ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

POST GRADUATE PROGRAM

SURVIVAL STATUS AND PREDICTORS OF MORTALITY AMONG ADULTS WITH COVID-19 ATTENDING EKA KOTEBE GENERAL HOSPITAL, ADDIS ABABA, ETHIOPIA, 2021.

BY: TEGENE ATAMENTA (BSc)

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTER DEGREE IN ADULT HEALTH NURSING.

May 26, 2021
Addis Ababa, Ethiopia

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May 26, 2021
Addis Ababa, Ethiopia

APPROVAL SHEET

ADDIS ABABA UNIVERSITY
COLLEGE HEALTH SCIENCE
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I, the undersigned MSc student, declare that I have submitted my original work on a title **"Survival status and predictors of mortality among Adults with COVID -19 attending Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021".**

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STATEMENT OF DECLARATION

By signing below, I announce and confirm that this research paper is my work. I adhered to all ethical standards of scholarship in developing, data collection, data analysis, and finalizing this research project. All scholarly document used in the study has been acknowledged by citation. I hereby certify that I have quoted, cited, and referenced all sources incorporated in this study. In preparing this thesis, every attempt was made to prevent plagiarism.

Tegene Atamenta _____ _____

Name of student Signature Date

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ACRONYMS AND ABBREVIATION

ACE2	Angiotensin-converting enzyme 2
ARDS	Acute respiratory distress syndrome
CRP	C-reactive protein
CT	Computerized tomography
FiO2	Fraction of inspired oxygen
HMIS	Health Management Information Systems
ICU	Intensive care unit
IDR	Incidence density rate
LDH	Lactate-dehydrogenase
MNCH	Maternal Neonatal and Child Health
NLR	Neutrophil-to-lymphocyte ratio
PaO2	Partial pressure of oxygen
SARS	Severe acute respiratory syndrome
SPO2	Oxygen saturation
SPSS	Statistical Package for Social Sciences
TASH	Tikur Anbessa Specialized Hospital
USA	United States of America
WBC	White blood cell count

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ABSTRACT

Coronavirus disease (COVID-19) affect peoples throughout the globe and is becoming a serious threat to the health and wellbeing of people. The disease has a higher transmission rate and a greater risk of morbidity and mortality. This study aimed to assess survival status and predictors of mortality among adults with COVID -19 attending Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021. A retrospective follow-up study was conducted among 602 Adults with COVID-19 attending Eka Kotebe General Hospital from March 13, 2020, to November 13, 2020. Patient charts were selected using a simple random sampling method. The data were entered by Epi- data version 4.2 while analysis was carried out using STATA version-16. A Kaplan Meier survivor curve was computed to estimate the survival probabilities. A Long-rank test was used to compare the difference in survival curves between categories of covariates. Cox proportional hazard models were fitted to identify predictors. Hazard ratio with a 95% confidence interval was computed to determine the level of significant association. On multivariable analysis, those variables having a p-value of ≤0.05 were considered statically significant. In this study, out of 602 participants, a total of 514 Adults with COVID-19 were censored and 87 have died with an incidence rate of 10.7 per 1000 person-day observations (95%CI: 8.79, 13.38). The median survival time of adult COVID-19 patients was 21 days. Older adults(≥65year) (AHR:2.22,95%CI:1.02,4.86), being Men (AHR:3.04,95%CI:1.61, 5.74), shortness of breathing at admission (AHR:2.29,95%CI:1.16,4.54),comorbidity (AHR: 2.23, 95%CI:1.04, 4.80),Diabetes Mellitus (AHR 2.31,95%CI:1.30,4.08),cardiac disease (AHR: 2.07, 95%CI: 1.21, 3.43) and baseline White blood cell count of greater than 10 (103/µL) (AHR 2.62, 95%CI: 1.55, 4.44) were identified as independent predictors of COVID-19 mortality. A major predictor of time to death of COVID -19 patients were found to be male sex, older adult (≥65 years), having shortness of breathing at admission, having at least one comorbidity, diabetes Mellitus, Cardiac disease, and baseline White blood cell count of greater than 10(103/µL). Therefore, concerned stakeholders should focus on the above-mentioned predictors of mortality and design interventions accordingly to enhance the survival of COVID-19 patients.

Keywords: - Survival status, Predictors of mortality, COVID-19

1. INTRODUCTION

1.1 Background

Human coronavirus is a large group of coronaviruses infected multiple organs mainly the respiratory system, ranging from the common cold to bronchiolitis and pneumonia. Coronavirus is named after its crown-like shape [1]. Coronavirus (COVID-19) is a disease of the respiratory tract caused by a newly occurring coronavirus species called SARS-CoV2. It was first identified in China, Wuhan, Hubei Province, in December 2019. On January 7, 2020, in Wuhan, Chinese researchers started isolating a new individual infected by a coronavirus [2].

There are four major coronavirus sub-groupings, known as alpha, beta, gamma, and delta. Only alpha and beta families can affect humans. The seven coronavirus species that can infect humans are alpha coronavirus (229E and NL63), beta coronavirus (OC43, and HKU1) MERS-CoV, SARS-CoV, and SARS-CoV2(the novel coronavirus that causes coronavirus disease 2019, or COVID-19)[3]. The precise origin, location, and biological reservoir of the Coronavirus is remaining unidentified, but the virus is presumed to be zoonotic. Due to the sequence identity of the bat CoV, bats may be responsible for coronavirus outbreaks. Bats are recognized as the natural host reservoir of Severe acute respiratory syndrome-like Coronavirus [4].

The World Health Organization announced on 11 March 2020 that the emerging coronavirus (COVID-19) disease was a global pandemic [5].

The clinical characteristics of the coronavirus are first recognized in china as fever, and cough, and Diarrhea (uncommon). The incubation period was 4 days. On radiologic examination of computed tomography, there was ground-glass opacity [6]. Additional studies are also revealed that the clinical feature of covid-19 includes fever, cough, and myalgia or fatigue. Sputum development, headache, coughing up of blood, diarrhea, shortness of breathing, and low level of lymphocytes were less frequent symptoms. A majority of patients had lung inflammation with unusual features on chest computerized tomography (CT). Complications comprise ARDS, anemia, and acute cardiac injury [7].

Inhalation of small airborne droplets is likely to be a route of transmission. Viruses are emitted during breathing out, talking, and coughing in micro droplets small enough to stay in the air and

pose an infection risk at a distance of one to two meters from the infected individual. Individuals are getting infected after inhalation of reparatory micro droplet [8].

According to several studies carried out worldwide; the median time from the onset of illness to the time they experienced dyspnea was 5–8 days, to acute respiratory distress syndrome was 8–12 days and from onset of illness to ICU admission was 9.5–12 days [9, 10]. Even though there is limited data to how much extent the human is reinfected with covid-19, there is a possibility for a human to be infected multiple times with SARS-CoV-2 [11-13].

Age, sequential organ dysfunction D-dimer, pre-existing cerebrovascular disorders, volumes of CD3+CD8+T cells, and Cardiac Troponin I have been reported as risk factors for the deaths of adult COVID-19 patients[14].

In Ethiopia the first covid-19 was detected on 13 March 2020, a 48 years Japanese man who has travel history. within a few days, another three cases of COVID-19 were identified, who had contact with the first person [15]. Until now, February 4, 2021, the country tested 1,980,005 suspects, of whom 139,408 cases had been confirmed positive and of these, 2,122 died and 123,988 recovered [16].

1.2. Statement of the problem

Currently, COVID-19 is a biggest public health burden affecting 56 million people worldwide. Several people are affected and dead in various countries. The morbidity and mortality of people due to COVID-19 is significantly growing with time. Globally, the distribution and seriousness of the virus have increased dramatically [17].

According to some reports in November 2020.COVID-19 covers 218 countries and territories with 56,261,952 confirmed cases of COVID-19 and 1,349,506 deaths. As the report indicates, the highest number of cases and death among countries were the United States of America (15,370,339 cases and 290,474 death), India (9,004,365 cases and 132,162 death), and Brazil (5,945,849 cases and 167,455 death) [18].

Studies show that the current estimations of covid-19 case fatality rate are found to be about, 12.8% in Italy, 10.2% in Spain, 2.3% in Germany, and 3.9% in the USA [19].In Wuhan china, the overall case fatality rate of COVID-19 was 4.54%. The epidemic of COVID-19 had a greater burden than the influenza pandemic that emerged in 2009 in terms of hospitalization and death and clinical seriousness. [20]. The average time of death from the onset is 17·8 days and 24.7 days for hospital discharge. The percentage of infectious individuals expected to be admitted to hospital has risen with age. Individuals at the age of 80 years and more are 18.4% more likely to be hospitalized [21].

The likelihood of COVID-19 mortality rises with age. Studies showed that men had 11.5% more risk of deaths than women. Renal disease, chronic lung diseases, and diabetes mellitus increased the risk of death by 52.3%, 89.5%, and 41.3% respectively [22]. The rates of spread of COVID-19 are higher than influenza and the likelihood of mortality is also greater. While most patients are estimated to have a remarkable improvement, the prognosis of elderly people with the underlying disease may be poor [23].

The COVID-19 pandemic also exerts an enormous impact on the health care system due to millions of people get sick and in severe cases need admission with invasive mechanical ventilation. The disease leads to the death of millions of people due to the total lack of health care, economic crisis, and intense social insecurity [24].In a similar scenario, most beds are now occupied by COVID-19 patients, this leads to an intensive care bed shortage. Most elective

surgeries are canceled due to the pandemic. This can contribute to potential disease progression and have an immense effect on patients' quality of life and the cost of treatment [25].

In Ethiopia, a study conducted in Addis Ababa revealed that following COVID -19 pandemic, there was a 12% and 35 % decrease in First antenatal attendance visits and under-five respectively. Fear of being infected by COVID-19 at the health facilities, restriction of access due to prohibitions of movement, engagement of health facilities as care centers for COVID-19,Health professional, and resources to direct COVID-19 response is found to be significant factors for the decrease in Maternal Neonatal and Child Health (MNCH) services [26].

In our country as of November 15, the number of confirmed cases of COVID-19 exceeded 100,000. It took 242 days for the number of confirmed cases of COVID-19 to exceed 100,000 Ethiopia is the fourth country in Africa and the first in east Africa in terms of the prevalence of COVID-19 [27].

No related study has been undertaken so far in Ethiopia. Understanding survival status and the risk factor for COVID-19 mortality is critical in designing a management protocol and making the right clinical management decision based on the available local scientific evidence. Therefore, the objective of this study was to assess survival status and predictors of mortality among adults with COVID -19 attending Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

2. LITERATURE REVIEW

This literature review has two subsections. The first subsection review literatures related to the survival status of COVID-19 patients and the second part is composed of predictors of mortality among adults with COVID -19.

2.2. Magnitude of covid-19 mortality

Globally, the morbidity and mortality of people due to COVID-19 is significantly growing from time to time. Over 218 Countries and Regions around the world have reported COVID-19 infection. As of November 30, 2020, worldwide there were 62,363,527 reported cases of COVID-19, including 1,456,687 deaths. Countries with the highest number of death are the United States of America, India, and Brazil 263,946, 137,139, and 172,561 respectively [28].

The overall cumulative incidence of mortality in the Democratic Republic of the Congo 29%[29] and Egypt (11.7%)[30].similarly the incidence of mortality in Denmark, China, New York City, and Brazil found to be 5.5.% 28%, 43% and 46.25 respectively [14, 31-33].

A study conducted across 16 countries reporting the highest number of cases indicates that the mortality rate of COVID-19 was 8.1 times and 62 times higher among those aged 55 to 64 and aged 65 or older respectively. The mortality rate of COVID-19 became 77% higher for men than women [34]. A meta-analysis study performed in China reveals that the distribution of COVID19 infection in males is 60% higher. The discharge and fatality rates for COVID19 patients were 52 percent and 5 percent respectively [35]. Hospital admission and mortality rates are less than 0.1% in infants but escalate to 10% or higher in older adults. Furthermore, at all ages, men are more likely than women to suffer serious consequences from COVID-19 [36].

In Africa as of November 30, 2020, there have been 2,170,843 confirmed Cases and 51,915 Deaths. The highest death was recorded in South African(23,800), Egypt (7,000), and Morocco (6,700) [37].

In Ethiopia, 1,636,729 peoples were tested, of which 110,074 confirmed cases and 1,706 death with case fatality rate of 1.5 have been reported. The highest number of cases is reported in Addis Ababa(64,277), Oromia (19,702), and Amhara regions (6,572) [27].

2.3. Survival status of COVID-19 patients

A retrospective study done in Congo revealed that the median survival time of Adults with COVID-19 is 9 days. The Overall probability of survival at 2 days, 3 days, 5 days, and

10 days were 90%, 78.7%,73.0% and 71.6% respectively [29].

