KEMENTERIAN KESIHATAN MALAYSIA

ANTI-S ANTIBODIES AGAINST SARS-COV-2 INFECTION AMONG FOUR TYPES OF VACCINES IN MALAYSIA

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Introduction

Studies have shown that SARS-CoV-2 antibody levels can vary significantly between individuals. Some people produce high levels of antibodies in response to infection, while others produce very little[1,2]. In general, people who experience more severe COVID-19 symptoms tend to produce higher levels of antibodies[3]. However, even people with mild or asymptomatic infections can produce significant levels of antibodies[4]. Monitoring SARS-CoV-2 antibody levels can provide insights into a person's immunity to COVID-19 and inform decisions about vaccination and public health measures. Anti-S may be useful as an indicator of an effective immune response.

Objective

We conducted this study that aims to determine the immune response of anti-S antibodies against SARS-CoV-2 for all the vaccine types over one year among adult recipients in Malaysia.

Methods

This study was a longitudinal study that recruited respondents who received COVID-19 vaccine between June 2021 and December 2021 from selected vaccination centres and were followed up for a period of 12 months. They were grouped according to the vaccine received i.e Pfizer, Astra Zeneca, Sinovac and CanSino.

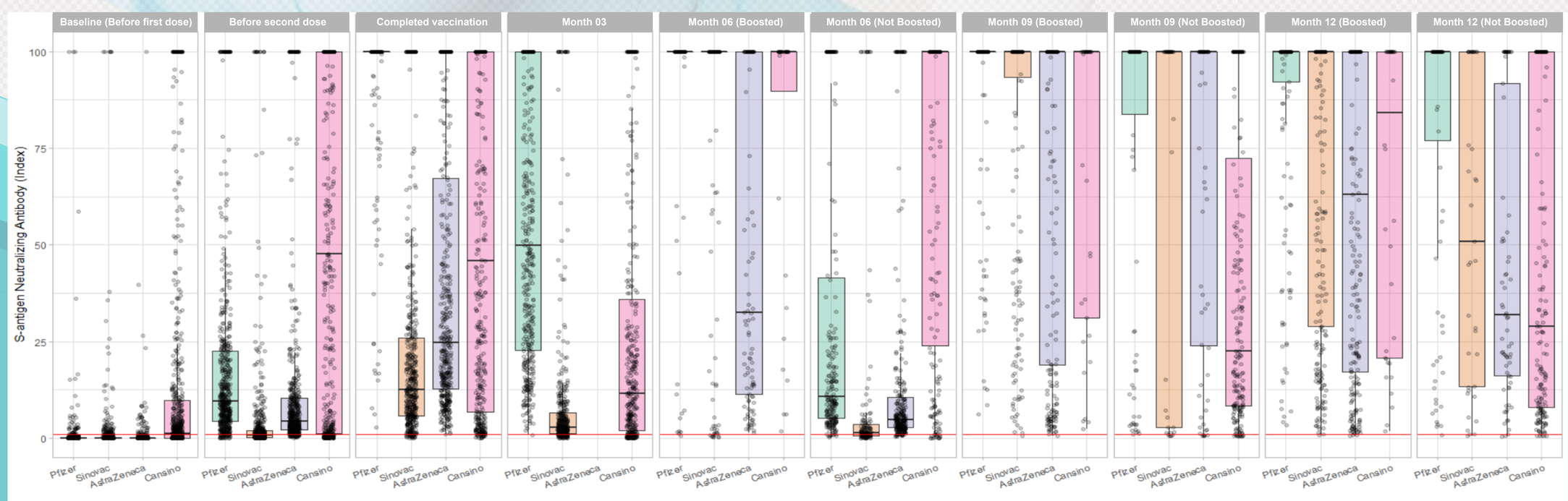
Each cohort participant from all vaccine types was followed-up for seven times in one year period from and inclusive of the initial dose of vaccination, namely, at baseline (initial dose), prior to second dose if any, 14 days after the second dose or 28 days after completed vaccination (single dose vaccine), and subsequently at 3/6/9/12 month from baseline. Respondents who agreed to join the study were given questionnaires, taken their height and weight, and were taken their venous blood to check for their antibody levels.

