

# Epidemiological Review on JN-1 Variant of COVID-19: An Emerging Global Threat

Muhammad Kamran<sup>1,2</sup>, Muhammad Noman<sup>1</sup>, Afreenish Amir<sup>3</sup>, Faheem Ullah<sup>4</sup>, Asma Balqees<sup>1,2</sup>, Hira Tariq<sup>2,5</sup>,  
Mayam Aftab<sup>1</sup>, Naseer Ali Shah<sup>1\*</sup>

<sup>1</sup>Department of Biosciences, COMSATS University, Islamabad, Pakistan; <sup>2</sup>Department of Allied Health Sciences, Islamabad Medical and Dental College, Islamabad, Pakistan; <sup>3</sup>National Fungal Disease Surveillance, National Institute of Health, Islamabad, Pakistan; <sup>4</sup>Department of Biological Sciences, National University of Medical Sciences, Rawalpindi, Pakistan; <sup>5</sup>Department of Microbiology, Abasyn University, Islamabad, Pakistan

## ABSTRACT

The global emergence of the Omicron variant, also known as the JN 1 COVID-19 variant, has raised concerns. This review aims to comprehensively assess the influence, prevalence, and characteristics of the JN 1 variant and discuss a wide range of studies that investigate the effectiveness of vaccines, genetic factors, hospitalizations, and clinical outcomes associated with this variant. The pathophysiology of the JN 1 variant, which could have implications for clinical management and public health, is also discussed. The review addresses the recent increase in cases of the JN 1 variant in Asia and other heavily impacted regions, providing epidemiological evidence. The findings of this review article contribute to a better understanding of the JN 1 variant and its implications for global health.

**Keywords:** Covid-19, JN.1 Variant, Epidemiology, Prevalence, Public Health

### Authors' Contribution:

All authors contributed equally to the conception, literature search, manuscript drafting, editing and review

### Correspondence:

Dr. Naseer Ali Shah  
Email: drnaseer@comsats.edu.pk

### Article info:

Received: November 3 2023  
Accepted: December 28, 2023

**Cite this article.** Kamran M, Noman M, Amir A, Ullah F, Balqees A, Tariq H, Aftab M, Shah NA. Epidemiological Review on JN-1 Variant of COVID-19: An Emerging Global Threat J Islamabad Med Dental Coll. 2023; 12(4): 353-359.  
DOI: <https://doi.org/10.35787/jimdc.v12i4.1095>

**Funding Source:** Nil  
**Conflict of interest:** Nil

## Introduction

As The impact of the new B.1.1.529 COVID-19 variant, commonly referred to as the Omicron variant, on public health has received significant attention. The United States reported this variant to the World Health Organization in December 2021, and it has been spreading ever since. At this point, Omicron has surpassed all other circulating variants in the US.<sup>1</sup> The rapid spread of this variant has sparked concerns about how easily it can be transmitted and its potential to bypass immunity

acquired through previous infections or vaccinations. The genetic factors linked to the severity of COVID-19 disease and SARS-CoV-2 infection continue to be a subject of interest<sup>2,3</sup>. SARS-CoV-2 and its variations continue to surprise scientists with their unique characteristics<sup>2,4</sup>. Understanding the genetic susceptibility to disease is crucial for understanding the potential effects of the B.1.1.529 variant on different populations.

