ORIGINAL ARTICLE

Impact of Vaccination on Symptomatology among COVID-19 Infection and Re-infection

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ABSTRACT

Background: Present indications proposed strong bases that people suffered from SARS-CoV-2 infection are still susceptible to re-infection. Studies proposed that one of the COVID-19 viral vector vaccine and two genetic mRNA vaccines presented generous defense for COVID-19 infection as well as persisted effectively against mutated variants.

Aim: To observe the impact of vaccination symptomatology among patients presented with COVID-19 infection for the first time and compared it with those of re-infected cases during 5th wave in Pakistan

Methods: This descriptive study included a total of 248 patients were interviewed using a semi-structured questionnaire. Patients themselves or their attendants receiving reports from the counter of various laboratories were targeted. A verbal informed consent was taken before data collection. Following information about, job nature, side effects after vaccination, comorbidities, level of symptoms (i.e. mild, moderate and high)

Results: A total 248 patients consisting of 52.0% females and 48.0% males with overall mean age of 35.96±17.94 years. A total of 37.5% patients were re-infected further proportion of male gender 46.2% and 29.5% were females. Proportion of re-infection in fully vaccinated group remained to be 35.5%, partially vaccinated as 43.9% and unvaccinated as 42.9%. ANOVA was applied to compare the severity of symptoms with full, partial and unvaccinated patients.

Conclusion: Lack of discernable variations in protection against COVID-19 re-infection were observe through vaccination or prior infection. Ultimately trends show an enhancement in level of protection from re-infection was shown as prior infection alone, partial vaccination and full vaccination respectively.

Keywords: COVID-19, SARS-CoV-2, re-infection, Symptomatology.

INTRODUCTION

A new taint with sever acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19 converted to the serious worrisome in December 2019 and global dashboard shows 627 million cases and 6.57 million confirmed deaths linked to COVID-19[1]. Generally, people who get infection with COVID-19 and recover from it afterwards should acquire immunity from re-infection which proved to be no longer effective and lasts for a maximum of five months or so among 83% people, as revealed in study disseminated during January 2021[2]. During the course of around last three years, repeated infections with SARS-CoV-2 have distressed the trust of physicians on capability of immune response to endure vs virus[3].

The initial patient of re-infection with COVID 19 was available in Hong Kong diagnosed in August 2020 when a 33 years old man happened asymptomatically this time and recognized to be infested with dissimilar strain from its primary infecting strain[4]. Following this many other countries like Italy[5] and United states[6] also presented the emerging re-infected cases. Various persons have possible professional acquaintance and comprise in diversity of works alike labor class, market workers and healthcare workforces are at greater risk of attaining COVID-19 infection[7]. Numerous explanations for re-infection have been assumed amongst various classes of community consisting decreased ability of natural immunity, professional disclosure, conceded sero-conversion in primary infection, minor symptoms if first contagion, inattention in using personal protective equipment, new COVID-variants escaping the immune response and co-morbidities etc[8].

Present indications proposed strong bases that people suffered from SARS-CoV-2 infection are still susceptible to re-infection. On the other hand rates of mortality and hospitalization among re-infected patients remained substantially low however the dynamics of COVID-19 reinfection vaguely understood. It has been noticed that prior infection with COVID-19 converses some

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immunity to unvaccinated individuals but this immunity has been reportedly wanes after a period of few weeks or months[9]. Five types of vaccines were prepared to control the COVID-19 including viral vector/adenovirus vaccines, Genetic mRNA vaccines, virus inactivated vaccines, attenuated vaccines and protein vaccines[10].

Studies proposed that one of the COVID-19 viral vector vaccine and two genetic mRNA vaccines presented generous defense for COVID-19 infection as well as persisted effectively against mutated variants. [11] As of in March 2022, more than 80% of the adult Pakistani population had been vaccinated for COVID-19 while the sufficient doses were available for the rest of population[12].

Considering the above discussions present study was proposed to observe the impact of vaccination symptomatology among patients presented with COVID-19 infection for the first time and compared it with those of re-infected cases during 5th wave in Pakistan.

METHODOLOGY

This is a descriptive study which was started in Health Research Institute (HRI), National Institute of Health (NIH) TB Research Centre King Edward Medical University Lahore and HRI Central Research Centre NIH Islamabad during March 2022 to July 2022. A statistically calculated sample size of 248 patients using a 95% confidence level, 5% absolute precision with anticipated rate of PCR positive COVID-19 infections as 36.6%[13]. Adult patients having age 18 years and above of both gender reported positive for COVID-19 PCR in present fifth wave were involved in study.

