Cohort Study to Measure COVID-19 Vaccine Effectiveness among Health Workers in Five University Hospitals Related to Al-Azhar University

Presented By

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Technical Consultation Meeting for the EM Regional COVID-19 Vaccine Effectiveness Studies

12–13 November 2023 | Cairo, Egypt

COVID-19 situation in Egypt and vaccine policies

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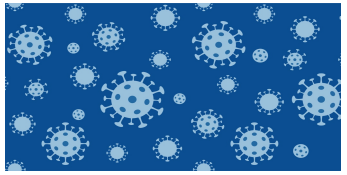
- Sinopharm
- AstraZeneca
- Johnson & Johnson
- Sinovac
- Pfizer/BioNTech
- Moderna
- Russia's Sputnik V

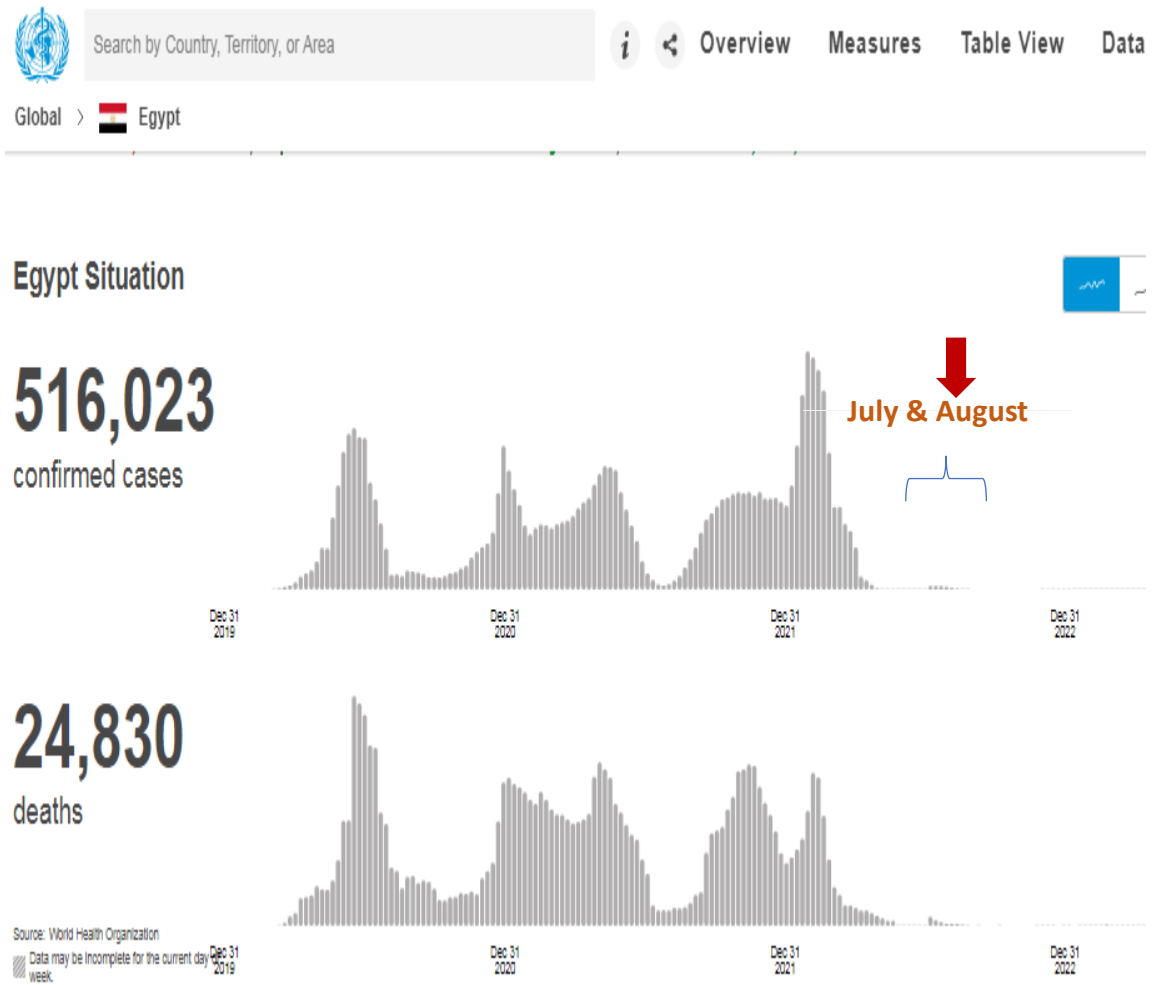


COVID-19 Variants in Egypt

Variant	Wave	Year
Alpha, B.1.1.7	First	2020
Alpha,C36	Second	2020
Alpha,C36	Third	2020
Delta,B.1.617.2	Fourth	2021
Omicron B.A.1	Fifth	2022
EG.5.2	------	2023

N.B: Beta variant was not detected in Egypt.

(Kandeel et al, 2023)



Overview of the Study

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Study design / methodology		Retrospective and Prospective Cohort Study
Enrollment	Start date	29th/June/2022
	End date	1st/September/2022
Estimated sample size		1006 participants
Actual Recruited Participants		1249
Follow up		Two weeks following date of enrollment & then biweekly for one year
Participating study sites (hospitals)		○ Al-Hussein University Hospital - Cairo ○ Bab AlShareia University Hospital- Cairo ○ Al- Zahraa University Hospital- Cairo ○ Al-Azhar University Hospital -Damaitta ○ Al-Azhar University Hospital - Assuit

Eligibility Criteria

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- All health workers (HWs) affiliated to Al-Azhar University Hospitals including:

➢HW who has already been vaccinated against SARS-COV-2.

