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COVID-19 Vaccination Status and Severe Outcomes among Patients Hospitalized for COVID-19 in West Africa, Togo, 2021

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Abstract

Objectives: More than a year after its introduction, COVID-19 vaccination coverage was low in the Togolese population and little data were available on its benefits for hospitalized patients. This study aimed to describe the impact of COVID-19 vaccination on the prognosis of hospitalized patients. **Methods:** This was a retrospective cohort study of patients admitted to the Centre Hospitalier Régional Lomé Commune (Togo) between June 1, 2021 and May 31, 2022. Primary outcomes (admission to the intensive care unit and death) were presented with frequency and proportion. Mortality rates were presented by sociodemographic and clinical characteristics and compared by appropriate statistical tests. Factors associated with inpatient death were described by performing a Cox proportional hazard regression. **Results:** A total of 604 patients were hospitalized (50.0% women). The mean age was 54.03 ±17.1 years. Only 55 patients were fully vaccinated (9.1%). ICU admission was significantly more frequent in unvaccinated patients than in vaccinated ones (63.0% vs. 38.2%; $p < 0.001$). Overall, 172 patients died (28.5%) and the mortality rate was significantly lower in vaccinated than in unvaccinated pa-

tients (9.1% vs. 30.4%; $p < 0.001$). The 15 and 30-day mortality rates for all the patients were 26.1% and 28.3% respectively. The instantaneous risk of death was 73.0% lower in fully vaccinated patients (aHR = 0.27 [95% confidence interval (0.11 - 0.67)]). **Conclusion:** COVID-19 vaccination had a significant benefit for patients with COVID-19 infection in terms of reducing the risk of death. Based on real-world data from sub-Saharan Africa, this information can help optimize the benefit of COVID-19 vaccination by raising community awareness and increasing vaccine coverage while reducing hesitancy.

Keywords

COVID-19, Vaccination, Prognosis, Mortality, Sub-Saharan Africa

1. Introduction

By the first quarter of 2021, just one year after the start of the outbreak of SARS-CoV-2, vaccination had emerged as a major strategy in the response to the COVID-19 pandemic, as evidenced by the World Health Organization (WHO) approval for the use of new vaccines under an emergency procedure [1]. The efficacy and safety of these vaccines were demonstrated in record time through Phase III clinical trials and post-introduction observations [2] [3]. Concerns soon arose about the availability and accessibility of these vaccines to developing countries [4]. In this context, international vaccine supply mechanisms, such as the COVAX Initiative, took up the issue to facilitate the availability of these vaccines in resource-limited countries [5]. The WHO had set itself the target of achieving 70% vaccination coverage by the end of June 2022, deemed necessary to obtain herd immunity and reduce the morbidity and mortality associated with COVID-19 [6].

However, by this deadline, vaccination coverage in Togo, like in many other sub-Saharan African countries, was still well below the target [7]. Many factors led to this low coverage: the first one was the unavailability of vaccines for low-income countries in the early months of their introduction; the second one was a deep mistrust of this strategy for several reasons, such as insufficient perceived hindsight to assess the safety of new vaccines, concerns arising from the use of new platforms such as mRNA vaccines, the "*infodemic*" about potential side effects, and the lack of local data on the efficacy and tolerability of COVID-19 vaccination [8] [9] [10]. Finally, vaccination failed to get public support, because the expected benefit was assumed rightly or wrongly, to be low in the African population where COVID-19 morbidity and mortality remained among the lowest in the world [11] [12]. However, similar studies have demonstrated the benefit of vaccination in reducing the severity and mortality associated with COVID-19, especially in middle and high-income countries, such as India and United Kingdom [2] [3]. In contrast, very little data were available in resource-limited countries. Thus, demonstrating the impact of vaccination on

the prognosis of hospitalized patients using local data and in the context of a low-income country like Togo should provide insights to those who doubt the effectiveness of this strategy. We hypothesized that the effectiveness of COVID-19 vaccination in preventing severe forms of the disease would be like what was observed in European or South-Eastern Asian countries [2] [3]. The aim of this study was therefore to describe the impact of COVID-19 vaccination on the prognosis of hospitalized patients in terms of admission to intensive care unit (ICU), length of hospital stays, and in-hospital mortality.

2. Methods

2.1. Study Design, Period, and Setting

This retrospective cohort study included patients admitted to the Centre Hospitalier Régional Lomé Commune (CHR-LC) in Togo from June 2021 to May 2022.

