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Epidemiological Distribution and Reinfection Status: A Cross Sectional Study of COVID-19 Patients in Makwanpur District, Nepal

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ABSTRACT

Background: The second wave of COVID-19 in Nepal showed increased infectivity and case fatality compared to the first wave, mirroring global trends. Despite the nationwide vaccination campaign initiated in February 2021, breakthrough infections and reinfections remained a public health concern. This study aimed to assess the epidemiological distribution of COVID-19 cases and evaluate reinfection patterns in relation to vaccination status in Makwanpur district, Nepal.

Method: A cross-sectional study was conducted involving individuals diagnosed with COVID-19 between May 15 and August 15, 2022. Data collection commenced in July 2022 using a systematic sampling technique. A total of 377 participants who were in home isolation during the study period were interviewed via telephone using a pretested, paper-based questionnaire.

Result: Among the 375 participants, 56.8% were female and 65.9% were Brahmin/Chettri. Asymptomatic cases constituted 83.8% of the sample. Twenty-three participants (6.1%) reported reinfection. Of the 210 vaccinated individuals, only 134 (65%) were fully vaccinated. Vero cell was the most administered vaccine (39.5%). A statistically significant association was observed between gender and vaccination status (p-value < 0.001), and between vaccination status and symptom presentation (p-value=0.007), with vaccinated individuals more likely to be asymptomatic. No significant associations were found between reinfection and vaccination status (p-value = 0.29), nor with age group (p-value = 0.42).

Conclusion: While vaccination appeared to reduce symptomatic cases, reinfection occurred regardless of vaccination status. These findings highlight the need for continued surveillance and further research into the long-term effectiveness of COVID-19 vaccines, especially in the context of emerging variants.

Key words: COVID vaccination; home isolation; Makwanpur; reinfection.

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INTRODUCTION

In Nepal the number of COVID19 infections as of April 2021 was 3,68,580 while the rate of case fatality is 0.02%. The second wave of COVID 19 had higher infectivity and case fatality as compared to the first wave. This rate is similar to that with other countries of the world.[1] As of August 2021, there was a sharp rise in the number of cases to 40 cases a day in Makwanpur district, the headquarter to the most populated province of Nepal.[2] However, the vaccination started in Feb 2021 in Nepal with vaccines received from India and other countries. Though people got vaccinated. Reinfections were seen which was a problem of global concern. A study in the UK shows that, that SARS-CoV-2 reinfection increases the risk of death and organ impairments up to 6 months after the infection whereas some have shown protective effect of the vaccine.[3] This research, thus, tries to present COVID-19 data of Makwanpur district and also study reinfection status of the virus, in

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both vaccinated as well as not vaccinated individuals. This data, we believe can generate and itself be used as significant scientific evidence for further research in COVID-19 variants and vaccines.

METHODS

A cross-sectional study design was adopted to assess the epidemiological distribution of COVID patients of Makwanpur districts who were staying in home isolation. Patient list was obtained from Hetauda Hospital's daily COVID 19 reports from the permission of hospital manager of the PCR Lab.[4] Data collection was started from July 2022 with those cases identified in between the period of May 15-August 15, 2022 in the hospital. The positive cases staying in home isolation of Makwanpur district was the sampling population. The study sample size was 377 which was calculated by using formula for population prevalence of COVID 19 in the district. A sampling list of cases was made and systematic random sampling was applied to select participants for interview. Verbal informed consent of the participants was taken before starting interview process. Phone interviews were carried out for data collection. Verbal consent as well as the phone interviews were recorded and were later filled out on data collection forms. Self- developed questionnaires encompassing demographic variables and questions regarding reinfection, and vaccination status was developed by the research team. A person with undergraduate degree in public health was recruited for data collection. The data collector was oriented about the tool and the collection process by the research team. This study included both male and female of 18 years and above. Altogether 377 infected cases staying in home isolation or had stayed in home were interviewed. Ethical approval was received from Nepal Health Research Council's Ethical Review Board (Ref. No.: 595) The questionnaire was prepared by extensive literature review and was pretested in 10 percent to ensure the validity of the tool. Data was entered and cleaned in excel and then transported to SPSS version 16 software for further analysis. Data regarding demographic variables was descriptively analyzed. According to the normalcy of the data, appropriate statistical tests were applied.To see the association of categorical variables like reinfection status, and morbidity chi-square test was used.

RESULTS

A total of 375 participants were included in the analysis. of these, 161 (42.9%) were male and 214 (57.1%) were female, with a slightly higher representation of females. In terms of ethnic distribution, the majority belonged to the Brahmin/ Chhetri group (65.9%), followed by Janajati (29.1%), Madhesi (2.1%), and others (2.9%). Most participants were asymptomatic at the time of infection (310; 83.8%), while 59 (15.9%) reported symptoms. Among those with available clinical history (n=370), 24 individuals (6.5%) had diabetes, 32 (6.8%) had hypertension, and 5 (1.4%) reported cardiovascular disease (CVD). Reinfection with COVID-19 was identified in 22 participants (5.9%). Of the 206 vaccinated individuals, 134 (65.0%) were considered fully vaccinated, having received two doses of either Covishield or Verocell, or a single dose of the Johnson & Johnson vaccine (Table 1).

Table 1. Characteristics of study variables.

