

Real-world effectiveness of the CoronaVac vaccine in a retrospective population-based cohort in four Colombian cities (2021-2022)

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- CoronaVac reduces risk of COVID-19 death by 90%.
- The highest vaccine effectiveness is observed in the first 4 months.
- Booster doses do not boost the effectiveness CoronaVac.
- The vaccine is less effective against infections (32%).
- The vaccine provides high protection for subjects aged 3-12 and those over 60.

BACKGROUND

The study aims to evaluate the real-world effectiveness of the CoronaVac vaccine in preventing COVID-19 infection, hospitalization, and death among different age and gender groups, as well as individuals with comorbidities, over a 12-month period in four major cities in Colombia. This research was conducted to address gaps in vaccine effectiveness data, particularly in the Americas, where disparities in vaccine acceptance and outcomes persist. Despite previous studies confirming CoronaVac's efficacy in countries like Mexico, Brazil, and Chile, further research is needed to assess its impact in Colombia, where a significant portion of the population received the vaccine.

METHODS

Study Design

A population-based retrospective cohort study.

Setting

The study included residents from Bogotá, Cali, Medellín, and Montería, representing 26.2% of Colombia's population.

Sample Size

Population based study. SIVIGILA (COVID-19 cases), PAIWEB (vaccination records), RUAF-ND (deaths), CAC (comorbidities) and BDUA (sociodemographics).

Participants

Vaccinated individuals with a complete two-dose schedule of CoronaVac and unvaccinated individuals.

Inclusion/Exclusion Criteria

Included: Individuals aged 3+ in the study cities, with complete vaccination data.

Excluded: Incomplete or inconsistent vaccination records, or other vaccine types.

Outcomes

Infection: Positive COVID-19 test (RT-PCR/antigen).

Hospitalization: Hospital admission with a COVID-19 diagnosis.

Death: COVID-19-related death confirmed by official records.

Follow-up

Follow-up began 14 days after the second vaccine dose, tracking outcomes for up to 12 months.

Variables

Identified using causal diagrams to explore their effects on outcomes.

Statistical Methods

Propensity score matching was used to create comparable groups. A Cox regression model with random effects estimated vaccine effectiveness (1 - HR) for each outcome over time.

RESULTS

The study found that 62.9% of COVID-19 cases occurred among vaccinated individuals, with the highest proportion in young adults aged 26-39 years and individuals aged 60 or older. Hospitalization rates were higher among the unvaccinated (43.1%), and 77.5% of deaths occurred in the unvaccinated group. Among vaccinated individuals, those without a booster had higher death rates. Women were more likely to be hospitalized, while men had higher death rates.

The vaccine's effectiveness (VE) was 32% for preventing infection, 55% for hospitalization, and 90% for death. Booster doses increased effectiveness, particularly with heterologous boosters, which provided around 20% more protection against hospitalization and 30% against death. VE was higher in younger children (3-11 years) and individuals aged 60 or older, with women generally showing greater protection than men. Booster doses further stabilized protection against severe outcomes after a year of follow-up.

RESULTS CONTINUED

Figure 1. Estimated effectiveness of the CoronaVac vaccine against infection, hospitalisation, and death outcomes in the one-year follow-up.

