



Vaccination and COVID-19 in Morocco

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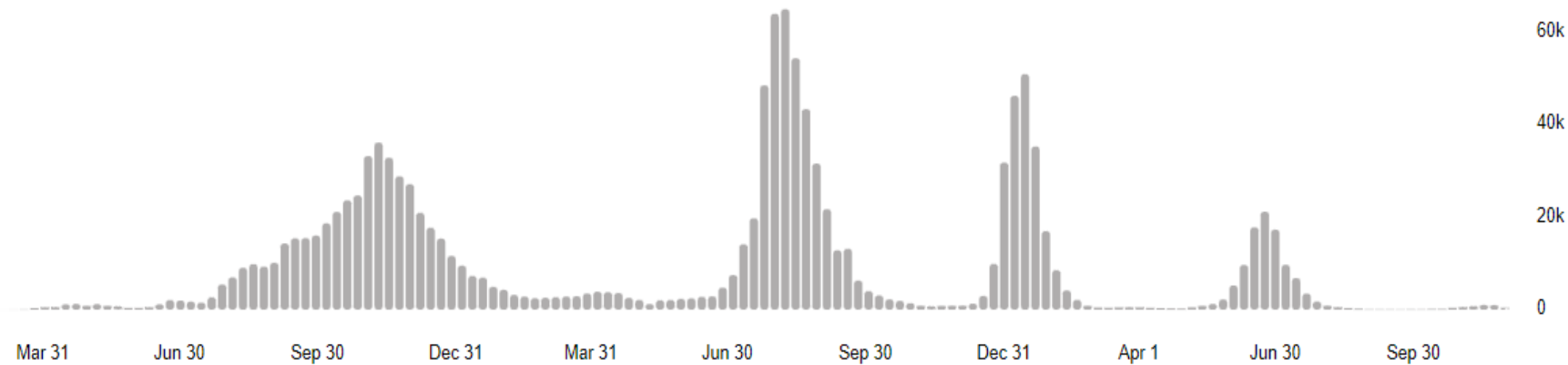
Background

Epidemic situation in Morocco

In Morocco, until November 8 , 2023,

- **1,277,461 confirmed cases** of COVID-19
- **16,297 deaths**
- a total of **55,389,602 vaccine doses** have been administered.
- Significant decline of new confirmations and deaths;
- Serious cases treated in intensive care still decreasing;
- continued decline in detection activities,