➢Unvaccinated participants, who did not receive any dose of vaccine.

- Participation is voluntary and vaccine is free of charge
- MOH&P supplies all University Hospitals by the required vaccine doses.

HW who is not eligible for SARS-COV-2 vaccination or do not sign informed consent were not be eligible to participate in the study.

RECRUITMENT(Current Sample Size)

Hospital	Human Resources	Recruited Participants	Enrollment date	
	Total Number		Start	End
Al-Hussein	3960	300	5/7/2022	23/8/2022
Bab Al-Shareia	4127	299	3/7/2022	31/8/2022
AlZahraa	2440	299	29/6/2022	27/8/2022
Damaitta	1584	201	28/8/2022	31/8/2022
Assuit	1149	150	24/7/2022	11/8/2022
Total	**13260**	**1249**	Biweekly F. Up for one year	

Study objectives

Primary Objectives: To measure SARS-COV-2 vaccine effectiveness (VE) among HCWs eligible for vaccination at AL-Azhar University hospitals against symptomatic confirmed RT-PCR SARS-COV2 infection.

Secondary Objectives: To measure SARS-COV-2 VE among:

- individuals who have been partially vaccinated compared to those who are fully vaccinated.
- vaccinated previously infected compared to unvaccinated previously infected.

Active follow-up

- The objective of the follow up is to;
  - Identify among the cohort of participant HWs new cases,
  - Changes in vaccination status
  - Changes in potential exposures
- All participant groups were followed up biweekly (Follow Up questionnaire)
- Any participant who develops symptoms **consistent with the COVID-19 suspected case definition** have to provide a nasopharyngeal swab to be tested for SARS-CoV-2 by rRT-PCR.

Data Collection and Management

REDCap

SPSS

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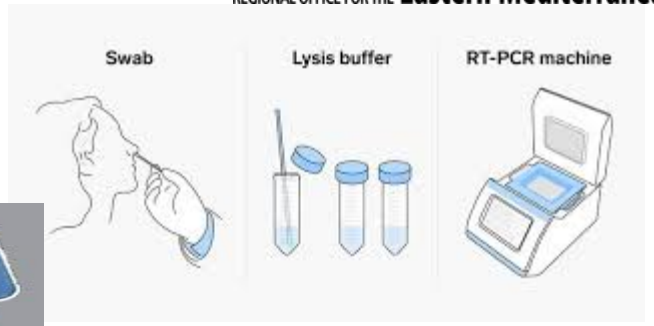
- Questionnaires were fulfilled at enrollment and during follow-up.
- Virology and Serology Questionnaires.
- Data entry was carried out using REDCAP program.
- The data was modified according to what was recommended by **MMGH colleagues.**
- Descriptive analysis as number and percent for qualitative data was presented, and median and interquartile range for quantitative data.
- VE was calculated using cox regression analysis.

Laboratory Methods

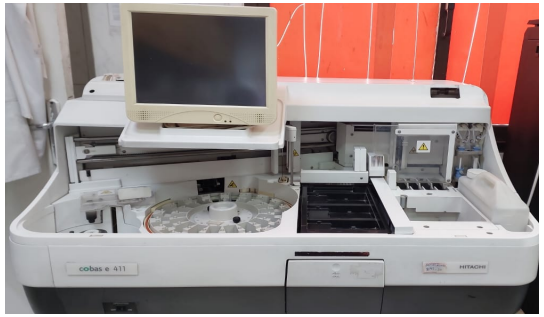


➢**Specimen collection:**

✓At enrollment: Nasopharyngeal specimen & serum

✓Follow- Up: Nasopharyngeal specimen for symptomatic participants who meet the WHO SARS-COV-2 case definition.

➢**Specific serology test used**: Roche Elecsys Anti-SARS-CoV-2 S immunoassay (Roche Diagnostics, GMbH, Germany) on a Roche Cobas e 411.

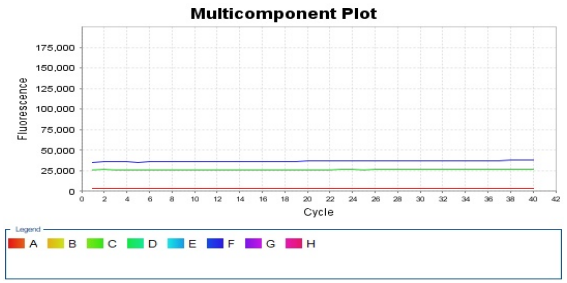


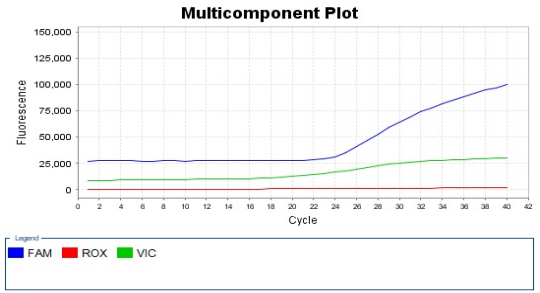
rR-t PCR

➢Real-time RT-PCR test using artus® SARS-CoV-2 Prep &Amp UM Kit - QIAGEN-Germany.

