



Original Article

Antibody Response of Covishield Vaccine among Health Care Workers at Rajshahi Medical College Hospital- A Cross-Sectional Study

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Abstract

Background: Nationwide vaccination against SARS CoV-2 is the hope for stopping the pandemic and death from COVID-19. Till today several vaccines have been developed. In Bangladesh, the Covishield vaccine was the first coronavirus vaccine that was administered to health care workers on a priority basis. To assess antibody response in our community, evaluation of response in this group was necessary.

Objectives: Our main aim of this study was to evaluate antibody response to SARS CoV-2 after vaccination with the Covishield vaccine in health care workers.

Patients and Methods: It was a cross-sectional type study. Eighty-seven purposively collected health care workers were included in the study. Demographic profile, Co-morbidities, and other variables were recorded in a questionnaire. Blood samples were collected to assess SARS CoV-2 specific antibody.

Results: Mean age in our study was 41.29±7.87 years. Most of them were between 35 to 44 years of age. Male: Female ratio was 3.35:1. Obesity (BMI>25) was present in 25.9% of individuals, hypertension in 33.3%, and DM in 14.9% of individuals. Overall 82.8% were vaccinated with the Covishield vaccine, and the remaining were not vaccinated. 96.6% were found to be antibody positive. All individuals (100%) who were either had a history of COVID-19 or received at least one shot of the Covishield vaccine were found antibody positive.

Conclusion: Covishield vaccine was found to be highly effective in producing antibody response among healthcare workers.

Keyword: Antibody response, Covishield, SARS CoV-2.

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Introduction

Several types of vaccines for COVID-19 had developed within one year since the first cases of COVID-19 due to infection with the SARS CoV-2

infection were reported in December 2019 from Wuhan in the Hubei province of China.¹ During this time, total COVID-19 cases exceeded 242.3 million and death 4.9 million worldwide.² In

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Bangladesh total number of confirmed cases were more than 1.5 million, and total death from COVID-19 were more than 27 thousand.³ Nationwide vaccination against the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS CoV-2) infection, the cause of Coronavirus disease-2019 (COVID-19) pandemic, is currently ongoing across the globe.⁴ In Bangladesh 1st vaccination against SARS CoV 2 was first started on 27 January 2021. Since then, 1st dose of vaccine was given to 38.8 million people, and 2nd dose of vaccine was given to 1.9 million people, which is 23% and 12% of the total population, respectively.³

Several studies have evaluated the immune response to the Covishield vaccine. The response rate range from 69.9% to 98.1%.^{1,4,5,6,7} Frequency of post-vaccination mild to moderate side effects were range from 18.1% to 82%.^{4,6} In a study performed in India; comorbidities were found to be significantly related to an increase in the nonseropositivity rate by >4 fold. Also, male gender was found to be a significantly increase in the nonseropositivity rate by >3 fold.⁴ The proportion of detectable antibodies were found to be similar across age group.^{4,7} Our study was

performed to detect the antibody response of the Covishield vaccine in health care workers at Rajshahi who received the Covishield vaccine.

Materials and Methods

It was a cross-sectional type study. Initially, ninety individuals were enrolled in our study. But 3 of them refrained from performing a blood test for specific antibodies. A total of eighty-seven health care workers from Rajshahi Medical College Hospital, Rajshahi, Bangladesh, were included in this study. Samples were taken purposively. All of them were included in the study following written informed consent. Demographic profile and comorbidities (HTN, DM, IHD, Bronchial asthma, and obesity) were recorded in a pretested questionnaire. Height and weight were measured for the calculation of BMI. History of COVID-19 of respondents and their family members were recorded. Respondents were asked about whether they were exposed to any COVID 19 patients or performed any aerosol-generating procedure. Finally, blood samples were collected to assess SARS CoV-2 specific antibodies.

Results

Table 1: Demographic characteristics (N=87)

		Frequency	%
Age distribution	1. <25 years	1	1.1
	2. 25-29 years	5	5.7
	3. 30-34 years	8	9.2
	4. 35-39 years	24	27.6
	5. 40-44 years	21	24.1
	6. 45-49 years	13	14.9
	7. >50 years	15	17.2
Gender	1. Male	67	77.0
	2. Female	20	23.0
Religion	1. Islam	79	90.8
	2. Hindu	8	9.2
Mean age: 41.29±7.85 years			

In our study mean±SD age of the respondents was 41.29±7.85 years. Most of our patients were between 35-44 years age group (51.7%) (Table-1). M: F ratio was 3.35:1. Obesity was found in 46 (52.9%) individuals, and only 11 (12.6%) had a normal BMI. Obesity was found to be more frequent

among females (75%) compared to males (46.3%) (Table 2). Only 2 (2.3%) had a history of smoking, and only 1 (1.1%) respondent had a history of betel nut use (Table 3).

