



Effect of Covid-19 Vaccination on disease Severity among Covid -19 patients admitted in KMCTH.

Navin Kumar Mishra¹, Rohit Karn², Milan Shrestha², Abhiskar Acharya², Sunil Acharya², Suresh Dahal³, Arpana Neopane¹

¹Department of Pulmonary, Critical Care and Sleep Medicine, Kathmandu Medical College Teaching Hospital

²Department of Internal Medicine, Kathmandu Medical College Teaching Hospital

³Department of Community Medicine, Kathmandu Medical College Teaching Hospital

ABSTRACT

Background: The COVID-19 Pandemic has affected millions of people globally with significant morbidity and mortality. Though the overall case fatality rate (CFR) in Nepal was less than 1% during the initial peak, the CFR is expected to increase during the current second wave of the pandemic. Since no specific effective therapies exist, breaking the chain of transmission sounds logical. COVID-19 vaccine development is believed to be effective and safe in preventing disease adverse outcomes.

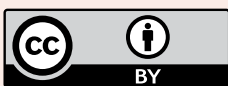
Aim: Primary aim of the study was to know the COVID-19 vaccination status among the patients admitted with RT-PCR positive for COVID-19 and secondary aim of the study was to observe the difference between the outcome in terms of resources utilization LIKE NON-INVASIVE VENTILATION (NIV), Hi-flow nasal cannula (HFNC) and invasive mechanical ventilation (IMV) in vaccinated and unvaccinated patients.

Method: This was a hospital-based Prospective Observational Study. All patients admitted at KMCTH from June 01, 2021 –July 31st 2021 with COVID-19 RT-PCR Positive meeting inclusion criteria were enrolled. Ethical Clearance was taken from KMC-IRC.

Result: During the study period, a total of 160 RT-PCR Positive Covid-19 cases were admitted at Kathmandu Medical College Teaching Hospital (KMCTH). Out of the total patients, 74 (46.25%) were not vaccinated for covid-19 whereas 86 (53.75%) patients were vaccinated either with Vero cell (39.53%) or Covishield (60.47%) Covid-19 vaccine. The study showed 2.32% of vaccinated patients required ventilatory support compared to 13.50 % of unvaccinated patients requiring ventilatory support having significant (p value <0.05) impact on outcome. The relative risk for unvaccinated patients going to ventilator was 5.81 times higher than for vaccinated patients.

Conclusion: The authors found out that more than half of the individual admitted were vaccinated (53.75 VS 46.25). Moreover, Vaccination (either with Covishield or Vero cell) appears to be effective in limiting requirement of more advance services like NIV, HFNC, and invasive mechanical ventilator. We recommend a larger, multicenter, randomized study in the future.

Keywords: Covid-19; Coronavirus; Covishield with Vero Cell vaccine.



This work is licensed under a Creative Commons Attribution 4.0 Unported License.

INTRODUCTION

The most widespread coronavirus to date was discovered in Wuhan, China in November 2019, and the disease it causes is named coronavirus disease (COVID-19). A SARS-CoV-2 RNA causes COVID-19 pneumonia. Coronavirus has Spike proteins on its surface and is rapidly transmitted from one person to another through respiratory droplets having an incubation period of two to fourteen days. COVID-19 infection is often associated with systemic inflammation and inflammatory biomarkers such as IL-6, IL-10, and TNF- α increase in the

patients^{1,2,3}. Although Cough, fever, and shortness of breath are the non-specific, dominant symptoms of COVID-19 infection, loss of taste and smell senses helps one suspect COVID-19 strongly and helps proceed with RT-PCR COVID-19 testing. According to the World Health Organization (WHO)

Corresponding author:

Navin Kumar Mishra
Kathmandu Medical College Teaching Hospital
Department of Pulmonary, Critical Care and Sleep Medicine
Email:navin.mishra@kmc.edu.np

report, from the emergence of COVID-19 in December 2019 to November 2021, more than 250,000,000 confirmed cases of COVID-19 have been reported, and more than five million deaths have been attributed to the disease globally⁴. During early 2020, when the entire globe was badly hit by a novel coronavirus with no clue on how to fight it, global commitment and willpower prompted vaccine development in addition to proven preventive strategies like using masks, keeping their distance, and isolation of infected individuals as well as respiratory and hand hygiene which helped in breaking chain of transmission. The government of Nepal began to vaccinate Nepalese Citizen on 21st January 2021 on a priority basis which continues till date.

The Oxford/AstraZeneca COVID-19 vaccine (ChAdOx1 nCoV-19 vaccine, AZD1222) contains a replication-deficient chimpanzee adenoviral vector ChAdOx1, delivering the SARS-CoV-2 structural surface glycoprotein antigen (spike protein; nCoV-19) gene^{5,6}. The significant role of COVID-19 vaccination in confining the infection and limiting disease progression seems key to combating Covid-19 disease.