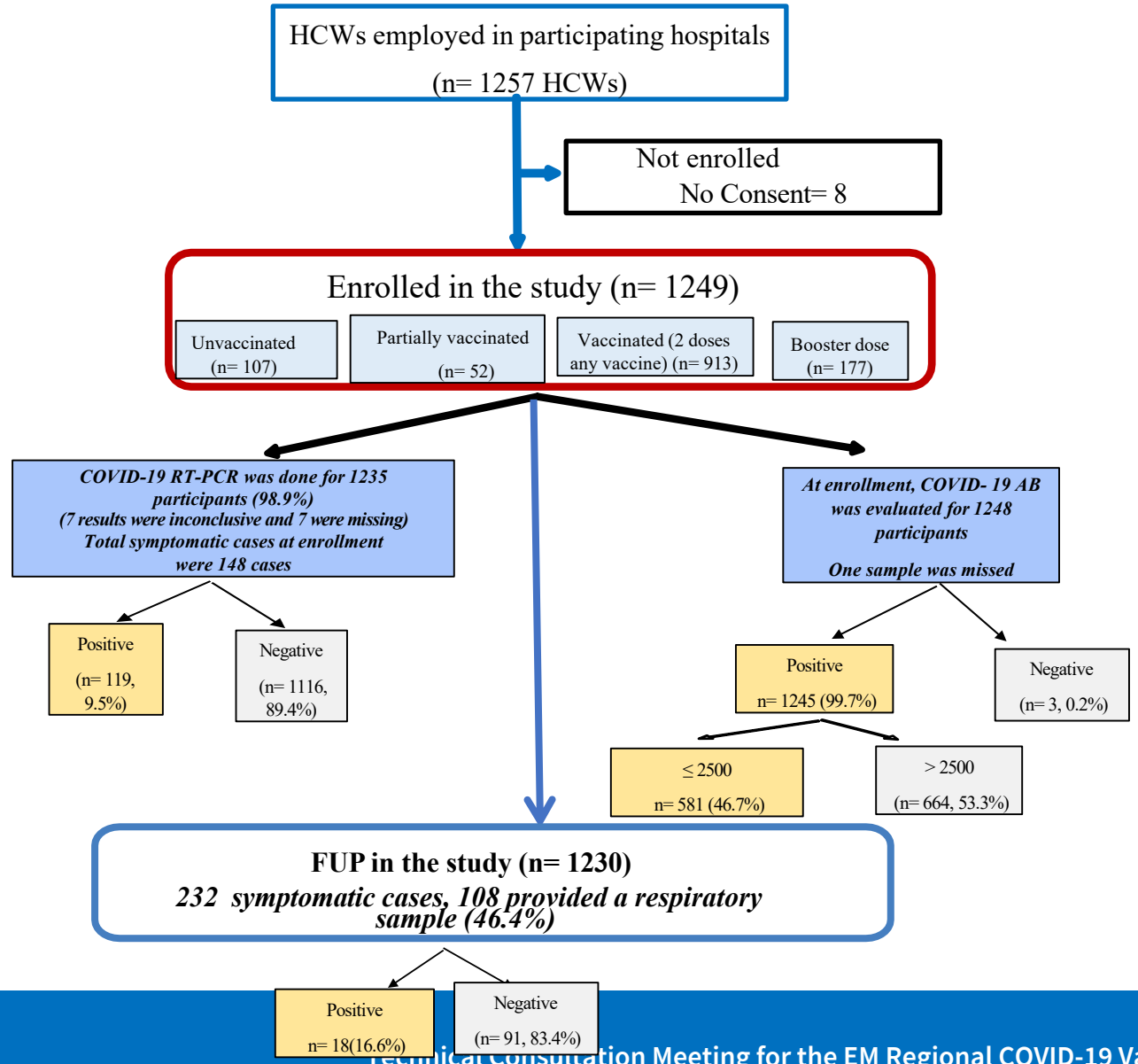
- ✓Sample preparation and detection steps integrated into one single kit.
- ✓Targets 2 viral genes (N1 and N2 genes)& sampling control (RNAse P) & internal RNA control.
- ✓External positive and negative controls.
- ✓limit of detection is 950 cp/ml.

➢QIAamp DSP Virus spin kit: for RNA extraction for all invalid samples.





Flow Charts for Study Enrollment and Sample Size



Results: Table 1. Participant Baseline Characteristics

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Variable	All Participants	Unvaccinated (any vaccine)	Partially vaccinated (1 dose any vaccine)	Vaccinated (2 doses any vaccine)	Booster dose
Total No.	1249 (100%)	107 (8.6%)	52 (4.2%)	913 (73.1%)	177 (14.2%)
Age (years), Median (IQR)	40 (30.0-49)	36 (31-44)	30.5 (27-37)	41 (31-49)	43 (34.0-55.1)
Sex (Female)	697 (55.8%)	63 (58.9%)	23 (44.2%)	516 (56.5%)	95 (53.7%)
Role/Occupation					
Physician	156 (12.5%)	18 (16.8%)	15 (28.8%)	101 (11.1%)	22 (12.4%)
Nurse	533 (42.7%)	59 (55.1%)	19 (36.5%)	370 (40.5%)	85 (48.0%)
Others	560 (44.8%)	30 (28.0%)	18 (34.6%)	442 (48.4%)	70 (39.5%)
Chronic Conditions (Yes)	322 (25.8%)	24 (22.4%)	7 (13.5%)	241 (26.4%)	50 (28.2%)
SARS CoV-2 Vaccine formulation at start of F-up					
Unvaccinated	107 (8.6%)	107 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Sinovac	81 (6.5%)	0	6 (11.5%)	66 (7.2%)	9 (5.1%)
Sinopharm	471 (37.7%)	0	12 (23.1%)	419 (45.9%)	40 (22.6%)
AstraZeneca	376 (30.1%)	0	26 (50.0%)	325 (35.6%)	25 (14.1%)
Moderna	11 (0.9%)	0	3 (5.8%)	7 (0.8%)	1 (0.6%)
Jhonson	10 (0.8%)	0	0 (0.0%)	10 (1.1%)	0 (0.0%)
Pfizer	85 (6.8%)	0	5 (9.6%)	74 (8.1%)	6 (3.4%)
MIXED	108 (8.6%)	0	0 (0.0%)	12 (1.3%)	96 (54.2%)
Delay between 2 dose and start of follow-up, Median (IQR)				310.50 (236.75-393.25)	
Delay between 3 dose and start of follow-up, Median (IQR)					157.0 (77.0-201.0)