A semi-structured questionnaire consisted the information regarding demography and history of patients was used to collect the data. A non-probability snow ball sampling technique was implicit to search the COVID-19 patients. Patients themselves or their attendants receiving reports from the counter of various laboratories were targeted to find COVID-19 patients. A purpose of

study was explained to each respondent and verbal informed consent was taken before data collection. After collection of demographic information respondents were asked about the history of COVID-19 vaccination. Following information about, job nature, side effects after vaccination, comorbidities, level of symptoms (i.e. mild, moderate and high), Patients were telephonically contacted in case of attendants had difficulty in responding any of the questions.

Data was entered in SPSS software and analyzed to present frequency and percentages for categorical variables including gender histories, status of vaccination, job nature and level severity of symptoms while continuous variables like overall age and segregated gender wise age were presented in the form of mean ± standard deviation. Symptoms of infection and re-infection were compared with full, partial or no vaccination using ANNOVA. Data was segregated with reference to the status of vaccination. Differences were considered significant by assuming p-value <0.05.

RESULTS

A total 248 patients were considered for the final analysis in this study. As the study was based on single interview and data was collected then and there after consent therefore no dropout was observed in this study. Frequency of female patients as 129(52%) remained a bit higher as compared to male participants remained 119(48%) with a male to female ratio of 1:1.09 in this study. Mean age of male patients suffered from COVID-19 remained as 37.97±18.26 years remained higher as compared to female 34.10±17.51 years for females to make an overall mean age of 35.96±17.94 years.

Fig. 1: Formal nature of job with reference to gender
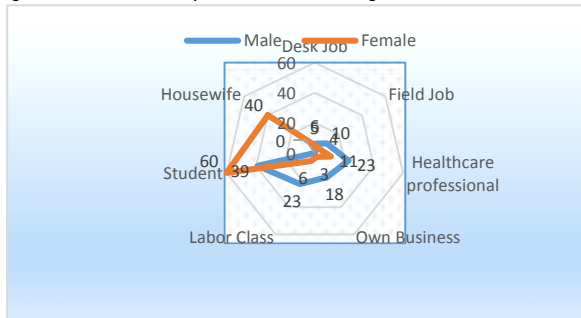
Highest number of patients i.e. 99(39.9%) were students followed by 40(16.1%) housewives, 34(13.7%) healthcare professionals, 29(11.7%) Labor class, 21(8.5%) had their own business, 14 (5.6%) field jobs and 11(4.4%) had desk jobs in this study. Frequencies of nature of jobs of patients with reference to their gender are presented in figure 1.

Maximum number of patients participated in this study were vaccinated as the status is shown in figure 2. Females were prone to have lower status of vaccination as compared to males where 75.6%, 17.6% and 6.8% males were fully vaccinated, partially vaccinated and not vaccinated respectively as compared to 74.4%, 15.5% and 10.1% females respectively.

Figure 2: Status of COVID-19 vaccination among Study Subjects
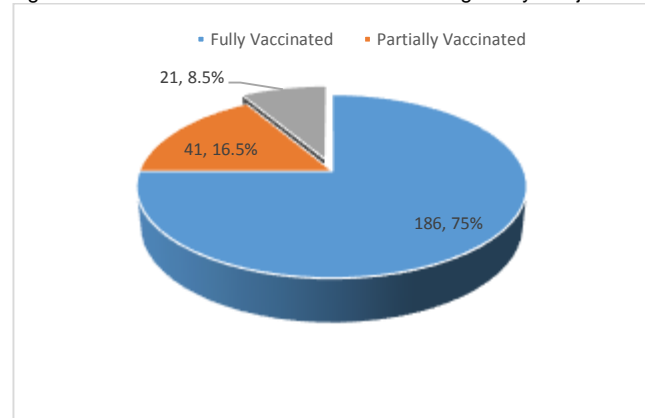
Out of total 248 confirmed COVID-19 patients 93(37.5%) were re-infected further proportion of male gender 55(46.2%) remained more prone to re-infection as compare to 29.5% (38) females. On the other hand proportion of re-infection in fully vaccinated group remained to be 66(35.5%), partially vaccinated as 18(43.9%) and unvaccinated as 9(42.9%) in this study. ANOVA was applied to compare the severity of symptoms with full, partial and unvaccinated patients. None of the major symptoms including fever, cough, tiredness, loss of taste/smell, sore throat, difficulty in breathing, loss of speech, aches and pain had significant difference (p-value >0.05) while only diarrhea, confusion and chest pain had significant differences (p-value <0.05) in this study. Segregation of symptoms with vaccination status is presented in Table I.