Background



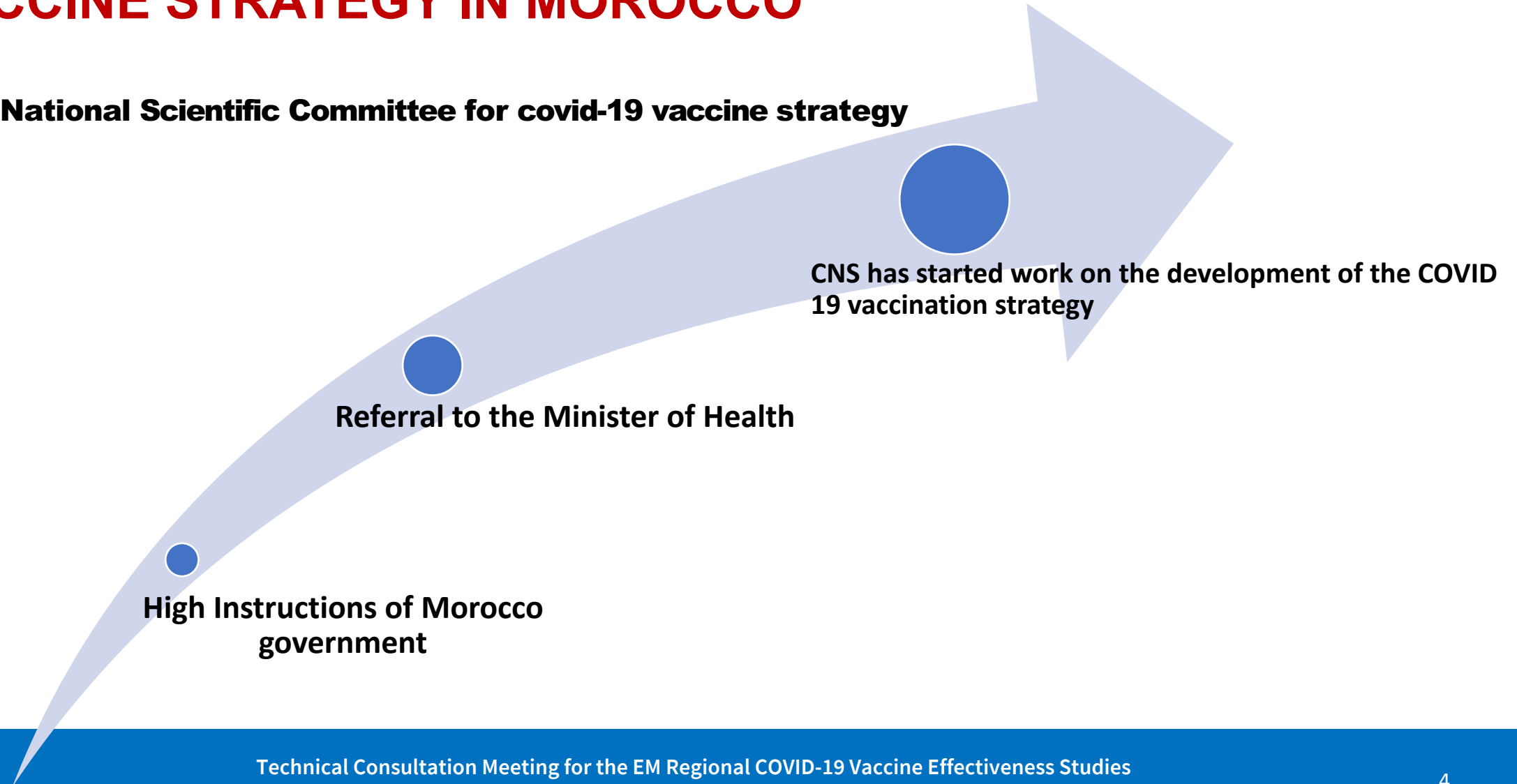
Since the start of the pandemic, Morocco has experienced three epidemic waves corresponding three periods of appearance variants of concerns

- Wave1 (from February to May 2021): circulation of the Alpha variant (B.1.1.7).
- Wave 2 (from July to September 2021): dominance of the circulation of the Delta variant (B.1.617.2) (80%).
- Wave 3 (January 2022): circulation of the majority Omicron (B.1.1.529) variant (70%).

Background

VACCINE STRATEGY IN MOROCCO

CNS: National Scientific Committee for covid-19 vaccine strategy



to support policy making, the CNS anticipated possible vaccination outline by taking into consideration

**Vaccine
characteristics**

**The Target
population**

**Logistical
capacities
deployed for the
vaccination
campaign**

**Campaign
governance and
process
management**

PLANNING THE COVID 19 VACCINATION CAMPAIGN

GUIDELINES Principles

Volunteering

Solidarity

Equity

Free

Transparency

Accessibility of the vaccine is ensured for all people living in Morocco and eligible for vaccination.

within and between regions, with pooling of resources.

Free provision of the vaccine for all individuals living in Morocco and eligible for vaccination

Vaccination activities are planned in collaboration with partners (governmental and non-governmental), communicated, explained to the population, and supported by the implementation of a pre-registration system

COVID-19 vaccination is voluntary. However, citizen engagement will contribute to achieving herd immunity

Background

January 2021: vaccination campaign

- Four COVID-19 vaccines deployed in Morocco: - BNT162b2 (Pfizer-BioNTech), Ad26.COV2.S (Johnson & Johnson-Janssen), the ChAdOx1 nCoV-19 (AZD1222; Oxford-AstraZeneca) and BBIBP-CorV (Vero Cells) Sinopharm;

January 2022: 70% of the target population

- 72% of Sinopharm vaccine receipt.