Description Clinical endpoints

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Total cohort	Vaccination Status at the time of onset				
At enrollment (total 1235)	Total Events	Unvaccinated	Number of doses		
			1	2	3
N symptomatic with positive PCR	**13**	**1**	**1**	**8**	**3**
N asymptomatic with positive PCR	**106**	**11**	**3**	**71**	**21**
N with positive PCR requiring medical care	**8**	**1**	**0**	**4**	**3**
N with positive PCR requiring hospitalization	**0**	**0**	**0**	**0**	**0**
N with positive PCR dying	**0**	**0**	**0**	**0**	**0**
At end of the F.up (total cohort 1235 as 8 drop out before any fup	Total Events	Unvaccinated	Number of doses		
			1	2	3
N symptomatic with positive PCR	18	3	**3**	**10**	**2**
N asymptomatic with positive PCR	Not applicable				
N with positive PCR requiring medical care	12	0	3	7	2
N with positive PCR requiring hospitalization	0	0	0	0	0
N with positive PCR dying	0	0	0	0	0

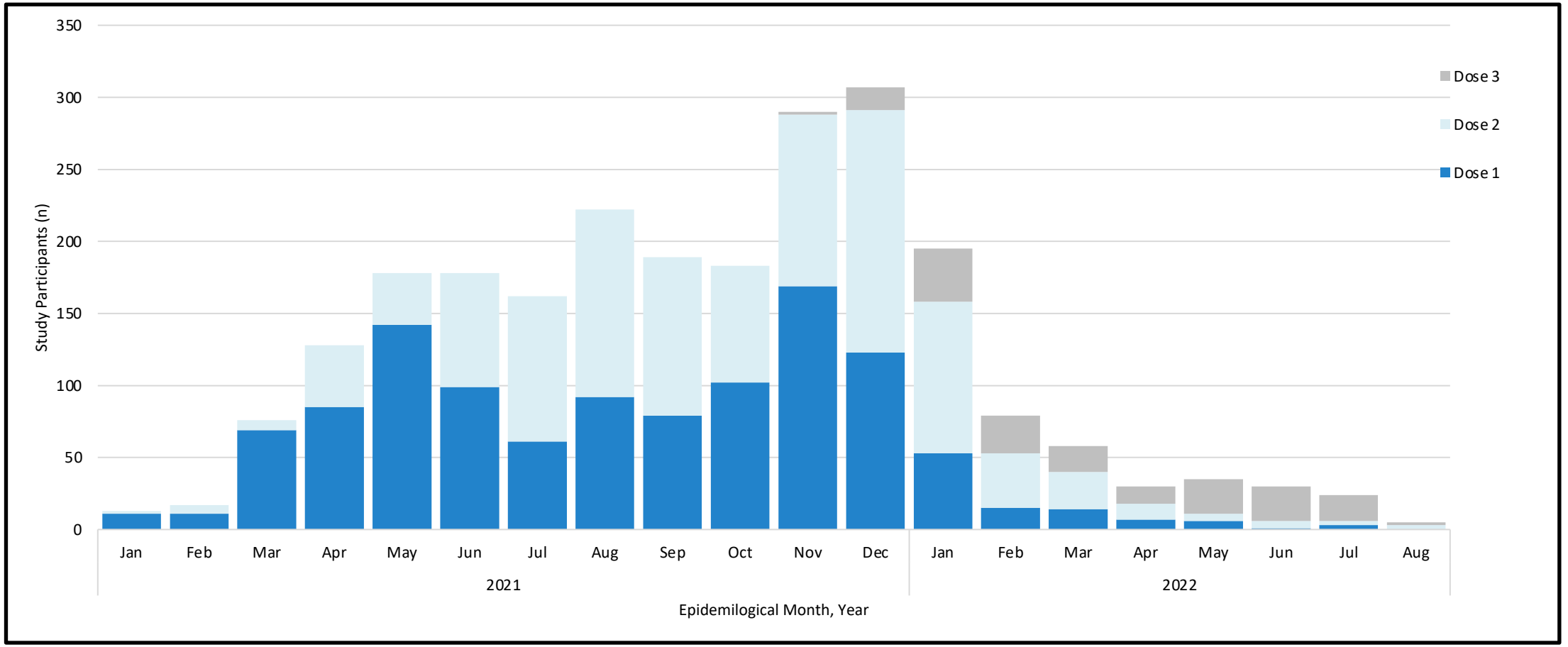

Figure 1 : COVID-19 vaccine coverage among study participants, by epidemiological month, year.

Figure 2 : Cumulative COVID-19 vaccine coverage among study participants, by epidemiological month, year.

