International Journal of Community Medicine and Public Health
Raveendranath PP et al. Int J Community Med Public Health. 2023 Aug;10(8):2868-2871
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20232380

Original Research Article

COVID-19 reinfection among health care workers in a tertiary care center in north Kerala: a descriptive study

Priyanka Prasanna Raveendranath[1]*, Jayasree Anandabhavan Kumaran[1], Jerrin Maria Jose[2]

[1]Department of Community Medicine, Government Medical College, Kannur, Kerala, India
[2]Department of Community Medicine, Government TD Medical College, Alappuzha, Kerala, India

Received: 22 May 2023
Revised: 14 July 2023
Accepted: 18 July 2023

***Correspondence:**
Dr. Priyanka Prasanna Raveendranath,
E-mail: priyankaraveendranath993@gmail.com

ABSTRACT

Background: Reinfection rates due to Covid-19 is on a rise. Prevention, identification, and management of these patients will be essential to reduce morbidity and mortality. Objective of this study was to determine the proportion of SARS COV-2 reinfection among health care workers, to determine the meantime interval between primary infection and reinfection and to compare the symptomatology during Primary infection and reinfection.
Methods: A descriptive study was conducted among healthcare workers who tested positive for COVID-19 from 1st July 2020 to 31st October 2021 which accounted for 704, of which 36 met the criteria for reinfection. Details of the health care workers who tested positive for COVID-19 was collected from regional PEID cell data base. Data was collected from study subjects using telephonic interviews. Data was analyzed using SPPSS Version 21.
Results: Out of the 704 study subjects, 36 (5.11%) met the criteria for reinfection. Mean age was 29.6±9.7 years. Of the 36 cases of reinfection, 36.1% were asymptomatic during the primary infection compared to 2.8% during the second one. Cough and fever were present in 41.7% and 83.3% respectively during reinfection compared to 11.1% and 33.3% in primary infection. Mean time interval between primary infection and reinfection was 244.6±75.6 days. During the time period between primary infection and reinfection 4 (11.1%) had symptoms.
Conclusions: Reinfection is possible in individuals who had primary infection with COVID-19. Reinfection can be symptomatically more severe. So regardless of history of infection with COVID-19 all individuals must strictly adhere to Covid protocol.

Keywords: COVID-19, Healthcare workers, Reinfection

INTRODUCTION

COVID-19 is an infectious disease caused by Severe Acute Respiratory Corona Virus-2 (SARS-CoV-2). It, binds to the angiotensin-converting enzyme 2 receptors using a receptor-binding domain in its spike protein for cell entry and ultimately, resulting in a respiratory syndrome.[1,2] COVID-19 was declared as global pandemic by WHO on March 11 2020. Approaches to control COVID-19 depend on the durability of immunity conferred by recovery and by vaccination. However, predicting the durability of immunity against the virus causing COVID-19, SARS-CoV-2, remains challenging amid a pandemic.[3] Reinfections are observed with many respiratory viruses, including human coronaviruses. Reinfections with respiratory viruses may be due to weak or waning initial immune response (e.g., respiratory syncytial virus), reinfection with another genotype/species (e.g., rhinoviruses) or the high variability of the viruses (e.g., influenza virus).[4]

Reinfection was defined as any reverse transcription polymerase chain reaction (RT-PCR) or antigen-confirmed SARS-CoV-2 infection in an individual with evidence of a prior SARS-CoV-2 infection. Evidence of

prior infection included a prior SARS-CoV-2 diagnosis by RT-PCR or antigen testing followed by recovery (molecular or clinical evidence of viral clearance). No minimum time interval was defined between primary and secondary infections; however, cases within 90 days of initial infection were considered suggestive of prolonged viral shedding following the primary infection.[5] Centres for Disease Control and Prevention (CDC) has considered the duration of 90 days between two positive SARS-CoV-2 RNA along with genomic evidence of re-infection as an investigative criterion to understand the phenomenon of re-infection.[6]

Re-infection rate is likely to be a significant threat to the current measures to control the COVID-19 pandemic. Understanding the protection conferred by previous infection against repeat infection, illness, and severe disease is key to projecting the future epidemiology of COVID-19 and to guiding vaccine policy decision.[7] Prevention, identification, and management of these patients will be essential to avoid mortality as re-infection can be severe.[8]

Aim of study were to determine the proportion of SARS COV-2 reinfection among health care workers in a tertiary care center in north Kerala and to determine the meantime interval between primary infection and reinfection. Also, to study the symptoms during primary infection and reinfection.