A retrospective and multicenter cohort study done in Brazil revealed that the median survival time following COVID-19 infection is 12 days (95% CI 11.82-12.18). The overall survival rate estimate to be 79.21% (95% CI 78.82%–79.59%) in 5 days of hospitalization, 59.22% (95% CI 58.69%–59.76%) in 10 days. There is a 45.4% (95% CI 44.6% –46.2%) estimate of survival is recorded in 10 days in case of ages above 68 years of, black or brown race of 51.3% (95% CI 50.3% –52.2%), living in the countryside 48.8% (95% CI 45.0%–52.5%) and illiterate 37.4% (95% CI 34.0% –40.9%) [32].The survival probabilities of COVID-19 patients in Mexico at 3 days is 86.9%[38] and in another set of Brazil, there are 95.1% survival probabilities at 10 days [39]. The overall median survival time with COVID- 19 was found to be 9 days in New York City [40],25 days in both china [41] and Mexico[42].

A similar study conducted in Fortaleza, among 2070 COVID-19 positive medical records 1939 (93.7%) were survived. the overall survival probability after the 24th day of infection is found to be 87.7%. Being elderly, neurological diseases, neuropathies, and cardiovascular diseases are found to be factors that decrease the survival status of COVID-19 patients [39]. In a quasi-experimental trial, Bolus vitamin D_3 infusion at or before COVID-19 infection was associated with less severe COVID-19 infection and increased survival status in elderly patients. Those taking vitamin D_3 had a longer survival time than the Placebo Group (log-rank P = 0.002) [43]. The average 7-day survival of COVID-19 is 89%. Serum blood urea nitrogen (BUN), age, neutrophil count, red cell distribution width, oxygen saturation, and serum sodium have been identified as forecasting the survival status of patients [44]. A prospective cohort study conducted in India showed that the average recovery time for Covid-19 patients is 25 days (95 percent C.I. 16 days to 34 days). Only Four percent of patients were recovered after 10 days of treatment. There is no difference in survival time between males and females [45].

2.4. Predictors of COVID-19 mortality

2.4.1. Scio demographic factors

A study conducted in Kinshasa University Hospital, Democratic Republic of Congo, from March to June 2020 showed that individual with the age of ≥60 years and 40-59 years are six and four times more likely to die with covid-19 respectively, as compared to an individual with the age of <40 years [29]. Similar study done in Morocco showed that older ages are more likely

to die with COVID-10[46]. Several studies conducted in China showed that older age individuals and male sex are more likely to die with COVID-19 [47-50]. Additional studies conducted in china also conclude that male sex was associated with a higher risk of mortality (OR, 1.8; P = 0.0003) [51, 52]. Retrospective research undertaken in the United States and Mexico concluded that altitude is correlated with COVID-19 mortality in men younger than 65 years of age. In those participants younger than 65 years of age, the probability of death was 36% higher in those residing at ≥ 2,000 m compared to those residing at < 1500. However, there is no relation between altitude and COVID-19 mortality in Mexican women or subjects 65 years of age or older[53].

A nationwide cohort study conducted in Denmark asserts that being male sex increase the risk for hospitalization and death with covid-19 [33]. A single-center cohort study of 1325 sequentially hospitalized patients with COVID-19 in New York also revealed that the overall mortality with covid-19 was significantly higher in males (P = .016) [54]. Another retrospective study done in United states found that male sex is the predictor of COVID-19 mortality (OR: 2.74)[55] and (OR: 1.50)[56].

2.4.2. Clinical characteristics during admission

A four -week follow-up study conducted in Renmin Hospital of Wuhan University in Wuhan, China showed that Symptoms of shortness of breathing on admission (HR 2.35, P = 0.001) found to be a strong predictor of death with covid-19 [29, 57, 58].similar study conducted in Millennium COVID-19 Care Center, Ethiopia, shows that having Fever AOR=0.328, p-value= 0.027) and shortness of breath (AOR= 4.034, p-value=0.006) at admission time were found to be significant predictors of death in COVID-19 patients [59].

2.4.3. Comorbidities

A retrospective cohort study conducted in Alborz province, Iran, which included hospitalized patients aged above 18 years with confirmed COVID-19 conclude that having any comorbidities increased the risk of in-hospital mortality from COVID-19 (OR: 2.66) [60, 61]. Patients with chronic pulmonary diseases diabetes (HR: 1.89, p: 0.008), and diabetes (HR: 1.41, p: 0.038) increased the risk of death with COVID-19 by 89.5% and 41.3% respectively [22]. a similar study done in New York revealed that having heart diseases is independently associated with

in-hospital mortality (aHR 1.7)[40]. Underlying cardiovascular or cerebrovascular diseases is also another predictor of high mortality of COVID-19 pneumonia [49, 62].

According to the study conducted in Fars (southwest of Iran) province hospitals found that hypertension is an independent predictor of COVID-19 mortality. Hypertensive patients declined more quickly than the non-hypertensive population. Additionally, HIV, cardiovascular, and kidney disease were diagnosed as factors that raise the risk of death in hypertensive patients [63]. Severe acute kidney injury (AKI) in patients with COVID-19 is a portentous clinical predictor and is linked with high mortality [22, 50, 64].

Diabetes is a significant predictor for COVID-19 prognosis. A study shows that the incidence of respiratory failure P = .022), acute cardiac injury (P < .01), and death (P = .001) in the diabetes group was significantly higher than that in the non-diabetic group. In addition, there was a slightly greater occurrence of bilateral pneumonia in diabetic patients (86.9%, P = .020). among diabetic patients those who are insulin-dependent have a higher risk of disease progression and fatal outcome than non-insulin-required groups [65].

A retrospective cohort study conducted in Hospital Clínico, a tertiary academic hospital from Valladolid found that The presence of chronic neurological disorders (OR=1.750 P=0.063) is an independent predictor of mortality in hospitalized Covid-19 patients [66]. Another predictor of COVID -19 mortality is hypertension. Hypertensive patients (p = .032) are deteriorated more rapidly and experience fatal outcomes than non-hypertensive groups [63]. a similar retrospective, multicenter cohort study, based on data from 46285 hospitalizations for COVID 19 in Brazil revealed that there is increased risk of death when they were admitted to the ICU (HR 1.28) and with comorbidities; diabetes mellitus (HR 1.17), neurological disease (HR 1.34), renal disease (HR 1.11), heart disease (HR 1.14), asthma (HR 0.71), pneumopathy (HR 1.12) [32].

2.4.4. Laboratory Findings

A Nationwide retrospective cohort study conducted in 1,590 hospitalized patients with COVID-19 in China asserts that procalcitonin level > 0.5 ng/mL (HR, 8.72), and aspartate aminotransferase level > 40 U/L (HR, 2.2) were independent risk factors associated with the fatal outcome of COVID-19 [48]. A retrospective cohort study conducted in New York City shows that patients with D-dimer of more than 1000 ng/mL, C-reactive protein of more than

200 mg/L, and lymphopenia were associated with mortality in individuals hospitalized for COVID-19 [31]. A systematic review and meta-analysis study found that those who died varied on several biomarker thresholds relative to those who survived, including elevated cardiac troponin levels, creatinine (>15.3 µmol/L), C-reactive protein (>66.3 µg/mL), cardiac troponin (>44.2 ng/L), D-dimer (>4.6 µg/mL),interleukin-6 (>4.6 ng/mL), reduce in albumin levels (<3.7 g/L) and Alanine transaminase (>5.7 U/L)) [51].

Human serum albumin (HSA) was found to be a significant predictor of COVID-19 mortality. Albumin (HR: 0.38, p<0.001) is independently associated with mortality, irrespective of another variable. patients in the lowest tertile or hypoalbuminemia (< 32 g/L) showed higher in-hospital mortality or reduced survival with COVID-19 [67]. A Laboratory parameter associated with critical COVID-19 disease were thrombocytopenia, leukocytosis, increased neutrophils, increased C reactive protein and ferritin, increased D dime, lymphopenia, raised ALT (alanine transaminase) and/or AST (Aspartate Transaminase), increased cardiac troponin, and elevated LDH (lactate dehydrogenase), decreased albumin. Computed tomography findings of ground-glass opacities were considered as the most important indicator for COVID-19 fatal outcome [68]. Low platelet count (<150 × 103/mm3) and higher ferritin levels (>750 ng/mL) are also independent predictors of death with COVID-19[69]. For each unit increase in Neutrophil-to-lymphocyte ratio (NLR) lead to an 8% higher risk of hospital mortality with COVID-19 (OR = 1.08; *P* = 0.0147) as compared with patients in the lowest tertile of NLR [70]. Systematic review and meta-analysis found that an increase from baseline of creatine kinase, CRP, white blood cell, D-dimer, and decrease in lymphocyte account were all associated with a higher mortality rate [71]. a similar study done in China showed that baseline leukocyte count (>10x109/L) is significantly associated with COVID-19 mortality [72, 73]. A retrospective study conducted among 219 individuals in Mash had Iran found that an increase in White blood cells (WBC) count is a significant predictor of mortality (aHR, 1.05)[74].

2.4.5. Treatment related factors

A study conducted in United Kingdom revealed that the dexamethasone group shows a reduce in COVID-19 mortality as compared to the usual care group without dexamethasone AOR=0.83, P<0.001) [75]. A study done in 671 hospitals in six continents found that chloroquine was independently associated with an increased risk of COVID-19 mortality (AHR: 1·365, CI:

1·218–1·531) [76]. Two different observational studies done in Italy found that patients receiving heparin were a 40% lower risk of death (AHR: 0.6, 95CI:0.49–0.74) [77] and Enoxaparin is associated with lower in-hospital mortality as compared to no enoxaparin treatment (AOR:0.53,95CI:0.4-0.9) [78]. Another retrospective study in Italy shows that Azithromycin was associated with a decrease in COVID-19 mortality (AOR:0.60, 95%CI:0.42–0.85)[79].

2.5. Conceptual framework

A conceptual framework was constructed based on rigorous review and analysis of concepts from different scholarly articles [29, 31, 32, 49, 59, 63]. It is the relationship between predictor variables (Socio-demographic characteristics, Clinical features, preexisting medical condition, Care and Treatment-related factors, and Laboratory findings) and the outcome variable (time to death).

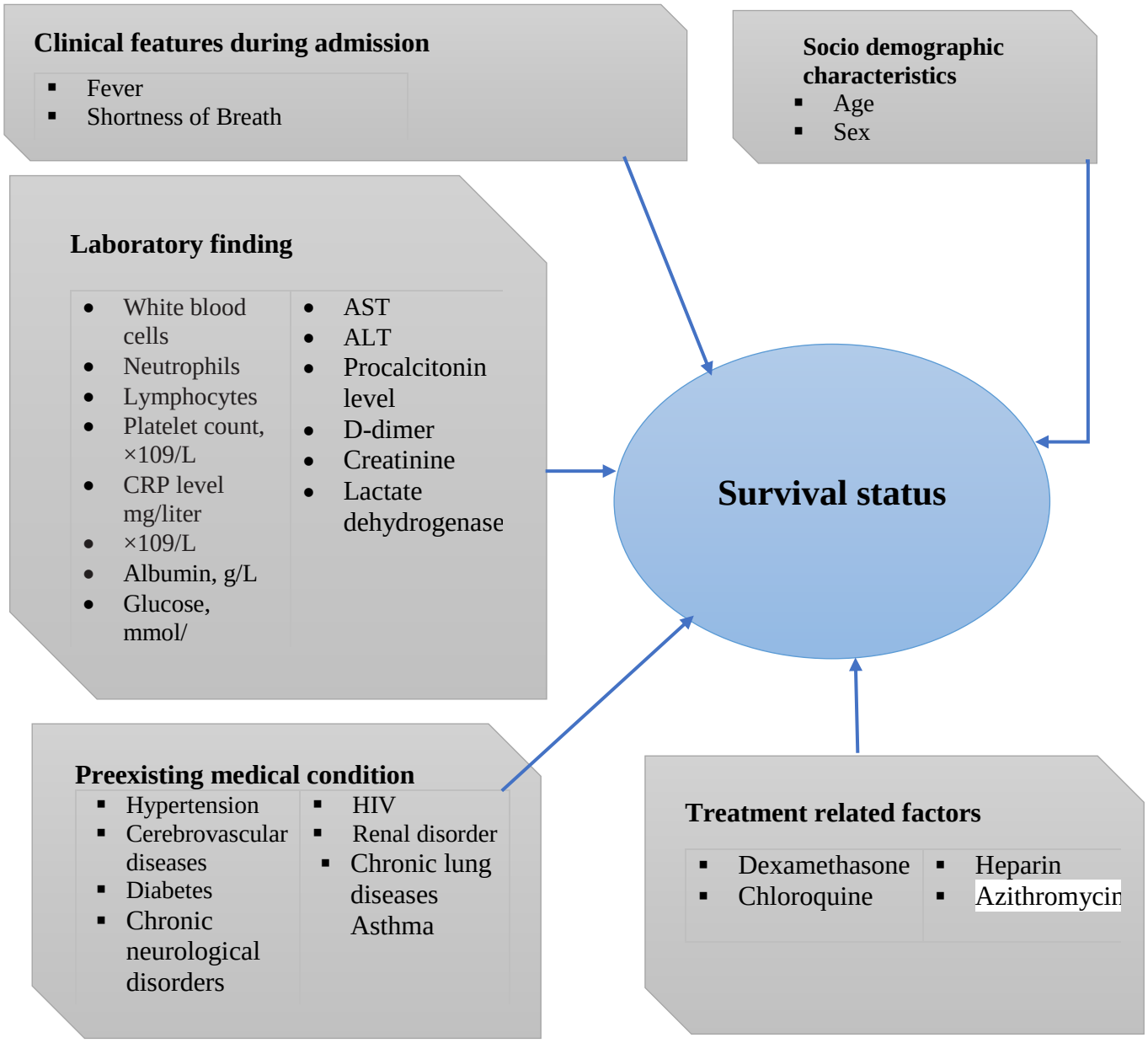

Figure 1: Conceptual framework of assessment of Survival status and predictors of mortality among Adults with COVID-19 attending Eka Kotebe General Hospital Addis Ababa, Ethiopia, 2021.