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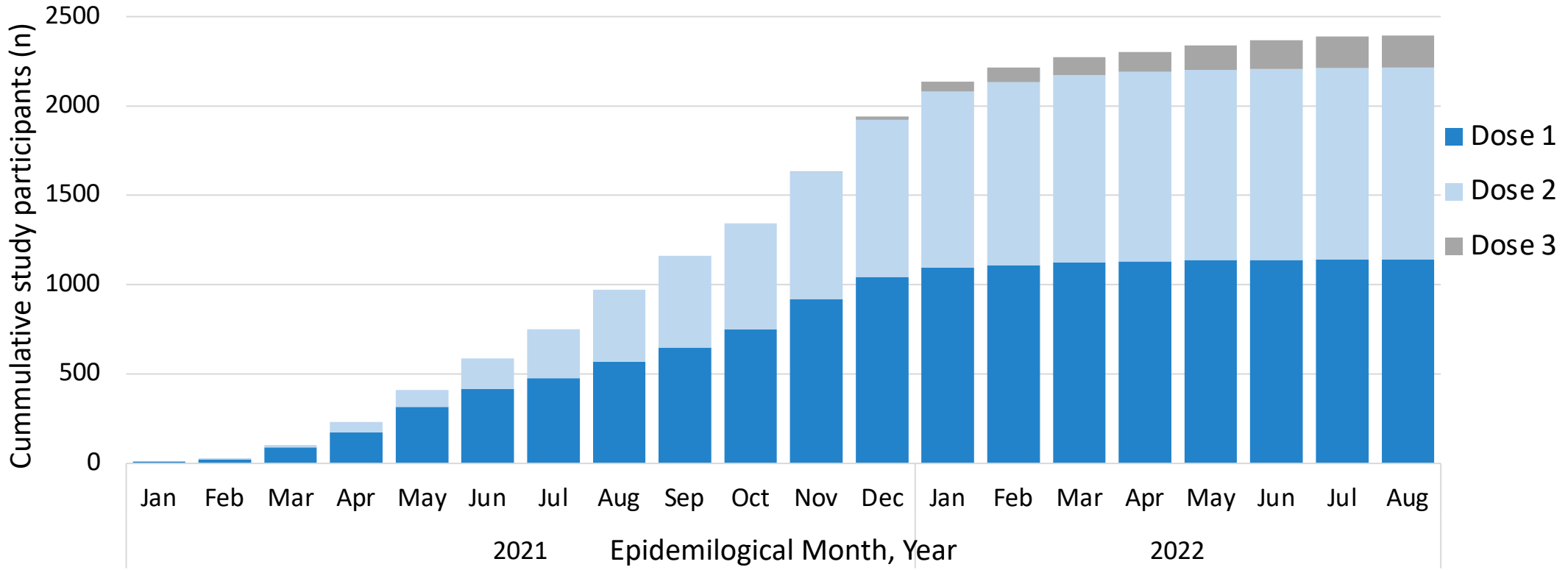


