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Magnitude of Covid-19 Related Death and Associated Factors Among Patients Admitted to Intensive Care Unit of Eka Kotebe General Hospital; Addis Ababa, Ethiopia, 2020/21

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Abstract

Background: Coronavirus disease 2019 (COVID-19) is an emerging disease caused by the Severe Acute Respiratory Syndrome Corona Virus (SARS CoV2), which is novel strain of Coronavirus. COVID-19 causes illness ranging from asymptomatic to life-threatening that ends up with death. To date, worldwide millions of people have died as a result of COVID 19. Ethiopia is among countries with the highest number of COVID-19 cases. Death related to COVID-19 varied significantly among individual countries/regions. The objective is to assess the magnitude and factors associated with COVID 19 related death among Intensive Care Unit admission at Eka Kotebe General Hospital, Addis Ababa, in 2020/21. **Subjects and Methods:** Facility based cross-sectional study design was conducted in the period from August 1/2021 to 30/2021. Participants(n=384) were selected using systematic random sampling technique among COVID-19 patients who were admitted to Intensive Care Unit (ICU) of Eka Kotebe General Hospital from April 25/ 2020 to August 30/2021. The data were collected by two trained data collectors using data retrieval form prepared on KoBo toolbox software; then exported to SPSS version 26.0 for analysis. Descriptive univariate results were presented with tables and graphs as well as bivariable and multivariable logistic regression methods were used to explore significant associated factors to COVID 19 related death among COVID-19 ICU admission, P-value < 0.05. **Results:** A total of 384 medical records of patients who admitted to Intensive Care Unit with the diagnosis of COVID-19 were included. The magnitude of death among the study population was 70.8%. The proportion of male and female were 67.4% and 32.6% respectively. The most frequently observed comorbidities among the study population were diabetes (59.4%), hypertension (47.1%), chronic cardiac diseases (19.8%), chronic kidney disease (11.5%) and asthma (6.9%). Diabetes (AOR=1.75 95% CI 1.01-2.56), age group >63years (AOR=2.61 95% CI 1.36-4.99), loss of taste and/ smell sensation [AOR=3.27, 95% CI 1.78-6.01], altered mental status [AOR=3.25, 95% CI 1.54-6.85] and fever [AOR=1.61, 95% CI 1.00-2.61] found significant association with COVID 19 related death P Value < 0.05. **Conclusion:** The magnitude of death among the study participants was high. Identified significant associated factors were diabetes, increasing age, and clinical factors: such as loss of taste/smell sensation, altered mental status and fever.

Keywords: COVID-19, COVID-19 related Death, ICU, Eka Kotebe Hospital, Comorbidities.

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Introduction

Coronavirus disease 2019 (COVID-19) is an emerging disease caused by the Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2), which is a novel strain of Coronavirus. It is first identified in Wuhan, China, in December 2019 and was declared as a pandemic by the World Health Organization (WHO) on 12 March 2020.[1] This virus belongs to the family of single sRNA viruses some of which have been previously described to be responsible for the severe acute respiratory syndrome (SARS) and Middle East Respiratory Syndrome (MERS).[2,3] Its wider spread is due to human to human transmission.[4] Currently the primary epidemiologic risk factors for acquiring COVID-19; travel-related (58.1%, 95% CI), close contacts with infected individuals within 14 days of symptom onset (43.1%, 95% CI) and community spread (27.4%, 95% CI).[4,5,6] An average incubation period is about 5 days, range 2–14 days.[4,5] COVID-19 causes illness ranging from asymptomatic infection to life-threatening illness that progress to multi-organ failure and death.[7,8] Currently the most widely used confirmatory test for diagnosis is polymerase-chain-reaction assays (PCR), the specimen taken from nasopharyngeal or oropharyngeal swab.[7]

The associated factors for mortality and detailed clinical course of the illness are not yet fully known. Comorbidities greatly affect the prognosis of the COVID-19.[8,9,10] Marked variations in prevalence and treatment outcome were noticed among different countries; this is potentially due to

the difference in demography, access to health-care, health care infrastructure, presence of comorbidities and preparedness against pandemics.[6] The COVID-19 pandemic poses enormous burdens and challenges to the medical care system, including ICUs, across different countries.[11,12,13]

COVID-19 is spreading all over the world at unpredicted rate, resulting in significant influences on global economies and public health.[13] Globally, in the earliest phase highest COVID-19 case and death were reported from United States, Europe and Eastern Mediterranean but currently the magnitude and region of coverage is rapidly changing.[1,14] According to WHO updated reports, until March 2022, over 445 million COVID-19 cases and 5.9 million deaths have been reported globally. Nearly half of these cases (48%) and deaths (55%) continue to be reported in the Region of Americas (1) Several cross-sectional studies held in China, Iran, New York and Pakistan found that elders were more likely to have COVID 19 related death among critically ill cases.[12,14,15,16,17,18]

The first African COVID 19 case was reported in Nigeria, then the virus has spread to all Sub-Saharan Africa (SSA).[14] Some African countries acted rapidly to reduce the spread; however successful containment measures come with a high economic cost.[19] Growth in Sub-Saharan Africa is predicted to fall, pushing the region into economic crisis and erasing at least five years of progress in fighting poverty.[1,20] The sharp deterioration of global conditions and the response measures taken in the region to combat the pandemic have already precipitated a major social-economic crisis.[20] Ethiopia has not been spared from the crisis of this epidemic. The socio-economic impacts being felt across Ethiopia already are wide-ranging and with the potential to become severe due to underlying and structural factors.[20] It is clear that assessment of associated factors is very essential to plan preventive strategies, to search solutions, and to predict severity, death rate and other crisis.

As COVID 19 is a newly emerging pandemic disease, in the local context of Ethiopia there is limited data that show the magnitude of COVID 19 related death and associated factors among ICU patients. Therefore, deep rooted search to find out potential associated factors of COVID 19 related death was a corner stone to this study. The beneficiaries will be expected to be the health system planners, health care providers and community as a whole. Therefore, the health system planners will be get ample information for designing appropriate strategies that can reduce COVID 19 related death through empowering capacity of the health care providers and building awareness to the society. It is also expected to be crucial for the community to take precautions for themselves that enable them to practice preventive measures of COVID 19 infection and to alert them about one's own chronic medical condition(s). Furthermore, the finding will be expected to help the health care providers to enable how to combat the pandemic using limited resources and enable them to get better understanding about the medical conditions of critical COVID-19 patient at ICU.