3. JUSTIFICATION OF THE STUDY

As of November 2020, worldwide, more than 56 million peoples get infected with COVID -19 and 1.3 million of them have died. Still, now COVID-19 is a big global public health concern[18]. The complex and multisystem nature of COVID-19 disease is also making it difficult to control the pandemic.

In Ethiopia as of November 27, more than 120,000 people get infected and 1,882 of them are died [16]. Despite a lot of efforts are made to face the pandemic, deaths tend to increase over days. So far, No or little related study has been undertaken in Ethiopia. Until now, little is known about the predictors of COVID-19 mortality, and nor even the disease process is not clearly known.

Understanding the characteristics of COVID-19 patients, identifying those predictors that lead to death, and how they are influenced by time is important to understand the nature of the disease and to design appropriate intervention. Therefore, this study intended to investigate survival status and predictors of mortality among adults with COVID -19.

4. SIGNIFICANCE OF THE STUDY

Worldwide, the morbidity and mortality of people due to COVD-19 is significantly growing. Currently, COVID -19 is a major public health problem. Now a day, health professionals face a complicated decision-making process due to a lack of the best available local scientific evidence.

The finding of this study will support the development of clinical management protocol thereby reduce the clinical dilemma of managing COVID -19 patients. It is also important to understand the characteristics of the diseases and thereby contribute to the identification of indicators for early detection and initiation of treatment. Furthermore, the result of this study is important for the policymakers and practitioners to design appropriate policy to control the pandemic

Studying survival status and predictors of mortality can have an enormous role in adding a body of knowledge in the field of infectious diseases and contribute to the control of disease epidemics. The finding of this study can be used as a baseline for other studies.

5. OBJECTIVES

5.1. General objective

To assess survival status and predictors of mortality among adults with COVID -19 attending Eka Kotebe General Hospital, Addis Ababa, Ethiopia,2021.

5.2. Specific objective

To assess survival status among adults with COVID -19 attending Eka Kotebe General Hospital, Addis Ababa, Ethiopia,2021.

To identify the predictors of mortality among adults with COVID -19 attending Eka Kotebe General Hospital, Addis Ababa, Ethiopia,2021.

6. METHODS AND MATERIALS

6.1. Study Area and period

The study was employed in Eka Kotebe General Hospital, Addis Ababa, Ethiopia. Addis Ababa is the biggest and the center of Ethiopia, with an approximate population of 3.6 million and a metro population of over 4.6 million. Addis Ababa has ten sub-cities in which the City lies at an altitude of 7,546 feet (2,300metres) [80].In Addis Ababa, there are twelve governmental and more than 40 private hospitals. Eka kotebe general hospital is one of the governmental hospitals. It has been about two years since the Eka Kotebe General Hospital started running. It provides both outpatient and inpatient services. Previously, Eka Kotebe General Hospital has a five-floor hospital with 150 beds and 200 beds for delivering mental health facilities, and general medical services respectively. Currently, it has a nine-floor building for administrative work and Mental Health Institute. For the first time in Ethiopia, On March 13, 2020, 450 infected and suspected patients have entered this facility and 73 patients have been confirmed. The study was conducted from February to March 2021.

6.2. Study design

A facility-based retrospective follow-up study with record review was conducted among adults with COVID -19 attending Eka Kotebe General Hospital COVID-19 treatment center, Addis Ababa, Ethiopia, 2021.

6.3. Population

6.3.1. Source population

All patients admitted to Eka Kotebe General Hospital COVID-19 treatment center.

6.3.2. Study population

All adults with COVID-19 who attended the COVID-19 treatment center of Eka Kotebe General Hospital between March 13, 2020, and November 13, 2020.

6.3.3. Sample population

All adults with COVID-19 who attended the COVID-19 treatment center of Eka Kotebe General Hospital between March 13, 2020, and November 13, 2020, and fulfill inclusion criteria.

6.4. Eligibility criteria

6.4.1. Inclusion Criteria

All medical records of confirmed Adult COVID-19 patients at Eka Kotebe General Hospital COVID-19 treatment center during the defined period.

6.4.2. Exclusion criteria

Incomplete patient charts

6.5. Sample Size Determination

To determine the sample size a single population proportion formula was used for the first objective by assuming a proportion COVID -19 mortality rate of 3.4% [16]. d= Margin of error 5% and Z α/2 = Z score of 95% CI.

$$N = \frac{Z\left(\frac{\alpha}{2}\right)^2 p(1-p)}{d^2}$$

$$\frac{(1.96)^2(0.034)(0.966)}{(0.05)^2} = 50$$

By considering a 10% of non-response rate for an incomplete chart, the final sample size is 55

A double population proportion formula was used to calculate the sample size for predictors . by considering age, being diabetic, and having a fever at admission as the major predictor variables [59].

$$n_1 = \frac{\left[Z_{\frac{\alpha}{2}}\sqrt{\left(1 + \frac{1}{r}\right)P(1 - P)} + Z_{\beta}\sqrt{\frac{p_1(1 - p_1) + r\,p_2(1 - p_2)}{r}}\right]^2}{(p_1 - p_2)^2}$$

Where:

P1: proportion of exposed with the outcome of death

P2: proportion of non exposed with the outcome of death

Z α/2: 95CI%

Zβ: 90% power and, r is the ratio of exposed to non-exposed 1:1

Variables	Assumption	Total sample size	After adding 10%
Age	P_1=0.143 P_2=0.256	558	614
Being diabetic	P_1=0.531 P_2=0.242	130	143
Having a fever at admission	P_1 =0.21 P_2 =0.40	264	290

Epi info version 7 was used to calculate the sample size. Among those above factors, Age was identified to give a maximum sample size of 558. After adding 10%, The final total sample size was **614.**

6.6. Sampling technique and procedures

A simple random sampling technique was employed. Adult patients admitted with COVID-19 from March 13, 2020, to November 13, 2020, at Eka Kotebe General Hospital were taken. Open-Epi software version 3 was used To take samples randomly. The first serial number or unique COVID-19 number was assigned for each patient registry. Unique COVID-19 number from small to the highest was entered into the software to select a sample of 614 records. Then after using the corresponding unique COVID -19 number, a random sample of 614 records was selected and the patient's card retrieves from the record room based on the Medical record number.

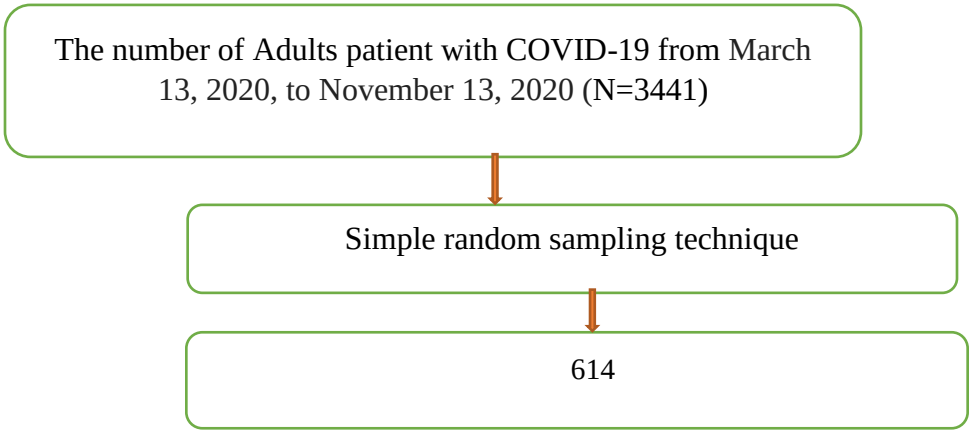

Figure 2: Schematic presentation of sampling procedure to assess Survival status and predictors of mortality among Adults with COVID-19 attending Eka Kotebe General Hospital Addis Ababa, Ethiopia, 2021.

6.7. Study variables

6.7.1. Dependent variable

Survival status (Time to death)

6.7.2. Independent variables

Scio demographic factors: Age, sex

Clinical characteristics on admission: Cough, Fever, Shortness of breathing, Chest pain, Sore throat, Abdomen pain, Myalgia, Fatigue, Arthralgia, Loss of sense of smell, Vomiting, Diarrhea, Headache, Anorexia, Temperature(C0), Respiratory rate (breath/min.), Plus rate (beat/min.), Systolic blood pressure, Diastolic blood pressure, and O2 saturation.

Comorbidities: Cardiac, Hypertension, Diabetes Mellitus, Chronic lung diseases(chronic obstructive diseases and /or Asthma), Human immune virus, Chronic hepatic disorder, Renal diseases, Malignancy, Tuberculosis, Neurological disorder, and Number of comorbidities.

Treatment-related factors: Azithromycin, Dexamethasone, Chloroquine, Paracetamol, Tramadol, Enoxaparin, Meropenem, Ceftriaxone, Vancomycin, Unfractionated heparin Omeprazole

Laboratory Findings: White blood cells, Neutrophils, Monocyte, Lymphocytes, Red blood cell, Hemoglobin Hematocrit, Platelet count, ×109/L, Random blood sugar, Alanine aminotransferase(U/L), Aspartate aminotransferase(U/L), Urea and Creatinine.

6.8. Operational definitions

Event: The occurrence of death due to COVID-19 at the time of hospital stay from March 13, 2020, to November 13, 2020.

Follow-up time: From the time of hospitalization until an event occurred**.**

Censored: Patients who did not develop the outcome of concern (death) during follow-up period.

Survival status: The status of the patients at the end of the follow-up period (death or censored).

Time to death: The Time interval from confirmed COVID-19 diagnosis till death happens.

Incomplete patient chart: refers to charts that have no date of admission and independent variable.

6.9. Data collection tools and procedures

The checklist was Adapted from several related studies [32, 46, 51, 59, 81]. After rigorous reviewing of literatures information on the patient chart is first observed and then, the data extraction checklist was prepared in English. The structured checklist was used to collect the data. The checklist contains five main sections; Part I aimed at collecting information on basic socio-demographic variables of the patients (2 items), part II consisted of questions required to gather information on patient Comorbidities status (13 items), part III includes questions to assess Clinical characteristics of admission (20 items), part IV deals about Laboratory Findings (12 items) and Part V contain question regarding Care and Treatment related factors (11 items). All COVID-19 patients' charts, diagnosed from March 13, 2020, to November 13, 2020, at Eka Kotebe General Hospital COVID-19 treatment center was reviewed from COVID-19 records through their medical record number.

The medical chart of all study subjects were picked based on the eligibility requirements. The survival status of patients was obtained from the medical record chart. Survival time is calculated between the times of the date of admission to the date of death or censored. Data were collected by five degree holder nurse and one supervisor was recruited.

6.10. Data quality Assurances

The data extraction tool was adapted after reviewing different literatures. Data quality was assured by designing rigors and appropriate data extraction tools. The adapted data extraction tool was be evaluated by experienced researchers in the field. To check the recorded variables on the patient's medical record, a Pretest was conducted to 5% of the sample size at Millennium COVID-19 Care Center two weeks before the actual data collection.

After the pretest, some unrecorded variables were omitted from the data extraction forms. Data collectors and supervisors were trained regarding the entire data collection process for two days. To ensure the quality of the data, close supervision and monitoring were carried out by supervisors and investigators at the time of data collection.

