

## Original Article

### Demographic and Clinical Characteristics of Deceased COVID-19 Patients in Oromia Region, Ethiopia: A Retrospective Record Review

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#### Abstract

**Background:** The mortality due to COVID-19 in low-income settings has been grossly underestimated. The gap in the estimated deaths as the cause of COVID-19 and observed deaths in Africa requires further investigation. Hence, we aimed to assess the socio-demographic characteristics, clinical and laboratory profiles of patients who died from COVID-19 at the treatment centers in the Oromia region, Ethiopia.

**Method:** A retrospective chart review was conducted from all health facilities that reported more than ten COVID-19 deaths from April 2020 to November 2021 in Oromia. CSPro Data Entry and STATA version 14 were used for data entry and analysis, respectively.

**Result:** Of the 594 COVID-19 deaths reported during the study period, 454 (76.4%) were captured in nine health facilities. Of the 454 participants, 288 (63.4%) were men and 192 (42.3%) were over 60 years. Cough and shortness of breath were the most prevalent symptoms. Upon presentation, 394 (97.28%) exhibited tachypnea, 78 (27.56%) had a fever, and 366 (84.92%) had oxygen saturation levels below 92%. At least one comorbidity was present in 60% of the individuals. The median length of stay in the facility before death was five days (IQR 2–8). Common laboratory tests include complete blood counts, renal function and liver function tests. In 35(15%) of cases, the estimated glomerular filtration rate was <30 ml/min/1.73 m<sup>2</sup>. Neutrophilia was in 83.9% of cases, lymphocytosis in 2.6% and elevated creatinine in 35%. Chest X-ray was the frequently used imaging modality with opacity was the most common finding. Antibiotics and steroids were administered primarily.

**Conclusion:** Most of the cases had comorbidity and were older aged. However, a quarter of patients were less than 45 years and two-fifths of patients had no known comorbidity. Strengthening vaccine acceptance across all age groups has paramount importance in preventing the severity of disease and death.

**Keywords:** COVID-19, SARS-CoV-2, Mortality, Pandemic, Oromia, Ethiopia.

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#### Introduction

The coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), caused significant mortality and huge socioeconomic consequences [1-3]. As of November 2, 2023, data, there were a total of 771 million confirmed COVID-19 cases reported to WHO, and about 6.9 million lives were lost [4]. The virus continues to spread with emerg-

ing potential variants for high transmission, increased virulence, and resistance to available vaccines [5]. In 2021, Africa experienced the highest SARS-CoV-2 infection rate, which has escalated rapidly. Yet the reported deaths remained low despite alarming predictions [6]. As of November 2, 2023, data shows 9.5 million confirmed cases have

been reported from Africa [4]. Ethiopia was ranked sixth in Africa, with 501,060 reported cases and 7,574 deaths as of November 3, 2023, data [7]. The true extent could be higher if regular and wide testing coverage existed in all parts of the country. Ethiopia has vaccinated a total of 68,856,793 people as of November 3, 2023 [4]. The presentations of COVID-19 diseases vary from mild symptoms of fatigue, myalgia, cough, sore throat, runny nose, sneezing, headache [8-10] to severe conditions like shortness of breath, hypoxia (SpO<sub>2</sub> < 92%) and systemic inflammations which need hospitalization [11, 12]. Severe COVID-19 disease may lead to critical and fatal conditions like acute respiratory distress, shock, myocardial injury, heart failure, coagulation dysfunction, and acute kidney injury [9-11]. Factors such as being over 60 years old, having comorbid conditions like chronic cardiac, renal, or pulmonary diseases, diabetes mellitus, or being infected with the human immunodeficiency virus are associated with increased severity [8, 9, 13, 14]. Populations may diverge in the demographic, clinical presentation, and laboratory findings of patients who die of COVID-19. Though there is plenty of published literature on COVID-19 deaths from different parts of the world, reports from Ethiopia are few and of a small sample size [13-15]. We, therefore, assessed the demographic and clinical characteristics of deceased COVID-19 patients in the COVID 19 treatment centers of Oromia region, Ethiopia.

