



ISSN: 2091-2749 (Print)  
2091-2757 (Online)

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#### Submitted

06 Jun 2021

#### Accepted

12 Aug 2021

#### How to cite this article

Rony Maharjan, Dipesh Mangal Joshi. Predicting third wave of COVID 19 in Nepal. Journal of Patan Academy of Health Sciences. 2021Aug;8(2):58-62.

<https://doi.org/10.3126/jpahs.v8i2.28873>

## Predicting third wave of COVID-19 in Nepal

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### Abstract

Nepal is experiencing a second wave of COVID-19 infection leading to major health impacts and crises. Despite the development of a vaccine against COVID-19 and its wider coverage, many countries have already experienced the third wave. After vaccination against COVID-19 antibodies has been seen to be present till eight months in different studies, evidence beyond that is yet to come. Looking at the trends of reinfections and mathematical models for the prediction of COVID-19 infection, there are high chances that Nepal will face the third wave, and children will be affected more due to the unavailability of vaccines for this age group. There is no fixed definite time to detect when the third wave hit. From the health crisis experience during the second wave, Nepal should stress the implication of various strategic and evidence-based measures for third-wave preparedness and mitigation to minimize morbidity, post COVID-19 infection complications, and mortality.

Keywords: COVID-19, Nepal, preparedness, third wave

## Introduction

**The first and second wave of COVID-19 in Nepal:** Nepal had its first case of COVID-19 on 24 Jan 2020 in a passenger returning from China and the number escalated to 3235 cases by 06 Jun 2020 with 13 deaths.<sup>1,2</sup> From the data of the John Hopkins University CCSE project, Nepal had a maximum number of 5743 daily recorded cases on 21 Oct 2020 which gradually declined to the lowest of 57 new cases on 13 Feb 2021 and remained below 200 till the end of March 2021. As of 1 June 2021, Nepal has total confirmed cases of 5,61,302 with 7,386 deaths and only 2.41% (6,89,516) of the total population is vaccinated.<sup>3</sup>

Nepal shares an open border with the northern part of India which now has the second-highest records of total cases globally. Despite the continuous efforts, the government of Nepal has failed to prevent the influx of migrants from India.<sup>4</sup>

Thus, it isn't a surprise that both the first and second waves coincide with the peaks in India which occurred in September 2020 and March 2021. Again, Nepal follows the pattern of decline of cases in India since the first week of May.<sup>5</sup>

**The third wave of COVID-19 in Nepal:** In an epidemic, the rising and declining trend of infections over some time resembles a shape of a wave. An increasing trend of cases for several weeks after the decline of the second wave would qualify as a third wave.

The stronger mutation of COVID-19 should warn of the possibility of a third wave. In addition, studies have found that the antibodies against COVID-19 last till eight months of infection. So, if the vaccination drive is not ramped up, the third wave could be inevitable and is predicted to occur after 6-8 months in India.<sup>6</sup> In that case similar predictions can be made for Nepal after looking at the trend of the first and second wave of COVID-19.<sup>5</sup> Similar assumptions have been made in South Africa of having an early

mild third wave or a surge of similar intensity as the second wave if it surpasses the time beyond immunity and mutation of a new variant.<sup>7</sup> Speculations have been made of increased risks to children in the third wave mainly due to the unavailability of vaccines for the pediatric population.<sup>8</sup>

Studies and trend analysis of COVID-19 infection done in Japan and many European countries show that the third wave has hit with an increased infection rate as soon as the relaxation of immigration restrictions and increased peoples' activities.<sup>9,10</sup> Various direct mathematical models are being used to study the trend and analysis of the first and second wave of COVID-19 infection across various countries of Asia, Europe, Africa, and America, and predict the time for the possible third wave of COVID-19. However, no definitive time frame could be estimated as the time frame varied with the first and second wave start and peak.<sup>11-13</sup>