Variables	Frequency (%)
Gender	
Male	161 (42.9)
Female	214 (57.1)
Ethnicity	
Brahmin/Chhetri	247 (65.9)
Janajati	109 (29.1)
Madhesi	8 (2.1)
Others	11 (2.9)
COVID-19 related variables	
Asymptomatic	315 (84.0)
Symptomatic	60 (16.0)
Disease Condition (n = 370)	
Diabetic	25 (6.8)
High Blood Pressure	32 (8.6)
Coronary Artery Disease	5 (1.4)
Re-infected from COVID-19	23 (6.1)
Medications during isolation	
Yes	315 (84.0)
No	60 (16.0)
Vaccination Status	
Vaccinated	210 (56.0)
Not Vaccinated	165 (44.0)
Received second dose of vaccines	134 (63.8)

Among the total study population (n = 375), 210 individuals had received at least one dose of a COVID-19 vaccine, while 165 remained unvaccinated. Of those vaccinated, only 134 (65.0%) were fully vaccinated, defined as having received two doses. The most administered vaccine was Verocell, received by 70.95% of vaccinated participants, followed by Covishield. Regarding reinfection status, all participants had tested positive for COVID-19 and were in home isolation during the study period. Among the vaccinated group, 11 had a prior history of COVID-19 infection, while the remaining 199 were experiencing their first infection (Table 2).

Table 2. Names of vaccines received by the study participants.

Name of Vaccines	Frequency (%)
Not Vaccinated	165(44.3)
Covishield	38(10.1)
Johnson and Johnson	22(5.8)
Pfizer	1(0.3)
Verocell	149(39.5)

Table 3. Association between gender and vaccination status.

Gender	Vaccinated (n)	Not vaccinated (n)	Total	df	p-value
Male	120	41	161	1	<0.001
Female	90	124	214		
Total	210	165	375		

There is a statistically significant association between gender and vaccination status (p-value < 0.05), with males being more likely to be vaccinated compared to females (Table 3).

Table 4. Association between vaccination and reinfection status.

Vaccination Status	Reinfection (n)	No Reinfection (n)	Total (n)	df	p-value
Vaccinated	15	195	210	1	0.29
Not Vaccinated	8	157	165		
Total	23	352	375		

There is no statistically significant association between vaccination status and reinfection (p-value > 0.05) (Table 4).

There is no statistically significant association between age group and reinfection status (p-value > 0.05) (Table 5).

Table 5. Association between age group and reinfection status.

Age Group (years)	Reinfection (n)	No Reinfection (n)	Total (n)	df	p-value
18-30	6	114	120	4	0.42
31-40	10	130	140		
41-50	4	60	64		
51-60	2	30	32		
>60	1	18	19		
Total	23	352	375		

Table 6. Association between vaccination and symptoms.

Vaccination Status	Symptomatic (n)	Asymptomatic (n)	Total (n)	df	p-value
Vaccinated	25	185	210	1	0.007
Not Vaccinated	35	130	165		
Total	60	315	375		

There is a statistically significant association between vaccination status and symptom presentation (p-value < 0.05). Vaccinated individuals were more likely to be asymptomatic compared to those not vaccinated (Table 6).

DISCUSSION

The results showed that Brahmin/Chettris were more likely to get infected than other castes which could be just due to chance or because other castes could have better immunity. This is an interesting finding because the proportion of Brahmin is only (15%), Chetrris is 6.2 % and Tamangs is the highest (48%). This could also result because of lack of general awareness regarding the disease and diagnosis of COVID-19 among this population as they mostly reside in rural parts of the district.[5] The age wise distribution data shows that the most infected of the age group was between 20-40 years which could be because this is the most active age group and could have caught the infection during work and travelling. It is alarming that patients of age group between 40-60 are also high in risk of COVID 19.[6] The data regarding co-morbid condition shows that since, elderly population has more co morbid conditions, special measures to protect this age group must be in place in the future to protect them from COVID 19 and other infections of similar nature.[7] Again, Chi-square tests showed that there was no association in between vaccination and reinfection status of individuals (p-value=0.290,

α=0.05). Also, there was association in between the number of doses of vaccine and the reinfection status. (Fisher test=0.00). This could mean that being vaccinated does not make one free from reinfection but could help in reducing the severity of the disease. The scope of this study was limited but similar studies have shown protective effects of the vaccine in prevention of reinfection.[8] This could also point towards that people were being infected with a new variant of COVID 19 even after they were vaccinated.[9] This aligns with other research which suggest that 1 in 10 people infected with SARS-CoV-2, will develop long COVID, which is defined as the development of new symptoms three months after the initial infection and can last at least two months.[10] Long COVID can develop in people of all ages, regardless of severity of original symptoms and previous health status.[11] However, there are studies which show the protective side of vaccines from these long COVID symptoms though reinfection occurs. These study reports that in unvaccinated group, 73 (25.1%) individuals experienced long COVID symptoms and the prevalence of Long COVID was lowest in the group with a complete vaccination regimen. This clearly indicates that vaccination decrease the severity of the disease and its symptoms.[12,13]

Limitations

The participants who were positive in May 2022 and had stayed in home isolation were out of home isolation by the study time. Thus, the study might not be able to capture the responses in the real time and there could have been recall bias as well.

CONCLUSIONS

Hence, in this study we briefly studied the epidemiological characteristics of patients in home isolation of Makwanpur district. Findings of the vaccination and reinfection data were quite interesting as we could not find the association between vaccination and COVID reinfection as most of the infected people in the study were vaccinated. Thus, further research regarding the credibility and effectiveness of different categories of vaccines can be carried out further in the coming days.

Conflict of Interest: None

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