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The Magnitude and Associated Factors of Mortality among Patients Admitted With Covid-19 in Addis Ababa, Ethiopia, 2021

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Abstract

Background: The COVID-19 pandemic continues to grow around the world and has caused enormous mortality and morbidity. The severity and death of coronavirus disease are associated with various comorbidities. The infection fatality rate was reported to be inconsistent with different studies. Therefore, the aim of this study was to assess the magnitude and factors associated with mortality among patients admitted to Eka Kotebe General Hospital, Addis Ababa, Ethiopia.

Methods: An institutional-based cross-sectional study was conducted at Eka Kotebe General Hospital among patients who were admitted for COVID-19 from January 15, 2021, to June 30, 2021. A total of 393 records of patients were selected by simple random sampling. Data was extracted from compiled data forms where available information was already tabulated. Data was entered and analyzed using SPSS version 25. The determinant factors associated with mortality among COVID-19 patients were identified using bivariate and multivariable logistic regression analysis. Statistical association was declared with multivariable logistic regression using a 95% confidence interval and a P-value of less than 0.05.

Result: The proportion of COVID-19 mortality among patients admitted to Eka Kotebe General Hospital was 8.1% (95% CI: (5.4-10.8%)). Furthermore, being over 50 [AOR=7.91; 95% CI (2.34-25.70)], being male [AOR=2.09; 95% CI (1.20-3.65)], having COVID-19 co-morbidity [AOR=4.57; 95% CI (1.86-12.85)], having diabetes mellitus [AOR=2.64; 95% CI (1.30–5.35)], having hypertension [AOR=2.67; 95% CI (1.22-5.88)] and having chronic kidney disease [AOR=12.04; 95% CI (4.03-14.22)] were determinant factors of COVID-19 mortality. .

Conclusion: The current study findings revealed that COVID-19 mortality was high among hospitalized COVID-19 patients. Furthermore, age, gender, presence of co-morbidity, diabetes mellitus, hypertension, and chronic kidney disease were discovered to be independent predictors of COVID-19 mortality. As a result, in addition to standard COVID-19 awareness-raising and mobilization activities, special attention should be paid to older COVID-19 patients and those with known co-morbidities such as hypertension, diabetes, and end-stage renal disease.

Keywords: COVID-19 Mortality; Magnitude; Determinants; Ethiopia

Introduction

The novel coronavirus disease 2019 [COVID-19] pandemic continues to grow around the world and has caused enormous mortality and morbidity [1]. The pandemic has resulted in a dramatic loss of human life and has posed an unparalleled challenge to the delivery of public health services [2]. Globally, there have been about 425 million confirmed illnesses and approximately 10 million deaths as of February 2022 [3]. It is especially dangerous for those who have previous medical disorders or are at a higher risk of suffering from preexisting medical conditions [4].

Despite numerous underlying factors like malnutrition, risky livelihood, cultural factors, economic factors, as well as overcrowding within urban settlements, Africa (with a median age of less than 20 years) has a lower number of severe COVID-19 cases and deaths than Europe and the United States (median age > 38 years), which have a higher number of severe COVID-19 cases and deaths [5,6], The epidemic curve in the continent remained flatter than in the Americas, Europe, and Asia, with a lower case fatality rate than in the Americas and Europe but comparable to Asia [5].

Excess death measures have been used to evaluate the impact of public health pandemics or disasters, especially when there are concerns about undercounting deaths directly linked to a specific event or cause [7].In Sub-Saharan Africa, particularly with limited testing capacity,

the epidemic's disruption of societal and health systems, mortality from other causes, and the long-term health impact of COVID-19 is uncertain [8,9].

According to a February 2022 report, COVID-19 infections are slightly decreasing in Ethiopia. 121 new infections were reported on average per day. That's 3% higher than the December 31st peak, which was the highest daily average ever recorded since the outbreak began. There have been 468,345 infections and 7,438 coronavirus-related deaths reported in the country since the pandemic began [10].

