hospital. 90% of severe and all critical patients received unfractionated heparin. 6.5% required intranasal oxygen, 61% required a facemask, and no one was intubated. The median hospital stay was 13 days (IQR: 12–14). 97.1 percent of patients improved enough to be discharged, 2.1 percent died while receiving treatment, and two were referred. Ten patients were admitted to ICU, five (50%) died. Only 2% of patients with mild illness died, compared to 55.6 % of patients with severe condition. Mortality was 44.5 years old (IQR: 40–60, range 39–60) (43).

A study conducted in Ekakotebe general hospital shows that about 50.9% died, 77% were male. About 69.9 % had at least 1 comorbidity. Hypertension was the most common comorbidity 41.7%, followed by diabetic 31.9%. Up on admission to ICU 56.3% were on oxygen support (intranasal or facemask oxygen), 23.9% were on CPAP and 19.6% were on IMV. About 26.4% patients were intubated and mean LOS 4.47 (CI 3.5-5.5) days at ICU. A total of 73 patients were put on MV and the Median duration on MV was 6(IQR3-12 95% CI 5-8, range 1-30) days. About 92% of the patients who were put on MV died at ICU. Median LOS was 16 (IQR 10-23 range 2-48) days. Median LOS in ICU was 7 (IQR 4-12 95% CI 5-8) days. At the time of censoring, 49.1% were survived from those 96% were discharged home and 4% were still at ICU (44).

# 3. Objectives

## 3.1. General objectives

- To assess the patterns of admission and outcomes of COVID-19 patients among those admitted in Michu COVID-19 treatment center from June 8, 2020 to June 8, 2021 G.C

## 3.2. Specific objectives

- To assess patterns of admission of patients admitted in Michu Covid-19 treatment center
- To assess outcomes of patients admitted in Michu Covid-19 treatment center
- To identify factors associated with outcome outcomes of patients admitted in Michu Covid-19 treatment center

# 4. Methods and material

## 4.1. Study area and period

The study was conducted in Ethiopia, Oromia regional state, Jimma town at Jimma university medical center of Michu Covid-19 treatment center which located 352 km southwest of the capital Addis Ababa. It is inaugurated as Covid-19 treatment center on April, 2020.It has been providing services for mild to critical COVID-19 patients from Jimma zones and as referral for southwest of Ethiopia regarding to covid-19. It has eight to twelve healthcare providers who are replaced every two weeks and supporting staffs. The center had 132 beds, four functional mechanical ventilators and 29 patient monitors.

The data was collected from September 1to 30, 2021.

## 4.2. Study design

A retrospective study was conducted based on the Michu COVID-19 treatment center patient medical records and charts.

## 4.3. Population

### 4.3.1. Source of data

The source population were all recorded charts of patients admitted in Michu Covid-19 treatment center

### 4.3.2. Study population

Selected Charts of patients admitted to Michu Covid-19 treatment center at JUMC over 1year period included in the study.

## 4.4. Inclusion and Exclusion criteria

### 4.4.1. Inclusion criteria

All patients' medical record chart who are admitted with an outcome of discharge with an improvement, refer to other institution, discharge against medical advice and deaths in the treatment center during the study period were included in to this study..

### 4.4.2. Exclusion criteria

- Patient records with incomplete information were excluded from the study.
- Those who tested positive were admitted to treatment centers, although they showed no signs or symptoms of the disease

## 4.5. Sample size determination and Sampling technique

All Covid-19 patients who fulfills inclusion criteria and admitted in Michu Covid-19 treatment center during the study period were included in to the study.

## 4.6. Variables

### 4.6.1. Dependent variables

- Disease outcome

### 4.6.2. Independent variables

- Age
- Sex
- Residence
- Cigarette smoker
- Comorbidity
- Status of patient upon admission
- Respiratory support

## 4.7. Data collection tool and procedures

Socio-demographic (age, sex, residence) and medical-related data (comorbidity, status upon admission, severity of diseases) were collected by BSc nurses working in the center. The data was collected by reviewing records of patient cards using the checklist, which was developed in reference to the central register, medical record charts and other tools from similar studies.

## 4.8. Data processing and analysis

The principal investigator made follow up of the data collection process on a daily basis to ensure that the data are accurate, consistent, and comprehensive. The data obtained was edited, coded, entered, and cleaned by Epidata version 4.6 by the principal investigator. Statistical Package for the Social Sciences (SPSS) version 25 was used for analysis and Statistical significance test was applied to see the association between disease outcome and predictor variables. Adjusted odds ratio (AOR) with corresponding 95% confidence interval (CI) was used to assess the strength of the association between the dependent and independent variables at P-value of ≤0.05 cut off point. Descriptive data presented as counts and percentages for categorical data. Continuous variables presented as Means, Medians and Standard deviations. The correlation between independent variables was checked for multi-collinearity by using variance

inflation factor (VIF) and tolerance test. The result of multicollinearity shows that (VIF ranged 1.026 to 1.142) there is no correlation between the independent variables.

### 4.9. Data quality control

Each day before data collection began, I have given an orientation to data collectors to ensure completeness, accuracy, and consistency. I have thoroughly verified the sessions before using the questionnaires. Also I was providing on-site technical assistance as well as diligent monitoring. The data was verified daily to ensure that the questionnaires were accurate, consistent, and complete. Before analyzing the data, I have entered and cleaned the data.

### 4.10. Operational definitions

**Outcomes –** demanding ICU and discharged without demanding ICU and also improvement or worsening of pre-existing condition and also death or survived.

**Comorbid disease** Refers to diseases or disorders that coexist with an index disease. These diseases would be expected to have an influence on certain outcomes, such as mortality, healthcare resource use, quality of life and the probability of receiving treatment (47). And also included the pre-diagnosed and diagnosed at admission.