Data were analysed mainly using descriptive analyses over time. Median (interquartile range), and proportion with their 95% confidence intervals were computed and described. For the association of infection status and booster vaccination with the level of anti-S IgG antibody, the Mann- Whitney test was used. While for the association of types of vaccines with the level of anti-S IgG antibodies, the Kruskal-Walli's test was used. Any value of $p<0.05$ was considered to have a significant association.

Results

A total of 2513 patients were recruited in this study (Table 1), including 1276 men and 1237 women. The average age was 43.61 ± 19.71 years for Pfizer recipients, 37.18 ± 12.52 years for Sinovac recipients, 33.42 ± 10.66 years for Astra Zeneca recipients, and 36.93 ± 11.50 years for CanSino recipients. Most of the respondents were Malay in all vaccine types except CanSino with Others ethnicity. Other characteristics can been in **Table 1**.

As shown in **Figure 1**, the anti-S antibody was mainly not detectable except for the CanSino recipients with a median of 1.27 (IQR = 0.00 - 9.72) at baseline. The antibody generally increased for all vaccine types and peaked at 2 weeks after the second dose vaccination or the time of completed dose (28 days after single dose vaccination for CanSino) with the median for Pfizer, Sinovac, Astra Zeneca and CanSino were 100(100.0-100.00), 12.61 (5.73-26.01), 24.01 (12.63-67.36) and 45.96 (6.84-100.0) respectively. During the third month follow-up, the antibody seemed to be decreasing for all vaccines. There was no follow-up made in the third month for respondents who received the Astra Zeneca vaccine due to the completion date and the third-month follow-up was around the same time. The median of anti-S antibody among those who received Pfizer vaccination was higher than other vaccines. From this figure, those who received booster dose vaccination had a higher level of anti-S antibody compared to those who did not receive a booster.



	Baseline (Before first dose) (n=2513)				Before second dose/ 14 days after single dose (n=2257)				Completed vaccination (n=1922)				Month 3 (n=1228)			Month 6 (Boosted) (n=495)				Month 9 (Not boosted) (n=901)				Month 9 (Boosted) (n=767)				Month 9 (Not boosted) (n=426)				Month 12 (Boosted) (n=725)				Month 12 (Not boosted) (n=393)			
Vaccine	PF	SN	AZ	CS	PF	SN	AZ	CS	PF	SN	AZ	CS	PF	SN	CS	PF	SN	AZ	CS	PF	SN	AZ	CS	PF	SN	AZ	CS	PF	SN	AZ	CS	PF	SN	AZ	CS	PF	SN	AZ	CS
Tested	612	608	617	676	577	555	563	562	507	487	486	533	441	419	368	109	241	109	36	377	139	285	234	188	283	263	33	114	37	72	203	177	269	243	36	100	39	73	181
o.of Positive	50	94	46	357	543	235	518	428	507	462	486	422	440	347	298	108	233	109	36	235	90	270	220	188	282	262	33	113	33	86	191	177	268	240	36	99	36	71	176
Positive rate (%)	8.2	15.5	7.5	52.8	94.1	42.3	92.0	76.2	100.0	94.9	100.0	79.2	99.8	82.8	81.0	99.1	96.7	100.0	100.0	62.3	64.7	94.7	94.0	100.0	99.6	99.6	100.0	99.1	89.2	91.7	94.1	100.0	99.6	98.8	100.0	99.0	92.3	97.3	97.2
Median (25^{th}, 75^{th} percentiles	0 (0, 0.21)	0 (0, 0.26)	0 (0,0)	1.27 (0, 9.72)	9.53 (4.44, 22.53)	0.77 (0.26, 2.07)	4.40 (2.27, 10.40)	47.58 (1.13, 100.0)	100.0 (100.0, 100.0)	12.61 (5.73, 26.01)	24.81 (12.63, 67.36)	45.96 (6.84, 100.0)	49.92 (22.64, 100.0)	2.71 (1.23, 6.64)	11.59 (1..92, 36.41)	100.0 (100.0, 100.0)	100.0 (100.0, 100.0)	32.44 (11.32, 100.0)	100.0 (80.50, 100.0)	10.84 (5.26, 42.00)	1.47 (0.65, 3.84)	4.84 (2.72, 10.47)	100.0 (23.24, 100.0)	100.0 (100.0, 100.0)	100.0 (92.55, 100.0)	100.0 (18.94, 100.0)	100.0 (31.10, 100.0)	100.0 (78.37, 100.0)	100.0 (2.86, 100.0)	100.0 (23.77, 100.0)	22.52 (8.34, 73.92)	100.0 (92.23, 100.0)	100.0 (28.94, 100.0)	63.09 (17.12, 100.0)	84.14 (20.68, 100.0)	100.0 (74.61, 100.0)	50.88 (13.20, 100.0)	31.91 (16.17, 91.66)	28.83 (7.91, 100.0)