It is known that the severity and death of coronavirus disease is associated with various comorbidities [11-12]. According to a finding

from a prospective cohort study, hypertension (23.5%), obesity (19.6%) and osteoarthritis (14.9%) were the most common, whereas chronic viral hepatitis type C (0.6%), type B (0.3%), and HIV (0.3%) were the least common [13]. Moreover, patients with a history of hypertension, obesity, chronic lung disease, diabetes, or cardiovascular disease had the worst prognosis and were more likely to develop deteriorating outcomes such as acute respiratory distress syndrome (ARDS) and pneumonia [13-14] . It was associated with a substantial risk of mortality and severe morbidity in cancer patients [15]. When comparing patients with COVID-19 who had been hospitalized to those without, the prevalence of diabetes mellitus, hypertension, and cardiovascular disease (CVD) appeared to be higher [16].

COVID-19 is currently a global discussion topic in the media and with the public. The outbreak has been declared an emergency, with the community facing an increased risk of infection. To our knowledge, few studies have been undertaken in Africa at a period when the pandemic appears to be different from that of other continents in terms of virus dissemination speed and death toll. As a result, the purpose of this research was to look at the magnitude of mortality and its associated factors among COVID-19 patients admitted to Eka Kotebe General Hospital treatment center, Addis Ababa, Ethiopia.

Methods

Study area and period

The study was conducted at Eka Kotebe General Hospital, Addis Ababa, Ethiopia. Addis Ababa city has 11 sub-cities. The city administration had an estimated total population of 5,005,524, where 7.16% were children under five years of age [17]. Eka Kotebe General Hospital is one of the seven federal government hospitals located in Addis Ababa. The hospital has more than 600 beds for COVID-19 patients and over 400 staff. The study was conducted between January 15 and June 30, 2021.

Study Design and Population

An institutional-based cross-sectional study was conducted with randomly selected patients infected with COVID-19 and admitted to Eka Kotebe General Hospital.

Inclusion and exclusion criteria

Inclusion: Patients who had been infected with COVID-19 and were admitted either to emergency, ICU, or critical care wards in Eka Kotebe General Hospital were included.

Exclusion: Patients who had incomplete documentation were excluded.

Sample size and sampling procedure

The sample size was calculated using a single population proportion formula, considering the prevalence of COVID-19 mortality to be 50% to have the largest sample size with 95% confidence level and a 5% margin of error were considered. Finally, adding a non-response rate of 10%, it was 422.

With a simple random sampling technique, respondents were selected using the total number of admitted patients as a sampling frame. In general, using the patient registry as a source population, random patients were selected in Eka Kotebe general hospital and admitted as COVID-19 patients.

Study variables

Dependent variables

The number of COVID-19 patients admitted to and dying at Eka Kotebe General Hospital between January 15 and June 30, 2021.

Independent variables

Sociodemographic factors

Clinical factors

Comorbidities

Pregnancy and child bearing

Malnutrition and micro-nutrient deficiency

Data collection procedures and quality control

Data was gathered from hospital documents using checklists in various wards such as ICU, critical care, and emergency wards. Computer-based registration formats were used to collect the data. To ensure the quality of the data, two professional nurses were recruited and training was given on the data collection procedures, purposes of the study, categorization, and coding of the data. Every day, the activities were reviewed and checked for completeness and relevance by the principal investigators. Finally, the collected data was transferred to a secured area.

Operational definition

Co-morbid disease: a chronic disease or group of chronic diseases that are present concurrently in COVID-19-infected patients.

Clients or patients: COVID-19-hospitalized individuals or COVID-19-infected individuals admitted to Eka Kotebe General Hospital for medical treatment.

Mortality: the number of deaths out of all admitted individuals infected by COVID-19 in Eka Kotebe General Hospital.

Data processing and analysis

The data was entered using Epi Data version 3.1 and exported to the statistical package for social science, SPSS version 25, for further analysis. Frequencies, proportions, and summary statistics were used to describe the study population in relation to relevant variables. Logistic regression was used to identify the association between dependent and independent variables. Bivariate logistic analyses were conducted to select candidate variables for the multivariable logistic regression analysis. The strength and direction of the association were determined using crude and adjusted odds ratios with their respective 95% confidence intervals. Variables with a p-value of less than 0.05 were used to declare their statistical significance. The result was then presented using text, tables, and charts based on the types of data.