The primary investigator reviewed the recording data extraction tool immediately at the end of each data collection day. Furthermore, the collected data were checked for completeness and consistency by the principal investigator. To assure the quality of the data Double data entry using Epi data 4.2 was employed.

6.11. Data processing and analysis

The data was coded, cleaned, and edited. Any error was identified and corrected at the spot through reviewing original data using the code numbers. Data entry was done via Epi- data version 4.2 while analysis was carried out using STATA version- 16. Categorical data were computed in terms of Frequency distribution. Continuous data were presented through basic descriptive analyses by computing central tendency and dispersion. The outcome of the participant was dichotomized into death and censored. Incidence of death was calculated for the entire study period per 1000-person day. A survival table was employed to estimate survival probabilities after diagnosis of COVID -19 at different time intervals. A Kaplan Meier survivor curve was computed to estimate the survival probabilities. A Long-rank test was used to compare the difference in survival curves between categories of covariates. Multi-collinearity was checked prior to running the Cox Proportional hazard regression model. In Schoenfeld residual test covariates with a P-value of greater than 0.05 were considered as satisfying the assumption for the Cox-proportional hazard model. Those independent variables having a p-value of ≤ 0.25 in the bivariate analysis were fitted and included in the multivariable cox-proportional hazard regression model. On multivariable analysis, those variables having a p-value of ≤ 0.05 are considered statically significant. Hazard ratio with a 95% confidence interval and p-values was used to assess the strength of a relationship and to determine factors that are statistically significant with the dependent variable. Finally, the finding was presented by using texts, tables, and graphs.

6.12. Ethical consideration

The study was carried out after getting an Ethical clearance letter from the institutional review committee of Addis Ababa University, College of health sciences, department of nursing, and midwifery research committee. Letter of cooperation from the department of nursing and midwifery was written to Eka Kotebe General Hospital administrative office. An institutional research review board of Eka Kotebe General Hospital reviews the proposal and writes a formal

letter to all concerned authorities. Permission for conducting this study was obtained from the clinical director and subsequent department and unit heads of the hospital.

Confidentiality was secured through using a nurse as a data collector, who works in the COVID-19 treatment center at Eka Kotebe General Hospital. Besides, patient names and medical record numbers weren't included in the data collection tool. Furthermore, the daily collected data was kept locked in cabinets and finally, the collected data was entered into a password-protected computer.

6.13. Dissemination of the study

Upon completion of this research, the final result will be submitted and presented to Addis Ababa University, School of Nursing and Midwifery, Department of Nursing as partial fulfillment of masters in Adult health nursing. A copy of the findings will also be disseminated to Eka Kotebe General Hospital. Furthermore, the finding will be presented at workshops, conferences, seminars, and annual nursing association meetings. Finally, the manuscript will be submitted for future publishing in scientific journals.

7. RESULTS

In this retrospective follow-up study, 614 Adult COVID-19 charts were reviewed, of which 602 (98.04%) records met enrollment criteria in the final analysis; 12 incomplete charts were excluded. out of the 602 adult COVID-19 charts followed for eight-month, 514 were censored and 87 have died.

7.1. Socio-demographic characteristics of the study participants

Among 602 study participants, 380(63.12%) were male. Regarding age distribution, the median age of the study participants was 41 years and the mean age was 44.8± 18.9 SD years. (Table 1).

Table 1: Socio-demographic characteristics of adult COVID-19 patients at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Variables	**Category**	**Status**		**Total(%)**
		Death(%)	**Censored(%)**	
Sex	Male	65(17.06%)	316(82.94%)	381(63.29%)
	Female	22(9.95%)	199(90.05%)	221(36.71%)
Age	18-40	12(4.4%)	261(95.6%)	273(45.35%)
	≥40-64	25(12.82%)	170(87.18%)	195(32.39%)
	≥65	50(37.31%)	84(62.69%)	134(22.26%)

7.2. Clinical features of the study participants on admission

The majority of study participants 518(86.05%) had a history of one or more symptoms at admission. Most of the participant 473(78.57%) had a cough on their admission, followed by fever 240(39.87%), Shortness of breathing 237 (39.37%), Fatigue 134(22.26%), Myalgia 87(14.45%), Chest pain 80(13.29%) and Sore throat 77(12.79%). The mean diastolic blood pressure on admission was higher among those who were died as compared to those who were censored (84.6mmHg vs 76.8mmHg). Regarding oxygen saturation, the mean Spo2 (%) among those who were died is significantly lower than those who were censored (86.1% vs 92.2%) (Table 2).

Table 2: Clinical features of adult COVID-19 patients at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Variables	**Category**	**Status**		
		Death(%) (n=87)	**Censored(%) (n=514)**	**Total(%) (n=602)**
Baseline symptoms	No symptom	9(10.71%)	75(89.29%)	84(13.95%)
	Have ≥1 symptom	78(15.06%)	440(84.94%)	518(86.05%)
Cough	No	13(10.08%)	116(89.92%)	129(21.43%)
	Yes	74(15.64%)	399(84.36%)	473(78.57%)
Fever	No	36(9.94%)	326(90.06)	362(60.13%)
	Yes	51(21.25%)	189(78.75%)	240(39.87%)
Shortness of breathing	No	14(3.86%)	349(96.14%)	363(60.30%)
	Yes	73(30.54%)	166(69.46%)	239(39.70%)
Fatigue	No	46(9.81%)	423(90.19%)	468(77.74%)
	Yes	41(30.83%)	92(69.17%)	134(22.26%)
Myalgia	No	65(12.62%)	450(87.38%)	515(85.55%)
	Yes	22(25.29%)	65(74.71%)	87(14.45%)
Chest pain	No	56(10.73%)	466(89.27%)	522(86.71%)
	Yes	31(38.75%)	49(61.25%)	80(13.29%)
Sore throat	No	63(12.00%)	462(88.00%)	525(87.21%)
	Yes	24(31.17%)	53(68.83%)	77(12.79%)
Headache	No	74(13.63%)	469(86.37%)	543(90.2%)
	Yes	13(22.03%)	46(77.97%)	59(9.8%)
Lose of sense of smell	No	74(13.29%)	483(86.71%)	557(92.52%)
	Yes	13(28.89%)	32(71.11%)	45(7.48%)
Arthralgia	No	75(12.46%)	485(80.56%)	560(93.02%)
	Yes	12(1.99%)	30(4.98%)	42(6.98%)
Diarrhea	No	82(14.34%)	490(85.66%)	572(95.02%)
	Yes	5(16.67%)	25(83.33)	30(4.98%)
Vomiting	No	79(13.795)	494(86.21%)	573(95.18%)

	Yes	8(27.59%)	21(72.41)	29(4.82%)
Lose of appetite	No	83(14.16%)	503(85.84%)	586(97.34%)
	Yes	4(25.00%)	12(75.00%)	16(2.66%)
			Status	
		Mean±SD	Death(%)	Censored(%)
Vital sign on admission	Temperature (^{O}C)	37.0±1.60	37.5	36.9
	Pulse rate (Beats/min)	88.3± 14.5	96.7	86.9
	Respiratory rate (RR/min)	23.7±4.4	26.7	23.16
	SBP (mmHg)	123.7± 22.3	128.3	122.9
	DBP (mmHg)	77.9±44.7	84.6	76.8
	Spo2 (%)	91.3 ±7.9	86.1	92.2

7.3. Baseline laboratory marker of the study participants

Concerning the baseline Complete cell count, the mean White blood cell count of study participants is higher among those who die as compared to those censored (13.7 vs 7.33). The mean Random blood sugar of study participants among died and censored are 140 mg/dl and 126.2 mg/dl respectively. The majority of participants 252(44.2%) have a blood group of “B”, followed by a blood group of “A” 213(37.3%).(Table 3).

Table 3: Baseline laboratory marker of adult COVID-19 patients at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Variables		**Mean±SD**	**Status**	
			Death (mean)	**Censored (mean)**
Complete cell count	White blood cell (10^3/µL)	8.2± 5.1	13.7	7.33
	Neutrophil(10^3/µL)	6.35± 2.6	8.78	5.94
	Monocyte(10^3/µL)	0.50±0.3	0.45	0.51
	Lymphocyte(10^3/µL)	2.6±3.11	1.76	2.79
	Red blood cell(10^6/µL	5.0±4.09	4.51	5.13
	Hemoglobin (g/dl)	14.1±2.9	13.0	14.3
	Hematocrit (%)	39.77±9.1	35.87	40.3
	Platelet count (cells/ L)	224.9± 95.1	184.9	231.7
Renal function test(n=551)	Urea (mg/dl)	19.9± 8.3	22.2	19.4
	Creatinine (mg/dl)	1.07±1.00	1.72	0.95
Liver function test(N=551)	Asparatate transaminase (U/L)	40.20± 20.9	49.44	38.4
	Alanine transaminase (U/L)	42.4± 27.45	51.6	40.69
Random blood sugar (mg/dl)(n=419)		126.18± 65.9	140.0	126.2

Variable	Category	Death(%)	Censored(%)	Total(%)
Blood group (n= 570)	A	27(4.75%)	186(32.6%)	213(37.3)
	B	44(7.72%)	208(36.5%)	252(44.2%)
	AB	7(1.23%)	16(2.81%)	23(4.04%)
	O	9(1.58%)	73(12.81%)	82(14.4%)

7.4. Preexisting co-morbidity status of study participants

Nearly half of study participants 292(48.5%) have at least one comorbidity, of them, 56(18.86%) patient had three or more comorbidity. Among comorbidities, hypertension is the leading in

count (28.24%), followed by Diabetes Mellitus (20.6%), Cardiac disease (9.63%), and Renal diseases (6.81%). (Table 4).

Table 4: Preexisting co-morbidity status of adult COVID-19 patients at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Variables	**Category**	**Status**		**Total(%)**
		Death(%)	**Censored(%)**	
Having Existing co-morbidity	No co-morbidity	13(4.19%)	297(95.81%)	310(51.5%)
	Have atleast one co-morbidity	74(25.34%)	218(74.66%)	292(48.5%)
Number of comorbidity	1-2	53(21.99%)	188(78.01%)	241(81.14%)
	≥3	22(39.29%)	34(60.71%)	56(18.86%)
Cardiac disease	No	54(10.09%)	481(89.91%)	535(88.87%)
	Yes	33(49.25%)	34(50.75%)	58(9.63%)
Hypertension	No	45(10.42%)	387(89.58%)	432(71.76%)
	Yes	42(24.71%)	128(75.29%)	170(28.24%)
Diabetes Mellitus	No	37(8.01%)	425(91.99%)	462(76.74%)
	Yes	50(37.71%)	90(64.29%)	140(23.26%)
Chronic lung diseases (COPD and /or Asthma)	No	84(14.8%)	496(85.525)	580(96.35%)
	Yes	3(13.64%)	19(86.36%)	22(3.65%)
HIV/AIDS	No	81(14.01%)	497(85.99%)	578(96.01%)
	Yes	6(25%)	18(75%)	24(3.99%)
Malignancy	No	84(14.26%)	505(85.74%)	589(97.84%)
	Yes	3(23.08%)	10(76.92%)	13(2.16%)
Chronic liver disease	No	80(13.63%)	507(86.37%)	587(97.51%)
	Yes	7(46.57%)	8(53.33%)	15(2.49%)
Renal diseases	No	65(11.55%)	498(88.45%)	563(93.52%)
	Yes	22(56.41%)	17(43.59%)	41(6.81%)
Chronic neurological Diseases	No	79(13.64%)	500(86.36%)	579(96.18%)
	Yes	8(34.78%)	15(65.22%)	23(3.82%)

7.5. Treatment-related characteristics of study participants

Nearly half of 297(49.34%) the study participants received azithromycin and 189(31.4%) of subjects were given Dexamethasone. About 122(20.27%) and 75(12.46%) of participants received Ceftriaxone and Vancomycin treatment. Only 12(1.99%) of the participant were given Chloroquine. (Table 5).