Subjects and Methods

Study Area and Period

Eka Kotebe General Hospital is found in Addis Ababa city administration, the capital of Ethiopia. The Administration has 11 Sub-cities and 121 woredas. The 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA) was used as a basis for projection, The current metro area population of Addis Ababa in 2021 is 5,006,000, a 4.42% increase from 2020 (47,48). The weather condition is mainly "dega" and the elevation is 7,726ft (2,355m) above the sea level.

The administration has a total of 41 hospitals (15 public and 26 private hospitals), 98 health centers and 1160 private clinics. Eka Kotebe General Hospital was established in 2009 E.C as the expansion of Amanuel Mental and Psychiatric Specialized Hospital. But following COVID 19 pandemic, it was the first and the only hospital that early shifted to corona center for isolating and treating COVID-19 patients. Until August 2021, the hospital gave service for more than 5260 COVID 19 patients under different specialized and general service units including (emergency, high demand unit and intensive care unit) based on the severity of the disease. Of these, until the last date of data collection (August 30/2021), 890 patients were admitted to Intensive care unit. According to the data that was obtained from the hospital's human resource management office, currently the hospital has a total of 1650 human powers. Among these 1531 are health care workers (including specialists, residents, general practitioner, health officer, nurses, and laboratory and radiology technologists). The study was conducted in the period from August 1/2021 to 30/2021.

Study Design

A facility based retrospective cross-sectional study design was conducted.

Population

Source Population

The source population was all medical records of patients admitted to Eka Kotebe General Hospital ICU with the diagnosis of COVID-19 from April 25/2020 to the last day of the study period (August 30/2021).

Study Population

Selected medical records of patients among those were admitted at Eka Kotebe General Hospital ICU with the diagnosis of COVID-19 in the period from April 25/2020 to August 30/ 2021.

Inclusion Criteria

Medical records of patients, who tested positive for COVID-19 on qualitative polymerase-chain-reaction assay or rapid diagnostic test, admitted to Eka Kotebe General Hospital ICU and have well documented/complete chart.

Exclusion Criteria

Those medical records of patients admitted in ICU whose chart were not obtained in the card room, or have incomplete medical record or registration.

Sample size determination

Sample Size Determination for magnitude

The sample size for this study was calculated using the formula for estimation of single population proportion formula:

$$n = \frac{Z^2 P (1- P)}{d^2}$$

Where,

n= Sample size

Z= Z statics for a level of Confidence

P= Expected prevalence or magnitude

d= Precision

The Magnitude of mortality among COVID-19 ICU patients varied significantly among individual countries.

Those countries from which prevalence of COVID 19 related death among ICU admissions showed quite different from Ethiopian general health care set up and demography. As well as there was no published previous local research reports up on similar topic. Therefore, this study was used the prevalence (P) to be 50% for the purpose of estimating the sample size. Z value is 95% confidence level which is 1.96; and d is the 5% (0.05) margin error of estimation.

Thus, based on the above formula the sample size (n) was calculated;

$n = (1.96)2x\ 0.5(0.5)/\ (0.05)2$

n =384

Sample Size Determination for associated factors

Double population proportion formula was used to determine the sample size for the factors associated with COVID 19 related ICU death. Sample size was calculated for some of the associated factors obtained from different literatures by using the StatCalc of Epi Info statistical software version 7 with the following assumptions:

- Confidence level = 95%
- Power = 80%
- The ratio of unexposed to exposed almost equivalent to 1.

Table 1: Sample size calculation for different selected factors associated with COVID 19 related death in different studies.

Variable	COVID 19 Related Mortality		Sample Size	Reference
	Exposed	Non-Exposed		
Cardiovascular disease	42.8%	6.9%	50	33
Hypertension	22.4%	5.78%	202	33
Age >65 year	21.6%	9.3%	181	3

Finally, the sample size (n) was taken by comparing the above sample size results that calculated for both the first and the second objectives. Thus, 384 samples were taken from the first objective and replacement was used in a condition when the selected chart did not satisfy the inclusion criteria.

Sampling Technique

The samples were selected from the study population by using a systematic random sampling technique. Accordingly, list of COVID 19 ICU patients was obtained from the registration book, arranged in the order of their registration number and then adequate sample size (n= 384) was selected from the total list through the interval that obtained by using the following formula.

K= N/n Where,

K=is sampling interval

N= Total ICU admission

n= Number of samples

k= 890/384 = 2.3

K ~ 2

Accordingly, the sample of the study was selected out at every 2nd interval from the list.

Data Collection Tool and Procedure

Data Collection Tool

The data was collected by using pretested structured data retrieval form that adopted from other related literatures. The checklists have 5 major sections. These are socio-demographic characteristic, clinical condition, comorbidities, clinical management, diagnosis and outcome of the patient in which each contained 3, 23, 13, 16 and 5 items respectively.

Data Collection Procedure

The data was collected from patient that were selected among the study population by using systematic random technique. After the selection of adequate sample, the data collection process was held on. Data was collected by two trained independent data collectors who work in Eka Kotebe General Hospital using pretested structured data retrieval form using KoBo Toolbox software. Each participant patient's chart was strictly reviewed, especially medical history and outcome was assessed in detail. Continuous monitoring of the existing data and regulation was conducted by a trained supervisor.

Variables

Dependent Variable

COVID 19 related death

Independent Variables

Demographic variables - Age, Sex and Residence

Clinical conditions - Clinical presentation of the patient (cough, fever, shortness of breath, loss of appetite, loss of taste/smell sensation…), duration of illness, History of medication prior to admission, clinical management and Pregnancy

Comorbidities– Asthma, COPD, pulmonary TB, Hypertension, chronic liver disease, chronic kidney disease, Diabetes, chronic cardiac disease, HIV/AIDs, Malignancy (any form of cancer) and stroke.