Results

Demographic characteristics of respondents

From the total of 422 records of patients selected, 393 individual records with complete responses were included in the analysis, yielding a response rate of 93.1%. Of the total participants, 233 (59.3%) of them were in the age category below 50 years. For the sex distribution, nearly two-thirds of 252 (64.1%) of the study participants were males, with a male to female ratio of more than 3:2 (Table 1)

Table 1: Demographic characteristics of COVID-19 patients in Eka Kotebe Hospital, Addis Ababa, Ethiopia, 2021: (393).

Characteristics	Frequency	Percentage
Age category of respondents		
<50 years	233	59.30%
≥50 Years	160	40.70%
Gender		
Male	252	64.1
Female	141	35.9

Moreover, most males (141, 35.9%) were below 50 years of age and the rest (111, 28.2%) were 50 and above, whereas among females who participated in this study, 92 (23.4%) and 49 (12.5%) were below 50 years and greater than or equal to 50 years of age, respectively (Table 2).

The magnitude of COVID-19 mortality

Of the total COVID-19 patient records evaluated, 32 (8.1%: 95% CI: (5.4-10.8%)) died as a result of COVID-19-related problems (Figure 1).

Furthermore, a majority of the study participants (275, 70%) had a co-morbidity, with hypertension and other cardiovascular disorders being the most prevalent (103, 26.2%), whereas cancer and malnutrition-related comorbidities were the least common 12 (3.1%) and 9 (2.3%), respectively. Records of patients were also examined in order to categorize them based on the sorts of co-morbidities they had at the time of diagnosis (Table 3).

The distribution of COVID-19 deaths with co-morbid prevalence showed that 14 (43.8%) of COVID-19 patients died from TB and other respiratory disorders, 13 (40.6%) from HIV/AIDS and other hematologic disorders, 1 (3.1%) from all types of cancer, 16 (50%) from hypertension and other vascular diseases, 15 (46.9%) from diabetic mellitus and other endocrine system disorders, and 7 (21.9%) from congested heart failure (CHF) and related disorders (Table 4).

***Other includes;** patients with nervous system, psychiatry, chronic kidney disease, skin, and musculoskeletal disorders

***The sum of all percentages is greater than 100%** due to the fact that patients can have multiple co-morbidities (multiple responses).

Factors associated with COVID-19 mortality

A two-step logistic regression analysis was done to see the presence and strength of the association between COVID-19 and different independent variables. In the bivariate logistic regression analysis, variables that scored a p-value of less than 0.2 were selected as candidate variables for the multivariable logistic regression analysis; accordingly, age, sex, COVID-19 associated with co-morbidity, HIV/AIDS, DM, HTN, CHD, CKD, malnutrition, micro-nutrient deficiency, and GIT related disease were found to be associated with COVID-19 mortality.

Finally, the selected variables were entered into multivariable logistic regression analysis. As a result, respondents aged 50 and above [AOR = 7.91, 95% CI: (2.34–25.69)], being male [AOR = 2.09, 95% CI: (1.20–3.65)], having COVID-19 associated with comorbidity [AOR = 4.57, 95% CI: (1.86–12.85)], having diabetes mellitus [AOR = 2.67, 95% CI: (1.22–5.88)] and having chronic kidney disease [AOR = 12.04, 95% CI: (4.03–14.22)] had a statistically significant association with COVID-19 mortality (Table 5).

Discussion

The current study revealed that COVID-19 mortality was found to be (8.1%: 95% CI: (5.4-10.8)) among patients admitted to Eka Kotebe

Table 2: Cross-tabulation of COVID-19 patients' gender and age at Eka Kotebe General Hospital in Addis Ababa, Ethiopia, in 2021 (n=393).

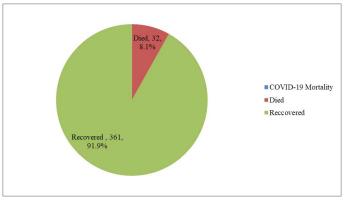|	Age of patients				
	<50 years	Percent (%)	>=50 years	Percent (%)	Total
Sex of patients					
Male					
	141		111		
		35.9		28.2	252
Female					
Total					
	92		49		
		23.4		12.5	141
	233		160		
		59.3		40.7	393

Figure 1: COVID-19 mortality among patients admitted to the COVID-19 treatment center in Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021 (n = 393).