METHODS

A record based descriptive study was conducted among health care workers in a tertiary care centre in north Kerala. All health care workers who tested positive for COVID-19 during 1st July 2020 to 31st October 2021 were included in the study which accounted for 704 cases.

Operational definition

Covid -19 case: A person with laboratory confirmation of COVID-19 infection either by molecular test or rapid antigen test.

Covid-19 reinfection: An individual who tested positive for SARS COV-2 on two separate occasions either by molecular test or rapid antigen test separated 90days apart.

Data collection and analysis

Data regarding COVID-19 positive healthcare workers was collected from Regional Prevention of Epidemic and Infectious Diseases cell (RPEID) data base. Data regarding symptoms was collected from individual study subjects by telephonic interviews. Data was entered in MS Excel and analyzed using SPSS version 21.

RESULTS

Demographic profile

Of the 704 HCW who tested positive for COVID-19 during the study period, 36 (5.11%) met the criteria for reinfection. Mean age was 29.6±9.7years (Figure 1).

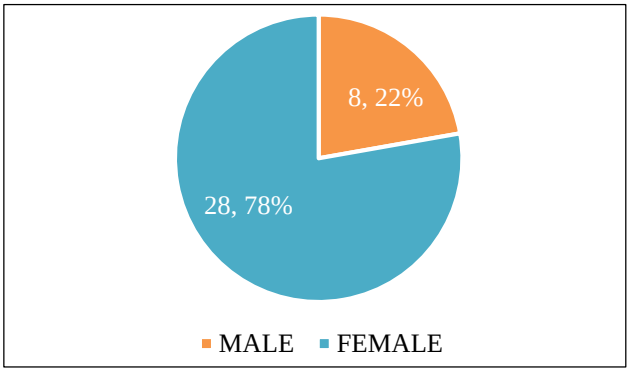

Figure 1: Sex distribution of the study population.

Symptomatology

During primary infection 36% were asymptomatic compared to 3% during reinfection. During reinfection majority (97 %) were symptomatic (Figure 2).

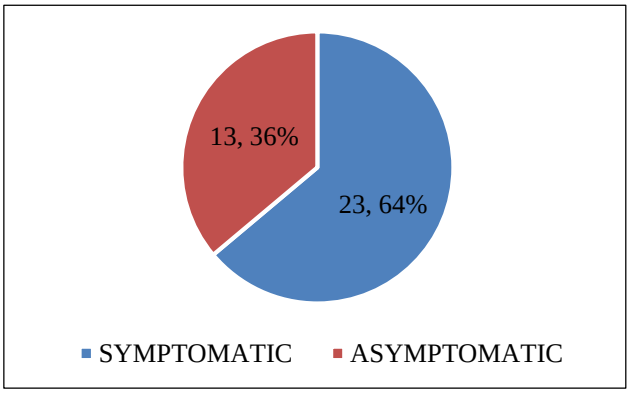

Figure 2: Primary infection.

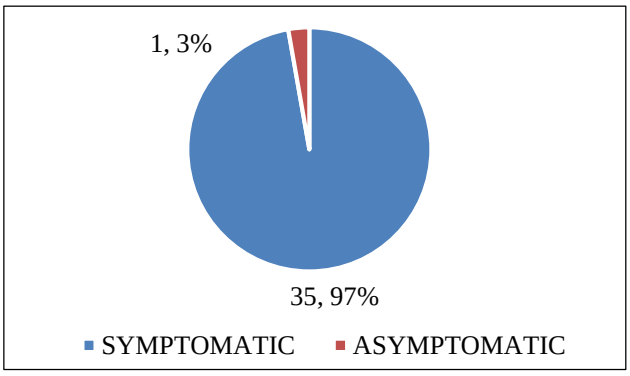

Figure 3: Reinfection.