Data Quality Assurance

The quality of data collecting process, analysis and interpretations were assured through sustainable experience sharing, discussions and frequent updates of the study team. The principal investigator gave one day training for the data collectors and supervisor. Prior to the actual application of

data collection, pre-test of the data collecting tool was made on 5% of COVID 19 ICU patient records of the study population and accordingly corrective measures were done in all aspect of the process. The data retrieval form included all potential associated factors that was developed referring to consistent related studies. Provision of training for data collectors and supervisor, pretest of data collecting tool, continuous monitoring of the existing data and the use of standard software were the corner stone activities held attentively to ensure the quality of data. Furthermore, the completeness of collected data was checked by supervisor and the completed data were submitted to KoBo Toolbox software server created by the principal investigator on the same day.

Data Analysis

Data was collected and checked using KoBo toolbox then exported to SPSS version 26.0 for analysis. Descriptive univariate such as percentage, frequency, ratio, mean and median were computed, and presented with tables, graphs and charts. Binary logistic regressions were applied to each independent variable with the outcome variable and for those variables with a p-value < 0.25; multivariable logistic regressions were carried out. The strength of association was measured through Odds Ratio (OR) and significance of association was determined at 95% confidence interval and p-value <0.05. In the analysis stage the effect of confounding factors was controlled using multivariate methods. Finally, Hosmer and Lemeshow goodness of fit was used to test model fitness.

Ethical Consideration

Ethical clearance paper was obtained from Dire Dawa University College of medicine and health sciences research and ethics review committee. Official letter was submitted to Eka Kotebe General Hospital Research office. Then the proposal was evaluated by Eka Kotebe General Hospital Ethical Committee and the permission paper that allows the study to be conducted at the hospital was given by Eka Kotebe General Hospital Medical Director office. Finally, the consent form will be given to ICU department head and data officers. In each step, data obtained from this study will be kept in confidentiality and secured not be used for other purposes except for this study.

Dissemination Plan

The result was prepared in both hard and soft copy then submitted to department of Public Health, College of Medicine and Health Sciences of Dire Dawa University. Then the finding was presented and enriched during seminars presentation. The document was shared to Eka Kotebe General Hospital after constructive comment and suggestions were incorporated. Finally, it will be submitted for publication to national or international peer reviewed journals based on its validation.

Results

Socio-demographic and clinical factors

As shown in [Table 2], more males were admitted than females with the proportion of 67.4% and 32.6% respectively. The most frequent age group admitted to ICU with the diagnosis of COVID 19 was >63 years old (60.7%), of them 69.9% were died. The median duration of illness before admission was 8 days (interquartile range 1-8days). Cough (93.2%), loss of appetite (88.3%), easily fatigability (88%), shortness of breath (87%) and fever (61.7%) were the most frequent symptoms respectively.

Table 2: Frequencies and percentages of Socio-demographic and Clinical characteristic of COVID 19 patients admitted to ICU at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2020/21 (n= 384)

	Categories	F(n=384)	%	Patient Outcome			
				Died		Alive	
				F(n=384)	%	F(n=384)	%
Participant Sex	Female	125	32.6	90	72	35	28
	Male	259	67.4	182	70.3	77	29.7
Participant residence	Urban	339	88.3	238	70.21	101	29.8
	Rural	45	11.7	34	75.56	11	24.4
Participant Age (in year)	<18yrs	3	0.8	1	0.4	2	99.6
	18 - 47yrs	90	23.4	55	20.2	35	79.8
	48- 63yrs	58	15.1	34	12.5	24	87.5
	>63yrs	233	60.7	182	66.9	51	33.1
Duration of illness (in days)	< 3	55	14.3	42	76.36	13	23.6
	3 to 7	106	27.6	70	66	36	34
	8 to 14	150	39.1	104	69.33	46	30.67
	15 to 21	64	16.7	49	76.56	15	23.44
	> 21	9	2.3	7	77.78	2	22.22
Cough	Yes	358	93.2	256	71.50	102	28.50
	No	26	6.8	16	61.54	10	38.46
Fever	Yes	237	61.7	161	67.94	76	32.06
	No	147	38.3	111	75.51	36	24.49
Shortness of breath	Yes	334	87.0	242	72.46	92	27.54
	No	50	13.0	30	60	20	40
Loss of appetite	Yes	320	83.3	223	69.69	97	30.31
	No	64	16.7	49	76.46	15	23.44

Easily fatigability	Yes	338	88.0	239	70.71	99	29.29
	No	46	12.0	33	71.74	13	28.26
Loss of taste/smell sensation	Yes	61	15.9	30	49.2	31	50.8
	No	323	84.1	242	75	81	25
History of treatment	Yes	300	78.1	239	66	99	33
	No	84	21.9	33	84.52	13	15.48
Diagnosis at admission	Asymptomatic	7	1.8	4	57.14	3	42.86
	Mild	8	2.1	5	62.50	3	37.50
	Moderate	8	2.1	5	62.50	3	37.50
	Sever	246	64.1	158	64.23	88	35.77
	Critical	115	29.9	100	86.96	15	13.04

F = Frequency, n= Sample size

Table 3: Frequencies and percentages of Comorbidities among COVID 19 patients admitted to ICU at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2020/21 (n= 384).

	Categories	F (n=384)	%	Patient Outcome			
				Died		Alive	
				F(n=384)	%	F(n=384)	%
Chronic Cardiac Diseases of any cause	Yes	76	19.8	55	72.67	21	27.63
	No	308	80.2	217	70.50	91	29.50
Chronic Kidney Disease	Yes	44	11.5	35	79.55	9	20.45
	No	340	88.5	237	69.71	103	30.29
Chronic Liver Disease	Yes	8	2.1	6	75	2	25
	No	376	97.9	266	70.75	110	29.25
Hypertensive	Yes	181	47.1	134	74.04	47	25.96
	No	203	52.9	138	67.99	65	32.01
Diabetes	Yes	228	59.4	171	71.93	57	28.07
	No	156	40.6	101	75.88	55	24.12
Asthma	Yes	26	6.8	26	100	0	0
	No	358	93.2	246	68.72	112	31.28
COPD	Yes	6	1.6	3	50	3	50
	No	378	98.4	269	71.17	109	28.83
Malignancy (Any form)	Yes	18	4.7	14	77.78	4	22.22
	No	366	95.3	258	70.49	108	29.51
HIV / AIDS	Yes	17	4.4	16	94.12	1	5.88
	No	367	95.6	256	69.76	111	30.24
Tuberculosis	Yes	24	6.3	24	100	0	0
	No	360	93.8	248	68.89	112	31.11
Stroke	Yes	16	4.2	12	75	4	25
	No	368	95.8	260	70.65	108	29.35
Pregnancy (n=125)	Yes	7	1.8	3	42.86	4	57.14
	No	118	30.7	87	73.73	31	26.27