Table 2: Category of BMI (N=87)

BMI	Gender		Total n (%)
	1. Male n (%)	2. Female n (%)	
1. Normal	10 (14.9)	1 (5.0)	11 (12.6)
2. Overweight	26 (38.8)	4 (20.0)	30 (34.5)
3. Obese	31 (46.3)	15 (75.0)	46 (52.9)
Total	67 (100)	20 (100)	87

Mean BMI: 25.59±2.81

Table 3: Personal history

	Frequency	%	
Smoking history	1. Smoker	2	2.3
	2. Ex-smoker	4	4.6
	3. Nonsmoker	81	93.1
Betel nut use	1	1.1	

Table 4: Comorbidities (N=87)

	Frequency	%
IHD	1	1.1
Hypertension	29	33.3
Diabetes	13	14.9
Bronchial asthma	8	9.2
Obesity	4	4.6
Major operation	5	5.7

Table 5: Drug history (N=87)

	Frequency	%
Regular sedative	1	1.1
Antihypertensive	28	32.2
Antidiabetic	13	14.9
Anti-Platelet	2	2.3
Lipid-lowering	10	11.5
Regular anti-ulcerant	5	5.7
Prophylaxis for COVID-19	4	4.6
Steroid and immunosuppressive	2	2.3

Hypertension was present in 33.3% of individuals, diabetes in 14.9%, and bronchial asthma in 9.2% of individuals. We did not have any respondents having CKD or cancer (Table 4). 32.2% of the subjects were taking antihypertensive, 14.9% were taking antidiabetic, and 11.5% were taking lipid-lowering regularly. 2 respondents were on steroid/immunosuppressive medications, and 4 (4.6%) had taken prophylaxis for COVID-19 (Table 5).

Table 6: History and exposure to COVID-19

		Frequency	%	Mean \pm SD
History of COVID		12	13.8	
Duration since COVID infection	1. <6 months	3	25.0	225.25 \pm 84.47 days
	2. >6 months	9	75.0	
Family member affected by COVID		12	13.8	
Exposure to COVID-19		68	78.2	
Place of exposure	1. Hospital	39	57.4	
	2. Private chamber	4	5.9	
	3. Both	25	36.8	
Performed aerosol-generating procedure		15	17.2	
Frequency of aerosol-generating procedure	1. Frequently	3	20.0	
	2. Occasionally	9	60.0	
	3. Rarely	3	20.0	

Among the respondents, 12 (13.8%) had a history of COVID-19. Mean \pm SD duration since the time of COVID-19 was 225.25 \pm 84.47 days. 25% of those had a history of COVID-19 within six months. 13.8% had a history of at least one family member affected with COVID 19. The majority of the respondents

(78.2%) had a history of exposure to COVID 19 patients. 57.4% (39) had been exposed to COVID 19 patients at a government hospital, 5.9% at the private chamber, and 36.8% at both practicing areas. 82.8% had never performed aerosol-generating procedures (Table 6).

Table 7: Previous vaccination status

	Frequency	%
Vaccinated as per EPI schedule	73	83.9
HBV	74	85.1
Influenza	13	14.9
Meningococcus	6	6.7
Pneumococcus	2	2.3

Table 8: Vaccination status against COVID-19 (N=87)

	“0” Shot	“1” shot	“2” shots
	n (%)	n (%)	n (%)
Vaccination status- all	11 (12.6)	4 (4.4)	72 (82.8)
Vaccination status of those who were never infected with covid	9 (12.0)	4 (5.3)	62 (82.7)

Table 9: Covishield vaccination duration and side effects (N=76)

		Frequency	%	Mean \pm SD
Duration since Covishield 1	1. <60 days	2	2.7	99.83 \pm 9.89 days
	2. >60 days	74	97.3	
Side effects after Covishield 1		23	30.7	
Duration since Covishield 2	1. <21 days	1	1.4	40.39 \pm 7.32 days
	2. >21 days	71	98.6	
Side effects after Covishield 2		10	13.9	

In our study, along with EPI vaccines, most of the respondents (85%) were vaccinated against HBV, but the frequency of other vaccinations was very low (Table 7). In our study, 82.8% (72) had completed two doses of the Covishield vaccine. 4.4% (4) had received a single dose, and 12.6% (11) did not receive any dose of the Covishield vaccine (Table 8). Mean (\pm SD) duration from 1st dose of vaccine was 99.83 (\pm 9.89) days, and 97.3% had received 1st dose >60 days back. Mean (\pm SD) duration from 2nd dose of vaccine 40.39 (\pm 7.32) days and 98.6% had received the second dose more than 21 days back. Mild to moderate side effects were observed in 30.7% after 1st dose and 13.9% after two and dose (Table 9).