Mean symptom duration during primary infection was 2.3 days. Mean symptom duration during reinfection was 5.08 days. Mean time interval between primary infection and reinfection was 244.6±75.6 days (113-427 days) (Figure 3).

Table 1: Symptoms during primary and reinfection.

Symptoms	Primary infection		Reinfection	
	Frequency	Percentage	Frequency	Percentage
Fever	8	33.3	30	83.3
Cough	4	11.1	15	41.7
Headache	5	13.9	12	33.3
Anosmia	2	5.6	12	33.3
Loss of taste	1	2.8	7	19.4
Fatigue	5	13.9	7	19.4
Breathlessness	0	0	5	13.9
Sore throat	6	16.7	8	22.2
Loose stools	3	8.3	0	0
Myalgia	0	0	4	11.1

Of the 36 cases of reinfection, 4 (11.1%) had symptoms during the time interval between primary infection and reinfection. All 4 had breathlessness during that time period between primary infection and reinfection. Among the reinfected cases 4 (11.1%) had comorbidities, of which 2 had type 2 diabetes mellitus, 2 had hypothyroidism, 1 had bronchial asthma (not mutually exclusive) (Table 1, 2).

Table 2: Vaccination status-COVID -19 vaccine.

Vaccination status	Primary infection (%)	Reinfection (%)
1ST dose taken	5 (13.9)	4 (11.1)
2 doses taken	3 (8.3)	29 (80.6)
Unvaccinated	28(77.8)	3 (8.3)

DISCUSSION

Study was conducted among 704 Health care workers who tested positive for COVID-19. In the current study 5.11% met the criteria for reinfection which was like study by Mukherjee et al in which 4.5% met the criteria for reinfection.[9] In a retrospective cohort study conducted by Sheehan et al and Akinbami et al reinfection rate was found to be 4.8% and 2.5% respectively.[10,11] In a cohort study by Slezak et al cumulative incidence of reinfection was 0.8 %.[12]

Mean age of the study population was 29.6±9.7years it was similar to study by Mukherjee et al.[9] In a systematic review by Dhillon et al mean age of patients was 46.2+/-18.9 years.[13]

Mean time interval between primary infection and reinfection was 244.6±75.6 days compared to 119 days in the study conducted by Mukherjee et al and 3-6 months in study by Islam et al.[9,14]

In the current study majority (77.8 %) were unvaccinated during primary infection compared to 8.3% during reinfection. At the time of reinfection 80.6% were vaccinated with 2 doses of COVID-19 vaccine.

In the study by Mukherjee et al, large proportion of the respondents were asymptomatic during the first episode (47.4%) as compared to the second one (15.8%).[9] This was similar to the current study in which a large proportion (36%) was asymptomatic during primary infection compared to a small proportion (3%) during reinfection.

In the current study mean symptom duration during primary infection was 2.3 days compared to 5.08 days during reinfection. In the study conducted by Sheehan et al, hospitalization was more common at suspected reinfection (11.4%) than initial infection (5.4%).[10] In a systematic review by Jingzhou et al, 68.8% had similar severity during reinfection while 18.8% and 12.5% had worse and milder symptoms respectively.[15]

Most common symptom during primary infection and reinfection was fever, it was similar to study by Dhillon etal.[13] During the time period between primary infection and reinfection majority were asymptomatic only 11.1% had symptoms. This was like study by Mukherjee et al in which 71.1% were asymptomatic during time period between primary infection and reinfection.[9]

Since the current study is a hospital based study reinfection rates obtained cannot be generalized to the community. The current study is a descriptive study and serological evidences are lacking, further serological studies must be conducted for the confirmation of existence of COVID-19 reinfection.

CONCLUSION

Reinfection is possible in individuals who had primary infection with COVID-19. Reinfection can be

symptomatically more severe compared to the primary infection even in vaccinated individuals. So regardless of previous history of infection with COVID-19 all individuals must strictly adhere to Covid protocol.