F = frequency, n= sample size

Table 4: Frequencies and percentages of clinical management among COVID 19 patients admitted to ICU at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2020/21 (n= 384)

	Categories	F(n=384)	%	Patient Outcome			
				Died		Alive	
				F(n=384)	%	F(n=384)	%
Prone positioning	Yes	194	50.5	133	68.56	61	31.44
	No	190	49.5	139	73.15	51	26.84
Oxygen Therapy	Yes	367	95.6	262	71.39	105	28.61
	No	17	4.4	10	58.83	7	41.17
Maximum oxygen support/demand at admission (L/min)	Not used	17	4.4	10	58.83	7	41.17
	<5	132	34.4	84	63.64	48	36.36
	6 to 10	75	19.5	51	68	24	32
	11 to 15	47	12.2	35	74.47	12	25.53
	16 to 25	59	15.4	43	72.89	16	27.11
	> 25	54	14.1	49	9.75	5	9.25
Intubation	Yes	150	39.1	141	94.00	9	6.00
	No	234	60.9	131	55.99	103	44.01
Length of hospital stay before intubation (in days)	< 3	67	44.9	60	89.56	7	10.44
	3 to 7	43	28.8	42	97.68	1	2.32
	8 to 14	22	14.7	22	100	0	0
	> 14	17	11.4	16	94.12	1	5.88
Antibiotic	Yes	379	98.7	270	71.25	109	28.75

	No	5	1.3	2	40	3	60
Anticoagulant	Yes	374	97.4	264	70.58	110	29.41
	No	10	2.6	8	80	2	20
Dexamethasone	Yes	357	93.0	255	71.43	102	28.57
	No	27	7.0	17	62.97	10	37.03
Remdesivir	Yes	26	6.8	23	88.47	3	11.53
	No	358	93.2	249	69.84	109	30.16
Vaccination of COVID19	Yes	6	1.6	4	66.67	2	33.33
	No	378	98.4	268	70.89	110	29.1
Total length of hospital stays (in days)	< 7	98	25.5	85	86.74	13	13.26
	7 to 14	99	25.8	80	80.81	19	19.19
	15 to 21	78	20.3	48	61.54	30	38.46
	22 to 30	62	16.1	30	48.39	32	51.61
	> 30	47	12.2	29	61.71	18	38.29
Outcome	Alive	112	29.2				
	Died	272	70.8				

F = frequency, n= sample size

Table 5: Associations of comorbidities and clinical factors to COVID 19 related death among ICU admission at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2020/21 (n= 384)

Associated factors	Categories	Outcome		COR (95% CI))	AOR (95% CI)	P- Value
		Died (n=384)	Alive (n=384)			
Diabetes	Yes	171	57	1.63(1.04,2.54)	1.75(1.01,2.56)	0.01**
	No	101	55	1	1	
Hypertension	Yes	134	47	1.34(0.86,2.09)	1.10(0.66,1.85)	0.69
	No	138	65	1	1	
HIV/AIDS	Yes	16	1	6.93(0.01,1.10)	0.10(0.01,0.80)	0.30
	No	256	111	1	1	
Chronic kidney disease	Yes	35	9	1.69(0.78,3.69)	1.40(0.69,2.85)	0.34
	No	237	103	1	1	
Participant age (in years)	< 18yrs	1	2	1	1	
	18 to 47yrs	55	35	7.13(0.63,80.30)	5.78(0.48,68.44)	0.16
	48 to 63yrs	34	24	2.27(1.34, 3.84)	2.20(1.18, 4.09)	0.01**
	>63yrs	182	51	2.51(1.37, 4.62)	2.61(1.36, 4.99)	0.004***
Mental status	Conscious	103	211	3.30(1.58,6.92)	3.25 (1.54,6.85)	0.002***
	Altered	9	61	1	1	
Loss of taste and/ smell sensation	Yes	61	31	3.08(1.76,5.41)	3.27(1.78,6.01)	0.01**
	No	323	81	1	1	
Fever	Yes	76	161	1.45(0.91.2.31)	1.61(1.00,2.61)	0.05
	No	36	111	1	1	

F= Frequency Crude COR= Odds Ratio = AOR= Adjusted Odds Ratio

As shown on [Figure 1], the majority of ICU patients, 246(64%) were diagnosed as sever COVID 19 at admission while 115(30%) were diagnosed as critical COVID 19.

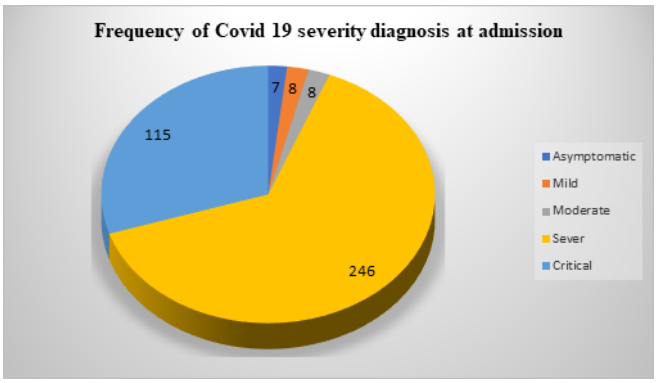

Figure 1: Frequencies and percentages of COVID 19 severity diagnosis among patients admitted to ICU at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2020/21 (n= 384).