**Admission pattern-** is concerned with the frequency and distribution of disease, injury and other health related events and their cause (46).

### 4.11. Ethical considerations

Prior to the start of the research, the principal investigator obtained ethical approval from the institutional ethical review board of Jimma University. The principal investigator has sent a formal letter to the Jimma emergency operation center (JEOC) for cooperation. All data obtained in the course of the study were kept confidentially and were used solely for the purpose of the research. The names of respondents were never used by any means throughout the research.

### 4.12. Dissemination plan

The research will be presented for partial fulfillment of specialty certificate in anesthesiology and critical care. This research's findings will be distributed to the anesthesiology department and other hospital departments. Selected findings will be presented at scientific conferences and seminars, and published in peer-reviewed scientific journals.

# 5. Results

## 5.1. Socio-demographics and clinical characteristics

A A total of 383 patients were admitted in Michu Covid-19 treatment center of JUMC from April 17, 2020 to May 29, 2021. From these 108 patients were asymptomatic, 62 patients were mild cases and their chart had incomplete data and excluded from the study. Finally, 213 patients' registration book and medical record charts were included in to this study. Majority (95.8%) of patients admitted by Covid PCR test were positive. This shows PCR test was used as admission criteria to the center. Of the total admitted patients 132(62%) were males and 81(38.0%) were females. The mean and standard deviation of age of the patients during admission was Mean ± SD= 55±16.16 years, and ranged between 11 to 102 years old. The majority (53.1%) of the patients were between ages 31-60 years. More than half (52.1%) of patients were come from Urban area. More than half (56.3%) of them were severe cases while more than a quarter (27.2%) were moderate cases, more than two third (71.4%) of patients were admitted to HCU and majority (90.6%) of them were less than 2 of Quick SOFA score at admission. More than two-third (71.8%) of the patient had comorbidity and more half 81(52.9%) of these had one comorbidity whereas close to half (47.1%) of them had multi-comorbidity. Regarding to types of comorbidities, the commonest was hypertension 73(46.8%) followed by diabetic mellitus 40(25.6%), and congestive heart failure were 27(17.3%). Majority of respondents 208(97.7%) had no history of cigarette smoking. (Table 1)

Table 1 Socio-demographic and clinical characteristics of patients admitted to Michu Covid-19 treatment center of JUMC from April 17, 2020 to May 29, 2021, southwestern Ethiopia, 2021 (n=213)

| Variables | Categories | Patients outcome | | Total |
|---|---|---|---|---|
| | | Survived | Died | |
| COVID-19 confirmatory test | Positive | 144(67.6%) | 60(28.2%) | 204(95.8%) |
| | Suspected | 2(0.9%) | 7(3.3%) | 9(4.2%) |
| Sex | Male | 84(39.4%) | 48(22.5%) | 132(62%) |
| | Female | 62(29.1%) | 19(8.9%) | 81(38.0%) |
| Age | < 30 years old | 12(5.6%) | 3(1.4%) | 15(7.0%) |
| | 31-60 years old | 84(39.4%) | 29(13.6%) | 113(53.1%) |
| | >61 years old | 50(23.5%) | 35(16.4%) | 85(39.9%) |
| Age (in years) | Mean ± SD= 55±16.16, ranged between 11 to 102 | | | |

| | | | | |
|---|---|---|---|---|
| Residence | Urban | 77 (36.2%) | 34(16%) | 111(52.1%) |
| | Rural | 69(32.4%) | 33(15.5%) | 102(47.9%) |
| Severity of Covid at admission | Moderate | 52(24.4%) | 6(2.8%) | 58(27.2%) |
| | Severe | 87(40.8%) | 33(15.5%) | 120(56.3%) |
| | Critical | 7(3.3%) | 28(13.1%) | 35(16.4%) |
| Quick SOFA score at admission | <2 | 139(65.3%) | 54(25.4%) | 193(90.6%) |
| | ≥ 2 | 7(3.3%) | 13(6.1%) | 20(9.4%) |
| Admission place | ICU | 10(4.7%) | 52(24.4%) | 62(29.1%) |
| | HCU | 136(63.8%) | 15(7.0%) | 151(70.9%) |
| Comorbidity | Yes | 99(46.5%) | 54(25.4%) | 153(71.8%) |
| | No | 47(22.1%) | 13(6.1%) | 60(28.2%) |
| Multi-comorbidity | One | 53(34.6%) | 28(18.3%) | 81(52.9%) |
| | More than one | 46(30.1%) | 26(17%) | 72(47.1%) |
| Coronary artery disease | Yes | 15(9.6%) | 8(5.1%) | 23(14.7%) |
| | No | 87(55.8%) | 46(29.5%) | 133(85.3%) |
| Congestive heart failure | Yes | 19(12.2%) | 8(5.1%) | 27(17.3%) |
| | No | 83(53.2%) | 46(29.5%) | 129(82.7%) |
| Hypertension | Yes | 45(28.8%) | 28(17.9%) | 73(46.8%) |
| | No | 57(36.5%) | 26(16.7%) | 83(53.2%) |
| Venous thromboembolism | Yes | 2(1.3%) | 3(1.9%) | 5(3.2%) |
| | No | 100(64.1%) | 51(32.7%) | 151(96.8%) |
| Diabetes mellitus | Yes | 28(17.9%) | 12(7.7%) | 40(25.6%) |
| | No | 74(47.4%) | 42(26.9%) | 116(74.4%) |
| Chronic lung disease | Yes | 21(13.5%) | 5(3.2%) | 26(16.7%) |
| | No | 81(51.9%) | 49(31.4%) | 130(83.3%) |
| Active tuberculosis | Yes | 7(4.5%) | 4(2.6%) | 11(7.1%) |
| | No | 95(60.9%) | 50(32.1%) | 145(92.9%) |
| Stroke/transient ischemic attack | Yes | 2(1.3%) | 5(3.2%) | 7(4.5%) |
| | No | 100(64.1%) | 49(31.4%) | 149(95.5%) |
| Others | | 20(9.4%) | 13(6.1%) | 33(15.5%) |
| Smoke cigarette | Yes | 5(2.3%) | 0 | 5(2.3%) |
| | No | 141(66.2%) | 67(31.5%) | 208(97.7%) |

Others: Cancer, chronic kidney diseases, chronic liver diseases, chronic neurologic condition, HIV/AIDS and Non ischemic cardiovascular diseases.