The CHR-LC is a public hospital that served as the national reference center for the exclusive care of patients with COVID-19 since the outbreak of the epidemic in Togo in March 2020 [13]. At the time of the study, this center had a capacity of 114 beds divided into 4 units: an intensive care and resuscitation unit (30 beds), a medical hospitalization unit (36 beds), a hemodialysis unit (2 beds), and an extension area for asymptomatic or convalescent cases (46 beds). Regarding the protocol of management, patients with critical and severe COVID-19 were admitted to the ICU. Moreover, in the absence of a high-dependency unit in our context, some patients with moderate conditions, but requiring continuous monitoring and care, due to a risk of rapid worsening, were also admitted to the ICU. The mild and moderate forms were admitted to general wards and managed with symptomatic treatment, such as paracetamol, and vitamin C, along with chloroquine and azithromycin. Patients with severe forms received standard oxygen, either by nasal cannula or by mask. Severe patients with suspected bacterial infection and critical patients received empirical antibiotics, as well as corticosteroids (dexamethasone), and antithrombotic prophylaxis (enoxaparin). Critical patients received specific management according to the complications, such as mechanical ventilation consisting of non-invasive ventilation or intubation for severe acute respiratory distress syndrome (ARDS), curative anticoagulation for pulmonary embolism, hemodialysis for acute renal impairment, fluids and vasopressors therapy for septic shock.

2.2. Study Population

All patients aged 15 years and above, having a positive SARS-COV-2 rT-PCR test and who were hospitalized at the CHR-LC during the study period were eligible. Patients with incomplete medical records and those with unknown vaccination status were excluded.

2.3. Operational Definitions

We defined the severity of COVID-19 according to WHO clinical categoriza-

tion [14].

- Mild: patients with mild symptoms without signs of pneumonia or hypoxia.
- Moderate: patients with pneumonia and moderate hypoxia with SpO2 > 90% without signs of respiratory distress were tagged.
- Severe: patients with signs of severe pneumonia and hypoxia, with SpO2 < 90% requiring an oxygen flow greater than 10 liters per minute.
- Critical: patients with acute respiratory distress syndrome (ARDS), sepsis, shock, or other complications.
- Respiratory failure (distress) was defined as dyspnea with a respiratory rate above 22 cycles per minute, struggle signs, and hypoxia,
- Renal failure was defined as having a serum creatinine clearance of less than 30 ml/min/1.73 m^2 or other conditions requiring haemodialysis.
- Fully vaccinated: patient who received at least two doses of any type of COVID-19 vaccine, the last one being administrated at least 15 days before admission
- Unvaccinated: patient who did not receive any dose of COVID-19 vaccine, or who received only one dose or who received the second dose within 15 days before admission, irrespective of type of vaccine.

2.4. Data Collection and Procedures

Data were collected using a data extraction form. Medical records and the electronic database of patients hospitalized at the CHR-LC were used as the basis for extraction. We collected, sociodemographic data (age, sex, profession, nationality), COVID-19 vaccination status based on patient's declaration, number of doses, presence of co-morbidities (arterial hypertension, diabetes, HIV infection, asthma, cardiopathy, bronchopneumopathy, etc.), clinical characteristics of COVID-19 (severity, unit of hospitalization), length of hospitalization and outcome of hospitalization (death or discharge).

2.5. Outcome and Covariates

The primary outcomes were all-cause mortality and admission to ICU. The first day of hospitalization was considered as the start of follow-up and the date of discharge or death as the end of follow-up. Socio-demographic and clinical characteristics were used as explanatory variables to describe the factors associated with death during hospitalization.

2.6. Statistical Analysis

A descriptive analysis was carried out. Categorical variables were presented as frequency. Quantitative variables were presented as medians with their interquartile range (IQR). Comparisons of medians were made by the Wilcoxon-Mann-Whitney test, and proportions were compared using the chi-square test or Fisher's exact test. The 15-day and 30-day mortality rates were presented. To describe the factors associated with inpatient death, a Cox proportional hazard

regression was performed. A multivariable model was constructed with the variables having a p-value < 0.20 in the univariable model. The results were presented as instantaneous hazard ratios (HR) with a 95% confidence interval (95%CI). All analyses were performed using R® software version 4.2.1. The significance level was set at 5%.

2.7. Ethical Considerations

The study was authorized by the Direction of the CHR-LC and was approved by the "Comité de Bioéthique pour la Recherche en Santé (CBRS)" (Bioethics Committee for Health Research) from the Togo Ministry of Health (014/2022/CBRS of May 24, 2022). Confidentiality was ensured through the anonymity of patients' data. Compliance with the rules of good research practice was also assured. Patient consent was not required as it was a retrospective study.

3. Results

3.1. Sociodemographic Characteristics of the Study Population and Comorbidities

During the study period, 610 patients were hospitalized. Of these, 6 were excluded from the analysis for being under 15 years of age (n = 2) and for unknown vaccination status (n = 4). Finally, 604 patients were included (Figure 1).

