Research Article

Comparison of Clinical Course of Covid 19 Infections in Vaccinated and Unvaccinated Individuals

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ABSTRACT

COVID 19 vaccines shows good efficacy and safety in real world data. However clinical outcome in vaccinated persons is not widely known. This was a Questionnaire based study conducted between September 2021 to March 2022 after permission of IEC (Letter no. SNMC /IEC /2021 / 50). A Google doc based validated questionnaire (18 questions) was circulated through E mail/social media groups to individuals who became COVID infected in the past. The respondents who were fully vaccinated and completed 14 days duration after second dose of vaccination at time of infection serves as study group (Group I) while those who were unvaccinated at the time of infection serves as control group (Group II). Clinical course of disease was compared between two groups. A total of 517 previously COVID infected individuals had responded the questionnaire. Out of it, 108 respondents were either partially vaccinated or infected before completion of 14 days of second dose so they were excluded from the study. A total of 210 fully vaccinated respondents were included in study group (Group I) while 199 individuals who were unvaccinated at the time of infection serves as control group (Group II). Difficulty in breathing, need of hospital stay and post COVID complications were significantly less in vaccinated group in comparison to control group. As per survey findings, vaccination significantly reduces difficulty in breathing and need of hospital stay. A significant reduction in post COVID complications was also noted. So, vaccination remains the most effective way to reduce the severity of clinical course and better outcome of COVID 19 infection.

Keywords: COVID-19, vaccination, outcome, breakthrough infection.

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INTRODUCTION

The COVID-19 pandemic, caused by SARS-CoV-2, has emerged and still is a global public health crisis [1]. Since the introduction of COVID vaccination, both clinical trial and real-world data have shown the high efficacy of COVID-19 vaccines in preventing SARS-CoV-2 infection and severe disease[2-4]. However, breakthrough infections are reported and long-term efficacy of vaccine is still not certain[5]. So, a detailed interpretation of the protective benefits ofCOVID-19 vaccines is necessary for protection against SARS-CoV-2 infection, as well as against progression of disease severity after breakthrough infection[6-7].

There is increasing interest in the study of breakthrough cases but there is limited data on patients who developed symptomatic COVID-19 after vaccination and may be even requiring hospitalization. Because vaccine effectiveness is less than 100%, breakthrough cases are expected, and in near future as vaccine coverage will increase in the population, the ratio of vaccinated to unvaccinated cases will rise [8].

To better understand vaccine breakthrough cases and their outcomes compared to unvaccinated COVID-19 cases, we analyzed and compared all consecutive patients, with or without prior vaccination, through questionnaire on Google forms.

MATERIALS AND METHODS

Study Design

This was a questionnaire-based survey among individuals who were infected with COVID 19 infection anytime and conducted between September 2021 and March 2022.

Participants

The study participants were those persons who were either unvaccinated at the time of infection or had received both doses of vaccine and had a documented SARSCoV-2 infection ≥ 14 days after the second dose of the vaccination. Demographic and clinical information was obtained through questionnaire based study via Google form.

Questionnaire

This questionnaire-based survey used a standard and validated questionnaire according to the guidelines of WHO [9]. The questionnaire was developed by a group of

experts and after detailed revision, it was finalized. Initial validation was done through its application in about 15 participants as a pilot survey. After the analysis of the pilot data, it was further modified. The final set was comprised of 18 questions (15 multiple choice questions with three open ended questions).

Sample size

According to a previous study through a questionnaire-based survey, it has been found that 36% responded to the questionnaire [10] . Considering the precision as 5% and the level of the confidence interval as 95%, sample size for this prevalence survey was estimated to be 296. Expecting 50% response (as compared to 36% of the previous study), the sample size for this survey was kept at around 500.

Data Collection

The questionnaire was circulated through social media groups individually by the investigators. The individuals who participated were given enough time to answer the questions by striking out the most appropriate option(s) against each item and sent back the answered document by clicking submit button in the Google Doc. All collected responses in form of a filled questionnaire form had undergone final analysis as Google doc. format. A completeness check and analysis quality of all the questionnaires received was carried out.

Presence of SARS-CoV-2 infection was confirmed by RT-PCR, CT chest, Truenat or antigen test. Co morbidities were retrieved from questionnaire review. Severe disease was defined as hospitalization, need of oxygen therapy, admission to an intensive care or monitored setting.

We analyzed all consecutive adult patients (≥18 years old) with a primary diagnosis of COVID-19 between September 2021 to February 2022.This retrospective study was approved by the Institutional Review Board of SNMC, Agra (Letter no. SNMC/IEC/2021/50). The investigators extracted the following variables of interest: age, gender, any co morbidities, need of oxygen therapy during disease, if hospitalized then its outcome, post COVID complications, and COVID-19 vaccination status.

The primary endpoint was to assess the impact of previous vaccination on outcomes. As a secondary endpoint, we compared hospitalization outcomes among previously vaccinated patients to unvaccinated patients with COVID-19 during the same period.

RESULTS

A total of 517 individual responded to the questionnaire out of which 108 were either partially vaccinated or didn't complete 14 days after second dose during infection. So they were excluded from study. Now the participants fulfilling the criteria were 210 fully vaccinated individuals (Group I) and 199 unvaccinated ones (Group II). There was no significant difference in baseline characteristics between two groups.

In vaccinated individuals (Group I) there was reduction in difficulty in breathing (30.48%) in comparison to unvaccinated individuals (39.70%) and difference was significant(p=0.05)

Similarly in Group I there is less admission in hospital ICU (2.86%) then Group II (6.53%) and p value was significant (0.03).