**Limited DATA on the real-world effectiveness
of inactivated COVID-19 vaccine BBIBP-CorV (Vero cells)**

Methods (study design)

Zhang et al. *BMC Public Health* (2022) 22:1584
<https://doi.org/10.1186/s12889-022-14016-9>

BMC Public Health

RESEARCH

Open Access

Real-world study of the effectiveness of BBIBP-CorV (Sinopharm) COVID-19 vaccine in the Kingdom of Morocco

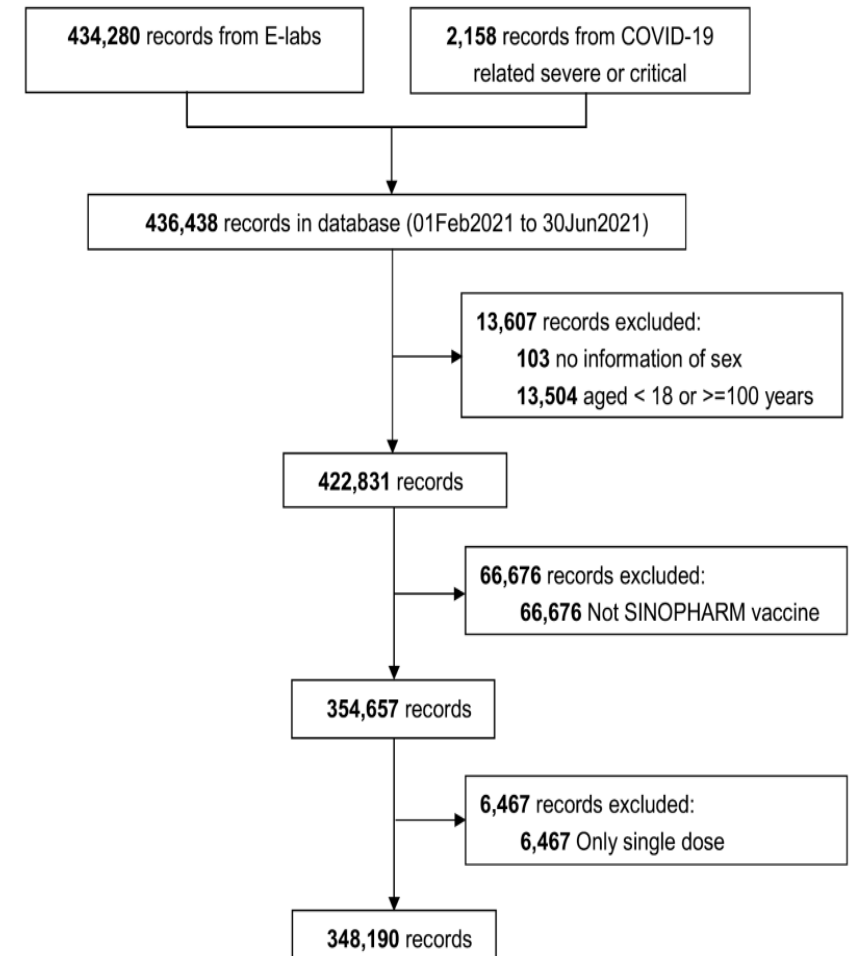


Yaowen Zhang^{1†}, Jihane Belayachi^{2,3†}, Yunkai Yang^{1†}, Qiang Fu^{4†}, Lance Rodewald⁵, Hongling Li¹, Bing Yan⁴, Ying Wang⁴, Yanna Shen¹, Qian Yang¹, Weiyun Mu¹, Rong Tang¹, Chen Su⁴, Tianfang Xu¹, Majdouline Obtet^{3,6}, Abdelkader Mhayi⁷, Rachid Razine^{3,6}, Redouane Abouqal^{2,3*}, Yuntao Zhang^{1*} and Xiaoming Yang^{1*}