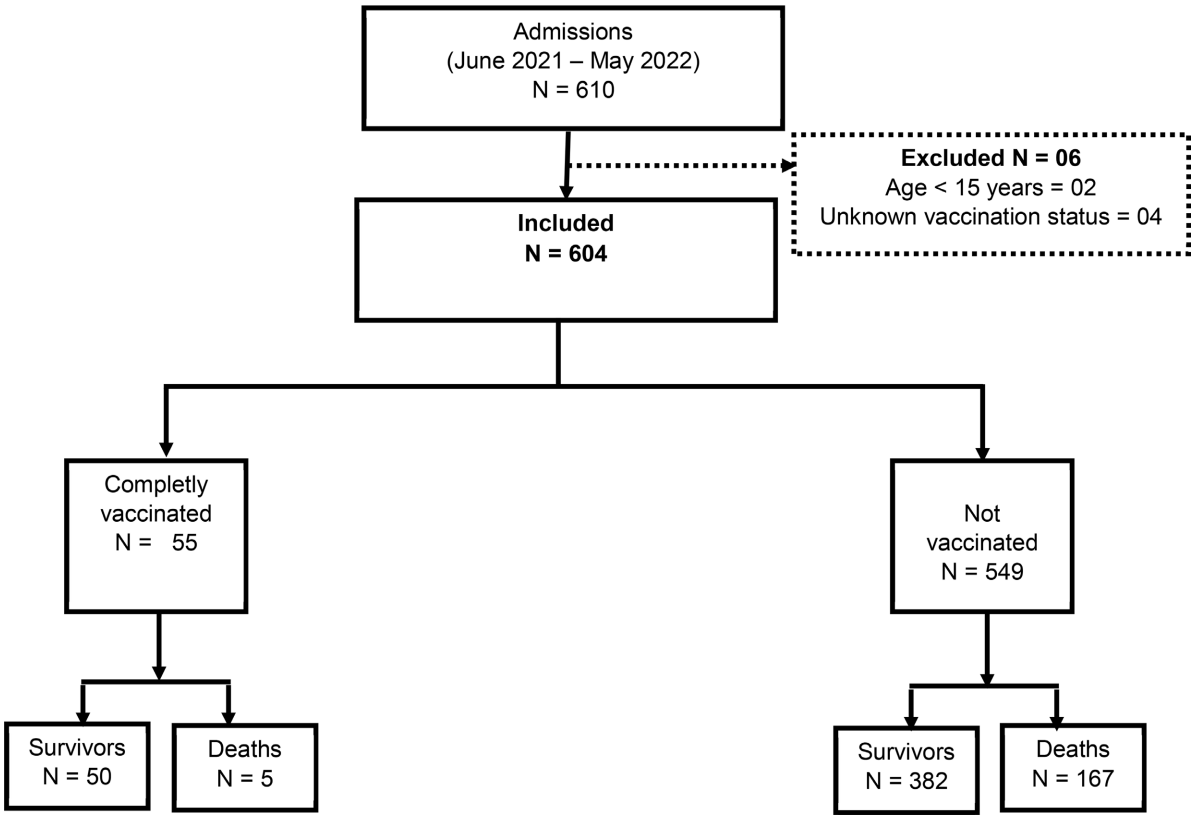

Figure 1. Flow chart of patients hospitalized between June 1, 2021 and May 31, 2022 at the Centre Hospitalier Régional Lomé Commune, Togo.

The median age of patients was 54 years (IQR: 41 - 68) with a sex ratio of 1:1. Hypertension and diabetes were the two main comorbidities observed in hospitalized patients (40.8% and 28.2%, respectively) (Table 1).

3.2. COVID-19 Vaccination Coverage

Overall COVID-19 vaccination coverage was 9.1% (55/604). The proportion of vaccinated patients varied according to socio-demographic profiles and comorbidities. Vaccination coverage was significantly lower among women than men (6.0% vs. 12.3%, p = 0.007) but was not different across age groups and comorbidities (Table 1).

Table 1. Socio-demographic characteristics and underlying diseases of patients at admission for COVID-19 at the Centre Hospitalier Régional Lomé Commune, Togo, June 2021-May 2022.