Majority 117(54.9%) of patients were admitted from emergency department followed by 82(38.5%) were from in hospital wards and 10(4.7%) were Transfer from another hospital/health facility (Figure 1).

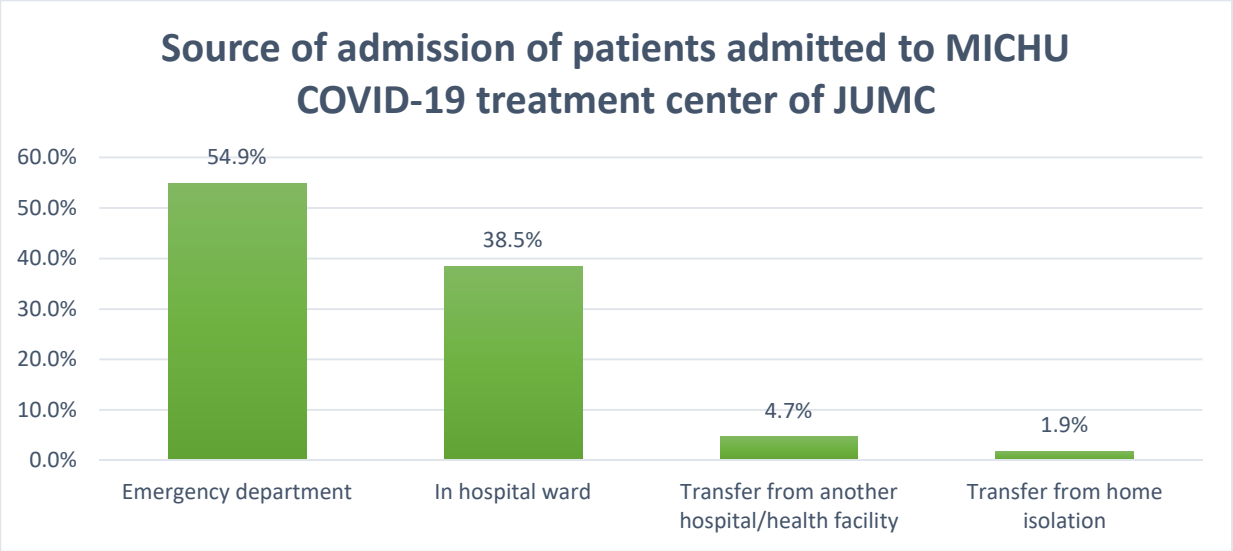


Figure 1 Shows Source of admission of patients admitted to MICHU COVID-19 treatment center of JUMC from April 17, 2020 to May 29, 2021, southwestern Ethiopia, 2021.

### 5.2.Treatment modality of Covid-19 patients

Majority of patients 199 (93.4%) got oxygen support where most of them 74(34.7%) received via facemask followed by nasal prongs 67(31.5%) and the remaining 58(27.2%) were on mechanical ventilators. Among mechanically ventilated patients, two third 39(67.2%) were on noninvasive ventilation and more than a quarter 17(29.3%) were on a prone position. Nearly three fourth 42(72.4%) of them stayed on mechanical ventilators for less than 7 days. All of the patients 213(100.0%) got antibiotics and majority of patients (95.8%) took steroid therapy. more than fourth of patients took therapeutic anticoagulation and less than one fifth 34 (16.0%) of them received inotropes. The median length of stay on mechanical ventilator was 3 days IQR [2-7]. Three fourth 159(74.6%) stayed in treatment center more than seven days and the median stay in the treatment center was 10 days IQR [6-16]. Majority of patients 44(71.0%) admitted in the ICU stayed less than seven days and the median length of stay in the ICU was 3 days IQR [2-7] (Table 2)

Table 2 Distribution of Treatment given to patients admitted to Michu Covid-19 treatment center of JUMC from April 17, 2020 to May 29, 2021, southwestern Ethiopia, 2021 (n=213)

| Characteristics | Categories | Overall patient outcomes | | |
|---|---|---|---|---|
| | | Recovered | Died | Total |
| Oxygen support | Yes | 132(62.0%) | 67(31.4%) | 199(93.4%) |
| | No | 14(6.6%) | 0(0.0%) | 14(6.6%) |
| Oxygen support | Nasal prongs | 65(30.5%) | 2(0.9%) | 67(31.5%) |
| | Facemask | 58(27.2%) | 16(7.5%) | 74(34.7%) |
| | Mechanical ventilation | 9(4.2%) | 49(23.0%) | 58(27.2%) |
| | None | 14(6.6%) | 0(0.0%) | 14(6.6%) |
| Types of ventilation | Noninvasive ventilation | 8(13.8%) | 31(53.4%) | 39(67.2%) |
| | Invasive ventilation | 1(1.7%) | 18(31.0%) | 19(32.8%) |
| | <7 | 6(10.3%) | 36(62.1%) | 42(72.4%) |