Vero Cell, Inactivated is made from the SARS-CoV-2, 19nCoV-CDC-Tan-HB02 strain which is inoculated on the Vero cells for culturing, harvesting, β-propiolactone-inactivation, concentration and purification, then followed by adsorption with aluminum hydroxide adjuvant to form the liquid vaccine. The vaccine is free of antibiotics and preservatives and is developed by Sino Pharma.

In fact, preventive medicine has been scientifically proven to be effective in various contagious diseases. The motto “Prevention is better than cure” is strongly trustworthy and scientifically proven medical tool; therefore, COVID-19 Vaccination was supposed to be the earliest possible modality to break chain of transmission as well as progression of disease severity. Hence, in addition to knowing vaccination status among admitted patients as a primary goal, observing its effect on resource utilization was secondary goal of the study.

METHODOLOGY:

This was a single hospital-based Prospective Observational Study. All patients admitted at KMCTH from June 01, 2021 –July 31st, 2021 coming with fever, cough, dyspnea, myalgia, fatigue, loss of taste, loss of smell etc. in various combinations regardless of vaccination status (vaccinated either single or double dose or unvaccinated) was enrolled and their records were kept. Ethical Clearance was taken from KMC-IRC Ref no: 2005202106. Results were analyzed using statistical tools like MS-Excel and percentage prevalence, association using p value by chi-square test was calculated, and the final report was interpreted.

RESULT:

During the study period, a total of 160 RT-PCR Positive Covid-19 cases were admitted at KMCTH and were included in the study. Out of the total patients, 74 (46.25%) were not vaccinated for COVID-19 whereas 86 (53.75%) patients were vaccinated either with Vero cell (39.53%) or Covishield (60.47%) Covid-19 vaccine. Out of 86 vaccinated, 50 (58.19%) were partially vaccinated i.e. single dose and 36 (41.86%) had complete i.e. two doses of vaccination.

Vaccination status of Patients

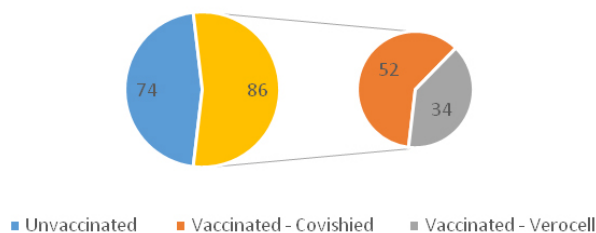


Figure 1: Vaccination status of the patients

We compared the treatment requirement between the vaccinated and unvaccinated patients and found out that only 2.32% of vaccinated patients required ventilatory support with respect to 13.50 % of unvaccinated patients which was statistically significant (p value <0.05). The relative risk of going into the ventilator was 5.81 times higher in unvaccinated than in vaccinated patients. The figure 2, shows the different treatment modalities needed (ventilatory and non-ventilatory methods) in both vaccinated and unvaccinated patients.

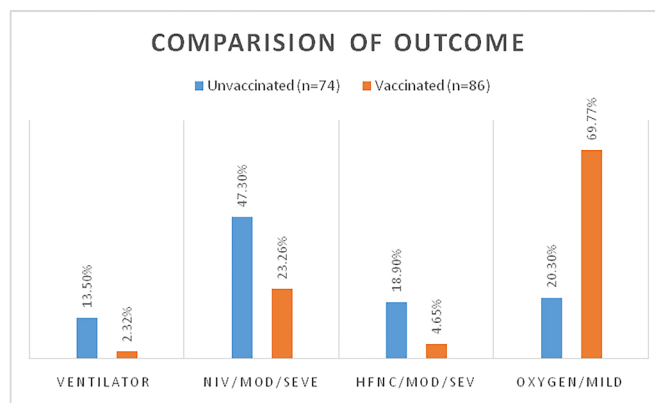


Figure 2: Comparison of outcome among vaccinated and unvaccinated patients

NIV: Non-Invasive Ventilator, HFNC: HI-Flow Nasal Cannula, Mod: Moderate Covid-19, Sev= Severe covid-19

Figure 2 shows vaccinated vs unvaccinated individuals requiring Oxygen therapy, HFNC, NIV, and Ventilator services.

It is visible from the above figure that the majority of COVID-19 patients who were vaccinated were managed with oxygen (69.7% vs 20.3%) alone, compared to unvaccinated

individuals who required additional therapy more in the form of HFNC (18.9% vs 4.65%), NIV (47.3% vs 23.26%), and Invasive Mechanical Ventilator (13.5% vs 2.32%) .

DISCUSSION:

In the beginning of the pandemic, when the entire globe was shaken by the consequences of COVID-19, because of the high contagious nature of the virus, vaccination has been considered a significant measure in the fight against COVID-19. Development and distribution of the vaccine was a great challenge; but with commitment, various vaccines were developed within a limited time frame which helped contain/mitigate the virus/disease.

