

# Reinfection of SARS-CoV-2: reports of three cases from a tertiary care hospital of Bangladesh

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### ABSTRACT

*Coronavirus disease 2019 (COVID-19) is a contagious respiratory and vascular disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). First identified in Wuhan, China, it has caused an ongoing pandemic. Some viruses give us lifelong immunity after first infection and initially researchers thought that SARS-CoV-2 infection may give lifelong immunity after first infection but few cases of reinfection are reported both locally and internationally. We report 3 symptomatic cases of reinfection, diagnosed clinically and confirmed by positive reverse transcriptase polymerase chain reaction (RT-PCR) for SARS-CoV-2. So, everybody who survived an infection of SARS-Cov-2, should maintain universal masking and social distancing.*

**Key words:** COVID-19, reinfection, SARS-CoV-2.

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### INTRODUCTION

At present severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is an important health issue all over the world. The spectrum of illness, caused by SARS-CoV-2 infection, ranges from asymptomatic infection to severe pneumonia with acute respiratory distress syndrome (ARDS) and death.<sup>1</sup> As reinfection occurs in SARS-CoV-2, so currently Center for Disease Control and Prevention/Infectious Disease Society of America (CDC/IDSA) give diagnostic criteria for reinfection. If the intervening period between 1<sup>st</sup> and 2<sup>nd</sup> infection is  $\geq 90$  days, it needs reverse transcriptase-polymerase chain reaction (RT-PCR) positive 2 samples with or without symptoms and if intervening period is 45 to 89 days, it needs RT-PCR positive 2 samples with

symptoms and no obvious alternate etiology for coronavirus disease (COVID)-like symptoms. Here, we report 3 reinfection cases of COVID-19 that were diagnosed clinically and in whom RT-PCR were positive.

### CASE REPORTS

#### Case 1

A 54-year-old male businessman, known case diabetes mellitus and hypertension, presented on 9<sup>th</sup> October, 2020 with the complaints of fever, anorexia, non-productive cough for 10 days and shortness of breath for 4 days. Physical examination showed, he was febrile, had tachycardia, tachypnea and bilateral pleural rub. His oxygen saturation (SPO<sub>2</sub>) was 89% on room air. Laboratory investigations showed lymphopenia, high C-reactive protein (CRP), ferritin and D-dimer level (Table I). High resolution computed tomography (HRCT) of chest showed bilateral ground glass opacities with 30% lung involvement. His RT-PCR from nasopharyngeal swab for SARS-CoV-2 was positive on 22<sup>nd</sup> May, 2020. He stated that he had mild COVID-19 on 3<sup>rd</sup> week of May, 2020 with positive RT-PCR for SARS-CoV-2 from nasopharyngeal swab. His RT-PCR for SARS-CoV-2 became negative on 3<sup>rd</sup> June, 2020 (Figure 1). In between, he was completely alright but he used to go public places without mask and did not maintain social distances.

### Author information

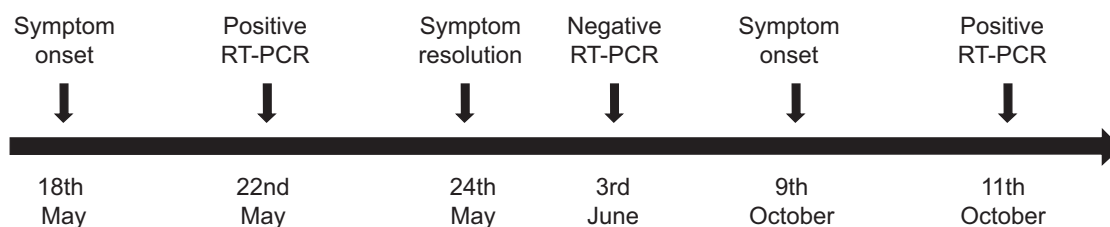
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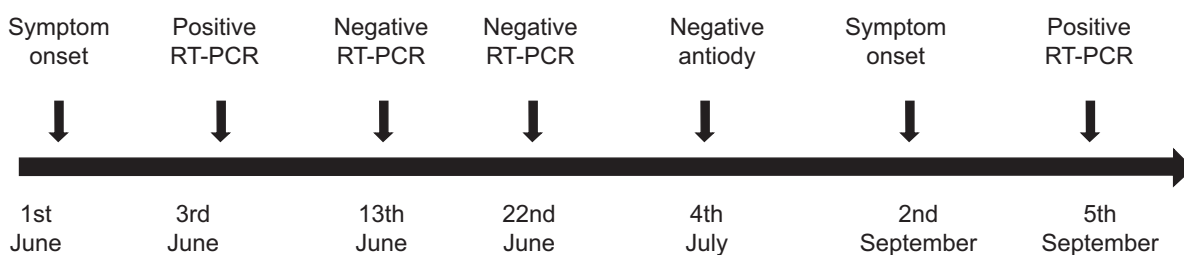
**Figure 1** Timeline of events in case 1 of SARS-CoV- 2 reinfection