Table 3: Medical conditions associated with COVID-19 among patients admitted to the COVID treatment center at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2021 (n=393).

Characteristics	Frequency	Percentage
Admission diagnosis		
Tuberculosis	63	16
HIV/AIDS	47	12
Cancer (All types)	12	3.1
Hypertension	103	26.2
Diabetes mellitus	82	20.9
Chronic heart disease	31	7.9
Chronic liver disease	13	3.3
Chronic kidney disease	70	17.8
Pregnancy and child birth	25	6.4
Malnutrition	9	2.3
GIT related disease	67	17
Skin and musculoskeletal disorder	40	10.2
Psychiatry & nervous system disorder	45	11.5
Others	22	5.6
COVID-19 associated with Other Comorbidity		
Yes	275	70
No	118	30

Table 4: Cross tabulation of COVID 19 deaths among comorbidities of patients admitted for COVID 19 treatment at Eka Kotebe hospital, 2021.

COVID-19 deaths	Tuberculosis # (%)	HIV /AIDS # (%)	Gastro intestinal disorders # (%)	Cancer (All Types) # (%)	Hypertension disorder # (%)	Diabetes mellitus # (%)	Congestive heart disease # (%)	Chronic liver disease # (%)	Chronic kidney disease # (%)	Others # (%)
Death	14(43.8)	13(40.6)	7(21.9)	1(3.1)	16(50.0)	15(46.9)	7(21.9)	2(6.3)	20(62.5)	18(56.3)
No Death	49(13.6)	34(9.4)	60(16.6)	11(3.0)	87(24.1)	67(18.6)	24(6.6)	11(3.0)	50(13.9)	123(34.1)

Table 5: Risk factors for death in COVID-19 patients admitted to Eka Kotebe hospital in Addis Ababa, Ethiopia, in 2021 (n = 393).

Variables	Death		COR (95% CI)	AOR (95%CI)
	Yes	No		
Age of patients:				
<50 years	8	245	1	1
≥50 years	24	116	6.34(2.76-14.53)	**7.91(2.43-25.70)**
Sex				
Male	24	228	1.75(0.76-4.01)	**2.09(1.20-3.65)**
Female	8	133	1	1
COVID-19 associated with co-morbidity				
Yes				
No	29	234	5.25(1.57-17.56)	**4.57(1.86-12.85)**
	3	127	1	1
HIV/AIDS and other hematologic disorders				
Yes				
No	13	34	6.38(2.99-14.48)	1.58(0.78-3.22)
	19	327	1	1
DM & other metabolic disease				
Yes	15	67	3.87(1.84-8.14)	**2.64(1.30-5.35)**
No	17	294	1	1
HTN & vascular disease				
Yes	16	87	3.15(1.51-6.56)	**2.67(1.22-5.88)**
No	16	294	1	1
CHD & related disease				
Yes	7	24	3.93(1.54-10.01)	2.69(0.98-4.93)
No	25	337	1	1
CKD & related disease				
Yes	20	50	10.37(4.77-22.51)	**12.04 (4.03-14.22)**
No	12	311	1	1
Malnutrition and micro-Nutrient deficiency				
Yes	2	7	3.37(0.67-16.95)	2.04(0.83-4.02)
No	30	354	1	1
GIT related disease				
Yes	7	34	2.22(0.85-5.77)	2.04(0.33-4.02)
No	25	327	1	1

General Hospital. The prevalence was higher than that of studies conducted in Nigeria (4.3%) [17,18] and Northern Ethiopia (0.8%) (14). However, it was lower than a study finding from the Democratic Republic of Congo (32%) [19] and Indus Hospital Karachi, Pakistan (39%) [20]. The disparity could be attributable to differences in the study participants' characteristics and the sample size employed. For instance, the findings from Pakistan and Congo were reported from a small number of participants among critically ill patients, and the majority of the study participants in Northern Ethiopia were asymptomatic patients.

