International Journal of Research in Medical Sciences
Shah AK et al. Int J Res Med Sci. 2022 Jul;10(7):1531-1535
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20221800

Case Series

Recurrent COVID-19 suggesting reinfection among seven health care workers in a teaching hospital in Mumbai

Anuradha K. Shah, Mayuri U. Raul, Rosna M. Anto, Kosturi Dakshit*

Department of Community Medicine, Seth GSMC and KEMH, Mumbai, Maharashtra, India

Received: 28 April 2022
Revised: 23 May 2022
Accepted: 30 May 2022

***Correspondence:**
Dr. Kosturi Dakshit,
E-mail: kosturi.18@gmail.com

ABSTRACT

The The Indian Council of Medical Research (ICMR) recently came up with an epidemiological definition for reinfection- a gap of 102 days between two positive molecular or rapid antigen tests with a negative molecular test in between. As it is not always feasible to do a genomic analysis, this working definition can provide useful insights. Here we describe a case series of seven health care workers (HCWs) who turned positive for the second time after a mean duration of 245.14 days (130-305 days). All of them had a minimum of one reverse transcriptase polymerase chain reaction (RTPCR) negative report in between the two episodes. Mere presence of neutralizing antibodies after natural infection or post-vaccination cannot be considered safe against COVID infection. Therefore, prevention should be always the priority -wearing masks, hand washing/sanitizing and social distancing needs to be continued, till we see an end to this pandemic.

Keywords: COVID-19, Reinfection, Pandemic

INTRODUCTION

Reinfection is not a possibility now, it's a reality.[1] Researchers around the world are trying to predict or bring out the possible definitions of the term "reinfection". The United States (US) and European Centre for Disease Prevention and Control (CDC) both consider a genomic difference of viral strains for proving reinfection, however, the Indian Council of Medical Research (ICMR) in a recent study has formulated an epidemiological or a working definition for reinfection- a gap of 102 days between two positive molecular or rapid antigen tests with a negative molecular test in between.[2]

Multiple cases have been reported around the world, with some of them carrying out genomic analysis to understand the difference of strains of the virus.[1] It is expected that some level of immunity builds up, be it post-infection or post-vaccination. But the measure or the exact extent to which this immune response is protective for second infection is not known. Here we describe a case series of seven health care workers (HCWs) who are working in a tertiary care hospital in Mumbai who turned positive for the second time and fit into the epidemiological definition of reinfection put forward by ICMR.

CASE SERIES

The detailed records about these seven HCWs are obtained from contact tracing activity records maintained by the department of community medicine at our institute. The average duration between recurrence of infection was 245.14 days (130-305 days). All cases had a minimum of one RTPCR negative report in between the two episodes. Vaccination for HCWs started in our institute on 16 January 2021. Case A became positive for the second time before vaccination drive. Case C and F did not take the vaccine. Rest had completed two doses of COVID vaccination before recurrence. The clinical details of the cases are presented in Table 1.

Table 1: Clinico-epidemiological details of probable cases of reinfection among seven HCWs.[2]

Case details	Type of test	Probable source of infection	Clinical profile and vaccination status	Investigation	Admission	Contacts	Negative test	Duration between episodes
Case A: 49-year-old, female, staff nurse								
1st episode	RTPCR (tested after COVID duty)	Breach in PPE due to misfit of PPE kit, was doing duty in community fever camps	Asymptomatic. known case of diabetes mellitus	Normal, anti SARS CoV2 IgG antibody not done	Hospitalised for -10 days, completed rest of the isolation at home	None tested positive	After 10 days	212 days
2nd episode	RTPCR	Exposure to a COVID-positive colleague	Fever, sore throat initially but, developed breathlessness and palpitation during isolation	D-dimer levels were raised for 3 weeks, antibody for SARS- CoV-2 positive after 30 days	Home isolated-25 days	Family members also tested positive at the end of quarantine	After 11 days	
Case B: 27-year-old, female, staff nurse								
1st episode	RTPCR	Living arrangement includes sharing common areas like washroom, where many inmates were positive	Body ache, cough, headache for 4 days	Normal anti SARS CoV2 IgG antibody not done	Hospitalised for 20 days	No contacts	After 27 days	261 days
2nd episode	RAT	Exposure to a COVID-positive family member	Asymptomatic, taken 2nd dose of vaccination one day back	Normal anti SARS CoV2 IgG antibody not done	Home isolated-17 days	No contacts	After 11 days	
Case C: 57-year-old, female, sweeper in operation theatre								
1st episode	RTPCR	Unknown	Fever for 8 days and breathlessness, known case of bronchial asthma	Normal, anti SARS CoV2 IgG antibody not done	Hospitalised for 30 days	No contacts	After 30 days	305 days
2nd episode	RTPCR	Unknown	Fever and cold for 2 days	Normal, anti SARS CoV2 IgG antibody not done	Hospitalised for 7 days, completed rest of the isolation at home	No contacts	After 7 days	
Case D: 21-year-old, male, MBBS student								
1st episode	RTPCR	Unknown	Nasal congestion for 7 days	Normal, anti SARS CoV2 IgG antibody was positive after 3 months	Home isolated-17 days	None tested positive	After 10 days	130 days

Continued.