Table I: Symptoms of COVID-19 versus Vaccination Status

Symptoms		Fully Vaccinated		Partially Vaccinated		Not Vaccinated		ANOVA p-value
		n	%	n	%	n	%	
Fever	Mild	74	78.7	10	10.6	10	10.6	0.088
	Moderate	80	71.4	22	19.6	10	8.9	
	Severe	32	76.2	9	21.4	1	2.4	
Cough	Mild	62	72.9	12	14.1	11	12.9	0.098
	Moderate	100	76.9	21	16.2	9	6.9	
	Severe	24	72.7	8	24.2	1	3.0	
Tiredness	Mild	79	74.5	18	17.0	9	8.5	0.887
	Moderate	65	74.7	13	14.9	9	10.3	
	Severe	42	76.4	10	18.2	3	5.5	
Loss of taste/smell	Yes	88	77.9	19	16.8	6	5.3	0.264
	No	98	72.6	22	16.3	15	11.1	
Sore throat	Mild	75	72.1	16	15.4	13	12.5	0.095
	Moderate	74	74.0	19	19.0	7	7.0	
	Severe	37	84.1	6	13.6	1	2.3	
Headache	Mild	66	75.0	13	14.8	9	10.2	0.316
	Moderate	76	74.5	16	15.7	10	9.8	
	Severe	44	75.9	12	20.7	2	3.4	
Aches and pains	Mild	58	77.3	12	16.0	5	6.7	0.106
	Moderate	83	82.2	12	11.9	6	5.9	
	Severe	45	62.5	17	23.6	10	13.9	
Diarrhea	Yes	55	66.3	23	27.7	5	6.0	0.003
	No	131	79.4	18	10.9	16	9.7	
Difficulty/Shortness in breathing	Mild	81	81.0	13	13.0	6	6.0	0.145
	Moderate	78	72.2	20	18.5	10	9.3	
	Severe	26	66.7	8	20.5	5	12.8	
Loss of speech	Yes	37	77.1	8	16.7	3	6.2	0.828
	No	149	74.5	33	16.5	18	9.0	
Confusion	Yes	30	57.7	13	25.0	9	17.3	0.003
	No	156	79.6	28	14.3	12	6.1	
Chest Pain	Mild	99	79.8	16	12.9	9	7.3	0.037
	Moderate	68	73.1	14	15.1	11	11.8	
	Severe	19	61.3	11	35.5	1	3.2	

DISCUSSION

A higher proportion of confirmed COVID-19 patients as 37.5% were re-infected in present study further proportion of male gender 46.2% (55) remained more prone to re-infection as compare to 29.5% (38) females. Findings are not in concomitant with the findings of a study recruited larger population which presented proportion of re-infection as 13.0% among non-vaccinated group, however same study could not attain appreciable results among other study groups and sub-groups. Above study explored 49% protection after completion of primary vaccination among residents of healthcare facility, 47% protection among employees and 62% protection in general population pretending to present various temporal differences and existence of clinical confounders[9]. From one or other way findings of present study are also looks to be in agreement with above findings where proportion of re-infection in fully vaccinated group remained to be 66(35.5%), partially vaccinated as 18(43.9%) and unvaccinated as 9(42.9%).

After initial emergence of COVID-19, many mutations in genetic material of SARS-CoV-2 were revealed while some of them have had the ability to transmit easily. These mutations also conferred the disease intensity, being utilized in diagnostics, remained useful in preparations of vaccines thus helpful in controlling the disease. Different mutations occur during replication of virus making variants. Any variant accountable of high rate of transmission and virulence becomes the "Variant of interest". Such variant of interest cause severe illness, highly septic and become resilient to routine health procedures like diagnosis, treatment and vaccine preparations. During first wave of COVID infection, Pakistan suffered from Wuhan strain followed by pre-dominance of alpha variant during second wave which was highly transmissible but remained susceptible to monoclonal antibodies against original strain and vaccination[14].

Omicron variant of COVID-19 was dominated in Pakistan during 5th wave of infection. A study from Qatar was undertaken to see the effectiveness of previous infection and vaccination with a specified brand of mRNA vaccination and revealed a high prevalence of re-infection as 46.1% among non-vaccinated patients is quite similar to the present findings. Further patients with prior infection plus two doses mRNA vaccination showed a negligible 1.1% rate of re-infection. Dramatically patients with no prior infection and received three doses of mRNA vaccine but did not infected earlier had the highest rate of re-infection as 52.2%. Similarly effectiveness increases with higher number of doses further elevates in cases having number of doses along previous infection[15].

Although the findings of present study are comparable with later study however in Pakistan mostly COVID-19 inactivated vaccines were administered to the general population while mix doses are also reported to be administered therefore the statements are difficult to present with authority. Further type and brand of vaccines were not included in the study questionnaire which is a limitation of this study and hoping to keep it future prospect in similar study group.

In conclusion findings of present study are evident to lack discernable variations in protection against COVID-19 re-infection through vaccination or prior infection. Similarly no much differences in symptomatology among non-vaccinated primary infection cases during fifth wave of COVID-19 were also not much sever indicating herd immunity. Ultimately trends show an enhancement in level of protection from re-infection was shown as prior infection alone, partial vaccination and full vaccination respectively.

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