Short Communication

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Cycle Threshold in RT-PCR: A Relevance to Low-Middle -Income Countries

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ABSTRACT

With the result of the various studies on the COVID issue, our view shows that determination of Cycle Threshold (Ct) value will help in managing COVID positive cases efficiently and economically during this time of high spread of pandemic. At large, COVID has created chaos and health sector facing extreme shortages of resources and not enough infrastructures to keep COVID patients in country like Nepal and other LMICs. Hence segregating COVID positive cases according to the viral load i.e.; Ct value will help us managing the cases without much stress on the nearly flooded hospitals and we can even easily monitor the cases along with their contacts.

Keywords: COVID; Cycle Threshold Value; LMICs; RT-PCR

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Cycle Threshold in RT-PCR: A Relevance to Low-Middle -Income Countries

The rapid spread of infection has devastated the already weak health care system of Low-Middle -Income Countries (LMICs) and has brought chaos in all around the world. The hospitals, health centers are full of the infected patients, the health workers who were already lesser in numbers have grown lesser due to falling prey to this virus. The chaotic situation is echoed in World Health Organization (WHO) as well. It has updated its policy so many times and so rapidly that it has got trapped in its own confusion. Firstly, the confusion on the 'human-to human' transmission back during month of December last year, then lack of the guidance on safety measures among public and health workers, later denying of COVID as 'airborne' transmission and later again accepting it has all affected on the formulation of health policies in LMICs that depend heavily on WHO guidelines. Hence, it is imperative to have the large-scale research on drugs, diagnosis, and public health safety measures by independently or together by all nations to have clarity in management. This clarity will help a lot to the countries in early and accurate diagnosis of COVID.

The detection of COVID infection is based on identifying the genetic material of COVID virus or finding the immune response to the COVID infection. The detection of antibody production is the simplest way to diagnose but it is an indirect way and the different techniques utilized until now shows large variability in antibody detection and thus specificity and sensitivity are low and inconsistent and so not very useful for COVID detection. The direct way, that is, identifying the genetic material of the virus seems the best and most reliable way to detect the presence of the virus. The method used for identifying genetic material from COVID virus is a real-time polymerase chain reaction (RT-PCR).

RT-PCR is the most accepted standard test for detection of COVID infection [1,2]. The test enables early detection of viral genes from clinical samples collected called swab. However, regardless of the method used, the sensitivity and specificity of the various RT-PCR are not 100%. The sensitivity is estimated to be approximately 70% and specificity, around 95% [3]. The accuracy of viral swabs varies depending on the site and quality of sampling. In a study of 205 patients, it was seen that highest sensitivity was seen in broncheo-alveolar lavage (93%) while lowest sensitivity was seen

in throat swabs (32%) and nasopharyngeal swab was in-between (67%) [4]. Similarly, other factor that may interfere with the result is the viral load of the sample (type of material collected, and the disease severity [5].

If the RT-PCR test result is positive, then it allows the clinicians and public health professionals to isolate the patient as soon as possible and prevent spread of the viral infection. The Cycle threshold (Ct) value of a RT-PCR is the number of cycles at which fluorescence of the PCR product is detectable over the background signal [6]. The Ct values are inversely proportional to the amount of genetic material (RNA) in the sample which means lower Ct values may be associated with more viral load and worse course of illness and outcomes and vice versa. The infectivity correlated with Ct value (Ct above 33 to 34 are not contagious) [7]. Although few disparities in Ct value and positivity in RT-PCR exist [8], the Ct value can be useful in predicting the clinical course and prognosis of patients. This will help health workers to categorize and prioritize the COVID patients to provide appropriate treatment and minimize risk.

The LMICs including Nepal has poor health system. The health costs are borne by the people themselves. The number of ICU and the available bed to the population ratio is frightening low. There is lack of proper quarantine or isolation facility. There are extremely low COVID dedicated hospitals. Nepal is leading its population towards the unpleasant situation of poorly controlled infection. The only protocol that Nepal had followed strictly was lockdown as it was seen effective in many other countries. Yet, the cities with high population density have been badly infected with this virus. However, approach of contact tracing, testing and treatment has been disappointing. The Ct value in RT-PCR testing thus can be very useful in management of cases as it can help us segregate based on severity and viral load [8]. The group with high Ct can be persuaded for home or other proper quarantine while those with low Ct value can be isolated in the stricter way and thus severe cases can be properly managed in the hospital. We understand the variable Ct value in different RT-PCR method, and hence suggest the researchers to focus on working out to bring one uniform Ct value that can help us determine the infectivity of the patient. This will prove very economical of LMICs including Nepal.

Presentation at a Meeting

None

Conflicting Interest

None to declare.

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