## Material and methods

### Study setting and study population

Oromia is the most populous region with the largest geographical coverage in the country, with a regional projection estimated to be 44 million in 2015 Ethiopian fiscal year (EFY). There are 109 functional hospitals, 1,411 health centers, and 7,099 health posts according to the 2013 (EFY) health and health-related indicators published by the Ministry of Health [16].

An institution-based retrospective chart review was applied in this study. Medical records that had COVID-19 admission data were included. We included all health facilities in the Oromia region that reported more than 10 COVID-19-related deaths from April 2020 to November 2021. There were 7652 cases admitted to all health facilities in the region as of November 9, 2021. The mortalities were reported from one health center, four primary hospitals, one general hospital, and three teaching hospitals.

### Data collection

The collected data include demographic information, cigarette smoking, comorbidities, length of hospital stay, symptoms upon presentation, vital signs, respiratory support type, laboratory results, imaging findings, and treatment modalities. Death from COVID-19 was defined as a death happening while patients were in a COVID-19 treatment center. The electronic data collection tool was developed and tested on ten randomly selected records, and appropriate revisions

were made. Cis-Pro data entry application was employed. The data collectors were fourteen general practitioners involved in COVID-19 care at the selected health facilities. All were trained on the data collection tool and procedure.

### Data analysis

The data were cleaned and analyzed using STATA version 14 (StataCorp. 2015. Stata 14 Base Reference Manual. College Station, TX: Stata Press). The categorical variables were summarized by percentage, and continuous variables were described using mean, median, and range.

### Ethical consideration

Ethical approval (Ref. No: BEFO/HBTFH/1-16/1123, dated July 5, 2021) was obtained from the Oromia Health Bureau internal review board, and we sought permission from all health facilities. Data were collected anonymized with a unique identifier generated by the Cis-pro application. The confidentiality of the collected data was maintained throughout the study.

### Results

#### Demographic characteristics and comorbidities

A total of 594 deaths due to COVID-19 were reported from health facilities in Oromia region, Ethiopia, in the period from April 25 2020 to November 9 2021. Of these deaths, 454 were confirmed COVID-19 deaths occurred in the nine selected health facilities for this study. Adama Hospital Medical College and Jimma University Hospital had the highest deaths, with 134(29.6%) and 92(20.3%), respectively.

The age range of those who died was from 4 months to 102 years, with a median age of 60 years (IQR 46 – 74). The majority of deaths were males, accounting for 288 (63.4%), and individuals over the age of 60, accounting for 192 (42.3%) (Table 1). Less than 1% of the deceased had a history of smoking cigarettes, and all smokers were male. More than half of the total deaths, 271 (59.7%), had at least one comorbidity, with hypertension being the most prevalent at 117 (25.8%). The median duration of stay in the facility before death was five days, with an interquartile range of 2 to 8 days.

#### Presenting clinical characteristics and vital signs

Upon arrival at the treatment centers, the prevalent symptoms were cough, observed in 427 (94%), and shortness of breath in 417 (94%). Approximately six out of ten individuals had a history of fever at presentation. In this study, vital signs were recorded for more than 80% of the patients, but temperature was the least recorded, being documented for only 62% of patients in this study. Upon presentation to the health facility, 78(27.6%) patients were febrile (>37.20C), and 394 (97.3%) were tachypneic (respiratory rate of > 21 breaths per minute). Additionally, 366 (84.9%) patients had oxygen saturation <92% on their first day of admission, and almost all of them required respiratory support (Table 3).

At the time of presentation, only four patients (0.9%) had mild COVID-19, 11 (2.4%) had moderate and 257

(56.6) had severe COVID-19 infection.  
Out of 415 patients on their second day of ad-

mission, complete records were only available for 273,  
representing 66% of the total.