Table 5: Treatment-related characteristics of adult COVID-19 patients at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Variables	**Category**	**Status**		**Total(%)**
		Death(%)	**Censored(%)**	
Azithromycin	No	38(12.46%)	267(87.54%)	305(50.66%)
	Yes	49(16.5%)	248(83.5%)	297(49.34%)
Dexamethasone	No	73(17.68%)	340(82.32%)	413(68.6%)
	Yes	14(7.14%)	175(92.59%)	189(31.4%)
Chloroquine	No	85(14.41%)	505(85.59%)	590(98.01%)
	Yes	2(16.67%)	10(83.33%)	12(1.99%)
Tramadol	No	62(11.61%)	472(88.39%)	534(88.70%)
	Yes	25(36.76%)	43(63.24%)	68(11.30%)
Enoxaparin	No	52(11.16%)	414(88.84%)	466(77.41%)
	Yes	35(25.74%)	101(74.26%)	136(22.59%)
Meropenem	No	51(9.36%)	494(90.645)	545(90.53%)
	Yes	36(63.16%)	21(36.84%)	57(9.47%)
Ceftriaxon	No	73(15.21%)	407(84.79%)	480(79.73%)
	Yes	14(11.48%)	108(88.52%)	122(20.27%)
Vancomyocin	No	33(6.26%)	494(93.74%)	527(87.54%)
	Yes	54(72.00%)	21(28.00%)	75(12.46%)
Unfractionated heparin	No	73(15.40%)	401(84.60%)	474(78.74%)
	Yes	14(10.94%)	114(89.06%)	128(21.26%)
Omeprazole	No	37(8.10%)	420(91.90%)	457(75.91%)
	Yes	50(34.48%)	95(65.52)	145(24.09%)

7.6. Survival status of COVID-19 patients

In this study, 602 adult patients with COVID-19 were followed retrospectively. The median hospital stay was 13 days with a minimum and the maximum follow-up time of 2 and 58 days. In this study, 514 were censored and 87 were died resulting in a total cumulative incidence of death was 14.4% during the follow-up period. The total follow-up time was 8109 person-day, with an incidence rate of 10.7 death per 1000 person-day observations (95%CI:8.79,13.38). The incidence rate of death of male patients was higher as compared to females(12.26 vs 7.95 deaths per 1000 person-day observation).

7.7. Overall survival rate of COVID-19 patients

The overall Kaplan- Meier estimate showed that the probability of survival of COVID-19 patients is high on the first day of admission, which relatively falls as follow-up time increases. The overall median survival time of adult COVID-19 patients was 21 days. The mean survival time of the study participant was 27.23 days(95%CI: 23.82, 30.63). The probability of survival for COVID-19 patients at the start of follow-up was 100%. The probability of survival at 2 days, 3 days, 5 days, and 10 days were 99.8%,99.5%,97.6%, and 76.7% respectively.

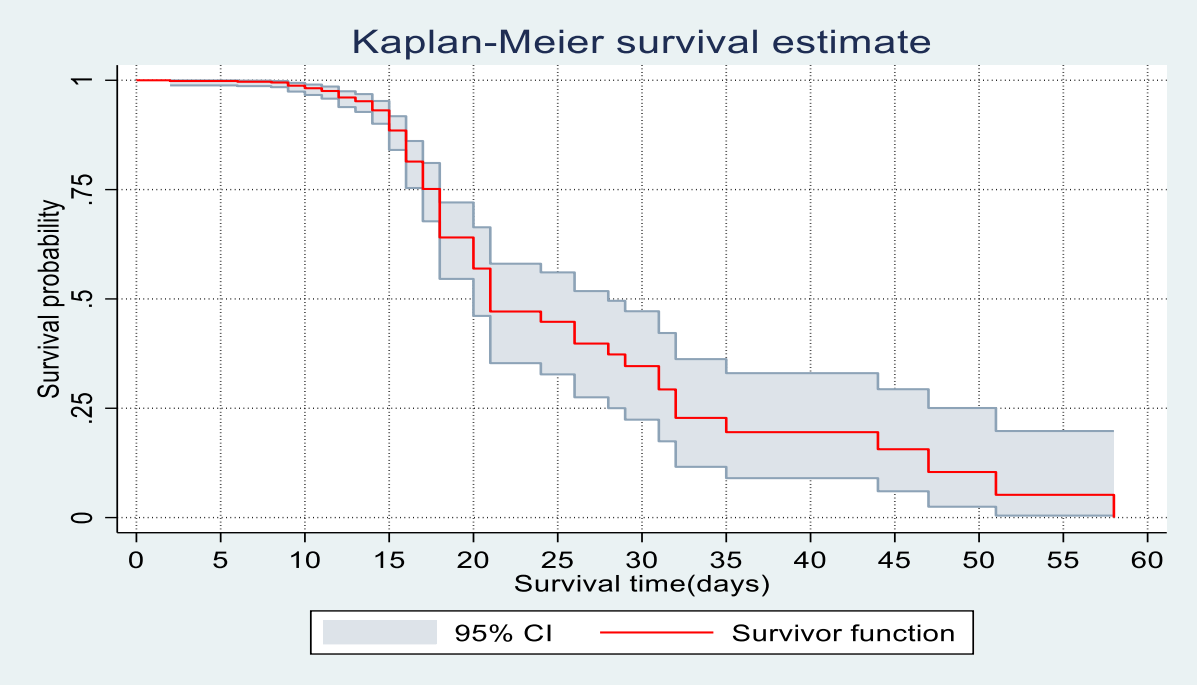

Figure 3: Overall Kaplan-Meier survival estimate of Adult COVID-19 patients at COVID-19 treatment center of Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

7.8. **Survival function and Comparison of Survivorship Functions**

In this retrospective study, the test statistics revealed that there is a statistically significant difference in survival function among different covariates. Log-rank test was computed to test the equality of survival curves among various levels of the categorical variables. The Kaplan-Meier estimator survival curve was computed to compare and estimate the survivor function among different group variables. As the Kaplan-Meier survival curve described that one survivorship function curve Located under another means, the lower curve group has a lower survival status than the upper curve group or has a less desirable survival probability than the upper curve. Furthermore, the difference was described statistically by log-rank test.

This study found that the median survival time of patients who were at the age of 65 years and above had a shorter survival time (18 days with 95%CI: 17,20) than those of at the age of between 40-64year (24 days 95%CI:18,32) and 18-40 year (35 days 95%CI:21,.).This difference was statistically significant with a p-value of = 0.000 (see Fig.4).

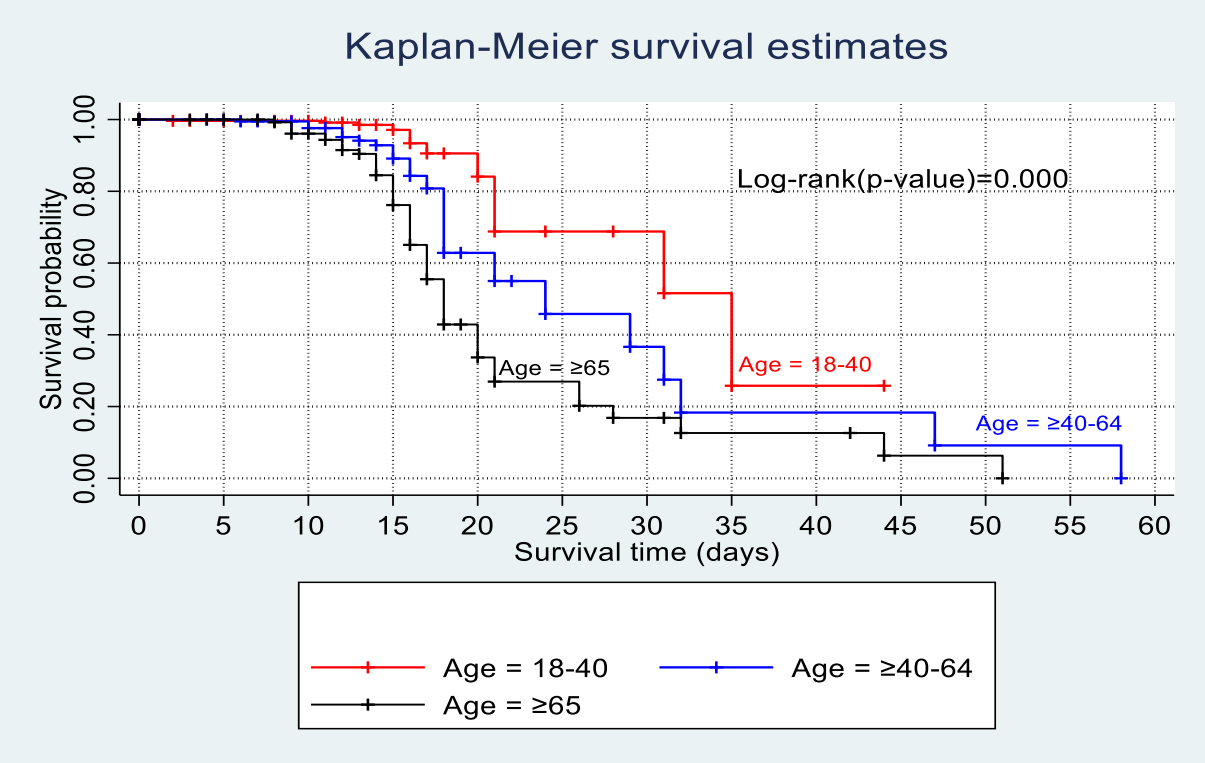

Figure 4: Kaplan-Meier survival curve shows a difference in survival time with categories of Age at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Similarly, the median survival time of COVID-19 patients who had shortness of breathing at admission (18 days 95%CI: 17, 21) found to be shorter as compared to those who hadn't (26 days 95%CI: 21, 31) with a statically difference of p value=0.000.

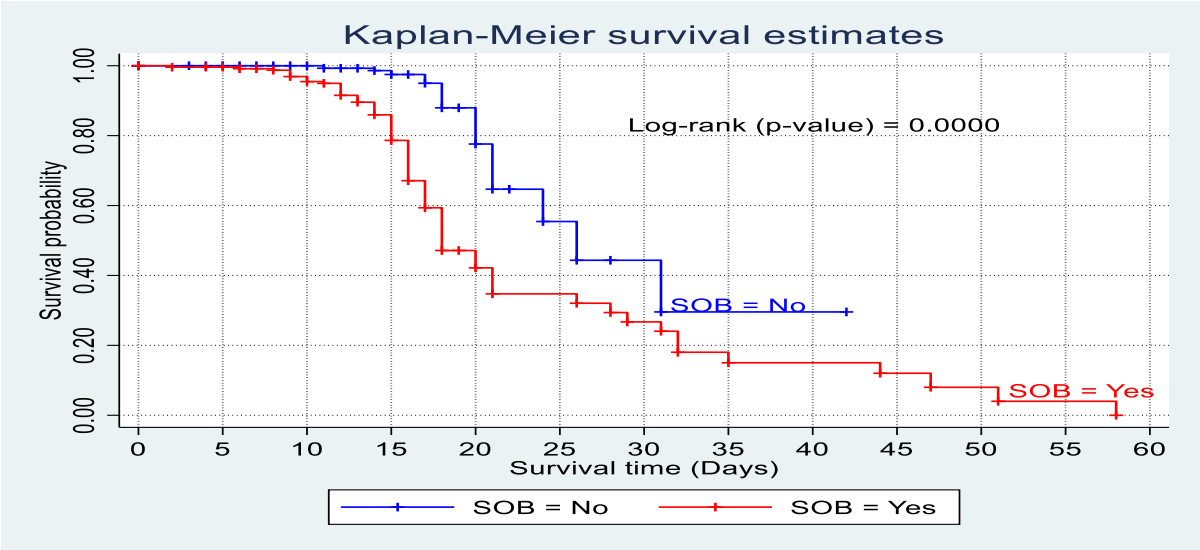

Figure 5: Kaplan-Meier survival curve shows a difference in survival time with categories of shortness of breathing at admission at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Patients with comorbidity (18 days 95%CI: 18, 21) had a lower median survival time than those who hadn`t comorbidity (32 days 95%CI:24,.) with a p value=0.000.(figure 6).

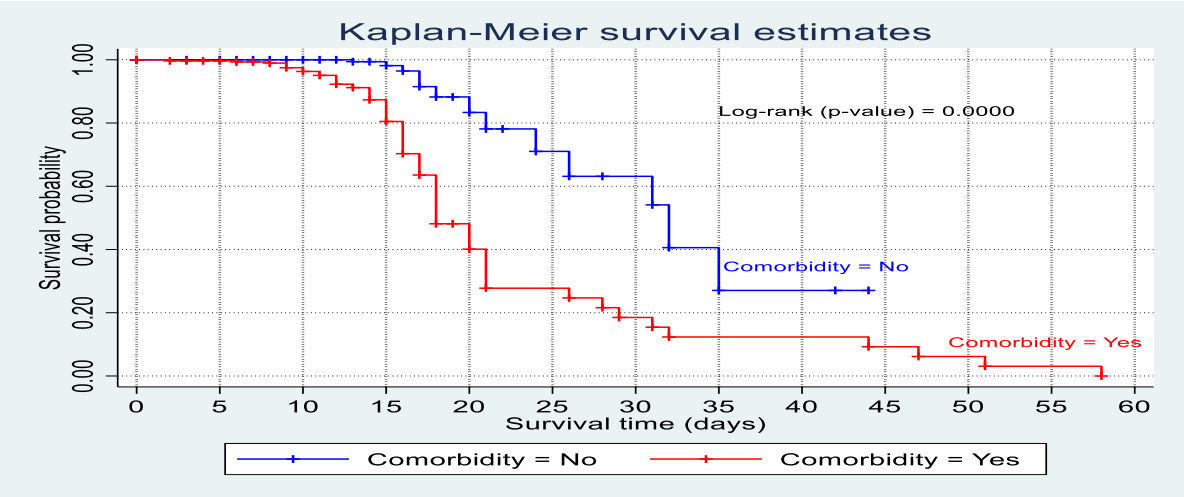

Figure 6: Kaplan-Meier survival curve shows a difference in survival time with categories of Comorbidity condition at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Regarding comorbidity condition, the median survival time of COVID-19 patients who had comorbidity of hypertension had a shorter survival time (18 days 95%CI:17, 20) than those who had no hypertension (29 days 95%CI:21, 35). This difference was statistically significant with a p-value = 0.000. (AS shown in figure 7 below).