Case details	Type of test	Probable source of infection	Clinical profile and vaccination status	Investigation	Admission	Contacts	Negative test	Duration between episodes
2nd episode	RTPCR (for travel)	Unknown	Asymptomatic, taken 2nd dose of vaccination one week back	Normal	Home isolated-17 days	None tested positive	After 4 days	
Case E: 30-year-old, female, senior resident doctor								
1st episode	RTPCR	Unknown	Headache, loss of taste, cough, and body ache for 3 days	Normal, anti SARS CoV2 IgG antibody was not detected	Hospitalised for 8 days, completed rest of the isolation at home	None tested positive	After 8 days	274 days
2nd episode	RTPCR	Unknown	Fever, cough, sore throat, body ache for 10 days, had completed both doses of vaccination 1.5 months back	Anti SARS CoV2 IgG antibody (post complete vaccination) was positive 10 days back	Home isolated-22 days	No contacts	After 22 days	
Case F: 27-year-old, male, junior resident doctor								
1st episode	RTPCR	Exposure to a COVID-positive colleague	Asymptomatic	Normal, anti SARS CoV2 IgG antibody not done	Hospitalised for 6 days, completed rest of the isolation at home	None tested positive	After 6 days	271 days
2nd episode	RTPCR	Unknown	Fever, myalgia, cold, and cough for 2 days	Normal, anti SARS CoV2 IgG antibody not done	Hospitalised for 12 days, completed rest of the isolation at home	No contacts	After 12 days	
Case G: 23-year-old, female, intern								
1st episode	RTPCR	Unknown (COVID ward duty)	Fever, rhinitis, and myalgia for 1 week	Normal, anti SARS CoV2 IgG Antibody not done	Home isolated-17 days	No contacts	After 16 days	263 days
2nd episode	RTPCR	Unknown (COVID ward duty)	Fever and anosmia for 1 day, had completed both doses of vaccination 1.5 months back	Normal, anti SARS CoV2 IgG antibody not done	Home osolated-17 days	No contacts	After 9 days	

Some of the cases were able to detect their sources of infection but rest couldn't. Among the sources breech in personal protective equipment (PPE), COVID ward duty or contact with COVID positive colleague are noted. Case A has been tested foe antibody after 2nd episode and it was positive even after 30 days of infection. Case E was opted for antibody testing after 10 days of vaccination and it was positive but eventually case E developed symptoms and tested positive for COVID-19.

DISCUSSION

The first few cases of reinfection around the world by the genomic analysis were reported with duration between two episodes ranging from 48 to 142 days.[3,4] Other reports are suggesting probable reinfection too but genomic sequencing was not done. Unavailability of resources and feasibility should not limit the knowledge regarding cases of reinfection. Genomic analysis is not always feasible, hence, the epidemiological definition of reinfection by ICMR is quite welcoming and has put an end to multiple queries regarding differentiating reinfection from reactivation and prolonged viral shedding. In this series, the duration between two episodes ranged from 130-305 days with a negative RTPCR report after the first infection.

Previous reports have shown the second infection can be of greater severity.[4,5] However, these have been reported before the vaccination for COVID was rolled out. COVID vaccines have shown protection against severe infection.[6,7] Therefore, one can expect cases of reinfection with reduced severity in vaccinated individuals. Case A in our study, got infected for the second time before COVID vaccination was rolled out in India. Her symptoms persisted for longer duration the second time and D-dimer levels were also raised for three weeks. In cases that had taken at least one dose of vaccine the second infection presented with mild symptoms/asymptomatic. Another observation that can be drawn is that the HCWs who were symptomatic in the initial episode tend to be asymptomatic or mildly symptomatic in the second episode (case B, C, D, and G) and those who were asymptomatic in the first episode developed symptoms in the second episode (case A and F). The total duration of symptoms also seems to be in this pattern as in, if longer duration of symptoms in the first episode, shorter is the duration during the second episode. This could be because the first episode with milder symptoms or shorter duration was not sufficient enough to generate a protective immune response which ended up in more severe or a longer duration of viremia in the second episode.[8] However, role of vaccination too cannot be ignored in the present context. In a study from India, they reported similar findings in addition to negative correlation between the number of days for recovery in the first and second episodes.[9]

The duration of hospital stay is can be disproportionately higher in few cases as it depended on the existing guidelines and facilities available for home or hospital isolation. None of the cases in our study reported having moderate/severe symptoms which required oxygen support or intensive care unit (ICU) admission in either of the episodes.

Another question that arises when we talk about reinfection is transmissibility. During the second infection one family member who was exposed to case A turned positive upon testing at the end of quarantine period. There was no other source of infection apart from the case which could be pointed out.