Figure 1: S-antigen neutralizing antibody titres from baseline to 12th months after vaccination follow-up (after 6th months based on booster dose)

Table 1: Socio-demographic characteristics, past medical history, lifestyle and Covid-19 infection of the respondents at baseline based on vaccine type.

Characteristics	Adults (N=2513) Pfizer (n; %)	Sinovac (n; %)	AstraZeneca (n; %)	CanSino (n; %)
Overall Participants	612 (100.0)	608 (100.0)	617 (100.0)	676 (100.0)
Age				
Mean age SD	43.61 19.71	37.18 12.52	33.42 10.66	36.93 11.50
18-39 years old	329 (53.8)	344 (56.6)	442 (71.6)	418 (61.8)
40-59 years old	92 (15.0)	235 (38.7)	168 (27.2)	232 (34.3)
60 years old and above	191 (31.2)	29 (4.8)	7 (1.1)	26 (3.8)
+	+	+	+	+
-	-	-	-	-
Sex				
Male	321 (52.5)	320 (52.6)	276 (44.7)	359 (53.1)
Female	291 (47.5)	288 (47.4)	341 (55.3)	317 (46.9)
Ethnicity				
Malay	424 (69.3)	480 (78.9)	422 (68.4)	275 (40.7)
Chinese	82 (13.4)	70 (11.5)	145 (23.5)	1 (0.1)
Indian	64 (10.5)	39 (6.4)	41 (6.6)	0
Bumiputera Sabah & Sarawak	34 (5.6)	10 (1.6)	6 (1.0)	54 (8.0)
Others	8 (1.3)	9 (1.5)	3 (0.5)	346 (51.2)
Nationality				
Malaysian	608 (99.3)	599 (98.5)	612 (99.2)	329 (48.7)
Non-Malaysian	4 (0.7)	9 (1.5)	5 (0.8)	347 (51.3)
Occupation				
Government	36 (5.9)	45 (7.4)	68 (11.0)	1 (0.1)
Semi-government	8 (1.3)	7 (1.2)	12 (1.9)	1 (0.1)
Private	136 (22.2)	283 (46.5)	293 (47.5)	262 (38.8)
Self-employed	117 (19.1)	90 (14.8)	62 (10.0)	180 (26.6)
Unpaid worker	1 (0.2)	2 (0.3)	1 (0.2)	1 (0.1)
Unpaid family worker	2 (0.3)	3 (0.5)	0	0
Non-employed	312 (51.0)	178 (29.3)	181 (29.3)	231 (34.2)
Location				
Kedah	0	0	0	272 (40.2)
Melaka	0	212 (34.9)	0	0
Penang	0	0	279 (45.2)	0
Sabah	0	0	0	125 (18.5)
Sarawak	167 (27.3)	0	0	0
Selangor	230 (37.6)	396 (65.1)	338 (54.8)	279 (41.3)
Terengganu	215 (35.1)	0	0	0

Discussion

The anti-S antibody among all the vaccines seemed to decline starting at third months after vaccination. This is similar to studies done previously by Alejo Erice that showed the antibody level decreased at three months after vaccination in 60% of the sample who received Pfizer vaccination5.