As shown below [Table 3], Overall, of the study population 70.8% patients were died. Among those died the most frequently observed comorbidities were Asthma (100%), Tuberculosis (100%), HIV/AIDS (94.1%), chronic kidney disease (79.5%), hypertension (74.4%) and DM (71.9%). The most frequently observed comorbidities among the study population were diabetes (59.4%), hypertension (47.1%), and chronic cardiac diseases (19.8%).

Regarding to clinical management of the study population [Table 4] the provision of oxygen support, antibiotics, anticoagulant, dexamethasone; practice of prone positioning and intubation were carried out for 95.6%, 98.7%, 97.4%, 93.0%, 50.5% and 39.1% of patients respectively. The median total hospital stay was 7 to 16 days. Among the study participants 150/39.1% of them were intubated; of these 94% were died and 6% were alive.

Among intubated patients, the majority of intubations were held within the first three days of admission [Figure 2]. The median duration of hospital stay before intubation was 3-7 days.

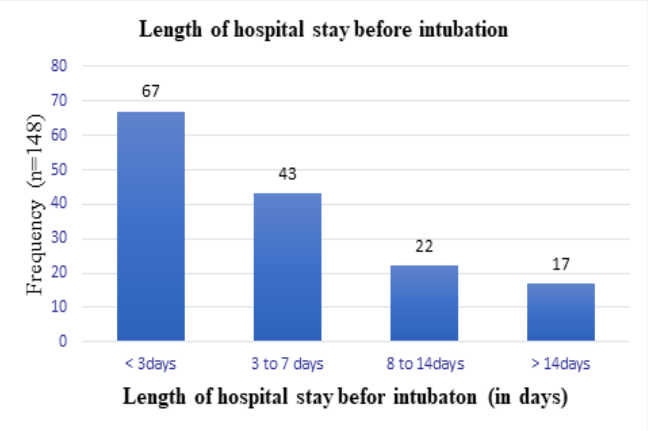

Figure 2: Length of hospital stay before intubation among intubated COVID 19 patients admitted to ICU at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2020/21.

As shown below [Figure 3], among patients who were intubated within 8 to 14 days of admission, observed death was 100%. Whereas, those intubated early, in the 1st 3days of admission, had death rate 89.56%.

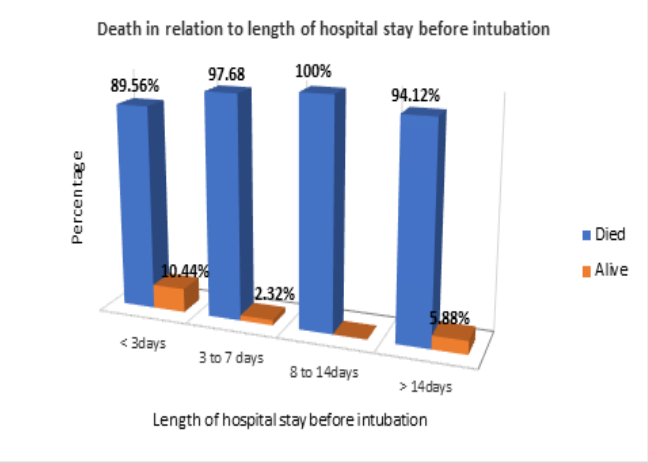

Figure 3: Proportion of death in relation to length of hospital stay before intubation among intubated COVID 19 patients admitted to ICU at Eka Kotebe General Hospital, Addis Ababa, Ethiopia, 2020/21 (in days).

Factors Associated with COVID-19 related death

In the analysis of, bivariable logistic regression eight associated factors; diabetes, age, loss of taste and/ smell sensation, mental status, fever, chronic kidney disease, HIV/AIDS and hypertension had shown association with COVID 19 related death at p< 0.25. Then these factors were analyzed by multivariable logistic regression and five of them showed significant association with COVID 19 related death, P Value < 0.05. These were; Diabetes (AOR=1.75 95% CI 1.01-2.56), age group >63years (AOR=2.61 95% CI 1.36-4.99), loss of taste and/ smell sensation [AOR=3.27, 95% CI 1.78-6.01], altered mental status [AOR=3.25, 95% CI 1.54-6.85] and fever [AOR=1.61, 95% CI 1.00-2.61].

Discussion

This study found that the magnitude of COVID 19 related death among Eka Kotebe General Hospital ICU admission was 70.8% (95% CI, 65.9, 75.8). The most frequently observed comorbidities among the study population were diabetes, hypertension, chronic cardiac diseases, chronic kidney disease and asthma. Diabetes, age >63years, as well as clinical factors; loss of taste and/ smell sensation, altered mental status and fever were showed significantly associated with COVID 19 related death among ICU admission.

In this study the magnitude of COVID 19 related death among ICU admission is higher than cross sectional studies that were conducted in Brazil, New York, China, Iran and Poland revealed 60.3%, 59%, 58.1%, 46.3% and 41.6% respectively.[17,21,22,23,24] Whereas a study held in Pakistan showed to be 77%.[25] This variation might be due to the difference in demography, admission criteria to ICU, socio-economic status and health care set up of study areas.

The mean age of patients among the study participant was 65 years and the proportion of male was 67.4%. This finding is consistent with a study done in Wuhan, China that showed 64years and 61.5% of the patients was male.[12] Another study from Poland showed that the median age was 62.4 years and the percentage of male patients was similarly higher than females (69%).[24] The similarity between these studies might be explained by sociodemographic pyramid, high prevalence of comorbidity in elders and due to potential risk behaviors, that were not addressed by this study, such as smoking and alcohol use.

This study found that elders age >63 years had 2.6 times more likely to have COVID 19 related death (AOR=2.61 95% CI 1.36-4.99). Similar studies done in Pakistan, Iran and New York found that increased age (age >60 years) was an independent significant associated factor that 2.6 times more likely to have COVID 19 related death among ICU admission.[3,4,15,16,17,25] This similar finding is more likely due to the fact that, as the age increases the likely hood to have comorbidities is very high, this again contributes for diseases severity. On the other hand, in this study sex had not showed association with death unlike a study held in Hong Kong, Peoples Republic of China, revealed that females with COVID-19 was significantly lower death than males [OR 3.4; 95% CI 1.2–9.1, P value < 0.05].[3,4]

Regarding to comorbidities the study found that being diabetic had 1.75 times more likely to have COVID 19 related death among ICU admission (AOR=1.75 95% CI 1.01-2.56).