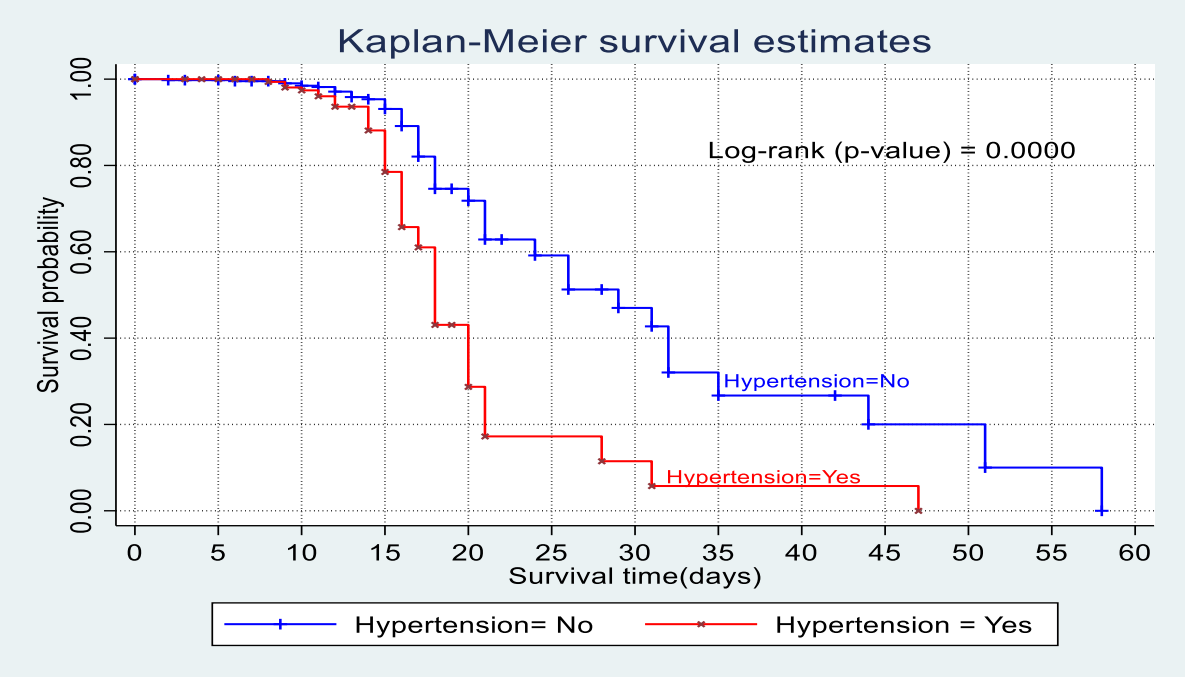

Figure 7: Kaplan-Meier survival curve shows a difference in survival time with categories of the presence of hypertension at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

The median survival time of COVID-19 patients who had comorbidity of diabetes had a shorter survival time (18 days 95%CI:17, 20) than those who had no diabetes (26 days 95%CI:21, 32. This difference was statistically significant with a p-value = 0.000. (AS shown in figure 8 below).

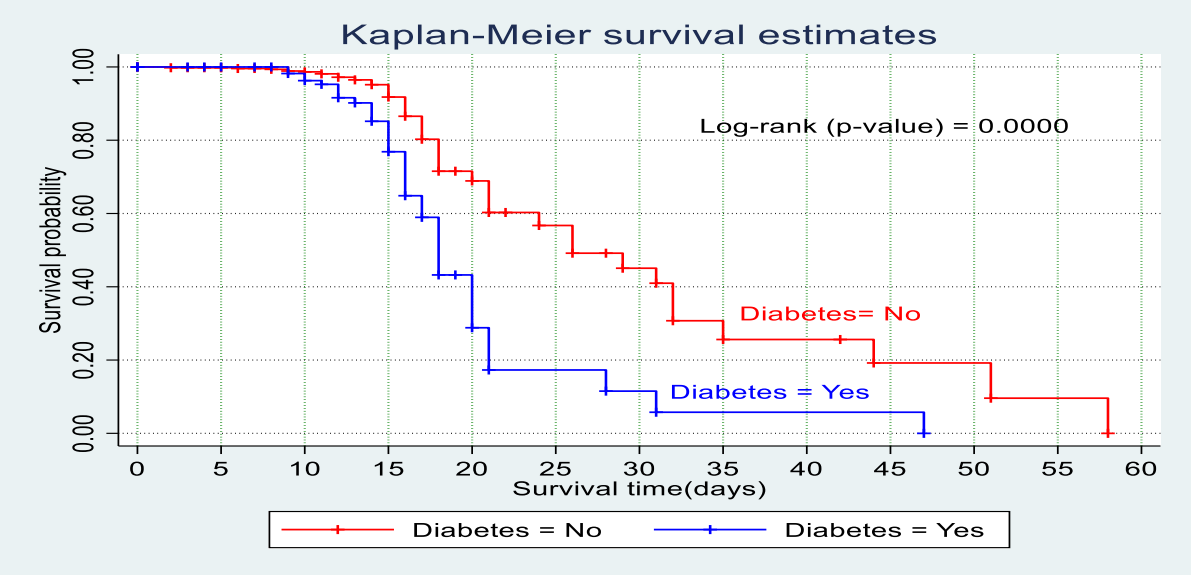

Figure 8: Kaplan-Meier survival curve shows a difference in survival time with categories of the presence of Diabetes at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

The median survival time of COVID-19 patients who had comorbidity of cardiac disease had a shorter survival time (17 days 95%CI:16, 21) than those who had no diabetes (26 days 95%CI:20, 31. This difference was statistically significant with a p-value = 0.000(AS shown in figure 9 below).

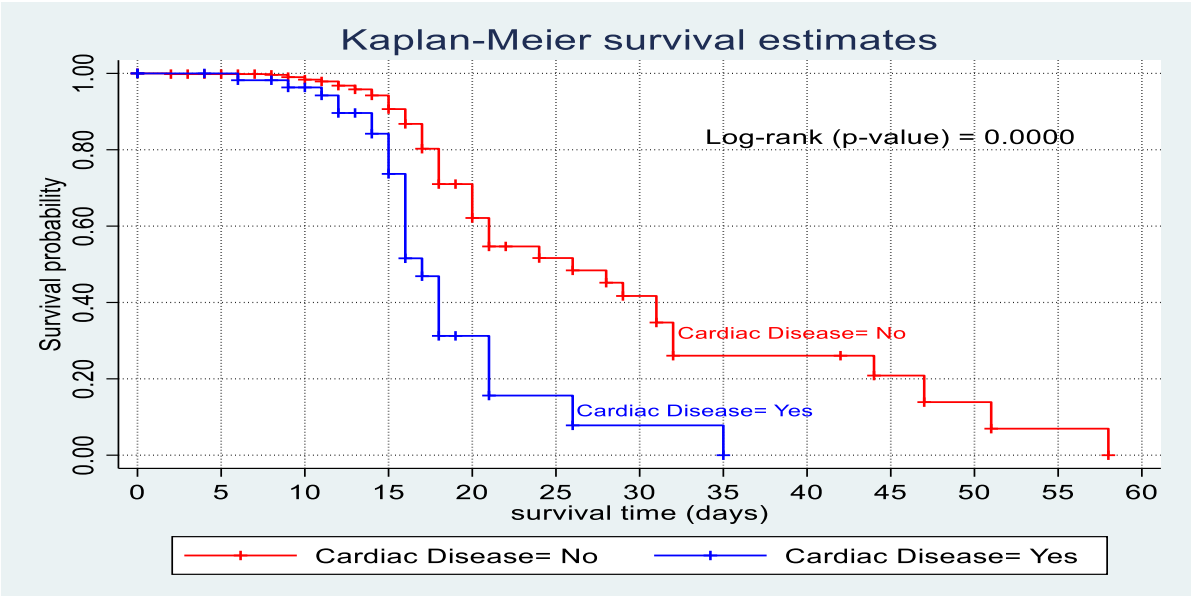

Figure 9:Kaplan-Meier survival curve shows a difference in survival time categories of the presence of cardiac disease at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021

The Kaplan-Meier graph shows that the median survival time for those who have taken Dexamethasone was (31 days, 95% CI: 24, 34), was higher than the median survival time of individuals who have not taken Dexamethasone (20 days, 95% CI: 18, 26). AS shown in figure 10 below)

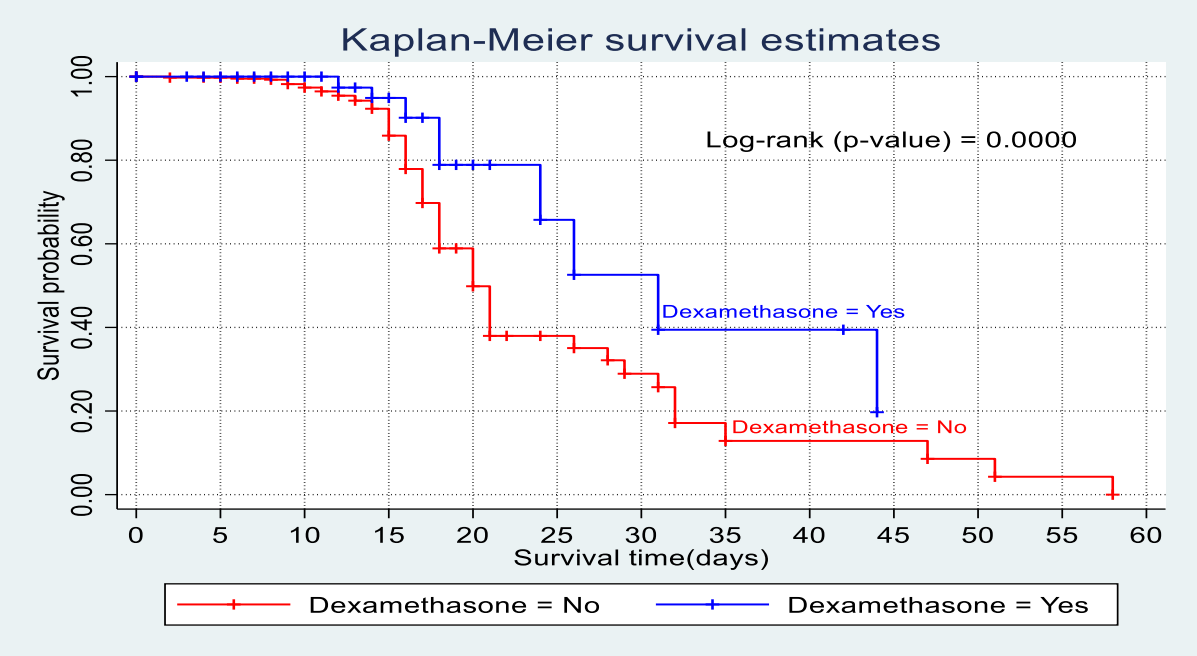

Figure 10: Kaplan-Meier survival curve shows a difference in survival time with categories of Dexamethasone treatment at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

A log-rank test was carried out to evaluate for any substantial differences in survival time between categories of variables. Kaplan-Meier survival curve indicated significant evidence of differences in survival times between categories of covariates. Some of the variables that showed a difference in survival probabilities are Sex. Age, shortness of breathing, Existing co-morbidity, Hypertension, Diabetes Mellitus, Cardiac disease, Renal diseases, White blood cell (10^3/µL), and Dexamethasone with Log-rank P-Value<0.05.Table 6.