Table I Characteristics associated with reinfection with SARS-CoV-2						
Case No	Sex	Age(years)	1 <sup>st</sup> Infection	2 <sup>nd</sup> infection	InterveningPeriod (day)	Probable sources
1	Male	54	Mild	Severe	145	Public place
2	Male	28	Asymptomatic	Mild	96	Hospital
3	Female	76	Moderate	Mild	37	Family

**Case 2**

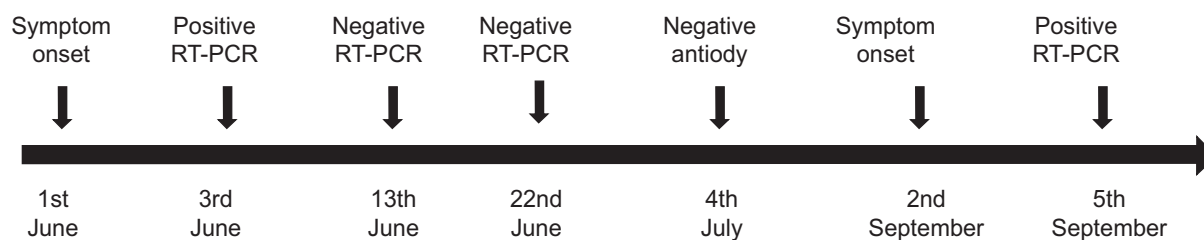
A 28-year-old physician presented with fever and generalized weakness on 2<sup>nd</sup> September, 2020. His vitals were normal. He was involved in managing patient in tertiary care hospital including COVID-19 patients. Laboratory reports including complete blood count (CBC), CRP, ferritin, chest x-ray and D-dimer remained within normal limits (Table II). On 5<sup>th</sup>

September, 2020, his RT-PCR for SARS-CoV-2 from nasopharyngeal swab was positive. He had history of asymptomatic COVID-19 with positive RT-PCR on 3<sup>rd</sup> June, 2020. That time he was nursing his father in a dedicated COVID hospital, who was diagnosed as a case of COVID-19 pneumonia. His 2 samples for RT-PCR for COVID-19 were negative on 13<sup>th</sup> and 22<sup>nd</sup> June (Figure 2).



**Figure 2** Timeline of events in case 2 of reinfection of COVID-19

Table II Biochemical and imaging finding of cases with SARS-CoV-2 reinfection cases during the second infection					
Case No	CRP (mg/L)	Ferritin (ng/ml)	Lymphocyte (%)	D-dimer (ng/ml)	Imaging
1	190	3909	13	1780	HRCT chest - 30% involvement
2	<3.1	141	23	539	Chest x-ray - normal
3	44.1	406	18	1893	Chest x-ray - normal



**Figure 3** Timeline of events in case 3 of SARS-CoV-2 reinfection

### CASE 3

A 76-year-old female, known case of diabetes mellitus, hypertension, ischemic heart disease, bronchial asthma and bullous pemphigoid, on oral prednisolone presented with fever, cough, body ache and generalized weakness on 2<sup>nd</sup> October, 2020. Her vitals were normal. Laboratory investigation showed lymphopenia, high CRP, ferritin and D-dimer (Table II). On 7<sup>th</sup> October, her RT-PCR for SARS-CoV-2 from nasopharyngeal swab was positive. She stated that she had a history of moderate COVID-19 on 1<sup>st</sup> week of September, 2020 with positive RT-PCR (Figure 3). That time, all her family members were RT-PCR positive SARS-CoV-2 infection.

