Covid-19 Vaccine Effectiveness for In-Hospital Mortality – Zambia, April 2021–January 2022

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BACKGROUND

Covid-19 vaccines have demonstrated remarkable effectiveness, particularly at preventing severe disease and death. However, vaccine effectiveness (VE) findings from countries in Africa are limited, an important gap because SARS-CoV-2 epidemiology in Africa has differed and vaccination rates remain lower than other parts of the world. Real-world evidence for Covid-19 vaccines from countries in Africa might help increase vaccination uptake. Covid-19 vaccines became available in Zambia in April 2021. We sought to measure VE for in-hospital mortality among persons admitted with Covid-19 in Zambia.

METHODS

- We did a retrospective cohort study of patients with confirmed or probable COVID-19 who were hospitalized at Covid-19 treatment centers in Zambia (Figure 1a)
- Demographic and clinical data (including hospitalization outcome) were abstracted from medical charts by trained clinicians from from July 2020 until January 2022.
- The odds of in-hospital mortality was calculated by vaccination status using mixed-effects multivariable logistic regression, adjusting for age, sex, province, comorbidities, disease severity at admission, and treatment center (random effects term)
- Because of high vaccination date missingness the primary analysis was done for patients who received ≥1 vaccine dose. We did sub-analyses by full/partial vaccination status and the predominant circulating variant (i.e., Delta before 12/01/2021 and Omicron after)

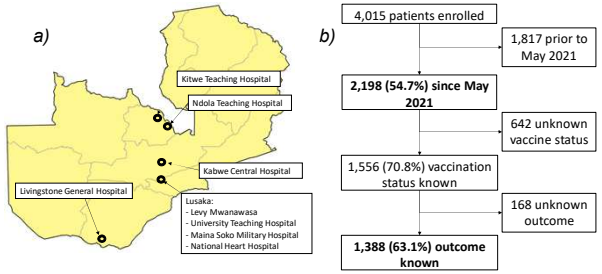


Figure 1. Study sites (panel A) and flow diagram (panel B) of patients with Covid-19 vaccine effectiveness study — Zambia, Apr 2021-Jan 2022

Covid-19 vaccine effectiveness of ≥1 dose for in-hospital mortality was 60.4% in Zambia

RESULTS

- 2,198 patients were recruited from April 2021 to January 2022, of whom 1,388 (63.1%) had information on vaccination status and hospitalization outcome (Figure 1b).
- There was no difference in age, sex, or presence of any comorbidities (Table 1)
- Overall, 159 (11.5%) patients had received ≥1 Covid-19 vaccine dose (Table 2), of whom 79 (49.7%) were missing information on vaccination date
- Among patients who received ≥1 vaccine dose, 17 (10.7%) died in-hospital compared with 295 (24.0%) in unvaccinated patients (p<0.01)
- VE of ≥1 Covid-19 vaccine dose for in-hospital mortality was 60.4% (95% CI: 31.5–78.3) (Figure 2). When stratified by admission date (dominant variant), Covid-19 vaccine remained effective at reducing in-hospital mortality

Table 1. Demographic characteristics of patients with Covid-19 by vaccination status — Zambia, Apr 2021-Jan 2022

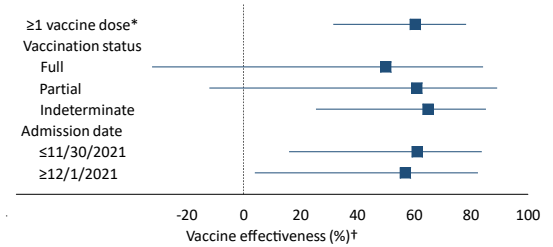
Characteristic	Vaccinated (n=159)	Unvaccinated (n=1,229)
Age, median (IQR)	46 (33–62)	49 (31–66)
Female, n (%)	86 (54.1)	625 (50.9)
Comorbidity, n (%)*	102 (64.2)	715 (58.2)
Hypertension	58 (36.5)	443 (36.0)
Diabetes	30 (18.9)	165 (13.4)
Alcohol use	**28 (17.6)**	**139 (11.3)**
HIV	27 (17.0)	193 (15.7)
Asthma	12 (7.5)	52 (4.2)
Smoking	11 (6.9)	54 (4.4)
Tuberculosis	4 (2.5)	68 (5.5)
Severe Covid-19 at admission, n (%)†	**70 (44.0)**	**708 (57.6)**

* Only most common comorbidity options are shown
† Severe Covid-19 was defined as an oxygen saturation <90% on room air, respiratory rate >30 breaths per minute, or receiving oxygen therapy
Bolded values have a p<0.05

Table 2. Vaccination characteristics of patients with Covid-19 — Zambia, Apr 2021-Jan 2022

Vaccination Variable	Vaccinated (n=159)
Timing of 1st vaccine dose, n (%)	
≥14 days before admission	73 (45.9)
0-13 days before admission	7 (4.4)
After admission	0 (0.0)
Missing	79 (49.7)
Vaccination status, n (%)	
Fully	44 (27.7)
Partially	29 (18.2)
Indeterminate*	86 (54.1)
Vaccine type, n (%)	
Janssen (J&J)	75 (47.2)
AstraZeneca	67 (42.1)
Pfizer	2 (1.3)
Moderna	1 (0.6)
Sinopharm	0 (0.0)
Missing	14 (8.8)

* Includes 79 patients with missing vaccination dates and 7 patients with 1st vaccine dose 0-13 days before admission



* Patients with unknown date of vaccination included as vaccinated persons because to boost sample size for vaccinated patients
† Adjusted for age, sex, province, comorbidities, disease severity at admission, and treatment center

Figure 2. Vaccine effectiveness for in-hospital mortality — Zambia, Apr 2021-Jan 2022

LIMITATIONS

- VE estimates had large confidence intervals
- Data did not include patients with Covid-19 admitted to regular hospitals in Zambia
- A large proportion of patients were missing vaccination status or hospitalization outcome information
- Missingness for vaccination date might have led to misclassification of vaccination status

CONCLUSIONS

- Person who had received ≥1 Covid-19 vaccine dose had lower in-hospital mortality in Zambia
- Covid-19 vaccines were effective at reducing in-hospital mortality during periods when Delta and Omicron were dominant variants in Zambia
- Improving data quality could increase precision of estimates
- Zambia should continue to rapidly scale-up Covid-19 vaccination to prevent mortality among in-patients in the country

ADDITIONAL INFORMATION

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