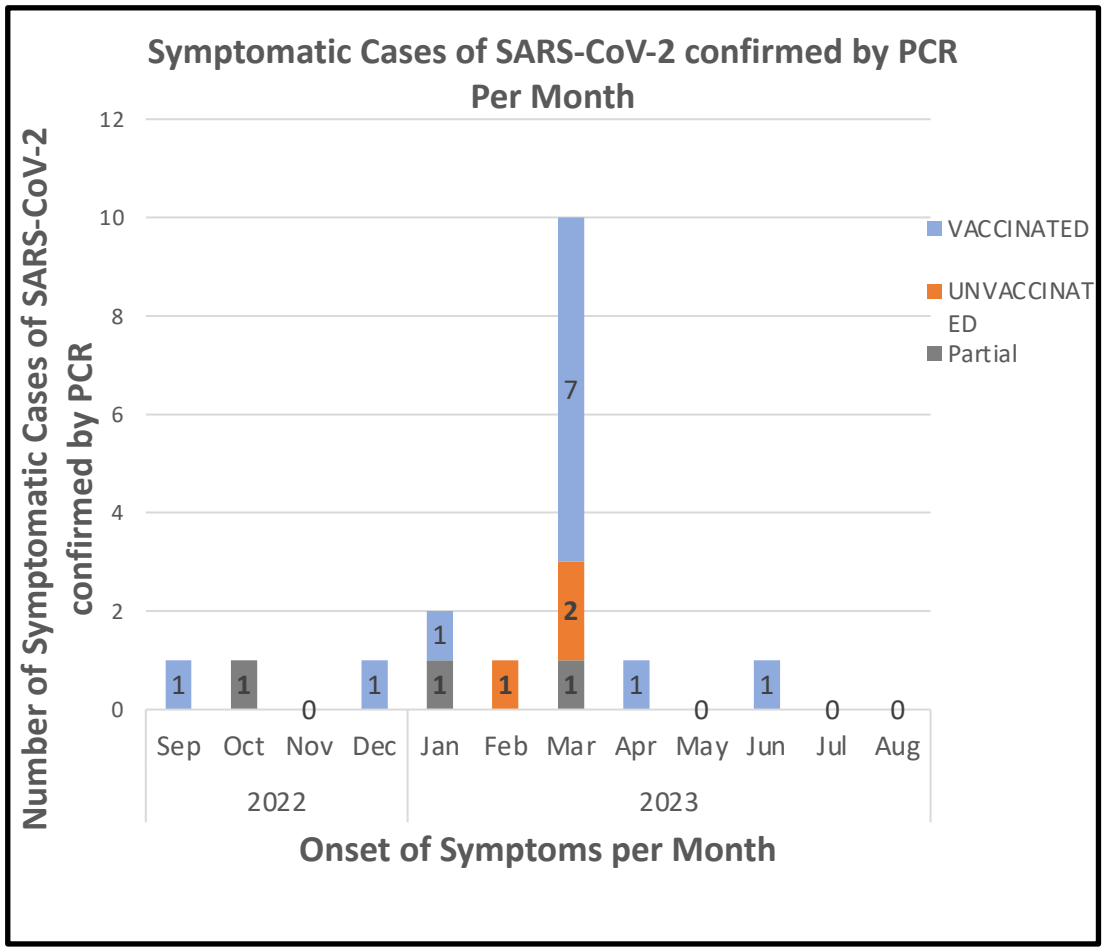


Figure 2: Number of Symptomatic Cases of SARS-CoV-2 confirmed by Rt-PCR

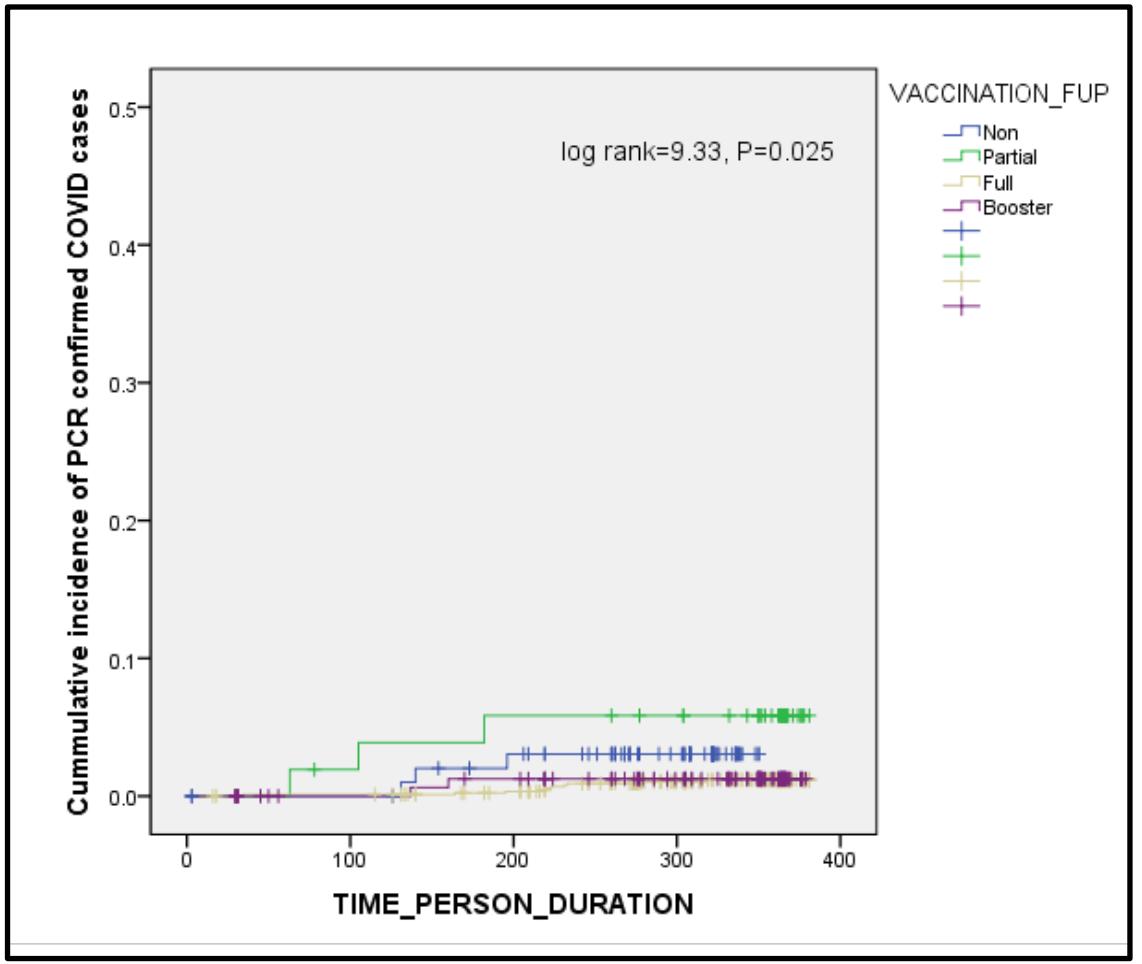
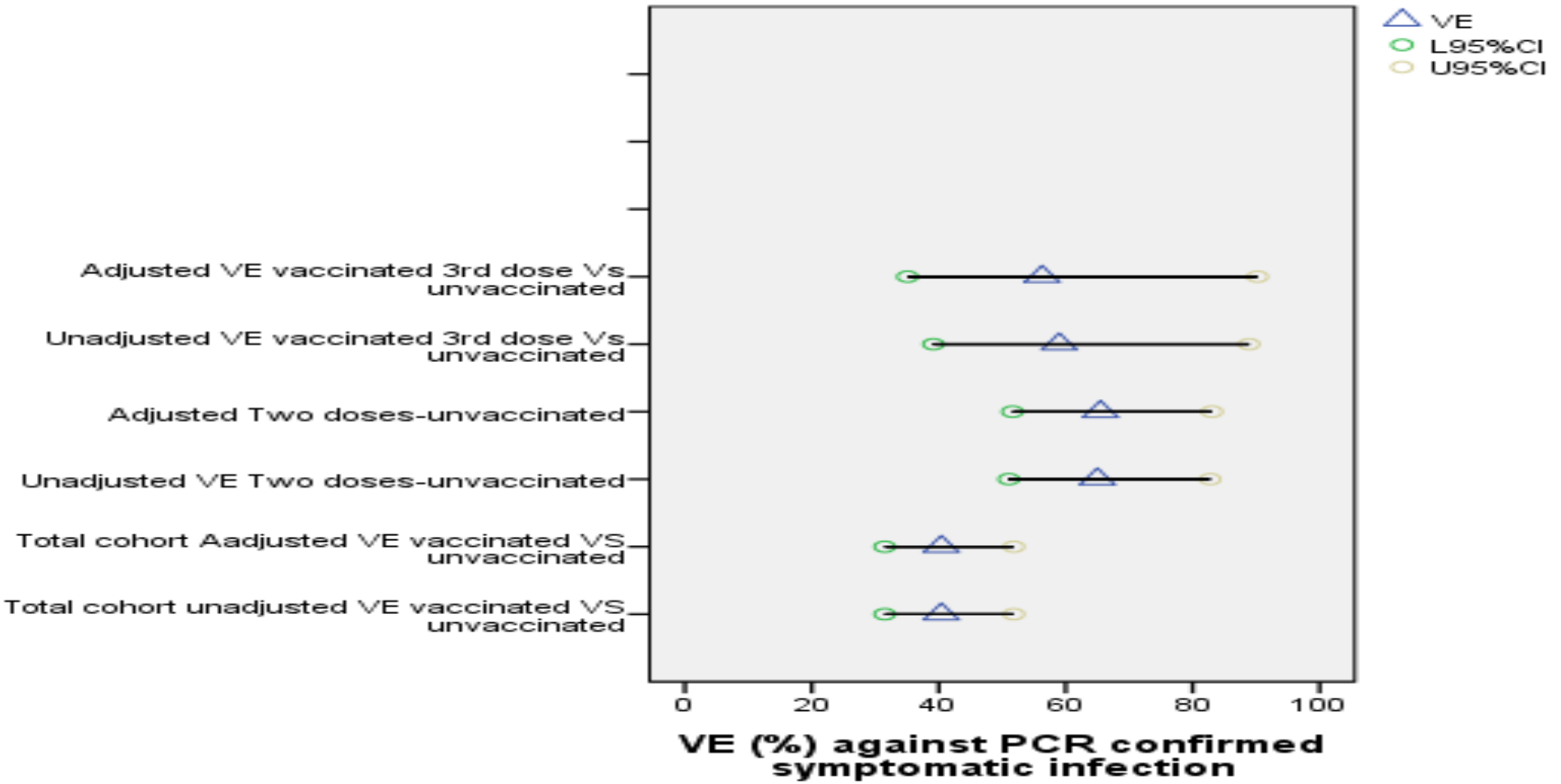