Case E and G are vaccine breakthrough cases.[10] It is expected that post-vaccination antibody response would have occurred by now. Case D had detectable levels of antibody 90 days after the first infection and developed the second infection 40 days later. The decline in the level of antibodies is variable and can explain this. Ju et al also reported second infection in patients with substantial titers of neutralizing antibodies. Therefore, their presence after natural infection or post-vaccination cannot be considered safe against covid infection.[11] The antibody tests were performed voluntarily by the HCWs, so the accurate time after which they developed antibodies is debatable cannot be generalized. We also do not know how many had neutralizing antibodies or the titer just before the second infection. With various mutant strains in the picture now, it is more difficult to comment on the role of protective antibodies.[12] We are still posed with questions like – how many times can reinfection occur? what is the level of protective antibody titer for reinfection? Will herd immunity ever be achieved? These will require systematic studies which can help in preparedness for the future. Till then, prevention should be always the priority and precautions should be the motto.[13] So, wearing masks, sanitizing hands and social distancing has to be continued till the chain of transmission is broken to the tip.

CONCLUSION

Due to continuous mutations new varieties of COVID-19 are emerging.[14] Some varients become our concern also due to high transmissibility or effect on human beings.[15] Presence of neutralising antibodies after natural infection or post-vaccination cannot be considered as complete immunity against COVID-19 infection. Therefore, prevention should be always the priority- wearing masks, hand washing/sanitizing and social distancing needs to be continued, till we see an end to this pandemic.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Shah AK, Raul MU. (RE) currences in COVID-19: (RE)-activation or (RE)-infection? J Fam Med Prim Care. 2021;10:1525-9.
2. 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.
3. European Centre for Disease Prevention and Control. Reinfection with SARS-CoV-2: considerations for public health response. Stockholm. 2020. Available at: https://www.ecdc.europa.eu/en/publications-data/threat-assessment-brief-reinfection-sars-cov-2. Accessed on 15 January 2022.
4. Shastri J, Parikh S, Agarwal S, Chatterjee N, Pathak M, Sharma C, et al. Whole Genome Sequencing Confirmed SARS-CoV-2 Reinfections Among Healthcare Workers in India with Increased Severity in the Second Episode. SSRN Electron J. 2020.
5. Shah AK, Velhal GD, Raul MU. Dilemma and implication of COVID-19 recurrences among healthcare workers. Int J Community Med Public Heal. 2021;8(3):1498.
6. The Bharat Biotech BBV152 COVAXIN vaccine against COVID-19: What you need to know. Available at: https://www.who.int/news-room/feature-stories/detail/the-bharat-biotech-bbv152-covaxin-vaccine-against-covid-19-what-you-need-to-know. Accessed on 27 May 2022.
7. Statement for healthcare professionals: How COVID-19 vaccines are regulated for safety and effectiveness. Available at: https://www.who.int/news/item/17-05-2022-statement-for-healthcare-professionals-how-covid-19-vaccines-are-regulated-for-safety-and-effectiveness. Accessed on 27 May 2022.
8. Huang AT, Garcia-Carreras B, Hitchings MDT, Yang B, Katzelnick LC, Rattigan SM, et al. A systematic review of antibody mediated immunity to coronaviruses: kinetics, correlates of protection, and association with severity. Nat Commun. 2020;11(1):1-16.
9. Mahajan N, Gajbhiye R, Lokhande P, Bahirat S, Modi D, et al. Clinical Presentation of Cases with SARS-CoV-2 Reinfection/Reactivation. JAPI. 2021;69.
10. Birhane M, Bressler S, Chang G, Clark T, Dorough L, Fischer M, et al. COVID-19 Vaccine Breakthrough Infections Reported to CDC — United States, January 1–April 30, 2021. MMWR Morb Mortal Wkly Rep. 2021;70(21):792-3.
11. Zhang J, Ding N, Ren L, Song R, Chen D, Zhao X, et al. COVID-19 reinfection in the presence of neutralizing antibodies. Natl Sci Rev. 2021;8(4).
12. What You Need to Know About Variants | CDC. Available at: https://www.cdc.gov/coronavirus/2019-ncov/variants/about-variants.html. Accessed on 27 May 2022.
13. Advice for the public. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public. Accessed on 27 May 2022.
14. COVID Variants: What You Should Know | Johns Hopkins Medicine. Available at: https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/a-new-strain-of-coronavirus-what-you-should-know. Accessed on 27 May 2022.
15. Coronavirus disease (COVID-19): Variants of SARS-COV-2. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-%28covid-19%29-variants-of-sars-cov-2?gclid=CjwKCAjw7cGUBhA9EiwArBAvogHkyqfZjHg8bdSOrDY6wkCxizkT93xesAbzPkX-dVvbuoO7VFqSKhoCNtcQAvD_BwE. Accessed on 27 May 2022.

Cite this article as: Shah AK, Raul MU, Anto RM, Dakshit K. Recurrent COVID-19 suggesting reinfection among seven health care workers in a teaching hospital in Mumbai. Int J Res Med Sci 2022;10:1531-5.