Characteristic	Complete vaccination against COVID-19*		Overall N = 604[1]	p-value[2]
	No N = 549[1]	Yes N = 55[1]		
Age (Year), median (IQR)[3]	54 (41 - 68)	55 (44 - 65)	54 (41 - 68)	0.740
Age classes (Year)				0.824
<20	6 (100.0)	0 (0.0)	6	
20 - 39	111 (91.0)	11 (9.0)	122	
40 - 59	202 (89.4)	24 (10.6)	226	
60 - 79	190 (91.3)	18 (8.7)	208	
≥80	40 (95.2)	2 (4.8)	42	
Sex				0.007
Female	284 (94.0)	18 (6.0)	302	
Male	265 (87.7)	37 (12.3)	302	
Nationality				0.200
Togolese	522 (91.3)	50 (8.7)	572	
Other	27 (84.4)	5 (15.6)	32	
Diabetes				0.893
No	394 (91.0)	39 (9.0)	433	
Yes	155 (90.6)	16 (9.4)	171	
High blood pressure				0.061
No	331 (92.7)	26 (7.3)	357	
Yes	218 (88.3)	29 (11.7)	247	
Asthma				0.067
No	529 (91.4)	50 (8.6)	579	

Continued

Yes	20 (80.0)	5 (20.0)	25	
HIV infection				0.758
No	518 (90.7)	53 (9.3)	571	
Yes	31 (93.9)	2 (6.1)	33	
Renal insufficiency				0.070
No	541 (91.2)	52 (8.8)	595	
Yes	8 (72.7)	3 (27.3)	11	
Cancer				0.381
No	545 (91.0)	54 (9.0)	599	
Yes	4 (80.0)	1 (20.0)	5	
Hemoglobinopathy				0.229
No	541 (91.1)	53 (8.9)	594	
Yes	8 (80.0)	2 (20.0)	10	
Obesity				0.335
No	538 (91.0)	53 (9.0)	591	
Yes	11 (84.6)	2 (15.4)	13	

[1]Median (25%-75%); n (%). [2]Wilcoxon rank sum test; Fisher's exact test; Pearson's Chi-squared test; [3]IQR: interquartile range. *At least two doses of vaccination against COVID-19.

3.3. Clinical Status and Its Evolution

Overall, 41.1% (248/604) and 12.1% (73/604) of patients were admitted at the severe or critical stage (Table 2, Table S1). The proportion of severe forms was significantly lower in fully vaccinated patients than in unvaccinated ones (30.9% vs. 42.1%, $p < 0.001$). Similarly, none of fully vaccinated patient was admitted with a critical stage of COVID-19 compared to unvaccinated ones (0% vs. 13.2%, $p < 0.001$).

During the hospitalization, 10.9% (66/604) of patients experienced one or more complications. Respiratory and renal failure were the most common complications, observed in a proportion of 3.6% (22/604) for both. None of these complications was significantly associated with the vaccination status as shown in Table 2.

3.4. Vaccination Status and Admission to Intensive Care Unit

Around 3 out of 5 patients were admitted to the intensive care unit. ICU admission was significantly more frequent in unvaccinated patients than in fully vaccinated ones (63.0% vs. 38.2%; $p < 0.001$). Table 2 shows the clinical characteristics of hospitalized patients according to vaccination status.

3.5. Vaccination Status and Length of Hospital Stay

When considering the whole sample, median hospital stay was 10 days (IQR: 6 -

Table 2. SARS-CoV-2 vaccination status and clinical outcomes of patients hospitalized for COVID-19 at the Centre Hospitalier Régional Lomé Commune, Togo, June 2021-May 2022.

Characteristic	Complete vaccination against COVID-19		Overall N = 604[1]	p-value[2]
	No N = 549[1]	Yes N = 55[1]		
Clinical severity at admission				<0.001
Asymptomatic/Mild	103 (18.8)	24 (43.6)	127 (21.0)	
Moderate	142 (25.9)	14 (25.5)	156 (25.8)	
Severe	231 (42.1)	17 (30.9)	248 (41.1)	
Critical	73 (13.2)	0 (0.0)	73 (12.1)	
At least one complication				0.654
No	490 (89.3)	48 (87.3)	538 (89.1)	
Yes	59 (10.7)	7 (12.7)	66 (10.9)	
Pulmonary embolism				0.702
No	531 (96.7)	53 (96.4)	586 (96.7)	
Yes	18 (3.3)	2 (3.6)	20 (3.3)	
Respiratory complication				0.711
No	528 (96.2)	54 (98.2)	584 (96.4)	
Yes	21 (3.8)	1 (1.8)	22 (3.6)	
Renal complication				0.441
No	530 (96.6)	52 (94.5)	584 (96.4)	
Yes	19 (3.4)	3 (5.5)	22 (3.6)	
Cardiovascular complication				0.127
No	544 (99.1)	53 (96.4)	599 (98.8)	
Yes	5 (0.9)	2 (3.6)	7 (1.2)	
Neurological complication				0.384
No	533 (97.1)	55 (100.0)	590 (97.4)	
Yes	16 (2.9)	0 (0.0)	16 (2.6)	
ICU admission				<0.001
No	203 (37.0)	34 (61.8)	237 (39.2)	
Yes	346 (63.0)	21 (38.2)	367 (60.8)	
Evolution				<0.001
Dead	167 (30.4)	5 (9.1)	172 (28.5)	
Alive	382 (69.6)	50 (90.9)	432 (71.5)	
Hospitalization duration (days), median (IQR)	10 (6 - 15)	10 (8 - 14)	10 (6 - 15)	0.741

[1]n (%). [2]Pearson's Chi-squared test; Fisher's exact test.