- We conducted a retrospective cohort study among adults 18–99 years old who were tested by RT-PCR for SARS-CoV-2 infection between 1 February and 30 June 2021.
- RT-PCR results were individually linked with outcomes from the COVID-19 severe or critical hospitalization dataset and with vaccination histories from the national vaccination registration
- Individuals with partial vaccination (< 2 weeks after dose two) or in receipt of any other COVID-19 vaccine were excluded.
- Unadjusted and adjusted VE estimates against hospitalization for serious or critical illness were made by comparing two-dose vaccinated and unvaccinated individuals in logistic regression models, calculated as (1-odds ratio) * 100%.

Results and analysis

- From 1 February 2021 to 30 June 2021, a total of 436,438 records from the COVID-19 related severe or critical hospitalization dataset and E-labs were able to be matched with vaccination histories in the NVR.
- After exclusions for missing data on sex or age, administration of a vaccine other than BBIBPCorV, and partial vaccination, 348,190 records remained and comprised the analytic dataset



Flow diagram of the study population with eligibility criteria, exclusions, and matching methodology

Results and analysis

This Table shows the vaccination status of subjects by sex and age group.

- Among subjects, there were more men than women (57.3 and 42.7%)
- more younger people than older people – for example, 29.9% were 18–29 years old and 9.9% were 60 years or older.
- There were 206,149 individuals (59.2% of subjects) completely unvaccinated, 140,892 (40.5%) individuals fully vaccinated with two doses of BBIBP-CorV, and 1,149 (0.3%) individuals who received booster doses

	Not Vaccinated N= 206,149	Fully Vaccinated N= 140,892	Booster-vaccinated N= 1,149	Total N= 348,190
Sex, n (%)				
Male	116,816 (56.7)	81,580 (57.9)	1,024 (89.1)	199,420 (57.3)
Female	89,333 (43.3)	59,312 (42.1)	125 (10.9)	148,770 (42.7)
Age (Years)				
Mean (SD)	40.7 (15.1)	37.9 (13.5)	45.1 (15.8)	39.6 (14.6)
Age group (Years), n (%)				
18–29	56,553 (27.4)	47,313 (33.6)	201 (17.5)	104,067 (29.9)
30–39	53,558 (26.0)	35,226 (25.0)	336 (29.2)	89,120 (25.6)
40–49	41,896 (20.3)	29,515 (20.9)	195 (17.0)	71,606 (20.5)
50–59	27,576 (13.4)	21,263 (15.1)	151 (13.1)	48,990 (14.1)
> =60	26,566 (12.9)	7,575 (5.4)	266 (23.2)	34,407 (9.9)

Results and analysis

The table shows unadjusted and adjusted vaccine effectiveness by sex and age group.

- Unadjusted, vaccine effectiveness against serious or critical hospitalization was 90.2% (95%CI: 87.8— 92.0%).
- After adjusting for age, sex, and calendar day of RT-PCR test VE against serious or critical hospitalization was 88.5% (95%CI: 85.8—90.7%).
- Adjusted VE was higher among females (92.6%, 95%CI: 89.4—94.9%) than males (83.8%, 95%CI: 78.9—87.6%),
- and higher among individuals < 60 years (96.4%, 95%CI: 94.6—97.6%) than individuals 60 years and older (53.3%, 95%CI: 39.6—63.9%).
- **Effectiveness of Sinopharm’s BBIBP-CorV was consistent with phase III clinical trial results.**
- **Two doses of BBIBPCorV was highly protective against COVID-19-associated serious or critical hospitalization in working-age adults under real-world conditions and moderately effective in older adults.**