Table 1. Characteristics of patients who died of COVID-19 in Oromia region, Ethiopia from April 2020 to November 2021

Variables (N=454)	Categories	n (%)
Sex	Male	288 (63.4)
	Female	166 (36.6)
Age (years)	<18	7 (1.5)
	18-30	29 (6.4)
	31-45	77 (17.0)
	46-60	149 (32.8)
	61-102	192 (42.3)
History of cigarette smoking	Yes	4 (0.9)
	No	450 (99.1)
Had any comorbidity	Yes	271 (59.7)
	No	183 (40.3)
Number of comorbidity	0	183 (40.3)
	1	179 (39.4)
	2	69 (15.2)
	3	19 (4.2)
	4	4 (0.9)
Types of comorbidities	Hypertension	117 (25.8)
	Diabetes Mellitus	81 (17.8)
	Cardiac Disease	55 (12.1)
	Chronic kidney disease	21 (4.6)
	Neurologic disease	19 (4.2)
	Asthma	14 (3.1)
	Chronic liver disease	5 (1.1)
Length of facility stay	< 24 hrs.	39 (8.6)
	1 - 2 days	105 (23.1)
	3 - 5 days	111 (24.5)
	6 - 8 days	90 (19.8)
	9 - 50 days	109 (24.0)

Table 2: Presenting clinical symptoms of patients who died of COVID-19 in Oromia region, Ethiopia from April 2020 to November 2021

Signs and symptoms (N=455)	n (%)
Cough	427 (93.8)
Shortness of breath	417 (91.9)
Easy fatigability	292 (64.3)
Fever	266 (58.6)
Poor appetite	207 (45.56)
Chest pain	136 (30.0)
Headache	118 (26.0)
Myalgia	71 (15.6)
Arthralgia	60 (13.2)
Chills	48 (10.6)
Nausea/ Vomiting	41 (9.0)
Rigor	39 (8.6)
Sore throat	29 (6.4)
Loss of smell and taste	17 (3.7)
Orthopnea, PND	11 (2.4)
Runny nose	6 (1.3)
* Other	62 (13.6)

\* Delirium, leg swelling, epigastric pain, body swelling, diarrhea, loss of consciousness, night sweating, body weakness, decreased urine output, failure to communicate, palpitation, abnormal body movement, etc,

Table 3: First-day vital signs of patients who died of COVID-19 in Oromia region, Ethiopia from April 2020 to November 2021

<b>Systolic blood pressure (mmHg) category (n=398)</b>	
< 90 mmHg	28 (7%)
90 - 129 mmHg	212 (53.3%)
≥ 130 mmHg	158 (39.7%)
<b>Diastolic blood pressure (mmHg) (n=398)</b>	
<80 mmHg	286 (71.9%)
81-89 mmHg	40 (10.1%)
≥ 90 mmHg	72 (18.1%)
<b>PR (beat per minute) (n=419)</b>	
< 60	8 (1.9%)
60 – 100	191 (45.6%)
> 100	220 (52.5%)
<b>RR (breath per minute) (n= 405)</b>	
< 11	2 (0.5%)
12 - 20	9 (2.2%)
>21	394 (97.3%)
<b>Temperature ( °C) (n= 283)</b>	
< 36	12 (4.2%)
36 – 37.2	193 (68.2%)
> 37.2	78 (27.6%)
<b>SpO<sub>2</sub> (n= 431)</b>	
< 92	366 (84.9%)
≥ 92	65 (15.1%)
<b>Random blood sugar (mg/dl) n= 284 (62.6%)</b>	
< 140	135 (47.5%)
140 – 199	76 (26.8%)
> 200	73 (25.7%)

**Imaging**

Patients were investigated using various imaging modalities, with chest X-ray being the most common, used in 174(38.3%), followed by abdominal ultrasound in 52(11.5%) cases. Opacity and bilateral lung involvement were the most common findings on chest x-ray.

**Laboratory results**

Complete blood count, renal function test, and liver function test were the most commonly performed la-

boratory tests. Most of the patients, 230 (83.9%), had neutrophilia, whereas only 7 (2.6%) had lymphocytosis. Around 35% of patients had higher creatinine and an estimated glomerular filtration rate < 60 ml/min/1.73m<sup>2</sup>.