| | | | | |
|---|---|---|---|---|
| Duration stay on mechanical ventilation (in days ) | ≥7 | 3(5.2%) | 13(22.4%) | 16(27.6%) |
| Proned while on mechanical ventilation | Yes | 5(8.6%) | 12(20.7%) | 17(29.3%) |
| | No | 4(6.9%) | 37(63.8%) | 41(70.7%) |
| Proned while not on mechanical ventilator | Yes | 70(32.9%) | 23(10.8%) | 93(43.7%) |
| | No | 76(35.7%) | 44(20.7%) | 120(56.3%) |
| Inotropes/vasoconstrictors | Yes | 1(0.5%) | 33(15.5%) | 34(16.0%) |
| | No | 145(68.1%) | 34(16.0%) | 179(84.0%) |
| Therapeutic anticoagulation | Yes | 19(9.0%) | 39(18.4%) | 58(27.4%) |
| | No | 126(59.4%) | 28(13.2%) | 154(72.6%) |
| Steroid therapy | Yes | 139(65.6%) | 64(30.2%) | 203(95.8%) |
| | No | 6(2.8%) | 3(1.4%) | 9(4.2%) |
| Antibiotics | Yes | 146(68.5%) | 67(31.5%) | 213(100.0%) |
| Duration of stay in treatment center (in days) | <7 | 19(8.9%) | 35(16.4%) | 54(25.4%) |
| | ≥7 | 127(59.6%) | 32(15.0%) | 159(74.6%) |
| Duration of stay in ICU (in days) | <7 | 6(9.7%) | 38(61.3%) | 44(71.0%) |
| | ≥7 | 4(6.5%) | 14(22.6%) | 18(29.0%) |

### 5.3. Patient outcomes

The overall mortality rate was 67(31.5%). More death was recorded in the age group above 61 years old and more patients recovered from the disease were seen in the age group between 31-60 years old and 71.6% of the deaths were from male gender. Regarding to ICU outcomes about 52(83.9%) of them died. Regarding to overall discharge status, more than two-third 101(69.2%) of patients were discharged to home and the rest 45(30.8%) were discharged to hospital ward (Table 3).

Table 3 Distribution of patient outcomes admitted to Michu Covid-19 treatment center of JUMC from April 17, 2020 to May 29, 2021, southwestern Ethiopia, 2021 (n=213).

| Characteristics | Categories | Frequency | Percentage |
|---|---|---|---|
| Overall patient outcome | Recovered | 146 | 68.5% |
| | Died | 67 | 31.5% |
| ICU outcome | Recovered | 10 | 16.1% |
| | Died | 52 | 83.9% |
| Status of overall discharge | Discharged to home | 101 | 69.2% |
| | Discharged to in hospital ward | 45 | 30.8% |

The commonest causes of death were respiratory failure and multi-organ failure 29(43.3%) followed by cardiac arrest 6(9.0%). (Figure 2)

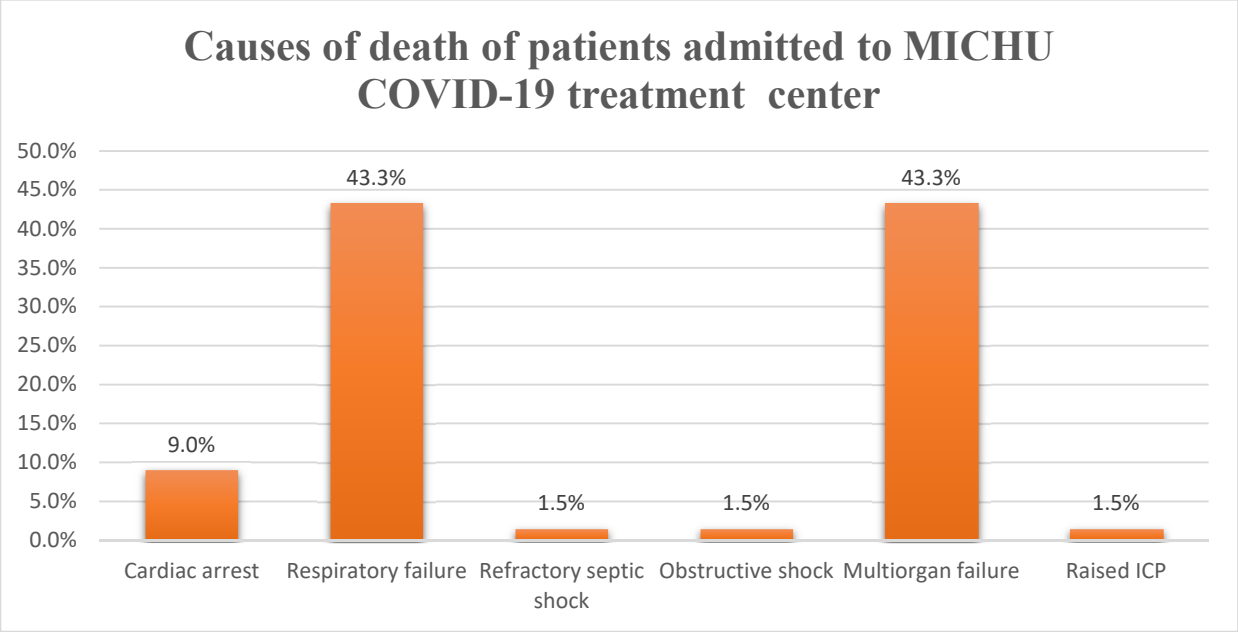


Figure 2 Shows causes of death among patients admitted to MICHU COVID-19 treatment center from April 17, 2020 to May 29, 2021, southwestern Ethiopia, 2021.