The anti-S antibodies among those who had been infected with COVID-19 regardless of the time points seemed to be higher as compared to those who were never been infected. The infection boosts the immune response. This can be supported by a study done by Gorriz that showed the group of vaccinated and infected people had the highest anti-S antibody level compared to other groups in the study6.

Conclusion

Our study showed the high seropositivity of anti-S antibodies even after one year of vaccination and various levels of anti-S antibodies among the vaccine recipients of every vaccine administered in Malaysia. In detail, this study provides information on the titre of anti-S antibodies to SARS-CoV-2 among the vaccine recipients over the one-year period post-vaccination. The greatest benefit of this research is the knowledge of the immune status before and after the vaccination which allows inferences about the immune response and serves as an indicator of the immunity level among the population in Malaysia.

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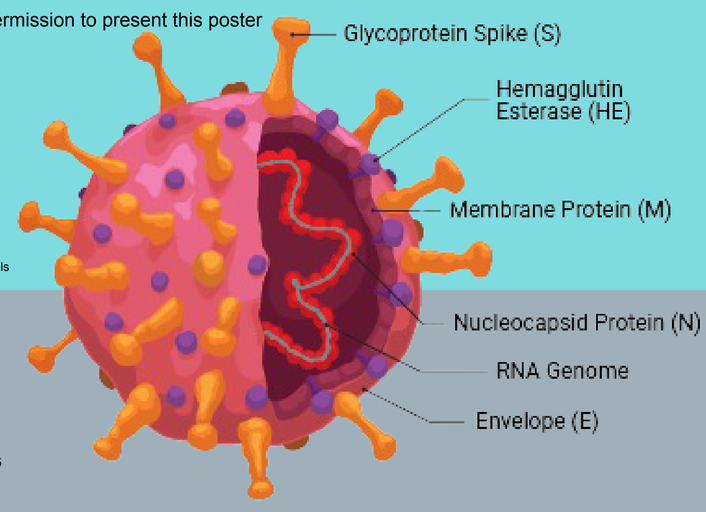

References

1. Liu S, Lu S. Antibody responses in COVID-19 patients. J Biomed Res. 2020;34(6):410. doi:10.7555/JBR.34.20200134
2. Scourfield DO, Reed SG, Quastel M, et al. The role and uses of antibodies in COVID-19 infections: a living review. Oxf Open Immunol. 2021;2(1). doi:10.1093/OXFIMM/IQAB003
3. Amjadi MF, O'Connell SE, Armbrust T, et al. Specific COVID-19 Symptoms Correlate with High Antibody Levels against SARS-CoV-2. Immunohorizons. 2021;5(6):466. doi:10.4049/IMMUNOHORIZONS.2100022
4. Ong DSY, Fragkou PC, Schweitzer VA, Chemaly RF, Moschopoulos CD, Skevaki C. How to interpret and use COVID-19 serology and immunology tests. Clinical Microbiology and Infection. 2021;27(7):981-986. doi:10.1016/J.CMI.2021.05.001
5. Erice A, Varillas-Delgado D, Caballero C. Decline of antibody titres 3 months after two doses of BNT162b2 in non-immunocompromised adults. Clin Microbiol Infect. 2022;28:139-140. doi:10.1016/j.cmi.2021.08.023
6. Gorriz JM, Dong Z, Socan M, Prosenc K, Mrzel M. Seroprevalence of Anti-SARS-CoV-2 Antibodies Following the Omicron BA.1 Wave. Int J Environ Res Public Health. Published online 2023. doi:10.3390/ijerph20043665