**Medications**

Antibiotics and steroids were the drugs most frequently prescribed (Table 4. Vancomycin and 3rd and 4th generation Cephalosporin were used most often among the antibiotics.

Table 4: List of commonly used drugs for patient management.

<b>S.N</b>	<b>Drug (N=454)</b>	<b>n</b>	<b>%</b>
1	Dexamethasone	349	77
2	Vancomycin	329	72
3	Cefatazidime	224	49
4	UFH	197	43
5	Ceftriaxone	136	30
6	Cemitedine	89	20
7	Cefepime	78	17
8	Azithromycin	76	17
9	Lasix	67	15
10	Tramadol	50	11

**Table 5:** Complete blood count, renal and liver function profiles of patients who died of COVID-19 in Oromia region, Ethiopia from April 2020 to November 2021

Laboratory test	N	Range	n (%)
WBC count ( $10^3/\mu\text{L}$ )	280	< 4	9 (3.2)
		4 – 11	135 (48.2)
		11-80	136 (48.6)
Neutrophil (%)	274	< 40	18 (6.6)
		40 - 70	26 (9.5)
		> 70	230 (83.9)
Lymphocyte (%)	274	< 20	240 (87.6)
		20 - 50	27 (9.6)
		> 50	7 (2.6)
Hemoglobin (g/dl)	287	<7	12 (4.2)
		7-9	24 (8.4)
		10-12	29 (10.1)
Platelet count ( $\times 10^3$ )	287	>12	222 (77.4)
		<150	63 (21.9)
		150-450	215 (74.9)
Alkaline phosphatase (U/L)	120	>450	9 (3.1)
		$\leq 150$	84 (70.0)
Alanine transaminase (U/L)	162	>150	36 (30.0)
		$\leq 50$	150 (92.6)
Aspartate aminotransferase (U/	161	>50	12 (7.4)
		$\leq 40$	67 (41.6)
Estimated Glomerular filtration rate using ( $\text{ml}/\text{min}/1.73\text{m}^2$ )	239	>40	94 (58.4)
		< 1.2	157 (65.7)
		$\geq 1.2$	82 (34.3)
Estimated Glomerular filtration rate using ( $\text{ml}/\text{min}/1.73\text{m}^2$ )	237	< 15	20 (8.4)
		15-29	15 (6.3)
		30-59	49 (20.7)
		60-89	69 (29.1)
		>90	84 (35.4)

**Table 6:** Types of imaging modalities used in patients who died of COVID-19 in Oromia region, Ethiopia from April 2020 to November 2021

S.N	Imaging	n (%)	N= 454
1	Chest x-ray	174 (38.3 )	
2	Abdominal ultrasound	52 (11.5 )	
3	Echocardiography	39 (8.6)	
4	ECG	18 (4)	
5	Computerized tomography scan	15 (3.3)	
6	*Other	3 (0.7 )	

\* Doppler ultrasound, Cystourethrography

Table 7: Frequency of chest x-ray findings

Chest x-ray finding	n (%) N=173	Chest x-ray finding: site of involvement	n (%) N=173
Opacity	76 (44)	Bilateral	89 (51)
Consolidation	17 (10)	Lower lung zone	21 (12)
Infiltration	13(8)	Upper lung zone	5 (3)
Effusion	7 (7)	Middle lung zone	4 (2)

### Discussion

In this study, we aimed to describe the sociodemographic characteristics, clinical and laboratory profiles, and management of COVID-19 cases who died during inpatient treatment in the Oromia region of Ethiopia. Death was more common in the male population compared to females, and hypertension is the most common comorbidity, which is consistent with other studies [8, 10, 13, 17-20].

In this study, we found that the age group of patients who died was younger compared to other studies. The mean age of patients was 57 years, which is relatively younger compared to other studies [10, 20, 21]. However, the mean age is lower than this study in a single-center study conducted in Iran [19]. Similarly, the population's median age, which is 60 years, is relatively younger in our study compared to other studies in China [17, 18].