In a multivariable logistic regression analysis, age of patients, sex, co-morbidity among all admitted patients, diabetes mellitus, hypertension, and chronic kidney disease were found to be significant

drivers of COVID-19 mortality.

Accordingly, people over the age of 50 years had roughly eight times [AOR = 7.91, 95% CI: (2.34–25.69)] higher odds of dying from COVID-19 compared to their younger counterparts. It's consistent with study findings throughout the world [20-24].This might be explained by the fact that older adults had higher rates of COVID-19-related hospitalization, and the majority of those admitted had underlying medical disorders that were common among older adults.

On the other hand, males had a two-fold higher risk of COVID-19 death than females. The greater death risks linked with COVID-19 for males could be due to associated comorbidities such as cardiovascular illnesses, hypertension, obesity, diabetes, biological or genetic factors,

but they could also be due to health-care system flaws [25-27].

According to the current results, hospitalized patients with prior co-morbidities had a fourfold increased risk of COVID-19 death. Comorbidities such as diabetes, COPD (Chronic Obstructive Pulmonary Disease), hypertension, renal disease, and cancer have also been linked to more severe infections and worse clinical outcomes [25,28,29]. In the context of the current COVID-19 pandemic, health experts believe that the presence of any coexisting comorbidity increases the chance of a catastrophic clinical outcome, including death [30].

The current finding also revealed that COVID-19 patients with diabetes mellitus had a 2.6-times greater risk of death. This could be due to the fact that diabetes might predispose patients to adverse outcomes and is a substantial risk factor for the severity and death of COVID-19 patients. This is supported by a number of research findings [21,31,32], which might be due to a weakened innate immune system caused by chronic hyperglycemia, overactive cytokine response, and hypercoagulability related clinical impairments [33].

Another conclusion from multivariate logistic regression analysis was that COVID-19 patients with hypertension were nearly three times more likely to die, implying that hypertension is a major predictor of hospital mortality. This conclusion is backed up by a number of studies [29,34,35] .It could be owing to the fact that aged people have a higher risk of cardiovascular disease and diabetes (all well-known risk factors for mortality in critical patients) than younger people do.

Chronic kidney diseases were a strong predictor of COVID-19 mortality. A COVID-19 patient with CKD had twelve times higher odds of death. In a similar study of the European population, in-hospital death of patients was found to be greater in patients with high creatinine levels and a history of previous CK [29,35,36].This may be linked to their weakened immune systems. In addition, non-survivors of COVID-19 showed higher levels of variables linked to renal illness, such as creatinine, blood urea, neutrophil count, and D-dimer [37].

Limitation: Hence many patients with one or more comorbidities were represented, and different clinical treatment regimens were implemented. This might lead to differing survival outcomes.

Conclusion and Recommendations

The results of the current study showed that the magnitude of COVID-19 mortality among hospitalized COVID-19 patients was high. Moreover, age, gender, presence of co-morbidity among all admitted patients, diabetes, hypertension, and chronic kidney disease were discovered to be determinants of COVID-19 mortality.

Therefore, in addition to standard COVID-19 awareness-raising and mobilization activities, special focus should be paid to older COVID-19 patients and those with known comorbidities such as hypertension, diabetes, and end-stage renal disease.

The list of abbreviations and acronyms

The following were some of the abbreviations and acronyms used in this study. ARDS-acute respiratory distress syndrome, body mass index (BMI), CHD-congestive heart disease, CKD-chronic kidney disease, DM-Diabetes Mellitus, HIV/AIDS-Human Immune Virus/ Acquired Immune Deficiency Syndrome, HTN-Hypertension, ICU-intensive care unit, RT-PCR-reverse transcriptase polymerase reaction, SARS-severe acute respiratory syndrome, SSA-Sub Saharan Africa, WHO-World Health Organization

Declaration

Ethical consideration

Ethical approval was obtained from Yanet College's research and ethical board and the institutional review board of Eka Kotebe General Hospital. Confidentiality was assured by blinding the name of the patient profile or any specific characteristics, instead by using a code or medical registration number.

Consent for publication

Not applicable

Data Availability

The datasets used to support the findings of this study are attached with the manuscript.

Conflicts of interest

The author declares they have no competing conflicts of interest.

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