### 5.4. Factors affecting patient outcomes

Age, sex, residence, COVID severity, Quick SOFA score at admission, comorbidity, and length of stay in the treatment center were all found to be statistically associated with patient outcomes in a binary logistic regression analysis at a P-value less than 0.25. Because of multicollinearity independent variables like age, residence, presence of comorbidity and length of stay in the hospital was omitted from regression model. After adjusting for potential confounders, sex, COVID severity, Quick SOFA score upon admission, and duration of stay in the treatment center were found to be significantly associated with patient outcome at a P-value less than 0.05 in a multivariable binary logistic regression. Male patients died three times (AOR=3.14 (95% CI=1.25-7.89) more likely compared to female patients. Critical cases had 16-fold higher mortality rate than moderate cases (AOR=16; 95% CI=3.4-75.1); P=0.0001), while severe cases had a six-fold higher mortality rate (AOR=6; 95% CI=1.56-2.66; P=0.009). Patients with a qSOFA score greater than two at admission had more than eight-fold (AOR=8.5 (95% CI=1.8-40.53, P=0.007) higher death rate than those with a qSOFA score less than two. Patients who stayed in the treatment center for less than seven days had an 8.5-fold higher mortality rate than those who stayed longer (AOR=8.5 (95% CI=3.27-22.09), P=0.0001) (Table 4)

Table 4 Distribution of factor affecting the outcomes of patients admitted to Michu Covid-19 treatment center of JUMC from April 17, 2020 to May 29, 2021, southwestern Ethiopia, 2021 (n=213)

| Characteristics | Categories | COR (95% CI) | AOR (95% CI) | P-value for AOR |
|---|---|---|---|---|
| Sex | Male | 1.86(0.99, 3.48) | 3.14(1.25, 7.89) | **0.014** |
| | Female | 1 | 1 | |
| Age | < 30 years old | 1 | 1 | |
| | 31-60 years old | 1.38(0.36, 5.24) | 5.15(0.4, 66.41) | 0.20 |
| | >61 years old | 2.8(0.73, 10.66) | 8.73(0.68, 111.94) | 0.096 |
| Residence | Urban | 0.92(0.51, 1.64) | 0.89(0.37,2.13) | 0.8 |
| | Rural | 1 | 1 | |
| Severity of COVID | Moderate | 1 | 1 | |
| | Severe | 3.28(1.29, 8.37) | 5.9(1.56, 22.66) | **0.009** |

| | | | | |
|---|---|---|---|---|
| | Critical | 34.66(10.6, 113.18) | 16(3.4, 75.1) | **0.0001** |
| Quick SOFA score at admission | <2 | 1 | | |
| | ≥ 2 | 4.78(1.81, 12.62) | 8.5(1.8, 40.53) | **0.007** |
| Comorbidity | Yes | 1.97(0.98, 3.96) | 1.36(0.5, 3.65) | 0.53 |
| | No | 1 | 1 | |
| Duration of stay in treatment center (in days) | <7 | 7.3(3.7, 14.42) | 8.5(3.27, 22.09) | **0.0001** |
| | ≥7 | 1 | 1 | |

**COR** crude odd ratio **AOR** adjusted odd ratio **CI** confidence interval

## 6. Discussion

This retrospective study was conducted on 213 patients to assess patterns of admission and outcomes of COVID-19 patients and factors affecting the outcome of patients.

Based on this, study displayed that sex, COVID severity, Quick SOFA score upon admission, and duration of stay in the treatment center were found to be significantly associated with patient outcome and discussed as follow:

In this study about 31.5%, 83.9% were mortality rate of overall and ICU respectively. This result was high when compared with study conducted in the United States in-hospital mortality was 13.6%_(38), in Central Florida was 19.8% (40), in Millennium COVID-19 Care Center in Ethiopia 71 (5.3%) died (42) and in Ekakotebe general hospital about 50.9% died (44). This result was high when compared with study conducted in ICU of Tokyo 8% (36), according to Chang, Raymond, the pooled ICU mortality rate was 28.3% (95% CI 0.27–0.36) (39). This discrepancy may be due difference in advancement of technology in treating and caring and also status of the patients upon admission. The availability of ICU beds and the provision of intensive care varies among countries (49).

This shows that among age groups more than half of death (52.2%) was recorded among age group above 61 years old. This result was in line with conducted in the United States, individuals aged 65 years and older accounted for 80% of deaths related with COVID-19 (33), and in China, almost 80% of deaths occurred in people over the age of 60(35). This is implies according to several hypotheses have been proposed due to older people might be more susceptible to severe COVID-19 infection, Due to changes in lung anatomy and muscle atrophy which results in charges in physiologic function, reduction of lung reserve, reduction of airway clearance, and reduction of the defense barrier function (50) and also a weaker immune response (51), obesity (52), frailty (53), and multi-morbidity (54,55).

In this study 71.6% of the deaths occurred among males and being male increases the risk of death by three-fold than female patients (AOR=3.14 (95% CI=1.25-7.89). This finding is in agreement with the study conducted in Ekakotebe general hospital which shows that about 50.9% died and from this 77% were male (46). The possible reason is because men and women's immune systems differ biologically, which may impair ability of the patients to fight viruses like SARS-2-CoV-2. Females are more resistant to infections than men, which could be due to a variety of factors such

as sex hormones and high expression of coronavirus receptors (ACE 2) in men, as well as lifestyle factors including smoking and drinking at higher rates in men than in women (56).

This study revealed that 71.8% had comorbidity. Among them, more than half 81(52.9%) had one comorbidity whereas about 47.1% had multi-comorbidity. regarding to types of comorbidity the commonest was hypertension 73(46.8%) followed by diabetic mellitus 40(25.6%), and congestive heart failure were 27(17.3%). In most the studies hypertension, diabetic and cardiovascular diseases were common for instance study conducted in Wuhan (37), in the United States_(38), In Central Florida (40), in Boru Meda Hospital_(45), in Ekakotebe general hospital (46). This study finding shows among patients having comorbidity about 54(35.3%) were died. The possible cause's patients with underlying medical condition has an increasingly rapid and severe progression, often leading to death of the covid towards severe and critical(57).