This finding is in line with similar studies held in China that showed diabetes was 2 times higher in ICU than in non-ICU COVID 19 patients.[9,10,33] Other studies from Dubai, New York and America showed that being diabetes had significant association with COVID 19 related death.[15,22] This consistency is more likely due to the high prevalence of DM among the study participants, its complication and synergistic compromising effect against immunity.

The assessment regarding to the clinical factors, this study

found that the presence of loss of taste and/ smell sensation had 3.27 times more likely to have COVID 19 related death among ICU admission [AOR=3.27, 95% CI 1.78-6.01]. For this finding comparison was not done with other literatures (not available) but facility based cross sectional studies among COVID 19 patients held in Switzerland showed that the magnitude of taste deficits was 74.1% (sweet), 77.8% (sour), 70.4% (salty), 63%, (bitter) (44) and 56.2% had altered smell sensation as the only presenting complaint.[45]

This study also assessed the significance of altered mental status, that found patients with altered mental status were 3.2times more likely to have death [AOR=3.25, 95% CI 1.54-6.85]. This is opposite to a cross sectional study held in Iran that showed altered mental status was not associated with mortality but it found in 54.5% of patients who died as a result of COVID 19.[26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42]

This study found that patients with fever, 1.61 times more likely to have COVID 19 related death [AOR=1.61, 95% CI 1.00-2.61] than those who have no fever. This finding is not consistent with other study done in New York that showed the association is insignificant but the proportion of fever was seventy seven percent. This difference might be explained by the difference in geographic climatic condition and/ the difference of the study design.[22,43,44,45,46]

Limitation of the Study

- The data were collected from secondary sources and this may lead to bias for generalization. And this also limited the investigator to assess very important potential associated factors that were missed to document in each patient's chart; like history of smoking, alcohol consumption or chewing khat.
- The accuracy and reliability of data can be affected by the knowledge and skill of treating physician who clerked and managed the patient, and documentation, not only the skill of study team.
- Cause-and-effect relationship between different factors with the outcome variable cannot be established
- Lack of adequate similar studies in the local area or other countries with similar set up to Ethiopia.
- Lack of precision may be unavoidable considering the experience beginner investigator and work burden while working on COVID 19 treatment center.
- As COVID 19 is new Emerging outbreak the earlier management has no properly designed guideline. Especially, in the earlier wave, this may lead to lack of uniformity.

Conclusion

The magnitude of COVID 19 related death among ICU admission is much higher (70.8%), so the stakeholders need to be active in all aspects to reverse the existing situation. The most frequently observed comorbidities among those patients died as a result of COVID 19 at ICU were Asthma, Tuberculosis, HIV/AIDS, chronic kidney disease, hypertension and DM. Diabetes, age >63years, as well as clinical factors; loss of taste and/ smell sensation, altered mental status and fever were showed significantly associated with COVID 19 related death among ICU admission. This study alarms the importance of pandemic preparedness and the need to maintain readiness to held studies in response to the outbreaks.

Recommendation

Based on the finding of the study, the following recommendations were forwarded to each responsible level.

Addis Ababa Health Bureau

Addis Ababa Health Bureau needs to be ready and structurally organized to install special infection prevention practice, especially for those old age and patients with comorbidity. Continuous evaluation and proper management of awareness building strategies, and accessing infection prevention protective equipment is the corner stone.

For Health Facilities

The health facility should be expected to empower the capacity of the health care providers in relation of COVID 19 related death and other clinical conditions of COVID 19 patient.

For Health care providers

As an outbreak response, health care providers are also expected to have active participation in public health perspectives that enhance awareness of the community.

Updating oneself is mandatory to combat the pandemic using limited resources.

From day-to-day practical exposure health care providers are expected to identify the clinical conditions that contribute to increase the risk of COVID 19 related death.

For researchers

Considering the global economic and social impact of COVID 19, actual understanding of the local context is explored through researches. Therefore, several detailed studies are needed to alleviate the holistic burden.

For Community

The community should be expected to practice early test if symptomatic, visit and get the medical advice as early as possible. Learn and practice how to safe others by keeping one's own health by minimizing social gatherings.

For individual

Each individual should be expected to aware of one's own comorbidity and carefully practice infection prevention precaution according to recommendations from medical and public health disciplines.