	Unadjusted VE % (95%CI) ^a	Adjusted VE % (95%CI)
Main analysis		
Not Vaccinated	Ref	Ref
Fully Vaccinated	90.2 (87.8–92.0)	88.5 (85.8–90.7)
Subgroup analysis		
Male		
Not Vaccinated	Ref	Ref
Fully Vaccinated	87.6 (83.8–90.5)	83.8 (78.9–87.6)
Female		
Not Vaccinated	Ref	Ref
Fully Vaccinated	92.9 (89.9–95.1)	92.6 (89.4–94.9)
18–29 years		
Not Vaccinated	Ref	Ref
Fully Vaccinated	100 (NA-NA)	100 (NA-NA) ^b
30–39 years		
Not Vaccinated	Ref	Ref
Fully Vaccinated	100 (NA-NA)	100 (NA-NA) ^b
40–49 years		
Not Vaccinated	Ref	Ref
Fully Vaccinated	96.3 (92.5–98.5)	97.0 (93.3–98.7)
50–59 years		
Not Vaccinated	Ref	Ref
Fully Vaccinated	93.5 (89.5–95.9)	93.9 (90.2–96.2)
< 60 years		
Not Vaccinated	Ref	Ref
Fully Vaccinated	96.2 (94.3–97.5)	96.4 (94.6–97.6)
> = 60 years		
Not Vaccinated	Ref	Ref
Fully Vaccinated	52.6 (38.7–63.3)	53.3 (39.6–63.9)

Limitations

- there were no analyses of virus strains, and VEs against specific SARSCoV-2 variants could not be estimated. According to the WHO reports, more than 90% of SARS-CoV-2 isolates were Alpha variants in Morocco in April 2021 [2], thus the VE estimates are mainly against the Alpha strain.
- we lacked data on comorbidities and other characteristics of the study population that could influence VE estimates, precluding controlling for potential confounding factors other than age, sex, and calendar date of RT-PCR testing.
- we did not have data on reasons for severe/critical hospitalization. As a result, our study could not distinguish hospitalization caused by SARS-CoV-2 infection from hospitalization coincidental to SARS-CoV-2 infection
- the timing of the study was such that too few individuals had received booster doses, precluding robust analysis of BBIBP-CorV booster dose VE.

Methods (study design) (2)

PLOS ONE

RESEARCH ARTICLE

Long term effectiveness of inactivated vaccine BBIBP-CorV (Vero Cells) against COVID-19 associated severe and critical hospitalization in Morocco

Jihane Belayachi^{1,2}, Majdouline Obtel^{2,3}, Abdelkader Mhayi⁴, Rachid Razine^{2,3}, Redouane Abouqal^{1,2*}

- We conducted a **test-negative, case-control** study among a population aged 18 years or older who were tested by rt-PCR for SARS-CoV-2 infection from February to October 2021 in Morocco.
- From the national laboratory COVID-19 database; we identified **cases** who were rt-PCR positive amongst severe and critical COVID-19 cases and **controls** who had a negative rt-PCR test for SARS-CoV-2.
- From the national vaccination register (NVR); individuals vaccinated with COVID-19 Vaccine (Vero Cell) and those unvaccinated were identified and included in the study.
- The linkage between databases was conducted for the study of Vaccination status based on the timing of the vaccine receipt relative to the SARS-CoV-2 rt-PCR test date.
- For each person, who tested positive for SARS-CoV-2, we identified a propensity score-matched control participant who was tested negative.
- We estimated vaccine effectiveness against SARS- CoV-2 severe disease/ hospitalization using conditional logistic regression.