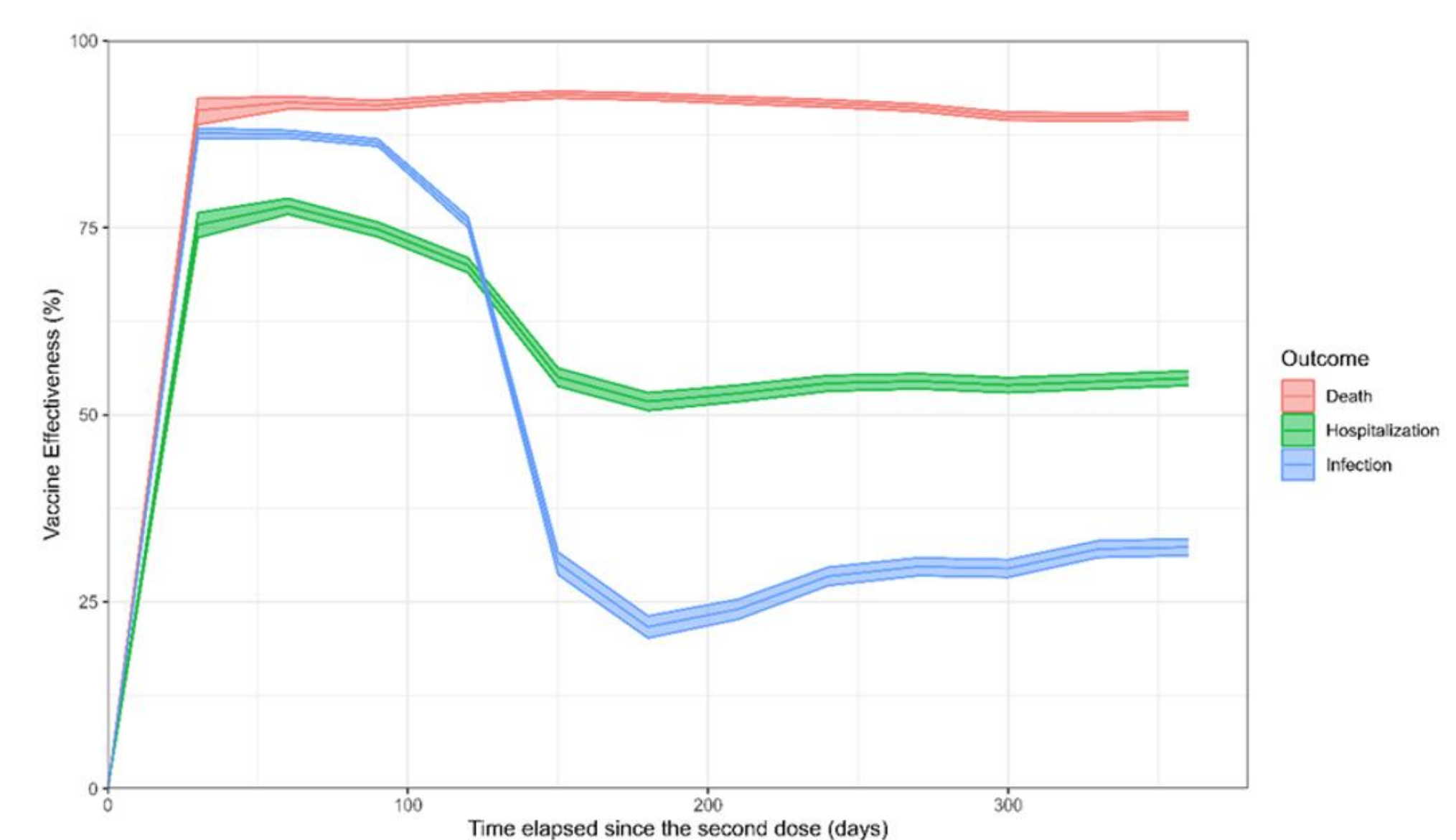


Table 1. The estimated effectiveness of the CoronaVac vaccine for different age groups.

Age group	Infection		Hospitalization		Death	
	Effectiveness %	95 % CI	Effectiveness %	95 % CI	Effectiveness %	95 % CI
3-11	66.58*	64.49, 68.56	36.64*	29.71, 42.87	100.00	-Inf, 100.00
12-25	-08.85*	-11.96, -05.82	40.90*	38.29, 43.39	99.86*	99.45, 99.97
26-39	-17.00*	-19.46, -14.59	49.06*	47.39, 50.68	99.74*	99.49, 99.86
40-49	32.43*	30.49, 34.31	54.01*	51.97, 55.97	99.49*	99.09, 99.72
50-59	68.40*	67.17, 69.58	59.23*	56.96, 61.39	98.23*	97.59, 98.70
>= 60	81.03*	80.40, 81.64	66.64*	65.34, 67.90	79.09*	77.90, 80.22

Adjusted for sex, age, social security system regime, and comorbidities stratified by sex and age. *P-value<0.05

Table 2. Estimation of the Hazard Ratio (HR) among those vaccinated with CoronaVac for the different outcomes of the study.

	Infection		Hospitalization		Death	
	Effectiveness %	95% CI	Effectiveness %	95% CI	Effectiveness %	95% CI
A. Booster dose in CoronaVac Vaccinated individuals Vs. Unvaccinated						
ChAdOx1	81.78*	80.99, 82.53	94.80*	94.45, 95.12	97.87*	97.69, 98.06
Ad26.COVS.2	77.40*	72.38, 81.52	92.82*	90.12, 94.78	96.61*	94.80, 97.79
mRNA-1273	89.45*	89.00, 89.88	96.56*	96.34, 96.76	97.88*	97.72, 98.03
BNT162b2	86.77*	86.18, 87.35	95.14*	94.82, 95.44	96.87*	96.63, 97.09
CoronaVac	70.88*	70.01, 71.72	92.01*	91.66, 92.34	95.37*	95.15, 95.59
B. Booster dose in CoronaVac Vaccinated individuals Vs. only two doses of CoronaVac						
ChAdOx1	-0.66	-1.17, 6.33	20.09*	14.96, 24.91	46.01*	41.27, 50.37
Ad26.COVS.2	-9.62	-33.99, 10.31	27.43*	0.18, 47.24	26.67	-12.59, 52.24
mRNA-1273	-3.25	-7.18, 0.54	16.15*	11.15, 20.86	41.70*	37.44, 45.68
BNT162b2	-5.71*	-10.22, -1.38	17.72*	12.43, 22.70	26.13*	20.70, 31.19
CoronaVac	-9.13*	-11.65, -6.67	4.44*	0.95, 7.81	-6.68*	-11.26, -2.28

CONCLUSIONS

The vaccine showed 66% effectiveness for hospitalization and 79% for preventing death in individuals aged 60 and older, consistent with similar studies, such as the Esperanza Cohort [5]. CoronaVac's effectiveness declined over time, especially in preventing infection, with the most significant drop occurring after six months. This trend mirrors findings from other studies and may be linked to waning immunity and the emergence of new variants, such as Omicron [6]. Although it was generally less effective than other vaccines like Pfizer, it still provided significant protection against severe outcomes.

Differences in vaccine effectiveness were observed by age and gender, with higher protection in children aged 3-12 and adults over 60. Women showed better immune responses than men, consistent with other research suggesting gender-based differences in immunity [7]. However, there were disparities in vaccine access and effectiveness based on social security status, with individuals from the subsidized health regime being less protected.

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