# 7. Conclusion and Recommendation

## 7.1. Conclusion

In conclusion the study demonstrated that there was a high mortality rate in Michu Covid-19 treatment center of JUMC and the independent factors associated with Covid-19 patient outcome were Sex, COVID severity, Quick SOFA score upon admission, and duration of stay in the treatment center.

## 7.2. Recommendation

Based on the results and findings obtained in this study I would like to recommend the following points to the concerned bodies:

**JUMC:** As the study revealed the commonest cause of death in Michu Covid-19 treatment center were respiratory failure and Multi-organ failure. Since all these patients need oxygen, mechanical ventilators, and broad-spectrum antibiotics, sufficient plans such as increases number of human powers, mechanical ventilators, continuous supplies of the oxygen and antibiotics must be in place to cope with this expected pattern of disease.

**Jimma zone health office:** This body must also consider expanding Covid-19 treatment centers in other areas of the zone to address patients in this catchment area and provide high-quality care focusing on increasing the capacity and quality of care.

**Department of anesthesiology:** The department of anesthesiology in collaboration with JUMC administrators should work on the provision of training to healthcare providers on mechanical ventilators and oxygen therapy in-depth to participate of healthcare providers during provoking of the outbreak. The department should develop a plan with administrators for budget allocation for oxygen supplies by using the average oxygen consumption of the patients.

**Researchers**: There are still many facts that we do not know about COVID-19 due to gaps in knowledge for instance to know the effects of COVID-19 on patients who had comorbidity, the outcome of patients after being discharged from the center, and the benefits and effects of antibiotics on COVID-19 patients. Therefore, many prospective studies should be undertaken, with higher number of patients, to strengthen the findings of this study.

## Reference


1. WHO. WHO Director-General's remarks at the media briefing on 2019-nCoV on 11 February 2020. World Heal Orgnatization [Internet]. 2020;(February):6–9. Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020

2. Management of Patients with Confirmed 2019-nCoV | CDC [Internet]. [cited 2021 Jun 17]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html

3. Stokes EK, Zambrano LD, Anderson KN, Marder EP, Raz KM, El Burai Felix S, et al. Coronavirus Disease 2019 Case Surveillance — United States, January 22–May 30, 2020. MMWR Morb Mortal Wkly Rep [Internet]. 2020 Jun 19 [cited 2021 Jun 17];69(24):759–65. Available from: /pmc/articles/PMC7302472/

4. Goyal P. C or r e sp ondence Clinical Characteristics of Covid-19 in China. Nejm. 2020;100(1):1–3.

5. Eythorsson E, Helgason D, Ingvarsson RF, Bjornsson HK, Olafsdottir LB, Bjarnadottir V, et al. Clinical spectrum of coronavirus disease 2019 in Iceland: Population based cohort study. BMJ [Internet]. 2020 Dec 2 [cited 2021 Jun 17];371. Available from: https://www.bmj.com/content/371/bmj.m4529

6. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet [Internet]. 2020 Feb 15 [cited 2021 Jun 17];395(10223):497–506. Available from: https://isaric.tghn.org/protocols/

7. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China. Jama. 2020;323(13):1239.

8. Overview of Testing for SARS-CoV-2 (COVID-19) | CDC [Internet]. [cited 2021 Jun 17]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/hcp/testing-overview.html

9. ACR Recommendations for the use of Chest Radiography and Computed Tomography (CT) for Suspected COVID-19 Infection | American College of Radiology [Internet]. [cited 2021 Jun 17]. Available from: https://www.acr.org/Advocacy-and-

Economics/ACR-Position-Statements/Recommendations-for-Chest-Radiography-and-CT-for-Suspected-COVID19-Infection

10. How to Protect Yourself & Others | CDC [Internet]. [cited 2021 Jun 17]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html

11. The Moderna COVID-19 (mRNA-1273) vaccine: what you need to know [Internet]. [cited 2021 Jun 17]. Available from: https://www.who.int/news-room/feature-stories/detail/the-moderna-covid-19-mrna-1273-vaccine-what-you-need-to-know

12. WHO Coronavirus (COVID-19) Dashboard | WHO Coronavirus (COVID-19) Dashboard With Vaccination Data [Internet]. [cited 2021 Jun 17]. Available from: https://covid19.who.int/

13. Coronavirus disease (COVID-19) [Internet]. [cited 2021 Jun 17]. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-covid-19

14. Health NI of. Coronavirus Disease 2019 (COVID-19) Treatment Guidelines. Disponible en: https://covid19treatmentguidelines.nih.gov/. Nih. 2020;2019:130.

15. Siemieniuk RAC, Bartoszko JJ, Ge L, Zeraatkar D, Izcovich A, Pardo-Hernandez H, et al. Drug treatments for covid-19: Living systematic review and network meta-Analysis. BMJ [Internet]. 2020 Jul 30 [cited 2021 Jun 17];370. Available from: /pmc/articles/PMC7390912/

16. COVID Live Update: 177,885,850 Cases and 3,850,529 Deaths from the Coronavirus - Worldometer [Internet]. [cited 2021 Jun 17]. Available from: https://www.worldometers.info/coronavirus/

17. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. Vol. 109, Journal of Autoimmunity. Academic Press; 2020. p. 102433.

18. Petrilli CM, Jones SA, Yang J, Rajagopalan H, O'Donnell L, Chernyak Y, et al. Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: Prospective cohort study. BMJ. 2020;369.

19. Cates J, Lucero-Obusan C, Dahl RM, Schirmer P, Garg S, Oda G, et al. Risk for In-Hospital Complications Associated with COVID-19 and Influenza — Veterans Health Administration, United States, October 1, 2018–May 31, 2020. MMWR Morb Mortal Wkly Rep. 2020;69(42):1528–34.

20. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. JAMA - J Am Med Assoc. 2020;323(11):1061–9.