Several predicting models of a pandemic, a trend of the COVID-19 cases in Nepal and other countries showed that the first wave was much mild in severity, incidence, and mortality compared to the second wave.<sup>10,13,15</sup> A Study done in Korea has shown that the third wave lasted longer than the second wave (36 vs >56 days) and had a higher case fatality rate of 1.26% vs 0.91% in the second wave.<sup>16</sup> In addition, the third wave in the US showed increased outbreaks in custodial institutions like prisons and detention centers.<sup>17</sup> Several factors such as ease in locked down, increased people's activity, increased relaxation of immigration policies would play a significant role in the increase of infection among people in coming days. With wider coverage of vaccination programs is believed to increase the immunity against COVID-19 infection, though it is still believed to occur in a larger picture and population group but in a less severe form of infection.<sup>8,11,13</sup>

Vaccination for health care workers in Nepal started on 27<sup>th</sup> January 2021, vaccine used was ChAdOx1 AstraZeneca.<sup>18</sup> At present we,

don't know how long will the immunity with the AstraZeneca vaccine last.<sup>19</sup> However Pfizer, BioNTech, and Moderna confirmed that immunity from their vaccine was still going strong six months after the second dose of vaccine.<sup>20</sup> At present, we are running in a three-month post-second dose of COVID-19 vaccine, it is a matter of concern whether the health care workers will still have sustained immunity during the third wave or not.

It has been observed that the pandemic of COVID-19 has affected severely most of the country leading to deep economic recession and serious health impacts. However, in the case of Nepal particularly during the peak of the second wave, along with the economy, there has been a rapid rise of COVID-19 infected patients, increased hospitalizations, and oxygen demand. As a result of lack of adequate COVID-19 dedicated hospital, excessive hospital beds occupancy, decrease in Oxygen production and supply, the real situation seemed to be chaotic and a health crisis is observed.<sup>14,21</sup> Since there have been no significant changes and development of medical infrastructure in Nepal, similar health scarcity and problems are most likely to occur during the third wave of COVID-19 infection.

**A way forward:** Evidence from the study done in Japan discovered that their ability to combat the second wave of COVID-19 without declaring a state of emergency by implementing several measures and policy such as decreasing crowd activity, increase the number of inspections, and strict immigration policy.<sup>9,10</sup>

Readiness and response to the COVID-19 pandemic at the national and local government level are needed for a possible third wave in Nepal. Some of the measures required to address this possible 3<sup>rd</sup> wave may be-

- i. Strengthening of Health Policy and Infrastructure: Preparedness with adequate health facilities (beds-both general and ICU, health workers, health equipment) with satellite hospitals,

laboratories (maintaining quality up to the standard set by WHO).<sup>21</sup>

- ii. Immigration Policy Review: Indo-Nepal Border immigration restriction and policy review is the other main strategy to prevent such a large number of incidence and prevalence of COVID-19 infection in the future, as it is evident that open Indo-Nepal Border was one of the main factors of increased COVID-19 cases in Nepal.<sup>21</sup>
- iii. Public Health Policy: Increased public health awareness among individuals is the other important factor for the decrease in transmission of infections. Maintaining hand hygiene, social distancing, and use of masks play a significant role to minimize infection transmission, overall hospitalization, and mortality.<sup>22,23</sup>
- iv. Wide Coverage of COVID-19 vaccine: Though not fully protective, several studies have shown that vaccines provide and boost immunity against COVID-19 infection, thus decreasing the overall severity, morbidity, mortality, and health complications of COVID-19 infection.<sup>2,21,24</sup> Since studies have shown the immunity to last for 6-8 months after vaccination, the provision of booster doses could cut down the severity of the third wave.
- v. Identifying the at-risk population: Elderly and patients with comorbidities would still be vulnerable during the third wave.<sup>25</sup> However, preparedness for the third wave should also target the pediatric population for which initiation has been taken by the government of Nepal by secluding the beds for children in hospitals for COVID-19 cases.<sup>26</sup> Safety of the front-line workers should be ensured via vaccination and maintenance of the Infection Prevention and Control

#### Acknowledgment

Assistant Prof. Dr. Ashis Shrestha for suggestions in the preparation of the manuscript.

#### Author Contribution

Concept, design, planning: All; Literature review: All; Data collection: All; Data analysis: All; Draft manuscript: All; Revision of draft:

All; Final manuscript: All; Accountability of the work: All.

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