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References

1. Liao X, Wang B, Kang Y. Novel coronavirus infection during the 2019-2020 epidemic: preparing intensive care units-the experience in Sichuan Province, China. Intensive Care Med. 2020;46(2):357-360. doi: 10.1007/s00134-020-05954-2.
2. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. N Engl J Med. 2020;382(8):727-733. doi: 10.1056/NEJMoa2001017.
3. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet. 2020;395(10229):1054-1062. doi: 10.1016/S0140-6736(20)30566-3.
4. Rasmussen SA, Smulian JC, Lednicky JA, Wen TS, Jamieson DJ. Coronavirus Disease 2019 (COVID-19) and pregnancy: what obstetricians need to know. Am J Obstet Gynecol. 2020;222(5):415-426. doi: 10.1016/j.ajog.2020.02.017.
5. Linton NM, Kobayashi T, Yang Y, Hayashi K, Akhmetzhanov AR, Jung SM, et al. Incubation Period and Other Epidemiological Characteristics of 2019 Novel Coronavirus Infections with Right Truncation: A Statistical Analysis of Publicly Available Case Data. J Clin Med. 2020;9(2):538. doi: 10.3390/jcm9020538.
6. Li J, Huang DQ, Zou B, Yang H, Hui WZ, Rui F, et al. Epidemiology of COVID-19: A systematic review and meta-analysis of clinical characteristics, risk factors, and outcomes. J Med Virol. 2021;93(3):1449-1458. doi: 10.1002/jmv.26424.
7. Jee J, Foote MB, Lumish M, Stonestrom AJ, Wills B, Narendra V, et al. Chemotherapy and COVID-19 Outcomes in Patients With Cancer. J Clin Oncol. 2020;38(30):3538-3546. doi: 10.1200/JCO.20.01307.
8. Fox TA, Troy-Barnes E, Kirkwood AA, Chan WY, Day JW, Chavda SJ, et al. Clinical outcomes and risk factors for severe COVID-19 in patients with haematological disorders receiving chemo- or immunotherapy. Br J Haematol. 2020;191(2):194-206. doi: 10.1111/bjh.17027.
9. Li B, Yang J, Zhao F, Zhi L, Wang X, Liu L, et al. Prevalence and impact of cardiovascular metabolic diseases on COVID-19 in China. Clin Res Cardiol. 2020;109(5):531-538. doi: 10.1007/s00392-020-01626-9.
10. Price-Haywood EG, Burton J, Fort D, Seoane L. Hospitalization and Mortality among Black Patients and White Patients with Covid-19. N Engl J Med. 2020;382(26):2534-2543. doi: 10.1056/NEJMsa2011686.
11. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. Lancet Respir Med. 2020;8(5):475-481. doi: 10.1016/S2213-2600(20)30079-5.
12. Yu Y, Xu D, Fu S, Zhang J, Yang X, Xu L, et al. Patients with COVID-19 in 19 ICUs in Wuhan, China: a cross-sectional study. Crit Care. 2020;24(1):219. doi: 10.1186/s13054-020-02939-x.
13. Aly MH, Rahman SS, Ahmed WA, Alghamedi MH, Al Shehri AA, Alkalkami AM, et al. Indicators of Critical Illness and Predictors of Mortality in COVID-19 Patients. Infect Drug Resist. 2020;13:1995-2000. doi: 10.2147/IDR.S261159.
14. Osseni IA. COVID-19 pandemic in sub-Saharan Africa: preparedness, response, and hidden potentials. Trop Med Health. 2020;48:48. doi: 10.1186/s41182-020-00240-9.
15. Gaobotse G, Ogbaga CC. COVID-19 in Africa: New opportunities created. Ethics Med Public Health. 2022;24:100832. doi: 10.1016/j.jemep.2022.100832.
16. Jordan RE, Adab P, Cheng KK. Covid-19: risk factors for severe disease and death. BMJ. 2020;368:m1198. doi: 10.1136/bmj.m1198.
17. Goshayeshi L, Akbari Rad M, Bergquist R, Allahyari A, Hashemzadeh K; MUMS Covid-19 Research Team, Hoseini B. Demographic and clinical characteristics of severe Covid-19 infections: a cross-sectional study from Mashhad University of Medical Sciences, Iran. BMC Infect Dis. 2021;21(1):656. doi: 10.1186/s12879-021-06363-6.
18. Soares Pinheiro FGM, Santana Santos E, Barreto ÍDC, Weiss C, Vaez AC, Oliveira JC, et al. Mortality Predictors and Associated Factors in Patients in the Intensive Care Unit: A Cross-Sectional Study. Crit Care Res Pract. 2020;2020:1483827. doi: 10.1155/2020/1483827.
19. Post LA, Argaw ST, Jones C, Moss CB, Resnick D, Singh LN, et al. A SARS-CoV-2 Surveillance System in Sub-Saharan Africa: Modeling Study for Persistence and Transmission to Inform Policy. J Med Internet Res. 2020;22(11):e24248. doi: 10.2196/24248.
20. Bedane D, Abdissa D, Leta B, Gerema U, Lomboro A, Kune G, et al. Assessment of COVID-19 prevention practice and associated factors in Jimma town, Ethiopia: A mixed study. Front Public Health. 2022;10:950202. doi: 10.3389/fpubh.2022.950202.
21. Zeiser FA, Donida B, da Costa CA, Ramos GO, Scherer JN, Barcellos NT, et al. First and second COVID-19 waves in Brazil: A cross-sectional study of patients' characteristics related to hospitalization and in-hospital mortality. Lancet Reg Health Am. 2022;6:100107. doi: 10.1016/j.lana.2021.100107.
22. Castaneda C, Ah Rhee CJ, Magh A, Eng C, Mann J, Sanso L, et al. Impact of ventilator model on mortality: a retrospective cross-sectional study in 147 mechanically ventilated patients with COVID-19 ARDS. Chest. 2020;158(4):A617. doi: 10.1016/j.chest.2020.08.581.
23. Al Mutair A, Al Mutairi A, Zaidi ARZ, Salih S, Alhumaid S, Rabaan AA, et al. Clinical Predictors of COVID-19 Mortality Among Patients in Intensive Care Units: A Retrospective Study. Int J Gen Med. 2021;14:3719-3728. doi: 10.2147/IJGM.S313757.
24. Kokoszka-Bargieł I, Cyprys P, Rutkowska K, Madowicz J, Knapik P. Intensive Care Unit Admissions During the First 3 Months of the COVID-19 Pandemic in Poland: A Single-Center, Cross-Sectional Study. Med Sci Monit. 2020;26:e926974. doi: 10.12659/MSM.926974.
25. Rahim F, Amin S, Noor M, Bahadur S, Gul H, Mahmood A, et al. Mortality of Patients With Severe COVID-19 in the Intensive Care Unit: An Observational Study From a Major COVID-19 Receiving Hospital. Cureus. 2020;12(10):e10906. doi: 10.7759/cureus.10906.
26. Bhatraju PK, Ghassemieh BJ, Nichols M, Kim R, Jerome KR, Nalla AK, et al. Covid-19 in Critically Ill Patients in the Seattle Region - Case Series. N Engl J Med. 2020;382(21):2012-2022. doi: 10.1056/NEJMoa2004500.
27. Wang L, He W, Yu X, Hu D, Bao M, Liu H, et al. Coronavirus disease 2019 in elderly patients: Characteristics and prognostic factors based on 4-week follow-up. J Infect. 2020;80(6):639-645. doi: 10.1016/j.jinf.2020.03.019.
28. Romero Starke K, Petereit-Haack G, Schubert M, Kämpf D, Schliebner A, Hegewald J, et al. The Age-Related Risk of Severe Outcomes Due to COVID-19 Infection: A Rapid