Table 6:Mean and median survival time and log-rank test for equality of survivor functions among adult COVID-19 patients at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Variables	Category	Survival estimates at		Log-rank test (p-value)
		Median (95%CI)	Mean (95% CI)	
Sex	Male	20(18,26)	24.6(21.3,27.9)	0.004
	Female	28(21,44)	31.9(25.5,38.4)	
Age	18-40	35(21,)	31.6(26.0,37.2)	0.000
	≥40-64	24(18,32)	27.9(21.4,34.4)	
	≥65	18(17,20)	22.1(18.7,25.5)	
Baseline Patient Symptoms				
Cough	No	24(18,31)	24.1(21.0,27.3)	0.4110
	Yes	21(20,31)	28.4(24.3,32.4)	
Fever	No	21(20,29)	23.8(21.7,25.9)	0.2090
	Yes	21(18,31)	27.8(23.3,32.2)	
Shortness of breathing	No	26(21,31)	28.9(23.8,32.9)	0.0000
	Yes	18(17,21)	24.2(20.8,27.6)	
Myalgia	No	24(21,31)	28.5(24.5,32.6)	0.0023
	Yes	18(17,20)	21.4(15.8,26.9)	
Fatigue	No	29(21,35)	31.3(26.3,36.4)	0.0000
	Yes	18(17,21)	20.7(17.8,23.7)	
Sore throat	No	26(21,31)	29.2(25.3,33.3)	0.0000
	Yes	17(16,18)	17.9(15.5,20.2)	
Headache	No	21(20,29)	27.5(23.9,31.1)	0.1150
	Yes	18(16,32)	22.6(16.0,29.2)	
Co-morbidity status				
Having Existing co-morbidity	No	32(24,.)	31.6(26.9,36.3)	0.0000
	≥1 co-morbidity	18(18,21)	22.9(19.6,26.2)	
Number of comorbidity	1-2	20(18,26)	24.3(19.9,28.7)	0.2803
	≥3	18(18,21)	19.9(16.9,22.9)	

Hypertension	No	29(21,35)	31.1(26.2,35.9)	0.0000
	Yes	18(17,20)	20.3(17.2,23.5)	
Diabetes Mellitus	No	26(21,32)	30.5(25.8,35.2)	0.0000
	Yes	18(17,20)	20.2(16.9,23.4)	
Cardiac disease	No	26(20,31)	29.5(25.3,33.7)	0.0000
	Yes	17(16,21)	18.6(15.9,21.2)	
Renal diseases	No	24(20,31)	28.6(24.6,32.7)	0.0000
	Yes	17(20,28)	19.7(14.9,24.4)	
Complete cell count				
White blood cell (10^3/µL)	<4	35(18,.)	35.9(26.5,43.3)	0.0000
	≥4 - ≤10	29(21,.)	31.1(25.1,37.2)	
	>10	17(16,28)	19.8(17.3,22.5)	
Lymphocytes (10^3/µL)	<1.3	18(16,26)	25.1(20.1,30.1)	0.0005
	≥1.3 - ≤4	24(20,32)	26.9(22.9,30.9)	
	>4	20(18,.)	23.9(18.7,29.2)	
Platelet count (cells/ L)	≤150	21(18,28)	24.3(20.3,28.1)	0.0163
	>150	21(20,44)	30.0(24.9,35.1)	
Renal function tests				
Urea (mg/dl)(n=551)	<10	18(16,.)	17.6(15.1,20.1)	0.0860
	≥10 - ≤20	21(20,44)	29.4(24.0,34.8)	
	>20	20(18,31)	25.0(21.1(28.9)	
Creatinine (mg/dl)(n=551)	<0.55	31(17,.)	33.7(23.2,44.2)	0.0000
	≥0.55 - ≤1.3	24(20,32)	27.9(23.8,31.9)	
	>1.3	16(15,17)	16.4(14.9,17.9)	
Liver function test(N=550)				
Asparatate transaminase (U/L	<15	26(16,.)	25.7(20.6,30.8)	0.0241
	≥15 - ≤37	28(21,.)	31.3(24.9,37.7)	
	>37	18(18,21)	24.1(20.2,27.9)	
Alanine transaminase(U/L)	<14	28(17,.)	25.3(21.4,29.1)	0.0873
	≥14 - ≤63	21(20,26)	27.5(23.4,31.3)	

	>63	18(17,.)	21.6(18.4,24.9)	
Treatment related characteristics				
Azithromycin	No	21(20,47)	32.5(27.1,38.0)	0.0052
	Yes	21(18,26)	22.6(20.5,24.7)	
Enoxaparin	No	21(20,28)	25.2(22.1,28.3)	0.3674
	Yes	21(18,32)	28.5(22.7,34.2)	
Ceftriaxon	No	21(20,26)	25.6(22.3,28.9)	0.4608
	Yes	31(24,.)	34.8(26.2,43.5)	
Dexamethasone	No	20(18,26)	25.2(21.7,28.7)	0.0049
	Yes	31(24,34)	31.4(25.2,37.7)	
Unfractionated heparin	No	21(20,26)	26.1(22.2,30.1)	0.0258
	Yes	31(18,44)	30.6(23.3,37.9)	

7.9. **Predictors of COVID -19 mortality**

Cox proportional hazard regression model was computed to identify the relationship between survival status and independent variables. In bivariable Cox Proportional Hazard regression model Age, Sex, Fever, shortness of breathing, Myalgia, Fatigue, Having Existing co-morbidity, Hypertension, Diabetes Mellitus, Cardiac disease, Renal diseases, White blood cell (10^3/µL), Platelet count (cells/ L), Dexamethasone and Unfractionated heparin were found to be p-value of less than 0.25. Those variables having a p-value of <0.25 in the bivariable analysis were fitted in multivariable analysis. In the multivariable cox proportional hazards model; Age, Sex, shortness of breathing, Having Existing co-morbidity, Diabetes Mellitus, Cardiac disease, and White blood cell (10^3/µL) were Significant predictors of COVID -19 mortality with a P-value of <0.05.

The multivariable analysis revealed that adults with COVID-19, who were 65 years or older had more than twofold hazard to die (AHR:2.22, 95%CI: 1.02,4.86) than those adults in the age group between 18 and 40 years. The hazard to die from COVID-19 was nearly three times (AHR:3.04, 95%CI:1.61,5.74) higher for men than that of women .Patients having shortness of breathing at admission had more than two times (AHR:2.29, 95%CI:1.16,4.54) hazard to die

than those patients without shortness of breathing at admission.COVID-19 Patients, who have at least one comorbidity had more than twofold hazard to die (AHR: 2.23, 95%CI: 1.04, 4.80) than those with no comorbidity.The hazard to die from COVID-19 was more than two times (AHR 2.31, 95%CI:1.30,4.08) higher for patients with Diabetes than those of without Diabetes.Patients having cardiac disease had more than twofold hazard to die (AHR:2.07, 95%CI: 1.21, 3.43) from COVID-19 than those of without cardiac disease.

Furthermore, Patients with baseline white blood cell count of greater than 10 (10^3/µL) had more than twice at high hazard to die(AHR 2.62, 95%CI: 1.55,4.44) than those with baseline White blood cell count of within the normal range(≥4 - ≤10 (10^3/µL).

Table 7: Cox-proportional hazard model analysis for predictors of time to death among adults with COVID-19 at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021

Independent variables	**Category**	**Bivariable cHR(95%CI)**	**Multivariable aHR(95%CI**
Age	18-40	1	1
	≥40-64	2.63(1.31,5.28)**	2.18(0.92,5.18)
	≥65	4.96(2.63,9.36)***	2.22(1.02,4.86)*
Sex	Female	1	1
	Male	2.03(1.22,3.38)**	3.04(1.61,5.74)***
Baseline Patient Symptoms			
Fever	No	1	1
	Yes	1.32(0.84,2.06)	0.60(0.35,1.04)
Shortness of breathing	No	1	1
	Yes	4.58(2.56,8.19)***	2.29(1.16,4.54)*
Myalgia	No	1	1
	Yes	2.07(1.27,3.38)**	0.94(0.49,1.78)
Fatigue	No	1	1
	Yes	1.29(0.84 1.99)	1.22(0.68,2.19)
Co-morbidity status			

Having Existing co-morbidity	No	1	1
	≥1 co-morbidity	4.90(2.71,8.87)***	2.23(1.04,4.80)*
Hypertension	No	1	1
	Yes	2.67(1.74,4.12)*	0.73(0.41,1.33)
Diabetes Mellitus	No	1	1
	Yes	2.63(1.70,4.06)***	2.31(1.30,4.08)**
Cardiac disease	No	1	1
	Yes	2.98(1.85,4.81)	2.07(1.21, 3.43)**
Renal diseases	No	1	1
	Yes	3.25(1.98, 5.33)***	1.47(0.82,2.63)
Baseline Laboratory markers			
White blood cell (10^3/µL)	<4	0.70(0.32,1.59)	0.56(0.23,1.48)
	≥4 - ≤10	1	1
	>10	4.19(2.57,6.84)***	2.62(1.55,4.44)***
Platelet count (cells/ L)	≤150	1.68(1.08,2.61)*	1.09(0.67,1.80)
	>150	1	1
Treatment related characteristics			
Dexamethasone	No	1	1
	Yes	0.48(0.27,0.86)	0.54(0.28,1.01)
Unfractionated heparin	No	1	1
	Yes	0.57(0.32,1.01)	0.54(0.27,1.09)

NB: (*),(**) and (***) shows statistically significant association with COVID-19 mortality at P-Value of (< 0.05), (<0.01) and (<0.001) respectively.

7.10. Proportional hazard assumption test

A proportional hazards assumption test was computed. Schoenfeld residual proportional hazard assumption test for each subject of covariates was calculated. In Schoenfeld residual test p-value of less than 0.05 is considered as not fulfilling the assumption. In this study (table 7) each covariate has a p-value of greater than 0.05 with a global test of P-Value=0.6234(>0.05). All of the covariates met the proportional hazard assumption.

Table 8: Schoenfeld residual test for assessing proportional hazards model Assumption

Predictors	**Rho**	**Chi-square test**	**Df**	**p-value**
Age	0.01011	0.01	1	0.9184
Sex	-0.13181	2.05	1	0.1519
Fever	0.04164	0.16	1	0.6896
Shortness of breathing	-0.15284	2.21	1	0.1374
Myalgia	-0.04115	0.20	1	0.6582
Fatigue	0.02976	0.11	1	0.7440
Having Existing co-morbidity	-0.13356	1.91	1	0.1665
Hypertension	0.11013	1.38	1	0.2395
Diabetes Mellitus	0.04761	0.26	1	0.6071
Cardiac disease	0.11050	1.43	1	0.2311
Renal diseases	-0.12756	1.44	1	0.2298
White blood cell (10^3/µL)	-0.06150	0.37	1	0.5449
Platelet count (cells/ L)	-0.10220	1.07	1	0.3012
Dexamethasone	0.11992	1.14	1	0.2849
Unfractionated heparin	0.03165	0.11	1	0.7402
Global test		12.73	15	0.6234

8. DISCUSSION

The present study was aimed to assess survival status and predictors of mortality among adults with COVID -19 attending COVID -19 treatment center of Eka Kotebe General Hospital. This study shows that the overall cumulative incidence of mortality in an adult with COVID-19 during the study period was 14.4%. This finding is lower than the study done in the Democratic Republic of Congo (29%)[29], China (28%)[14], New York City (43%)[31], and Brazil (46.25%)[32]. The discrepancy of result that has been seen among studies might be due to the high prevalence of comorbidity recorded in New York City (77%), and Brazil(70.9%) studies and the high number of older adults (≥65 years) in the study done in the Democratic Republic of the Congo as compared to this study(31.9 % vs 19.93% respectively)[29]. Furthermore, this retrospective follow-up study includes patients that had mild symptoms and a high number of younger adults than the above studies.

On other hand, the overall cumulative incidence of mortality in the current study is higher than the study done in Egypt (11.7%)[30] and Denmark(5.5%)[33]. The difference is likely to be due to the fact that later on time in our setup health resources are becoming restricted and admission become allowed for moderate and severe cases. This may tend to increase the mortality rate in the hospital. The incidence of mortality in this study is consistent with the study in Italy (14.4%)[69].

This study revealed that the probability of survival at 2 days, 3 days, 5 days, and 10 days were 99.8%,99.5%,97.6%, and 76.7% respectively. The probability of survival in the current study was higher than a study conducted in Congo (90%, 78.7%,73.0% and 71.6%)[29],in Mexico (86.9%)[38] at 3 days and Brazil(79.21% and 59.22%) [32] at 5 day and 10 day respectively.In contrast the finding of this study lower than the study done in another setting in Brazil with 95.1% survival probabilities at 10 days [39]. This difference might be due to Demographic characteristics. Furthermore, This discrepancy may be due to a lack of an early screening program, a higher proportion of severe COVID-19 at admission. It may also be due to variations in follow-up time, study period, and clinical features of patients.