Table 10: Antibody response among different groups depending on exposure to COVID-19 and/or vaccination (N=87)

		Antibody titer			p
		1. Negative (n=3) N (%)	2. Positive (n=84) N (%)	Total N (%)	
History of COVID 19	1. Yes	0 (0)	12 (100)	12 (100)	>0.05
	2. No	3 (4.0)	72 (96.0)	75 (100)	
Exposure to COVID 19	1. Yes	2 (2.9)	66 (97.1)	68 (100)	>0.05
	2. No	1 (5.3)	18 (94.7)	19 (100)	
Category of vaccination	1. "0" Shot	3 (27.3)	8 (72.7)	11 (100)	<0.01
	2. "1" shot	0 (0)	4 (100)	4 (100)	
	3. "2" Shots	0 (100)	72 (100)	72 (100)	
Neither infected nor vaccinated vs. either infected and/or vaccinated	1. Neither infected nor vaccinated	3 (33.3)	6 (66.7)	9 (100)	<0.01
	2. Either infected and/or vaccinated	0 (0)	78 (100)	78 (100)	
Vaccination status of those who were never infected with covid	1. "0" Shot	3 (33.3)	6 (66.7)	9 (100)	<0.01
	2. "1" shot	0	4 (100)	4 (100)	
	3. "2" Shots	0	62 (100)	62 (100)	
Total		3 (3.4)	84 (96.6)	87	

Mean antibody titer: 11.64 (± 7.79)

Overall antibody against SARS COV-2 was positive among 96.6% (84) respondents and negative in only 3.4% (3). Three antibody-negative individuals were neither vaccinated nor had a history of COVID-19 infection. Antibody titer was found positive in all individuals (78) who were either had a history of COVID-19 or received at least one shot of Covishield vaccine. Antibody response is significantly higher among those responders who were either infected with COVID-19 or vaccinated with Covishield vaccine compared to those who were neither infected with COVID-19 nor vaccinated ($p < 0.01$) (Table 10).

Discussion

In our study, mean age was similar to most other studies, but a lower mean was observed by Borkakoty et al.⁵ and Chau et al.⁷ and a higher mean was observed by Njarekkattuvalappil et al.⁸. Sing et al.⁴ and Njarekkattuvalappil et al.⁸ showed a male preponderance which is similar to our study, although the proportion of males was much higher in our study. Female preponderance was seen in some studies.^{1,5,6,7} Sing et al.⁴ and Njarekkattuvalappil et al.⁶ had found higher BMI,

which are 67.5% and 61.1%, respectively. But a lower frequency of overweight and obesity was observed by Sing et al.⁴. High frequency of overweight (BMI>23) and Obese (BMI>25) individuals were observed among health care workers (HCW) included in our study. Affluence, sedentary, and lack of exercise may be the cause.

Although the total frequency of comorbidities was high in our study, the frequency of IHD was less (1.1%) compared to Sing et al. (2.5%)⁴. The frequency of comorbidities in our study was very

high, which is far more than most other studies. Sing et al.⁴ had shown that 24.3% of the respondents had at least one comorbidities (HTN, DM, IHD, dyslipidemia), and hypertension was observed in 18.3%. Whereas in our study, it was 33.3%. Jeewandara et al.¹ and Njarekkattuvalappil et al.⁶ had found the frequency of co-morbid conditions to be 7.9% and 19.4%, respectively.

The proportion of respondents having a history of COVID-19 was higher than that observed by Jeewandara et al.¹ and Njarekkattuvalappil et al.⁸ (3.9% and 5.6%, respectively). A higher frequency of COVID-19 was also observed by Sing et al.⁴ Different studies had observed different frequencies of side effects after receiving Covishield vaccine ranging from 18.1% to 82%.^{4,6} Including ours, none of the studies had observed any severe side effects after receiving the vaccine dose.

The seroconversion rate in the current study was 100%. A high rate of seroconversion after the Covishield vaccine was observed by all previous studies^{1,4,5,6,7}, the lowest being observed by Njarekkattuvalappil et al.⁶, which is 69.9%. The Single-dose Covishield vaccine was found to induce a high level of antibody to the receptor-binding domain (RBD) and ACE2. Blocking antibody was present in naïve individuals, which is greater than the immune response in those who experienced a mild or asymptomatic natural infection.¹ Seroconversion was >95% after two and doses of the Covishield vaccine in most of the studies.⁴ Evidence for optimal vaccine dose, time, and need for booster dose remains scarce⁶, as well as the effectiveness of the vaccine towards different concerning variants of SARS CoV-2, is also to be defined.

Conclusion

The antibody response of the Covishield vaccine was found to be high in our setting, even after a single dose. Mutation of virus and newer variants of SARS CoV-2 pose a challenge to the effectiveness of the vaccine. The limitations of our study were the small sample size and purposive sampling process.

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