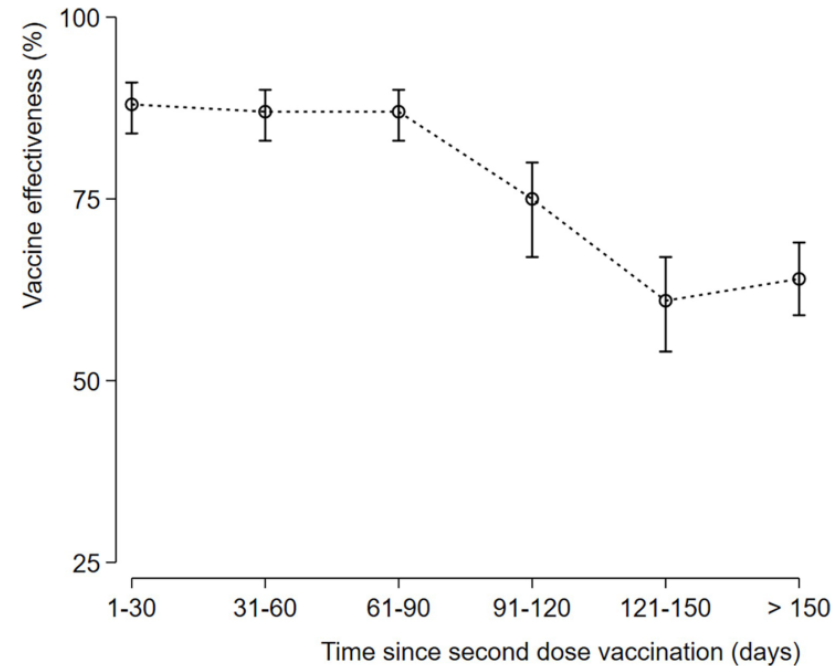
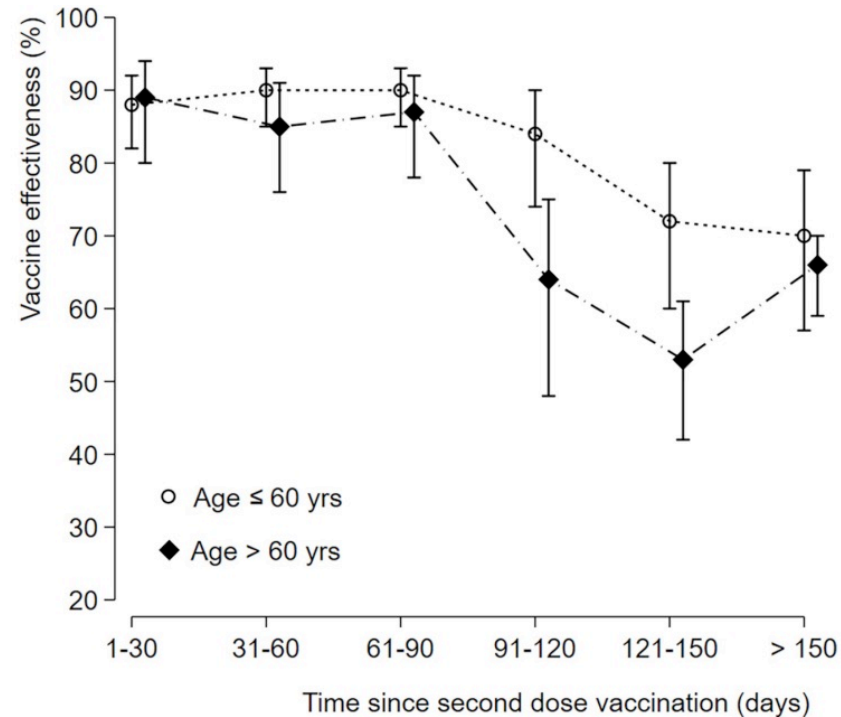
Results and analysis

Table 1. Baseline characteristics of individuals tested positive for SARS-COV-2 infection by rt-PCR test and Propensity Score-Matched control participants who tested negative for SARS-COV-2 infection.