21. Wiersinga WJ, Rhodes A, Cheng AC, Peacock SJ, Prescott HC. Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19) A Review. 2020;2019:1–13.

22. Post-COVID Conditions | CDC [Internet]. [cited 2021 Jun 17]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects.html

23. Nalbandian A, Sehgal K, Gupta A, Madhavan M V., McGroder C, Stevens JS, et al. Post-acute COVID-19 syndrome. Nat Med [Internet]. 2021;27(4):601–15. Available from: http://dx.doi.org/10.1038/s41591-021-01283-z

24. Among SO, Hospitalized P. Annals of Internal Medicine Sixty-Day Outcomes Among Patients Hospitalized With. 2020;(November):1–3.

25. Carfì A, Bernabei R, Landi F. Persistent symptoms in patients after acute COVID-19 [Internet]. Vol. 324, JAMA - Journal of the American Medical Association. American Medical Association; 2020 [cited 2021 Jun 19]. p. 603–5. Available from: https://www.

26. Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R, Norman L, et al. Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: Prospective observational cohort study. BMJ. 2020;369:1–2.

27. Carvalho-Schneider C, Laurent E, Lemaignen A, Beaufils E, Bourbao-Tournois C, Laribi S, et al. Follow-up of adults with noncritical COVID-19 two months after symptom onset. Clin Microbiol Infect [Internet]. 2021;27(2):258–63. Available from: https://doi.org/10.1016/j.cmi.2020.09.052

28. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, et al. Clinical Characteristics of Coronavirus

Disease 2019 in China. N Engl J Med. 2020;382(18):1708–20.

29. Young BE, Ong SWX, Kalimuddin S, Low JG, Tan SY, Loh J, et al. Epidemiologic Features and Clinical Course of Patients Infected with SARS-CoV-2 in Singapore. JAMA - J Am Med Assoc. 2020;323(15):1488–94.

30. Livingston E, Bucher K. Coronavirus Disease 2019 (COVID-19) in Italy. Jama. 2020;323(14):1335.

31. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, et al. Presenting Characteristics, Comorbidities, and Outcomes among 5700 Patients Hospitalized with COVID-19 in the New York City Area. JAMA - J Am Med Assoc. 2020;323(20):2052–9.

32. Arentz M, Yim E, Klaff L, Lokhandwala S, Riedo FX, Chong M, et al. Characteristics and Outcomes of 21 Critically Ill Patients with COVID-19 in Washington State. JAMA - J Am Med Assoc. 2020;323(16):1612–4.

33. Bialek S, Boundy E, Bowen V, Chow N, Cohn A, Dowling N, et al. Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) — United States, February 12–March 16, 2020. MMWR Morb Mortal Wkly Rep [Internet]. 2020 Mar 27 [cited 2021 Jun 17];69(12):343–6. Available from: https://www.cdc.gov/mmwr/volumes/69/wr/mm6912e2.htm

34. Vahidy FS, Drews AL, Masud FN, Schwartz RL, Askary BB, Boom ML, et al. Characteristics and Outcomes of COVID-19 Patients during Initial Peak and Resurgence in the Houston Metropolitan Area [Internet]. Vol. 324, JAMA - Journal of the American Medical Association. American Medical Association; 2020 [cited 2021 Jun 17]. p. 998–1000. Available from: https://pubmed.ncbi.nlm.nih.gov/32789492/

35. Liu Z, Xue XB, Zhi Z. Epidemiology Working Group for NCIP Epidemic Response, Chinese Center for Disease Control and Prevention. [The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China]. Chinese Cent Dis Control Prev. 2020;41(2):145–51.

36. Banno A, Hifumi T, Okamoto H, Masaki M, Seki K, Isokawa S, et al. Clinical

characteristics and outcomes of critically ill COVID-19 patients in Tokyo: a single-center observational study from the first wave. BMC Infect Dis. 2021;21(1):1–9.

37. Feng X, Li P, Ma L, Liang H, Lei J, Li W, et al. Clinical Characteristics and Short-Term Outcomes of Severe Patients With COVID-19 in Wuhan, China. Front Med. 2020;7(August):1–12.

38. Di Fusco M, Shea KM, Lin J, Nguyen JL, Angulo FJ, Benigno M, et al. Health outcomes and economic burden of hospitalized COVID-19 patients in the United States. J Med Econ [Internet]. 2021;24(1):308–17. Available from: https://doi.org/10.1080/13696998.2021.1886109

39. Chang R, Elhusseiny KM, Yeh YC, Sun WZ. COVID-19 ICU and mechanical ventilation patient characteristics and outcomes—A systematic review and meta-analysis. PLoS One [Internet]. 2021;16(2 February):1–16. Available from: http://dx.doi.org/10.1371/journal.pone.0246318

40. Oliveira E, Parikh A, Lopez-Ruiz A, Carrilo M, Goldberg J, Cearras M, et al. ICU outcomes and survival in patients with severe COVID-19 in the largest health care system in central Florida. PLoS One [Internet]. 2021;16(3 March):1–14. Available from: http://dx.doi.org/10.1371/journal.pone.0249038

41. Osibogun A, Balogun M, Abayomi A, Idris J, Kuyinu Y, Odukoya O, et al. Outcomes of COVID-19 patients with comorbidities in southwest Nigeria. PLoS One [Internet]. 2021;16(3 March):1–12. Available from: http://dx.doi.org/10.1371/journal.pone.0248281

42. Leulseged TW, Hassen IS, Maru EH, Zewde WC, Chamiso NW, Bayisa AB, et al. Characteristics and outcome profile of Hospitalized African COVID-19 patients: The Ethiopian Context. medRxiv [Internet]. 2020 Oct 28 [cited 2021 Jun 17];2020.10.27.20220640. Available from: https://doi.org/10.1101/2020.10.27.20220640

43. Abdela SG, Abegaz SH, Demsiss W, Tamirat KS, van Henten S, van Griensven J. Clinical profile and treatment of covid-19 patients: Experiences from an ethiopian treatment center. Am J Trop Med Hyg. 2021;104(2):532–6.