### DISCUSSION

The COVID-19 pandemic has exploded since cases were first reported in China in December 2019. According to World Health Organization (WHO) weekly epidemiological update as of November 10, 2020, more than 49.7 million cases of COVID-19, caused by SARS-CoV-2 infections have been reported globally, including more than 1.2 million deaths since the start of the pandemic.

Between 8 March and 9 November 2020, according to the Directorate General of Health Services (DGHS) Press Release, there 421,921 COVID-19 confirmed by RT-PCR, including 6,092 related deaths (CFR 1.76%). Bangladesh is the top 22th country in the world and accounts for about 1% of the COVID-19 disease burden in the world.

SARS-CoV-2-specific antibodies and cell-mediated responses are induced following infection.<sup>2</sup> Evidence suggests that some of these responses are protective.<sup>3</sup> However, it is unknown whether all infected patients mount a protective immune response and how long protective effects will last.<sup>4</sup> The magnitude of antibody

response may be associated with severity of disease and that patients with mild infection may not mount detectable neutralizing antibodies.<sup>3</sup> The durability of neutralizing activity following infection is uncertain. Neutralizing antibodies decline over several months after infection.<sup>3</sup> In a study of 37 patients who had symptomatic COVID-19, by eight weeks following hospital discharge, neutralizing activity decreased by a median of 12 percent in 62 percent.<sup>5</sup> Studies have shown that antibody response was not detectable in some patients until 2–3 weeks after onset of symptoms.<sup>3</sup>

Study showed that antibody levels fell by around 50% during the first two months after infection but then plateaued.<sup>3</sup> The magnitude of the T cell response at six months was strongly correlated with the magnitude of the peak antibody response.<sup>6</sup> Overall, the short-term risk of reinfection (eg, within the first few months after initial infection) appears low. Nevertheless, sporadic cases of probable reinfection have been documented.

Few COVID-19 reinfection cases were published intentionally and one case locally.<sup>7</sup> Internationally, four cases from Hong Kong, USA, Belgium and Ecuador.<sup>3,8-10</sup> First case, an asymptomatic 33-year-old man in Hong Kong tested positive for SARS-CoV-2 on travel-related screening five months after mild laboratory-confirmed COVID-19; sequencing of viral genomes extracted from saliva specimens collected during each infection indicated two distinct strains, suggesting two distinct infections.<sup>3</sup> The first infection elicited detectable neutralizing activity (evaluated using a reference strain-based neutralizing assay) that was undetectable at the time of the second infection.<sup>3</sup> Nevertheless, that the second infection was asymptomatic, raises the possibility that immunity from an initial infection might attenuate the severity of a reinfection even if it does not prevent it.

However, not all cases of purported reinfection have been less severe than the initial infection and at least one fatal reinfection has been reported in a patient undergoing B cell-depleting therapy and chemotherapy.<sup>4</sup>

We reported three cases of reinfection of COVID-19. Several lines of evidence support that the second episode is caused by reinfection instead of prolonged viral shedding. First, second infection occurred 145 days, 96 days and 36 days after first infection (Table I). Second, all patients were symptomatic during second infection including severe infection. Third, inflammatory markers for COVID-19 were significantly increased in all cases (Table II). Fourth, in one patient there was typical radiological finding on HRCT chest.

In our cases, we did not do whole viral genome sequencing as it required both samples which is not possible in our country as routine, due to lack of facilities. So, COVID-19 reinfection can occur few days to few months after first infection depending on antibody level, viral load and patient's co-morbidity and reinfection may be mild or severe.

Asymptomatic reinfection cases can only be picked up by routine community testing or at an airport, for example and we are probably severely underestimating the number of asymptomatic reinfections.<sup>2</sup> Why do some reinfections result in milder disease whereas others are more severe? Further investigation is needed of pre-existing immune responses before second exposure and viral inoculum load.

CDC/IDSA recommends, patients with previous COVID-19 infections, should also comply with epidemiological control measures such as universal masking and social distancing.

**Authors' contribution:** MJI and JUA diagnosed the case, planned publication and did literature search and drafted the manuscript. IUH did record keeping. All authors read and approved the final manuscript for publication.

**Conflicts of interest:** Nothing to declare.

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