Post COVID complications in Group I (73.33%) were far less then Group II (92.96%) and the difference was significant (p<0.001). [TABLE 1]

Table 1: Baseline patient characteristics

Characteristic of study population	Study group n (%) Vaccinated (n=210)	Study group n (%) Unvaccinated (n=199)	P Value
Gender			
Male	103 (50.49)	101(49.51)	0.73
Female	107 (52.20)	98 (47.80)	
Age in years			
20-40 yrs	122(58.10)	114(57.29)	
40-60 yrs	76(36.19)	74(37.18)	0.98
>60 yrs	12(5.71)	11(5.53)	
Oxygen level at time of diagnosis			
<90%	7(3.33)	13(6.53)	
90-95%	42(20.00)	41(20.60)	0.30
>95%	161(76.67)	145(72.86)	
Need of oxygen therapy at time of illness			
Yes	21(10.00)	32(16.08)	
No	189(90.00)	167(83.92)	0.07

Diagnosis confirmed by			
RTPCR	151(71.90)	144(72.36)	
Antigen	43(20.48)	41(20.60)	0.46
Trunat	7(3.33)	6(3.02)	
CT Scan	9(4.29)	8(4.02)	
Difficulty in breathing			
Yes	64(30.48)	79(39.70)	0.05*
No	146(69.52)	120(60.30)	
CT score			
</=7	51(24.29)	44(22.11)	
8-17	36(17.14)	41(20.60)	0.09
>/=18	3(1.43)	11(5.53)	
Not done	120(57.14)	103(51.76)	
Co-morbidities			
Obesity	44(20.95)	42(21.10)	
Diabetes mellitus	14(6.67)	15(7.54)	
Hypertension	19(9.05)	16(8.04)	
Coronary artery disease	8(3.81)	7(3.52)	>0.05
Any Lung disease	5(2.38)	3(1.51)	
Any Liver disease	1(0.48)	0(0.00)	
Any Renal disease	2(0.95)	1(0.50)	
None of the above	117(55.71)	115(57.79)	
Disease managed			
Home isolation	178(84.76)	149(74.87)	0.03*
In Hospital (ward)	26(12.38)	37(18.59)	
In Hospital (ICU)	6(2.86)	13(6.53)	
Post Covid Complications			
Present	154(73.33)	185(92.96)	0.001*
Absent	56(26.67)	14(7.04)	
Which post covid complications were present			
Generalised weakness	68(32.38)	76(38.19)	
Bodyache	36(17.14)	41(20.60)	
Loss of smell/taste	24(11.43)	29(14.57)	
Difficulty in breathing	3(1.43)	10(5.03)	
Diarrhoea	5(2.38)	7(3.52)	>0.05
Others	18(8.57)	22(11.06)	
No complications	56(26.67)	14(7.04)	
Outcome of Disease			
Recovered	192(91.43)	171(85.93)	
Recovered with complications	13 (6.19)	24(12.06)	0.11
Recovering	5(2.38)	4(2.01)	

DISCUSSION

Fully vaccinated persons who developed a breakthrough infection were significantly less likely to experience severe disease as compared with unvaccinated persons who developed infection. Several studies showed similar findings [11], and study done to see impact of various baseline characteristics on immunogenicity produced by vaccination[12]. Most currently available vaccines consistently provide >90-100% primary protection against severe disease or death. Our data provides further assurances of the effectiveness of the vaccines even when the vaccine was not able to prevent infection. These results are important since no COVID vaccine provides 100% protection against infection, and even with ~95% efficacy

observed with the mRNA vaccines, a significant number of breakthrough infections can be expected. Knowing that these vaccines provide a high level of protection against severe disease if such breakthrough infection will occur, can boost the public's confidence in vaccines and improve vaccination rates.

- Increasing age was strongly and independently associated with a higher risk of severe disease in persons with breakthrough infection [13]. It may be postulated that older persons have a higher burden of co morbidities that may predispose them to poorer clinical outcomes. Poor immune response in older age groups and overall frailty may be potential explanations for a higher risk among older persons. Burden of co morbidities was not associated with a higher risk of severe disease in this study. Co morbidities are well recognized risk factors for poorer clinical outcomes in patients with SARS-CoV-2 infection [14] .On the other hand, symptomatic infection was associated with a higher risk [15].

In this study, unvaccinated group suffers from more difficulty of breathing then vaccinated ones and the difference was statistically significant. Nick Andrews et al study also shows similar findings. [16]

The hospitalization and admission in ICU of vaccinated individuals were significantly less in comparison to unvaccinated ones. Very high level of protection against hospitalization was seen in Nick et al study[16]. Similar study done by Mark W Tenforde et al has shown that vaccinated patients were significantly less likely hospitalized and with reduced disease progression, consistent with risk reduction among vaccine breakthrough infections [17].

A significant difference was seen in occurrence of post COVID complications as vaccinated group shows significant reduction in comparison to unvaccinated group.

While there is no doubt that vaccination is among the most important and critical elements of the pandemic response, identifying factors associated with critical disease among those with breakthrough infection is of obvious clinical and policy significance. This knowledge can help the providers identify and prioritize the triage of those at highest risk and ensure appropriate monitoring. Policymakers can also determine the resources required to provide the most effective and efficient services based on the population characteristics.

CONCLUSION

In summary, increasing age is the most important factor determining poor clinical outcomes in persons with breakthrough SARSCoV-2 infection, while vaccination is associated with a strong protective effect. Older persons who develop breakthrough infection, particularly those with any symptoms, should be quickly evaluated and monitored for severe outcomes.

Significant reduction is seen in difficulty in breathing, need of hospital stay and occurrence of post COVID complications in vaccinated group. Thus, vaccination remains one of most important measure for prevention and better outcome in COVID infection.

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