In this study, the overall median survival time of Adults with COVID-19 was found to be 21 days. This finding is higher than the study done in Congo (9 days)[29], New York City (9 days)[40], Brazil(12 days)[32], and Fortaleza(19 days)[39]. The possible explanation might be

due to a high number of severely or critically ill patients. For example, the study done in Congo, Kinshasa University Hospital, is in tertiary care hospital. A high number of critically ill patients were referred from other hospitals. Therefore patients may tend to die within a short period of time. Additionally, the possible explanation for variations in median survival time could be due to different follow uptime. In this study, there is a high follow-up time as compared to the above studies. However, this finding was lower than the study done in Tongji hospital, china(25 days) [41] and German(25 days)[82].This couild be due to the differnce in the quality of care in case of COVID-19 between Low income and high income countries such as shortage of Ventilator machines [83].

According to the results of this study, age was found to be a significant predictor of COVID-19 mortality. Older adults (≥65 years) were nearly 2 times at high hazard to die as compared to young adults (18-40 years). As this finding points out that, older people with an early symptom of COVID-9 should seek care immediately as possible. This finding is supported by other previous studies conducted in African countries [29, 46], Denmark[33] and China[49], and the United States and Mexico[53]. The possible explanation might be older adults were susceptible to multiple organ failure and comorbidities thereby increase the likelihood of dying. Furthermore, a recent study revealed that older adult is at high risk of mortality with COVID-19 due to four main reasons: The existence of asymptomatic systemic inflammation in the absence of significant disease, a reduced immune system and type I interferon response due to the long-lasting inflammation, down regulation of ACE2 receptore and biological aging [84].

Sex is also found to be another important predictor of COVID-19 mortality. Men are nearly three times increase the hazard of mortality as compared to females. This finding is consistent with the studies done in China[49, 51, 52] and United States [54-56]. This may be due to recent emerged scientific evidence that COVID19 in men can be worsened by androgen-enabled expression of ACE2 receptors, a permissive feature that engages the SARS CoV2 spike protein for infection [85]. Additionally, Men's staggeringly high mortality rate with COVID-19 may be partly explained by their pre-existing diseases (cardiac diseases, hypertension, and diabetes) and higher risk behavioral patterns (cigarette smoking and alcohol consumption), and occupational exposure.

The hazard of death among patients who presented with shortness of breath at admission was 2.29 times higher as compared to those with no such symptom. The implication of such a finding is that early identification of a patient with shortness of breathing on admission may save the lives of patients. This finding is supported by the study done in Ethiopia[59]. Having Shortness of breathing is one of the expressions of lung problems ranging from reduced lung function up to a life-threatening condition. Patients with insistent shortness of breath might be an indicator of structural and/or functional problems in the lung. This may increase the chance of vulnerability to diseases like COVID-19 and decrease the likelihood of survival with the stress leading to poor outcomes.

COVID-19 patients having at least one comorbid condition were more than two times increased in hazard to die as compared to non-comorbid patients. This finding is supported by other studies [60, 61]. Patients who have diabetes as preexisting comorbidity are two times more likely to die than those who don't have diabetes. This finding is pretty close to the study done in Iran[22] and China [65]. This might be due to the fact that being diabetic is directly associated with low immune function thereby increase the risk of both bacterial and viral infection including COVID-19, consequently poor outcome. This finding highlights that, the importance of timely monitoring and greater conservative management for those individuals with comorbidities. Furthermore, these findings point to the fact that those vulnerable individuals should do be in the front line in receiving COVID-19 vaccine.

Likewise, several studies conducted in different parts of the world: Brazil[32], China [49], Iran[62], and New York City[40], in this study Having Heart disease is also another predictor of COVID-19 mortality. The presence of heart disease increases the hazard to die by two times. This might be due to the fact that one of the most common immediate causes of death in COVID -19 patients is respiratory failure [82]. Having exiting comorbidities such as cardiac disease might increase the incidence of respiratory failure and consequently leads to a poor prognosis. This finding implies that in the care of cardiac patients with COVID-19 Special care should be incorporated to prevent further injury to vital organs thus improving their chance of survival.

Having a baseline WBC count of more than 10(103/µL) was found to be a 2.62 times increase in hazard to die as compared to the normal range (≥4 - ≤10). This implies that an early increase in WBC count might be considered as an indicator of poor outcome. This finding argues that

early screening of WBC count on admission is important to identify and give Special care for those patients thereby reduce the likelihood of dying with COVID-19. This finding is in a row with the study done in Hungary[71], China[72, 73], and Iran[74]. The possible reason might be an increase in baseline White blood cell count is an early indicator of series infection. Series infection increases the chance of dying. However, the exact mechanism of how higher WBC lever patients were at a high risk of death is not clear.

9. STRENGTH AND LIMITATION OF THE STUDY

9.1. Limitation of the study

The data were derived retrospectively from medical reports of the patients and some important variables such as laboratory markers(CRP level, Albumin, cardiac markers dimer, IL-6, lactate dehydrogenase, and serum ferritin) which were strong predictors of COVID-19 mortality on other studies were not or inadequately recorded and not included in the analysis. This leads to difficulty to know the role of those predictors on survival time and underestimated in predicting hospital death. Secondly, since Eka Kotebe COVID-19 treatment center is the first in Ethiopia and has better equipped and care, patients were transferred late in their illness from other hospitals, through these circumstances mortality rate might be overestimated.

9.2. Strength of the study

In spite of the shortcoming described above, the study has the following strong side: The follow-up period in this study was fairly long, which may increase the possibility of developing an event. Nurses who had been qualified in COVID-19 care and treatment collected the data, which played a significant role in the data's quality. The outcome of the event was death, so it was easy to formulate a time-based relationship of outcome variables with predictor variables.

10. CONCLUSION

Great efforts have been done to overcome the seriousness of COVID-19 diseases, however, the mortality rate is not showing a significant decline. The survival probability of COVID-19 patients in this study was relatively high. Male sex, older adult(≥65 years), having shortness of breathing at admission, having at least one comorbidity, diabetes Mellitus, Cardiac disease, and baseline White blood cell count were found to be independent predictors of COVID-19 mortality. To the best of my knowledge, this is the first all-inclusive study in Ethiopia that gives insight regarding to the survival status of COVID-19 patients. I believe it provides the best locally available evidence towards different characteristics or nature of the COVID-19 disease thereby contribute in the initial identification of patients with a poor outcome.

11. RECOMMENDATIONS

Based on this study finding, the following recommendations are forwarded to each respective bodies:-

To Federal minister of health:

Should design programs and expand awareness regarding strict infection prevention practice especially for those with a high risk of COVID-19 mortality such as older adults, cardiac diseases, and diabetic individuals.

Should continue in early screening of individuals with comorbidities and give more emphasis for them to become vaccinated.

To Eka kotebe general hospital COVID -19 traetment center:

Health care providers should perform a sensitive identification of shortness of breathing starting from triage and practice careful evaluation and treatment. Since having shortness of breathing at admission is considered a warning sign of possible death.

Health care providers should consider an early increase in white blood cell count as a poor prognostic factor and design early screening and timely interventions to save the lives of those patients.

A strong recommendation is for health care providers to closely monitor those patients with male sex, comorbidities, having shortness of breathing on admission, and an increase in baseline white blood cell count as markers for potential progression to death.

To upcoming researchers

A further prospective follow-up study is highly recommended by addressing the limitation of this study and through incorporating important predictors of COVID-19 mortality.

Further research should be considered regarding an early warning sign of possible Death with COVID 19.

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ANNEX

Annex 1: Information Sheet

Title of the Research Project: Survival status and predictors of mortality among adults with COVID -19 attending Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Name of Investigator: Tegene Atamenta (BSc in Nursing)

Name of the Organization: Addis Ababa University, College of health science, School of Nursing and Midwifery, Department of Nursing.

Name of the Sponsor: Addis Ababa University.

Introduction: This information sheet is prepared for Eka Kotebe General Hospital managers and COVID-19 care and treatment coordinators.

Purpose of the Research Project: The main aim of this research is to determine Survival status and predictors of mortality among adults with COVID -19 attending Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

Procedure: Information that is necessary for this study will be taken from adult COVID-19 patient's medical record form.

Risk: There will be no harm to the patient. Because this study uses secondary data.

Benefits: The finding will not provide direct incentives for study participants who's are recorded on the chart. However, the study will have an enormous role in improving care and treatment service for newly and reinfected COVID-19 patients.

Confidentiality: The name and identification numbers of patients will not be included in the tool. Data will be collected by nurses working in COVID-19 treatment center of Eka Kotebe General Hospital. Assuring that all information gathered will be kept strictly confidential except an investigator and supervisor.

Person to contact: If you want to know additional information about this research, you can contact the following individuals.

Tegene Atamenta: Addis Ababa University, College of Health Science, Department of Nursing and midwifery:

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Annex 2: Data collection tools

The checklist is designed to collect information that important to assess survival status and predictors of mortality among adults with COVID -19 attending Eka Kotebe General Hospital, Addis Ababa, Ethiopia, and 2021. It has four-part: Socio-demographic characteristics, Clinical characteristics on admission, preexisting medical condition, and Laboratory Findings. All of the information was gathered from the patient's registration book as well as the actual patient charts with the name and medical registration number of patients under confidential by nurses working in the COVID-19 treatment center of Eka Kotebe General Hospital.

Table 9: A checklist to determine Survival status and predictors of mortality among adults with COVID -19 at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021.

	Code _____		
No.	Questions	Possible answers	
	Part one: Socio-demographic characteristics		
101	Age	_____	
102	Sex	1. Male 2. Female	
	Part two: Clinical characteristics of admission		
202	Cough	1. No 2. Yes	
203	Fever	1. No 2. Yes	
204	Shortness of breathing	1. No 2. Yes	
205	Chest pain	1. No 2. Yes	
206	Sore throat	1. No 2. Yes	
207	Abdomen pain	1. No 2. Yes	
208	Myalgia	1. No 2. Yes	
219	Fatigue	1. No 2. Yes	
210	Arthralgia	1. No 2. Yes	
211	Loss of sense of smell	1. No 2. Yes	
212	Vomiting	1. No 2. Yes	
213	Diarrhea	1. No 2. Yes	
214	Headache	1. No 2. Yes	
215	Anorexia	1. No 2. Yes	

216	**Vital sign on admission**	_____	
	Temperature(C^0)	_____	
	Respiratory rate (breath/min.)	_____	
	Plus rate (beat/min.)	_____	
	Systolic blood pressure, mmHg	_____	
	Diastolic blood pressure, mmHg	_____	
	O_2 saturation	_____	
Part three: Preexisting Co-morbid			
301	Cardiac	1. No 2. Yes	
302	Hypertension	1. No 2. Yes	
303	Diabetes Mellitus	1. No 2. Yes	
304	Chronic lung diseases(chronic obstructive diseases and /or Asthma)	1. No 2. Yes	
305	Human immune virus	1. No 2. Yes	
306	Chronic hepatic disorder	1. No 2. Yes	
307	Renal diseases	1. No 2. Yes	
308	Malignancy	1. No 2. Yes	
309	Tuberculosis	1. No 2. Yes	
310	Neurological disorder	1. No 2. Yes	
311	Number of comorbidities	1. No 2. Yes	
312	Other	1. No 2. Yes	
	Part four: Laboratory findings		
401	White blood cells	_____	
402	Neutrophils	_____	
403	Monocyte		
404	Lymphocytes	_____	
405	Red blood cell	_____	
406	Hemoglobin	_____	
407	Hematocrit	_____	

408	Platelet count, ×109/L	_____	
409	Random blood sugar	_____	
410	Alanine aminotransferase, U/L	_____	
411	Aspartate aminotransferase, U/L	_____	
412	Urea	_____	
413	Creatinine	_____	
Part five: Care and Treatment related factors			
501	Azithromycin	1. No 2. Yes	
502	Dexamethasone	1. No 2. Yes	
503	Chloroquine	1. No 2. Yes	
504	Paracetamol	1. No 2. Yes	
505	Tramadol	1. No 2. Yes	
506	Enoxaparin	1. No 2. Yes	
507	Meropenem	1. No 2. Yes	
508	Ceftriaxone	1. No 2. Yes	
519	Vancomycin	1. No 2. Yes	
510	Unfractionated heparin	1. No 2. Yes	
511	Omeprazole	1. No 2. Yes	
601	COVID-19 severity	**1.** Mild Disease **2.** Moderate Disease **3.** Severe COVID-19 disease	
602	Length of hospital stay	_____	
603	Date of discharge	_____	
604	Time of admission		
605	Time of death	_____	
606	Patient status	1. Death 2. Cured 3. Lost follow-up 4. Transferred	