15), and did not vary according to patients' vaccination status (p = 0.741).

Among those patients who were discharged, hospitalization was significantly shorter in fully vaccinated patients (median 10 vs. 13 days, p = 0.012). The duration of hospital stay was not different according to vaccination status among deceased patients as death occurred within the first week of hospitalization in both groups (Figure 2, Table S2).

3.6. Mortality Rate

Overall, 172 patients died, representing an in-hospital mortality rate of 28.5% (Table 2). The 15 and 30-day mortality rates were 26.1% (158/604) and 28.3% (171/604) respectively. Table 3 presents the fifteen and thirty-day mortality rates in patients hospitalized.

Mortality was significantly lower in fully vaccinated patients than in unvaccinated

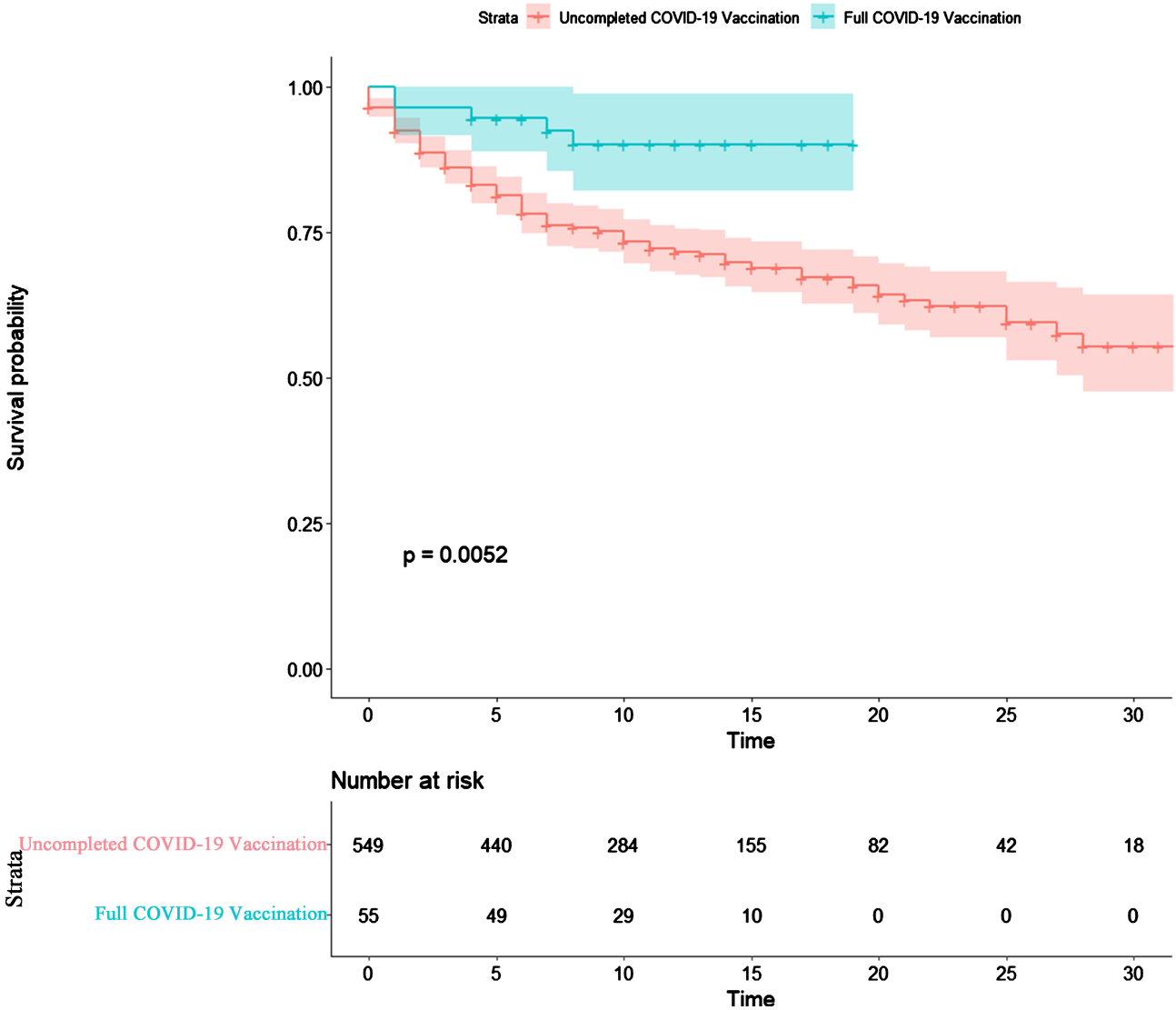

Figure 2. Duration of hospitalization according to COVID-19 vaccination status in 432 alive and 172 dead patients admitted for Covid-19 at the Centre Hospitalier Régional Lomé Commune, Togo, June 2021-May 2022.