Figure 3: Survival Curve and Person-Time at Risk

VE (%) against Rt-PCR confirmed symptomatic infection



VE (%) against Rt-PCR confirmed symptomatic infection

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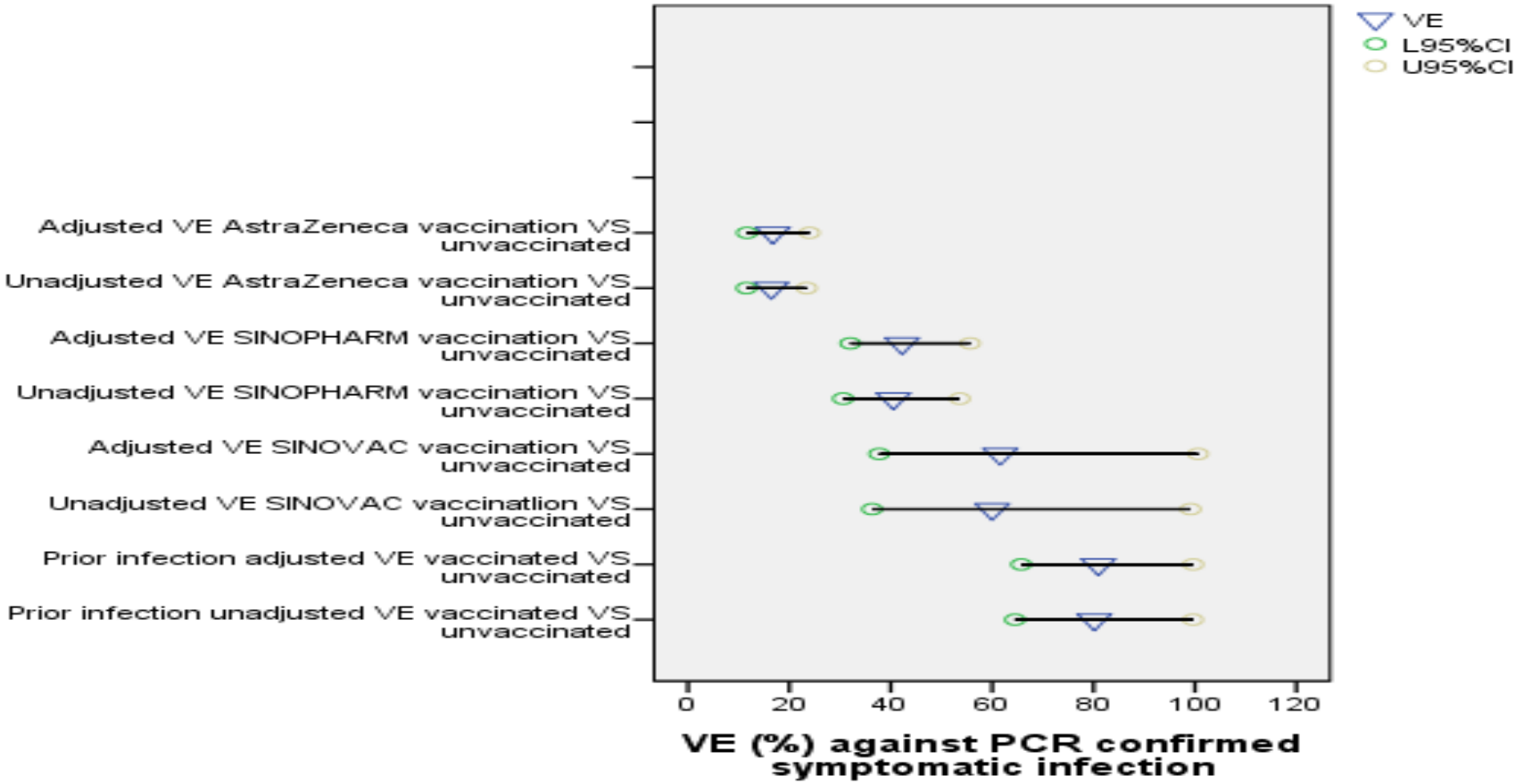