44. Baraki T. Schoolof Medicine Departement Of Anesthesiology Critical Care And Pain

Madicine Reaserch Thesi Mortality And Associated Factors In Covid19 Patients Admitted To Covid19 Icu In Ekakotebe General Hospital Addis Abeba Ethiop [Internet]. Addis Abeba University; 2020 [Cited 2021 Jun 17]. Available From: http://etd.aau.edu.et/handle/123456789/25282

45. Lone NI. an Evaluation of Five Year Survival and Major Health Care Resource Use Following Admission To Scottish Intensive Care Unit. Univ Edinburgh. 2013;(September):100–65.

46. Departement of Emergency Medicine Assessment of Patterns of Admission , Outcomes and Requirement ' S for Masters Degree of Science in College of Health Sciences. 2020;

# Annexes

## Annex 1: Information sheet & consent form

Patterns of admission and outcomes of covid-19 patients in Michu Covid-19 treatment center June 8, 2020-June 8, 2021, Jimma town, Ethiopia.

Introduction

Hello, I am _____from Jimma Medical Center and working with investigator Biruk Abera (MD) who is doing his thesis for partial fulfillment of the requirement for a specialty certificate in anesthesiology.

In this study, data will be collected from the patients' medical record cards retrospectively. Information regarding any specific personal identifiers like the name of the clients will not be collected and information generated will be disclosed in totality. In addition, confidentiality of any personal information will be maintained throughout the study process and no unauthorized access to the information is allowed. If you have any questions or need further information regarding the planned study, you are free to get clarification from the principal investigator, from the institution, or through the following address.

Biruk Abera, (principal investigator).

Telephone: +251912243596

Email: birukabera31@gmail.com

**Signature of the data collector: _____**

## Annex 2: Questionnaires

Code: _____

MRN: _____

I. Socio demographic data

1. Age: _____in years
2. Sex: 1. Male ☐ 2. female ☐
3. Residence: 1.Urban ☐ 2. rural ☐

II. clinical data of the patient

1. date of admission _____
2. where the patient stayed just prior to admission to Michu covid-19 Rx center
    1. Emergency department
    2. In-hospital ward
    3. Transfer from another hospital/health facility
    4. Transfer from home isolation
3. Criteria for admission in the center
    1. positive
    2. suspected
4. If suspected what is test result lately
    1. positive
    2. negative
    3. test not done
5. What is the severity of covid-19
    1. mild
    2. moderate
    3. severe
    4. critical
6. What is the qSOFA score upon admission?
    1. <2
    2. >=2
7. Is there any comorbidity? 1. yes ☐ 2. no ☐
8. if yes specify:____

1. hypertension
2. diabetes
3. IHD
4. other cardiac illness
5. CKD
6. CLD
7. asthma
8. COPD
9. stroke
10. RVI
11. malignancy
12. others

9. History of Smoking 1. yes ☐ 2.no ☐
10. What was the mode of respiratory support upon admission?
    1. nasal prong
    2. simple facemask
    3. non re-breather facemask
11. Is the patient transferred to the ICU? 1. yes ☐ 2. no ☐
12. Was the patient put on IMV during his stay? 1. yes ☐ 2. no ☐
13. if yes
    1. noninvasive ventilation
    2. invasive ventilation
14. for how long stayed on MV_____ days
15. for how long stayed in the ICU_____ days
16. Was the patient put in a prone position during his stay? 1. yes ☐ 2. no ☐
17. What medication is given during the stay in the center?
    1. antibiotics
    2. vasopressors
    3. anticoagulants
    4. antivirals
18. What was the outcome of the patient? 1. dead ☐ 2. Improved ☐
19. If the outcome was death, what is the possible cause of death?_____

20. If the outcome was death, how many days did the patient stay at the center since admission? _____in days
21. if the outcome was improved, for how long stayed in the center since admission_____ in days
22. if improved , discharged from center to
    1. in-hospital ward
    2. referred to other hospital
    3. home

Ref.No IHRPG/81/21
Date 26/11/2021

To : Dr. Biruk Abera

**Subject: Ethical Approval of Research Protocol**

The IRB of Institute of Health has reviewed your research project " **Patterns of admission and outcomes of COVID-19 patients in MICHU COVID-19 treatment center** "

Thus, this is to notify that this research protocol has presented to the IRB meets the ethical and

Scientific standards outlined in national and international guidelines. Hence, we are pleased to inform you that your research protocol is ethically cleared under the following strict conditions:

1. Any significant deviation from the methodological details indicated in the approved protocol must be communicated to the IRB before it has been implemented.
2. Approval shall be only for a period of twelve months. The principal investigator is required to submit an application for the renewal of the ethical approval.
3. The Committee must be notifi Determinants of delayed care seeking for TB suggestive Symptoms in Siltie Zone, Southern Ethiopia: A community based unmatched case-control study ed, in writing, of any alteration to the project including unforeseen events/circumstances that might affect the acceptability of the approved protocol.
4. The Principal researcher is required to immediately notify the committee in the event of any adverse effects on participants or of any unforeseen events that might affect continued ethical acceptability or amendment to the original consent form.
5. The inability of the Principal Researcher to continue in that role, or any other change in research personnel involved in the project; should be communicated.

IRB, Chairperson

Million Tesfaye, PhD
Tel: +251917063744
E-mail: ethicsjuirb@gmail.com

Tel. +251-47 11 114 57
PBX: +251471111458-60
Fax: +251471111450
+251471112040
P.O.Box. 378
JIMMA, ETHIOPIA
e-mail: iro@ju.edu.et
website: http://www.ju.edu.et