Table 3. Fifteen and thirty days mortality rates in patients hospitalized for COVID-19 at the Centre Hospitalier Régional Lomé Commune by selected sociodemographic and clinical characteristics, June 2021 - May 2022 (n = 604)

Characteristic	15 days mortality			30 days mortality			Overall, N = 604[1]
	No N = 446[1]	Yes N = 158[1]	p-value[2]	No N = 433[1]	Yes N = 171[1]	p-value[2]	
Age (Year)	52 (41-64)	63 (47-73)	**<0.001**	51 (40-64)	63 (47-73)	**<0.001**	54 (41-68)
Age classes (Year)			**<0.001**			**<0.001**	
<20	6 (100.0)	0 (0.0)		6 (100.0)	0 (0.0)		6
20 - 39	97 (79.5)	25 (20.5)		96 (78.7)	26 (21.3)		122
40 - 59	186 (82.3)	40 (17.7)		180 (79.6)	46 (20.4)		226
60 - 79	136 (65.4)	72 (34.6)		132 (63.5)	76 (36.5)		208
≥80	21 (50.0)	21 (50.0)		19 (45.2)	23 (54.8)		42
Sex			0.711			0.786	
Female	221 (73.2)	81 (26.8)		215 (71.2)	87 (28.8)		302
Male	225 (74.5)	77 (25.5)		218 (72.2)	84 (27.8)		302
Clinical severity at admission			**<0.001**			**<0.001**	
Asymptomatic/Mild	125 (98.4)	2 (1.6)		125 (98.4)	2 (1.6)		127
Moderate	141 (90.4)	15 (9.6)		139 (89.1)	17 (10.9)		156
Severe	159 (64.1)	89 (35.9)		148 (59.7)	100 (40.3)		248
Critical	21 (28.8)	52 (71.2)		21 (28.8)	52 (71.2)		73
Hospitalization in the intensive care unit			**<0.001**			**<0.001**	
No	219 (92.4)	18 (7.6)		218 (92.0)	19 (8.0)		238
Yes	227 (61.9)	140 (38.1)		215 (58.6)	152 (41.4)		367
At least one complication			0.089			0.124	
No	403 (75.0)	135 (25.0)		391 (72,7)	147 (27.3)		538
Yes	43 (65.2)	23 (34.8)		42 (63.6)	24 (36.4)		66
Complete COVID-19 vaccination			**0.003**			**<0.001**	
No	396 (72.1)	153 (27.9)		383 (69.8)	166 (30.2)		549
Yes	50 (90.9)	5 (9.1)		50 (90.9)	5 (9.1)		55

[1]Median (25%-75%); n (%); [2]Wilcoxon rank sum test; Fisher's exact test; Pearson's Chi-squared test.

ones (9.1% vs. 30.4%; $p < 0.001$) (Table 2). The same trend was observed for 15 days' mortality rate (9.1% vs. 27.9%; $p = 0.003$) and 30 days' mortality rate (9.1% vs. 30.2%; $p < 0.001$).

3.7. Factors Associated with Mortality

The instantaneous risk of death at any time after hospital admission was 73.0% lower (adjusted HR (aHR): 0.27 (0.11 - 0.67)) in fully vaccinated patients, inde-

pendently of other risk factors. In contrast, age equal to or greater than 55 years (aHR: 1.82; 95% CI: 1.32 - 2.52), diabetes (aHR: 1.60; 95% CI: 1.17 - 2.19), and renal failure (aHR: 3.94; 95% CI: 1.73 - 8.98) were significantly associated with an increased risk of mortality (Figure 3).

4. Discussion

This cohort retrospectively evaluated the prognosis of patients hospitalized for COVID-19 according to their vaccination status. We found that only 55 patients out of 604 were fully vaccinated (9.1%), ICU admission was significantly more frequent in unvaccinated patients than in fully vaccinated ones (63.0% vs. 38.2%; $p < 0.001$), and finally, overall 172 patients died (28.5%) with a significantly lower mortality rate in vaccinated than in unvaccinated patients (9.1% vs. 30.4%; $p < 0.001$).

The low rate of vaccinated patients in our data contrasts with the situation in some developed countries, like in Italy where the coverage was approaching or even exceeding 70% [15]. This may be linked to the vaccine's unavailability, or to the vaccine hesitancy among comorbid patients composing the large proportion of our study population, as observed by Tsevi *et al.* in a previous study on the acceptability of vaccination among hemodialysis patients in Togo [10].