Characteristics	Overall (n = 25768)	Tested Negative (n = 12884)	Tested Positive (n = 12884)	Standardized mean difference
Median (IQR) age at specimen collection date, years	62 (49–73)	62 (49–73)	63 (50–72)	0.002
Age at specimen collection date, years: NA				
	3645 (14.2)	1749 (13.6)	1896 (14.7)	
Age 41–60 years, n (%)	8190 (31.8)	4296 (33.3)	3894 (30.2)	
Age ≥ 60 years, n (%)	13933 (54.1)	6839 (55.1)	7094 (55.1)	
Gender:				
				0.017
Female, n (%)	12,169 (47.2)	6140 (50.5)	6029 (49.5)	
Male, n (%)	13599 (52.8)	6744 (49.6)	6855 (50.4)	
Month of specimen collection:				
				0.004
February 2021	183 (0.7)	130 (1.0)	53 (0.4)	
March 2021	512 (2.0)	357 (2.8)	155 (1.2)	
April 2021	996 (3.9)	324 (2.5)	672 (5.2)	
May 2021	806 (3.1)	294 (2.3)	512 (4.0)	
June 2021	1263 (4.9)	686 (5.3)	577 (4.5)	
July 2021	3643 (14.1)	1923 (14.9)	1720 (13.3)	
August 2021	11999 (46.6)	5976 (46.4)	6023 (46.7)	
September 2021	5686 (22.1)	2905 (22.5)	2781 (21.6)	
October 2021	680 (2.6)	289 (2.2)	391 (3.0)	
Vaccine Status				
				NA
Unvaccinated (%)	21818 (84.7)	9949 (77.2)	11869 (92.1)	
Partially vaccinated (%)	448 (1.7)	285 (2.2)	163 (1.3)	
Any time after second dose (%)	3502 (13.6)	2650 (20.6)	852 (6.6)	

- Among 12,884 persons who tested positive and 12,885 control participants, the median age was 62 years.
- We identified 25,768 matched pairs of patients who were tested for SARS-CoV-2 infection between February 01, 2021 and October 01, 2021
- The median age was 62 years among those who tested negative and 63 years among those who tested positive for SARS-CoV-2 infection;
- in both groups, 47.2% of participants were female.
- Among those who tested positive, 1015 (7.9%) had been vaccinated, and among those who tested negative, 2935 (22.8%) had been vaccinated.

Results and analysis



- Our results showed that the effectiveness of Sinopharm vaccine against severe COVID-19 associated hospitalizations reached a maximum level during the first month, and remains high and durable during the three months after the second dose (87–90%), declines little in the fourth month (75%), and stabilizes around 60% beyond the fifth month

- VE remained high and stable during the first three months in the two-age subgroup.
- In the fourth month, the VE in the older population aged 60 years and above (64%) was reduced by 20 points compared to VE in the younger population (84%)

Limitations

- Limitations of our study include looking only at, critical care hospitalization as outcomes. We did not estimate the effectiveness of the vaccine against other outcomes, such as symptomatic infections; hospitalization, organ injury or death. we primarily investigated the severe and hospitalized COVID-19 cases, which are a better indicator of vaccine effectiveness for public health relevance.
- Second, we adjusted for factors, such as age, sex, calendar days of the rt-PCR test; geographic location; and the 7-day moving average of the percentage of SARS-CoV-2 positive test., but we did not account for other factors that may have influenced the outcomes such as obesity, comorbidities, smoking, and clinical data.

Challenges and lessons learned

- these studies confirm that Sinopharm vaccine is highly protective against SARS-CoV-2 in real conditions.
- Also the durability of the protection
- VE depends not only on the effectiveness of the vaccine itself but also on factors such as the age of the recipient and time since the latest dose
- The elderly population is more vulnerable and at greater risk of immune depletion overtime after full immunization and deserves special attention. Therefore, maintaining the stability of their protection, through either continued social distancing or active vaccination, must be a priority



Thank you

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