This study's median length of hospital stay before death was comparable to that in the Netherlands and East India, where it was six days [22-24]. However, another study conducted in Iran reported a higher median length of stay at 8 days [19]. In this study, the proportion of smokers is much lower, which is 0.9% compared to the study conducted in Illinois state, which reported that 39% of patients were current or former smokers and 4.3% reported in a study of Saudi, Jaza [10, 18]. In the same way as this study, the study conducted in Saudi reported all smokers who died due to COVID were male [10].

In this study, most patients who died from COVID-19 presented with symptoms such as cough, shortness of breath, and fever. These findings are consistent with other studies [8, 10]. However, while fever was the most common symptom reported in other studies [17, 19, 25], this was not the case in this study. This might be due to the absence of full documentation of temperature in this study in comparison to other vital sign components.

In this study, most patients who died from COVID-19 had a systolic blood pressure record of < 140 mmHg and diastolic blood pressure of < 90 mmHg. These values were higher than those reported in a study conducted at the Ethiopian Millennium COVID-19 care center [13].

In this study, about half of the patients (48.6%) had leukocytosis, with a white blood cell count of greater than 11,000 per  $\mu\text{L}$ . The majority of the cases showed a predominance of neutrophils and lymphopenia. Platelet counts were within the normal range for most patients. These findings of leukocytosis with lymphopenia are consistent with other studies [10, 17, 26]. However, unlike a study conducted in a Saudi Arabia Jaza, most of the patients in our study had elevated hemoglobin [10].

In this study, most patients had normal creatinine levels, consistent with other studies' findings. Glomerular filtration rate (GFR) is usually accepted as the best overall index of kidney function in health and disease [27]. In this study, about 15% of patients had an estimated GFR (eGFR) of less than 30 ml/min/1.73m<sup>2</sup>. This is higher than the proportion reported in Spain, where about 10% of patients who died from COVID-19 had stage 4 chronic kidney disease [26].

Most of the liver function tests were within the normal range or slightly elevated, which is consistent with findings from other studies [17, 26]. However, we have found alanine transaminase had decreased in our study. According to the Ethiopian national guideline, a chest x-ray is recommended as a suggestive imaging modality for classifying patients as probable cases. It was done for 18 (4%) patients in this study [28].

In this study, patients who died from COVID-19 were treated with higher-generation antibiotics, including 3rd and 4th-generation cephalosporins. This is similar to the study conducted in China, where higher-grade antibiotics such as carbapenem and linezolid were used [17]. However, this study did not treat patients with antivirals and intravenous immunoglobulin.

### Conclusion

In this study, we analyzed 454 deaths due to COVID-19 from nine health facilities in the Oromia region. The death rate was higher among males and individuals older than 60 years. Most patients who died had at least one comorbidity, with hypertension being the most common. The median length of stay before death was five days. Most patients presented with cough and shortness of breath. Almost all of them required some

form of respiratory support upon presentation to the treatment center due to tachypnea and low oxygen saturation. However, chart reviews revealed incomplete records for patient follow-up, with complete records found for only 66% of patients on their second day of admission. Therefore, it is important to ensure adequate supplies of respiratory support for COVID-19 treatment centers and to maintain complete records of patient charts during consecutive follow-up periods.

### **Declarations**

#### **Acknowledgement**

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#### **Ethics consideration**

Ethical approval was obtained from the Oromia Health Bureau internal review board.

### **Authors contribution**

TS, EKG, MW, DG, TN and DN conceptualized and designed the study and supervised all aspects of the study. TS, TT and KK performed the statistical analysis and interpreted the data. TS, EKG, MW, DG, KK, TT, TN and DN Drafted the manuscript, contributed to the literature review and provided critical revisions to the manuscript for important intellectual content. TK, ZM participated in the conceptualization and design of the study, drafted manuscript, and contributed to the literature review. All authors read and approved the final version of manuscript.

### **Conflict of interest**

The authors declare that they have no known competing interests.

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We have not received any fund for this study.

### **Data availability**

Data can be shared up on request

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