VE (%) against Rt-PCR confirmed symptomatic infection

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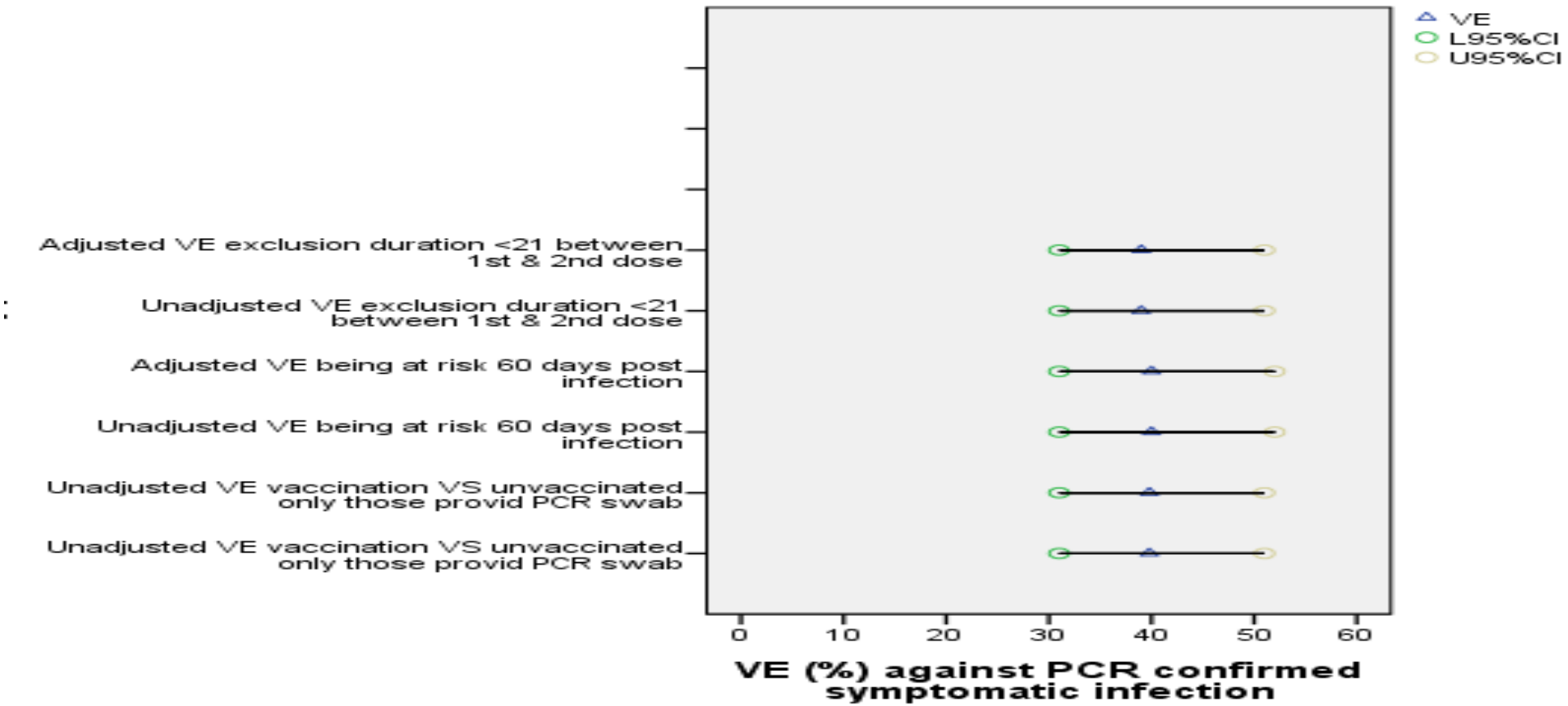

Limitations

- Starting recruitments of participants before issuing contract that is reflected in delay in purchasing required kits needed for the study.
- Subsequent delay in laboratory investigations that is passively reflected on participants' loss of interest and missing a number of samples.
- Delay in getting the security clearance by NRC side, with subsequent delay in laboratory analysis and REdCap data entry.
- Vaccine hesitancy is still a challenge among HCWs.

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Conclusions

- COVID-19 vaccine effectiveness among HCWs is between 40% - 60% , with no significant difference between groups.
- Cumulative incidence of COVID-19 infection is significantly higher among those with incomplete vaccination.
- Sensitivity analysis shows similar results of vaccine protection after:
  - exclusion of participants who had duration < 21days, between 1st and 2nd dose.
  - decreasing the post infection period to 60 instead of 90 days.
  - exclusion of symptomatic patients who refused to give nasopharyngeal swab *vs* including them in the analysis.
- VE rises up to 80% in those with hybrid immunity compared to unvaccinated HCWs with COVID-19 previous infection.

Recommendations

- The clinical significance of the booster vaccination has to be thoroughly investigated.
- The rise in antibody titers against SARS-CoV-2 and its duration are important indicator for evaluating the effectiveness of a COVID-19 vaccine.
- Knowing the circulating COVID-19 variants is an issue of concern

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Any Question?

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Thank you

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