Is SARS-CoV-2 re-infection, a result of ineffective antibody response?

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ABSTRACT

This is a case report of two patient who developed symptoms and retested positive for SARS COV-2 after being recovered from the same infection one month back. Reinfections will increase the case burden and delay herd immunity. Reinfection is possibly due to poor antibody response of the first infection. Poor antibody response is possibly due to mild infection with low viral load.

Keywords: antibody, COVID-19, reinfection

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Case

A 24-year-old female and 26-year-old male, from Kathmandu, Nepal presented to the fever clinic of Patan Academy of Health Sciences with history of fever and malaise for 1 day. Common finding in both of the cases being both of the patients recovered from COVID 19 one month back with asymptomatic and uneventful course of 14 days and separated by two negative reports in between. With the ongoing pandemic and those symptoms, nasopharyngeal and oral swab were sent for Real Time Polymerase Chain Reaction test. After 1 day, yet again both of their report came as positive for both ORF 1 ab gene and N gene. This time, they both were symptomatic with common symptoms of fever with dry cough, malaise, headache and anosmia. However, both denied of having shortness of breath or chest pain. Clinically examinations did not show significant findings. Both of their saturation were maintained above 94% throughout the illness. The Cycle threshold (ct) value for first case was 35.36 and 38.14 for ORF 1 ab gene and N gene respectively on 25th August and 23.56 and 26.64 for ORF 1ab gene and N gene respectively on 4th October. The Ct value for second case was 35.7 and 37.03 for ORF 1ab gene and N gene respectively on 23rd August and 34.9 and 34.52 for ORF1ab gene and N gene respectively on 4th October. Other lab parameters (Complete blood count, serum creatinine, C-reactive protein) were within the normal values. As both the cases had mild symptoms and no supplemental oxygen demand, both were kept under home isolation and prescribed with paracetamol on as needed basis. Their symptoms gradually improved and full recovery was achieved by 14 days.

DISCUSSION

Infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) results in generation of neutralizing antibodies in patients.[1] However, it is still under research subject that to what extent does this immune response provides a protective immunity to subsequent infection with SARS-CoV-2. The humoral immune response is critical for the clearance of cytopathic viruses and is generally important for the prevention of viral reinfection.[2] Cases of reinfection have been reported from USA[3], Hong Kong[4], the Netherlands and Belgium[5] and Ecuador.[6] Cases of primary illness due to infection followed by a discrete secondary infection or illness with the same biological agent can best be ascertained as distinct infection events by genetic analysis of the agents associated with each illness event. However that is not feasible in most of the settings around the globe.

The concept of reinfection among the patients with COVID 19 depends on how well and how long the immune response lasts. For some viruses, the first infection can provide lifelong immunity; for coronaviruses, protective immunity can be short-lived.[7]

If our patients are the case of reinfection, is it because of an inadequate antibody response after first infection, since both of them were asymptomatic in the first instance. Several studies have revealed that patients with severe symptoms have higher prevalence and level of SARS Cov 2 Antibody that in patients with no or mild symptoms. [8-10]

The Ct value of PCR correlates with viral load, and low Ct values (high viral load) might indicate infectiousness of the individual. In a study done by Singanayagam et al, samples with Ct values greater than 35 were only 8% positive for cultivable virus.[11] A study found significantly higher ct values, i.e. significantly lower viral loads, in the swabs obtained from asymptomatic contact persons compared to symptomatic. In addition, ct values and the SARS-CoV-2-IgG ratio were significantly negative correlated in both groups. Significantly higher ct values in contact persons and the negative correlation of the ct values with the SARS-CoV-2-IgG ratio suggests a lower viral load as a possible explanation for lower rate of seropositivity in asymptomatic contact persons.[12] This could be the explanation to the ct value of above 34 in both of our cases in the first instance of infection.

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