The proportion of patients with severe and critical conditions on admission was significantly lower in fully vaccinated patients than in unvaccinated ones. We observed similar trends regarding the frequency of admission to ICU and the rate of deaths. The benefit of COVID-19 vaccination in the reduction of morbidity and mortality linked to COVID-19 has been widely demonstrated,

Variable		N	Hazard ratio	p
Complete COVID-19 vaccination	No	549		Reference	
	Yes	55		0.27(0.11,0.67)	0.005
Age (Year)	<55	303		Reference	
	>=55	301		1.82(1.32,2.52)	<0.001
Sex	Female	302		Reference	
	Male	302		1.02 (0.76,1.38)	0.885
Diabetis	No	433		Reference	
	Yes	171		1.6o(1.17,2.19)	0.003
Renal failure	No	593		Reference	
	Yes	11		3.94(1.73,8.98)	0.001

Figure 3. Factors associated with death in patients hospitalized for COVID-19 at the Centre Hospitalier Régional Lomé Commune, Cox regression, final multivariable model.

especially in European and South-Eastern Asian countries [2] [3] [15] [16] [17] [18] [19]. Thus, in an observational study on healthcare workers in France, a significant reduction in the incidence of infections was clearly demonstrated by Paris *et al.* [20]. In another European multicentric study conducted in the autumn of 2021, Sikora *et al.* evaluated this vaccine efficacy, highlighting a negative linear association between vaccine coverage and the mean number of hospital admissions ($r = -0.61$ to -0.88), the mean number of ICU admissions ($r = -0.62$ to -0.81), and the mortality rate ($r = -0.64$ to -0.84) [21].

It should be noted however that, among all the patients in our study, the proportion of severe cases (53.2%), ICU admissions (60.8%), and overall mortality (28.5%) remained high and close to those reported at the start of the pandemic in Wuhan by Li *et al.* [22]. A similar mortality rate of 27.5% was reported in Limpopo Province in South Africa, between November 2020 and February 2021, before the availability of vaccination [23]. A higher mortality rate of 48.2% was observed before the start of vaccination in a prospective multicenter cohort of patients admitted to intensive care units in Africa [24]. Another study on a prospective cohort in Douala reported also a high in-hospital mortality of 24% among 67 unvaccinated patients [25]. In a retrospective cohort study carried out in Lombardy, COVID-19 vaccines significantly decreased the risk of ICU admission for COVID-19, but there was no significant association between ICU mortality and COVID-19 vaccination status [15]. One hypothesis for the poor prognostic of our patients may be that vaccination coverage was far too low and insufficient to influence the overall number of ICU admissions and deaths. In addition, as suggested by Cox's regression model, some pejorative factors such as advanced age and comorbidities contributed to worsening this prognosis.

Due to the retrospective nature of the study, we could not ascertain the type of vaccine received and the time between vaccination and hospitalization. This led to exclusion of some patients in order to minimize the biases. Secondly, the proportion of fully vaccinated patients according to our definition may be underestimated, as some patients received the Johnson & Johnson vaccine for which a single dose was required. It is known however that the most widely used vaccines in Togo between March 2021 and June 2022, were those from AstraZeneca and Pfizer BioNTech, administered according to a similar schedule of at least two doses as primary immunization [26] [27] [28]. Likewise, we could not take therapeutic aspects into account in our analysis. We believe that the treatment administered should not be a confounding factor, since the criteria for choice of therapy were not based on vaccination status. Finally, given the low proportion of vaccinated subjects in our sample, our results must be interpreted with caution.

Despite these limitations, the setting of this study highlighted the benefit of vaccination in the hospitalized population which has received very little attention in the low-income countries of sub-Saharan Africa to date.

5. Conclusion

Our results have shown a very low COVID-19 vaccination coverage in this in-hospital population, characterized by an advanced age and multiple comorbidities. The hospitalization resulted in poor outcomes, with a high incidence of ICU admission and a high in-hospital mortality. However, vaccination against SARS-CoV-2 has a definite benefit for fully vaccinated patients in terms of reducing the risk of severe COVID-19 requiring ICU admission and mortality. Based on real-world data from sub-Saharan Africa, this information can help optimize the benefit of COVID-19 vaccination by raising community awareness and increasing vaccine coverage while reducing hesitancy.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Supplementary

Table S1. SARS-CoV-2 vaccination status and clinical outcomes of patients hospitalized for COVID-19 at the Centre Hospitalier Régional Lomé Commune by number of COVID-19 vaccine doses received, Togo, June 2021-May 2022.

