

# “Immune Response in SARS-CoV-2 Reinfection- A Friend or a Foe”- A Case Study from Kerala, India

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## ABSTRACT

Covid-19 caused by the SARS-CoV-2 is a major public health threat affecting the entire world causing significant mortality. Few studies have demonstrated possible chances of reinfection with the SARS-CoV-2. This case study describes the features of reinfection with the virus thirty two days after RT-PCR negativity in a 20 year old female in Kerala. This case highlights the possible chance of reinfection and the shortened viremia in response to the mounted good immune response.

**Key words:** SARS-CoV-2, COVID-19, Reinfection, Kerala, India.

## INTRODUCTION

COVID-19 pandemic is a looming public health threat which results in severe mortality across the globe owing to its high spreading rate, even though *per se* mortality is near 3 %. Studies by Tomassini *et al.*<sup>1</sup> and Batisse *et al.*<sup>2</sup> highlight the possibility of reinfection among patients with COVID 19. Both of them have emphasised the seroconversion these patients had and the probable reinfection among those with seroconversion. Among the cases reported by Tomassini *et al.* few had complete resolution of clinical symptoms with a negative PCR on follow up but turned positive again after a significant time duration. The possible reason they have suggested is that the antibodies wean off over a period and the host gets a reinfection. But this needs to be read with the fact that patients had worse outcomes with re infection in the series by Batisse *et al.* likely due to a hyperinflammatory response. There is currently no evidence that people who have recovered from COVID-19 and have antibodies are protected from a second infection.<sup>3</sup> We had an interesting observation in this regard. Here we describe the features of a patient who developed clinical features suggestive of COVID-19, thirty-two days after being symptom free and negative for Real time Polymerase chain reaction (RT-PCR). She had a positive result with RT-PCR at this time but became negative within 48 hr with a good IgG response. This case is probably the first reported case of reinfection with the SARS-COV-2 in India. It highlights the possible chance of SARS-COV-2 reinfection and the shortened viremia in reinfection possibly due to the mounted good immune response. So, a reinfection may have an exuberant inflammatory response resulting in

worse outcome as in Batisse *et al.* study or may have a shortened viremia as in our case.

## CASE STUDY

A 20-year-old female who was the primary contact of a COVID-19 super spreader developed mild fever and nasal discharge since 23/03/2020 and was tested positive for SARS- COV-2 on 24/03/2020. Her throat swab was positive for PCR for SARS-CoV-2 E (29.3), ORF1 (30.3) and RdRP (36.9) antigens. Her symptoms subsided within four days of onset and repeat throat swabs taken on ninth and fourteenth day of admission were all negative. There were no secondary cases from her and was released from home quarantine after 14 days.

She didn't travel anywhere or had any contact with confirmed or suspect cases since discharge. On 12/05/2020, 32 days after her discharge from the hospital she developed fever, rhinitis, mild cough and chest discomfort. Her RT-PCR was positive this time for both E (35.06) and S (34.52) antigens. But a repeat RT-PCR done 48 hr later became negative. Her Rapid antibody test was strongly positive for IgG. Her symptoms subsided by the fourth day of admission and the patient was discharged on 19/05/2020.

Pre-existing immunity due to the prior infection of SARS-CoV-2 might be the reason for the shortened secondary viremic phase associated with the enhanced IgG response as evidenced by the antibody test. The hyperinflammatory response seen in Betesse *et al.* study might have stemmed from the immune enhancement or antibody dependent enhancement (ADE) of virus uptake into immune cells during the secondary infection. These immune complexes are formed between the non-neutralizing cross

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reacting antibody and the SARS-CoV2- virus.<sup>4,5</sup> Alternatively, antibody dependent cell mediated cytotoxicity (ADCC) may also be involved. As per the existing literature, these inflammatory responses may be fatal, especially in the case of co-morbidity. In the current study the patient was only 20 years old and there was no co-morbidity issues which might have augmented the fast recovery.

The study also points towards the possibility of recurring infection of SARS-CoV-2 irrespective of pre-existing immunity, which is a hallmark of flu viruses belonging to beta coronavirus family.<sup>4</sup> These findings also need to be taken into consideration while developing the vaccine against SARS-CoV-2, wherein the long-term persistence of protective immunity is debatable. All these cases point towards the double-edged nature of immune response in cases of reinfection and it can either be a short viremia with a good outcome or an exuberant response with poor outcome- a friend or a foe?

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## ABBREVIATIONS

**SARS-CoV-2:** Severe Acute Respiratory Syndrome Corona virus 2; **RT-PCR:** Real time Reverse Transcriptase Polymerase Chain Reaction; **E:** Envelope protein; **S:** Spike protein; **ORF 1:** Open Reading Frame 1; **RdRP:** RNA dependent RNA Polymerase; **ADE:** Antibody dependent enhancement; **ADCC:** Antibody dependent cell mediated cytotoxicity.

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