ACKNOWLEDGEMENTS

We would like to thank all the interns who actively helped in data collection and to all teaching staffs in the department of Community Medicine who gave their valuable feedback during various stages of the study. Authors also would like to thank all the RPEID cell staff for their support and help during the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Fergie J, Srivastava A. Immunity to SARS-CoV-2: lessons learned. Front Immunol. 2021;12:654165.
2. Costa AO, Neto HD, Nunes AP, de Castro RD, de Almeida RN. COVID-19: Is reinfection possible? EXCLI J. 2021;20:522.
3. Jain R, Mallya MV, Amoncar S, Palyekar S, Adsul HP, Kumar R, et al. Seroprevalence of SARS-CoV-2 among potential convalescent plasma donors and analysis of their deferral pattern: Experience from tertiary care hospital in western India. Transf Clini Biolo. 2022;29(1):60-4.
4. Khoshkam Z, Aftabi Y, Stenvinkel P, Lawrence BP, Rezaei MH, Ichihara G, et al. Recovery scenario and immunity in COVID-19 disease: A new strategy to predict the potential of reinfection. J Advan Res. 2021;31:49-60.
5. Murchu E, Byrne P, Carty PG, De Gascun C, Keogan M, O'Neill M, et al. Quantifying the risk of SARS-CoV-2 reinfection over time. Rev Med Virol. 2022;32(1):e2260.
6. CDC. Common Investigation Protocol for Investigating Suspected SARS-CoV-2 Reinfection. Atlanta, USA, 2020. Available at: https://www.cdc.gov/coronavirus/2019-ncov/php/reinfection.html. Accessed 3 November 2021.
7. Cohen C, Pulliam J. COVID-19 infection, reinfection, and the transition to endemicity. Lancet. 2023;401(10379):798-800.
8. Jain VK, Iyengar K, Garg R, Vaishya R. Elucidating reasons of COVID-19 re-infection and its management strategies. Diab Metab Synd: Clin Res Revi. 2021;15(3):1001-6.
9. Mukherjee A, Anand T, Agarwal A, Singh H, Chatterjee P, Narayan J, et al. SARS-CoV-2 re-infection: development of an epidemiological definition from India. Epidemiol Infect. 2021;149:E8.
10. Sheehan MM, Reddy AJ, Rothberg MB. Reinfection rates among patients who previously tested positive for coronavirus disease 2019: a retrospective cohort study. Clin Infect Dis. 2021;73(10):1882-6.
11. Akinbami LJ, Biggerstaff BJ, Chan PA, McGibbon E, Pathela P, Petersen LR. Reinfection with severe acute respiratory syndrome coronavirus 2 among previously infected healthcare personnel and first responders. Clin Infect Dis. 2022;75(1):e201-7.
12. Slezak J, Bruxvoort K, Fischer H, Broder B, Ackerson B, Tartof S. Rate and severity of suspected SARS-Cov-2 reinfection in a cohort of PCR-positive COVID-19 patients. Clin Microbiol Infect. 2021;27(12):1860-e7.
13. Dhillon RA, Qamar MA, Gilani JA, Irfan O, Waqar U, Sajid MI, et al. The mystery of COVID-19 reinfections: A global systematic review and meta-analysis. Ann Med Surg (Lond). 2021;72:103130.
14. Islam MZ, Riaz BK, Akbar Ashrafi SA, Farjana S, Efa SS, Khan MA. Severity of COVID-19 reinfection and associated risk factors: findings of a cross-sectional study in Bangladesh. medRxiv. 2022:2021-12.
15. Wang J, Kaperak C, Sato T, Sakuraba A. COVID-19 reinfection: a rapid systematic review of case reports and case series. J Investig Med. 2021;69(6):1253-5.
16. World Health Organization. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV). Geneva: WHO; 2020. Available at: https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov). Accessed on 6 May 2023.

Cite this article as: Raveendranath PP, Kumaran JA, Jose JM. COVID-19 reinfection among health care workers in a tertiary care center in north Kerala: a descriptive study. Int J Community Med Public Health 2023;10:2868-71.