Review, Meta-Analysis, and Meta-Regression. Int J Environ Res Public Health. 2020;17(16):5974. doi: 10.3390/ijerph17165974.
29. Du RH, Liang LR, Yang CQ, Wang W, Cao TZ, Li M, et al. Predictors of mortality for patients with COVID-19 pneumonia caused by SARS-CoV-2: a prospective cohort study. Eur Respir J. 2020;55(5):2000524. doi: 10.1183/13993003.00524-2020.
30. Nasiri MJ, Haddadi S, Tahvildari A, Farsi Y, Arbabi M, Hasanzadeh S, et al. COVID-19 Clinical Characteristics, and Sex-Specific Risk of Mortality: Systematic Review and Meta-Analysis. Front Med (Lausanne). 2020;7:459. doi: 10.3389/fmed.2020.00459.
31. Sharma G, Volgman AS, Michos ED. Sex Differences in Mortality From COVID-19 Pandemic: Are Men Vulnerable and Women Protected? JACC Case Rep. 2020;2(9):1407-1410. doi: 10.1016/j.jaccas.2020.04.027.
32. Li X, Wang L, Yan S, Yang F, Xiang L, Zhu J, et al. Clinical characteristics of 25 death cases with COVID-19: A retrospective review of medical records in a single medical center, Wuhan, China. Int J Infect Dis. 2020;94:128-132. doi: 10.1016/j.ijid.2020.03.053.
33. Wei-jie Guan, Zheng-yi Ni, Yu Hu, Wen-hua Liang, Chun-quan Ou, Jian-xing H. et al. Clinical characteristics of Coronavirus Disease 2019 in China. N Eng J Med. 2020;382:1708–20.
34. Zhou Y, Chi J, Lv W, Wang Y. Obesity and diabetes as high-risk factors for severe coronavirus disease 2019 (Covid-19). Diabetes Metab Res Rev. 2021;37(2):e3377. doi: 10.1002/dmrr.3377.
35. Bhatti R, Khamis AH, Khatib S, Shiraz S, Matfin G. Clinical Characteristics and Outcomes of Patients With Diabetes Admitted for COVID-19 Treatment in Dubai: Single-Centre Cross-Sectional Study. JMIR Public Health Surveill. 2020;6(4):e22471. doi: 10.2196/22471.
36. Zheng Z, Peng F, Xu B, Zhao J, Liu H, Peng J, et al. Risk factors of critical & mortal COVID-19 cases: A systematic literature review and meta-analysis. J Infect. 2020;81(2):e16-e25. doi: 10.1016/j.jinf.2020.04.021.
37. Apicella M, Campopiano MC, Mantuano M, Mazoni L, Coppelli A, Del Prato S. COVID-19 in people with diabetes: understanding the reasons for worse outcomes. Lancet Diabetes Endocrinol. 2020;8(9):782-792. doi: 10.1016/S2213-8587(20)30238-2.
38. Hurst JR, Skolnik N, Hansen GJ, Anzueto A, Donaldson GC, Dransfield MT, et al. Understanding the impact of chronic obstructive pulmonary disease exacerbations on patient health and quality of life. Eur J Intern Med. 2020;73:1-6. doi: 10.1016/j.ejim.2019.12.014.
39. Alqahtani JS, Oyelade T, Aldhahir AM, Alghamdi SM, Almehmadi M, Alqahtani AS, et al. Prevalence, Severity and Mortality associated with COPD and Smoking in patients with COVID-19: A Rapid Systematic Review and Meta-Analysis. PLoS One. 2020;15(5):e0233147. doi: 10.1371/journal.pone.0233147.
40. Choi HG, Wee JH, Kim SY, Kim JH, Il Kim H, Park JY, et al. Association between asthma and clinical mortality/morbidity in COVID-19 patients using clinical epidemiologic data from Korean Disease Control and Prevention. Allergy. 2021;76(3):921-924. doi: 10.1111/all.14675.
41. Danzi GB, Loffi M, Galeazzi G, Gherbesi E. Acute pulmonary embolism and COVID-19 pneumonia: a random association? Eur Heart J. 2020;41(19):1858. doi: 10.1093/eurheartj/ehaa254.
42. Tang N, Bai H, Chen X, Gong J, Li D, Sun Z. Anticoagulant treatment is associated with decreased mortality in severe coronavirus disease 2019 patients with coagulopathy. J Thromb Haemost. 2020;18(5):1094-1099. doi: 10.1111/jth.14817.
43. Goyal P, Choi JJ, Pinheiro LC, Schenck EJ, Chen R, Jabri A, et al. Clinical Characteristics of Covid-19 in New York City. N Engl J Med. 2020;382(24):2372-2374. doi: 10.1056/NEJMc2010419.
44. Singer-Cornelius T, Cornelius J, Oberle M, Metternich FU, Brockmeier SJ. Objective gustatory and olfactory dysfunction in COVID-19 patients: a prospective cross-sectional study. Eur Arch Otorhinolaryngol. 2021;278(9):3325-3332. doi: 10.1007/s00405-020-06590-8.
45. Karthikeyan P, Sivanand N, Vijayan N, Latheef MN. A Clinical Study of Smell Disorders in COVID-19 Patients in a Tertiary Care Hospital in Pondicherry: A Cross Sectional Study. Indian J Otolaryngol Head Neck Surg. 2022;74(Suppl 2):2900-2905. doi: 10.1007/s12070-021-02499-8.
46. Nejad JH, Allahyari F, Hosseinzadeh R, Heiat M, Ranjbar R. Neurological symptoms of COVID-19 infection; a cross-sectional study on hospitalized COVID-19 patients in Iran. Clin Neurol Neurosurg. 2021;210:106985. doi: 10.1016/j.clineuro.2021.106985.
47. Chuang DT, Aydemir S, Magda P, Thomas C, Zarnegar R. Neurological manifestations as primary presentation of COVID-19 in hospitalized patients. Acta Neurol Scand. 2021;143(5):569-574. doi: 10.1111/ane.13399.
48. Flores-Silva FD, García-Grimshaw M, Valdés-Ferrer SI, Vigueras-Hernández AP, Domínguez-Moreno R, Tristán-Samaniego DP, et al. Neurologic manifestations in hospitalized patients with COVID-19 in Mexico City. PLoS One. 2021;16(4):e0247433. doi: 10.1371/journal.pone.0247433.

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