Characteristic	Number of COVID-19 vaccine doses received			Overall N = 604[1]	p-value[2]
	0 N = 504[1]	1 N = 45[1]	2 N = 55[1]		
Age (Year)	56 (41 - 68)	48 (38 - 59)	55 (44 - 65)	54 (41 - 68)	0.074
Age classes (Year)					-
<20	6 (1.2)	0 (0.0)	0 (0.0)	6 (1.0)	
20 - 39	99 (19.6)	12 (26.7)	11 (20.0)	122 (20.2)	
40 - 59	180 (35.7)	22 (48.9)	24 (43.6)	226 (37.4)	
60 - 79	182 (36.1)	8 (17.8)	18 (32.7)	208 (34.4)	
≥80	37 (7.3)	3 (6.7)	2 (3.6)	42 (7.0)	
Age (Year)					0.138
<55	247 (49.0)	29 (64.4)	27 (49.1)	303 (50.2)	
≥55	257 (51.0)	16 (35.6)	28 (50.9)	301 (49.8)	
Sex					0.006
Female	255 (50.6)	29 (64.4)	18 (32.7)	302 (50.0)	
Male	249 (49.4)	16 (35.6)	37 (67.3)	302 (50.0)	
Nationality					0.342
Other	26 (5.2)	1 (2.2)	5 (9.1)	32 (5.3)	
Togolese	478 (94.8)	44 (97.8)	50 (90.9)	572 (94.7)	
Clinical severity at admission					<0.001
Asymptomatic/Mild	92 (18.3)	11 (24.4)	24 (43.6)	127 (21.0)	
Moderate	128 (25.4)	14 (31.1)	14 (25.5)	156 (25.8)	
Severe	215 (42.7)	16 (35.6)	17 (30.9)	248 (41.1)	
Critical	69 (13.7)	4 (8.9)	0 (0.0)	73 (12.1)	
Evolution					0.003
Dead	155 (30.8)	12 (26.7)	5 (9.1)	172 (28.5)	
Healed/Alive	349 (69.2)	33 (73.3)	50 (90.9)	432 (71.5)	
Hospitalization in intensive care	326 (64.7)	20 (44.4)	21 (38.2)	367 (60.8)	<0.001
At least one complication	58 (11.5)	1 (2.2)	7 (12.7)	66 (10.9)	0.120
Hospitalization duration	10 (6 - 16)	9 (8 - 13)	10 (8 - 14)	10 (6 - 15)	0.602

[1]Median (25%-75%); n (%). [2]Kruskal-Wallis rank sum test; Pearson's Chi-squared test; Fisher's exact test.

Table S2. Factors associated with death in subjects hospitalized at the National Center for the Management of COVID-19, Lomé, Togo, Cox regression analysis

Characteristic	Univarible model			Initial multivariable model			Final multivariable model		
	HR[1]	95% CI[1]	p-value	HR[1]	95% CI[1]	p-value	HR[1]	95% CI[1]	p-value
Complete COVID-19 vaccination									
No	—	—		—	—		—	—	
Yes	0.27	0.11, 0.66	0.004	0.27	0.11, 0.66	0.004	0.27	0.11, 0.67	0.005
Age (Year)									
<55	—	—		—	—		—	—	
≥55	1.84	1.31, 2.59	<0.001	1.78	1.28, 2.49	<0.001	1.82	1.32, 2.52	<0.001
Sex									
Female	—	—		—	—		—	—	
Male	1.08	0.79, 1.47	0.6	1.05	0.78, 1.42	0.8	1.02	0.76, 1.38	0.9
Diabetes									
No	—	—		—	—		—	—	
Yes	1.55	1.12, 2.15	0.008	1.55	1.12, 2.14	0.008	1.60	1.17, 2.19	0.003
High blood pressure									
No	—	—		—	—				
Yes	1.20	0.87, 1.66	0.3	1.22	0.88, 1.68	0.2			
Asthma									
No	—	—							
Yes	0.84	0.34, 2.05	0.7						
HIV									
No	—	—		—	—				
Yes	1.46	0.79, 2.69	0.2	1.43	0.78, 2.63	0.2			
Renal failure									
No	—	—		—	—		—	—	
Yes	3.78	1.64, 8.71	0.002	3.70	1.61, 8.49	0.002	3.94	1.73, 8.98	0.001
Pregnancy									
No	—	—							
Yes	1.47	0.82, 2.63	0.2						
Cancer									
No	—	—							
Yes	0.76	0.11, 5.50	0.8						
Hemoglobinopathy									
No	—	—							

Continued

Yes	2.04	0.64, 6.52	0.2
Obesity			
No	—	—	
Yes	1.16	0.47, 2.88	0.7

[1]HR = Hazard Ratio, CI = Confidence Interval.