Our study showed that 53.75% of the study population was vaccinated with either Covishield or Vero cell Vaccine partially (single dose) or complete (2 doses). Indeed our study also showed that the majority of COVID-19 patients who were vaccinated were managed with oxygen (69.7% vs 20.3%) alone compared to Unvaccinated individuals who required additional therapy more in the form of HFNC (18.9% vs 4.65%), NIV (47.3% vs 23.26%), Invasive Mechanical Ventilator (13.5% vs 2.32%) compared to a study from Vellore, India showed Vaccine Effectiveness among Health Care Workers who had received two doses of a Covid-19 vaccine to be 65% (95% CI: 61–68)⁷. Similarly, Studies from Singapore and Malaysia estimated about 55% protection against severe disease, including hospitalization requiring oxygen supplementation and admission to the intensive care unit (ICU) using Vero cell^{8,9}.

Mild infections are the main source of SARS-CoV-2 transmission. Successful prevention of mild infections is crucial for containing the pandemic. However, the efficacy of vaccination in preventing asymptomatic infections was suboptimal and could well be lower than 50%, suggesting that the vaccines alone are unlikely to be able to stop the pandemic. In addition, vaccine efficacy against symptomatic infections seemed lower than that estimated in other meta-analysis^{10,11} of earlier RCTs done in the wild-type strain predominant period (about 95% for mRNA vaccines and 80% for virus vector vaccines) which is in line with our finding of majority of vaccinated patients were managed with oxygen (69.7%) therapy only compared to unvaccinated individuals.

The study had several limitations; a single center, non-randomization with small sample size. Also, we did not look at the effectiveness of each vaccination separately.

CONCLUSION:

The authors found out that more than half of the individual admitted were vaccinated (53.75 VS 46.25). Moreover, Vaccination (either with Covishield or Vero cell) appears to be effective in limiting requirement of more advance services like NIV, HFNC, and invasive mechanical ventilator. We recommend a larger, multicenter, randomized study in the future.

REFERENCES:

1. Gilzad-Kohan H, Jamali F. Anti-inflammatory Properties of drugs used to Control COVID-19 and their Effects on the renin-angiotensin system and angiotensin-converting Enzyme-2. *J Pharm Pharm Sci.* 2020;23:259–77. <https://pubmed.ncbi.nlm.nih.gov/32735768/>
2. Chen G, et al. Clinical and immunological features of severe and moderate coronavirus disease 2019. *J Clin Invest.* 2020;130(5):2620–9. <https://pubmed.ncbi.nlm.nih.gov/32217835/>
3. Guan WJ, et al. Clinical characteristics of Coronavirus Disease 2019 in China. *N Engl J Med.* 2020;382(18):1708–20. <https://pubmed.ncbi.nlm.nih.gov/32109013/>
4. WHO., WHO Coronavirus (COVID-19) Dashboard. 2021. <https://data.who.int/dashboards/covid19/cases>
5. Sadoff J, et al. Safety and efficacy of single-dose Ad26. COV2. S vaccine against Covid-19. *N Engl J Med.* 2021;384(23):2187–201. <https://www.nejm.org/doi/full/10.1056/NEJMoa2101544>
6. Kumar VM, et al. Strategy for COVID-19 vaccination in India: the country with the second highest population and number of cases. *npj Vaccines.* 2021;6(1):1–7. <https://www.nature.com/articles/s41541-021-00327-2>
7. Victor PJ, Mathews KP, Paul H, Mammen JJ, Murugesan M Protective Effect of COVID-19 Vaccine Among Health Care Workers During the Second Wave of the Pandemic in India. *Mayo Clin Proc.* 2021;96(9):2493–2494. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8233962/>
8. Premikha M, Chiew CJ, Wei WE, Leo YS, Ong B, Lye DC, Lee VJ, Tan KB. Comparative effectiveness of mRNA and inactivated whole virus vaccines against COVID-19 infection and severe disease in Singapore. *Clin Infect Dis.* 2022;75(8):1442–45. doi: 10.1093/cid/ciac288. <https://pubmed.ncbi.nlm.nih.gov/35412612/>
9. Suah JL, Husin M, Tok PSK, Tng BH, Thevananthan T, Low EV, Appannan MR, MuhamadZin F, Mohd Zin S, Yahaya H, et al. Waning COVID-19 vaccine effectiveness for BNT162b2 and CoronaVac in Malaysia: an observational study. *Int J Infect Dis.* 2022;119:69–76. doi: 10.1016/j.ijid.2022.03.028. <https://pubmed.ncbi.nlm.nih.gov/35331933/>
10. Pormohammad A, Zarei M, Ghorbani S et al. Efficacy and safety of COVID-19 vaccines: a systematic review and meta-analysis of randomized clinical trials. *Vaccines (Basel).* 2021; 9: 467. <https://pubmed.ncbi.nlm.nih.gov/34066475/>
11. Chen X, Chen Z, Azman AS et al. Neutralizing antibodies against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) variants induced by natural infection or vaccination: a systematic review and pooled analysis. *Clin Infect Dis.* 2022; 74: 734-742. <https://pubmed.ncbi.nlm.nih.gov/34302458/>