Studies, such as those conducted by Mahi et al.,

(2021), have explored the efficacy of vaccines against variants like B.1.351<sup>5</sup>. The effectiveness of vaccines against B.1.1.529 variant should guide public health strategies and vaccination campaigns. Researchers have investigated the efficacy of COVID-19 vaccines during outbreaks, particularly when the Omicron variant is the predominant strain<sup>6</sup>. These investigations have enhanced our understanding of the potential protective effects of vaccination against the B.1.1.529 variant. Numerous studies have examined clinical outcomes and hospitalization rates associated with COVID-19, particularly among specific demographics like children and adolescents<sup>1,7</sup>. Knowledge of how the B.1.1.529 variant affects hospitalization rates and disease severity across different age groups is essential for healthcare planning and resource allocation. Given the rapid spread of the B.1.1.529 COVID-19 variant, concerns have been raised regarding its impact on vaccine effectiveness, disease severity, and transmissibility. To mitigate the global health consequences of this variant, public health interventions must be based on research findings related to genetic factors, vaccine efficacy, and clinical outcomes associated with JN.1 variant. The existing research on the JN 1 COVID-19 variant covers vaccine effectiveness, genetic factors, hospitalizations, and various aspects of COVID-19 vaccines. Madhi and colleagues (2021) demonstrated that the ChAdOx1 vaccine was effective against the B.1.351 variant<sup>5</sup>, thus emphasizing the importance of understanding how vaccines work against variants with mutations like JN 1. Another study by Andrews et al. (2021) examined the efficacy of COVID-19 vaccines against the Omicron variant<sup>8</sup>. Their findings helped alleviate concerns about the rapid increase in cases associated with the JN 1 variant. In 2020, Anastassopoulou and colleagues conducted research that explored genetic factors in humans that may increase the risk of SARS-CoV-2 infection and the severity of COVID-19 disease.

Specific human genetic variants may be linked to varying levels of disease or infection risk, particularly when considering the effects of the JN 1 variant<sup>2</sup>. Delahoy et al. (2021) provided valuable information about COVID-19 hospitalizations among children and adolescents, which aids in better understanding the impact of the JN 1 variant on different age groups<sup>1,7</sup>.

Wijk et al. (2022) focused on potential mechanisms of action for cytoskeletal protein variants that cause atrial fibrillation. By applying these findings, we can gain insights into how the JN 1 variant affects cardiovascular health and associated issues<sup>9</sup>. A study was conducted during an outbreak in a prison where the Omicron variant was the predominant circulating strain<sup>6</sup>. An investigation by Davies et al. (2021) examined the predicted impact and transmissibility of the SARS-CoV-2 lineage B.1.1.7 in England. The study raised concerns about significant resurgences of COVID-19 cases linked to specific variants<sup>10</sup>. Scharf and Anaya (2023) addressed adult post-COVID syndrome and highlighted the possibility of an increase in COVID-19 cases and various autoimmune diseases<sup>11</sup>. The study conducted by Fernández-de-las-Peñas et al. (2022) focused on symptoms experienced by hospitalized survivors infected with different SARS-CoV-2 variants after COVID-19. This study shed light on the prevalence of these symptoms across various variants<sup>12</sup>. Akaishi et al., (2022) provided insights into the prevalence of specific symptoms associated with the Omicron variant by comparing COVID-19-related symptoms during the surge of the SARS-CoV-2 variant in Japan<sup>13</sup>. Cheong (2023) discussed the clinical characteristics of COVID-19 patients infected with the Omicron variant in Macao, China, and offered insights into its prevalence and clinical manifestations<sup>14</sup>. Tallei et al. (2022) updated us on the Omicron sub-variants BA.4 and BA.5, highlighting the importance of remaining vigilant about the prevalence of new variants,

despite the global decline in COVID-19 cases<sup>15</sup>. Christensen et al. (2022) presented evidence that specific variants impact disease severity and vaccine breakthrough<sup>16</sup>. Organ dysfunctions in patients was determined in a systematic reviews and meta-analyses carried out by Tong et al. (2020) and Agyeman et al. (2020)<sup>17,18</sup>. These studies provide a better understanding of the frequency of certain COVID-19 symptoms in affected populations. Zhang et al. (2023) studied the effects of geography on postpartum depression, highlighting the high rates of occurrence in Asia<sup>19</sup>. Hayat et al. (2020) investigated public perceptions and beliefs regarding the control of COVID-19 in Pakistan through a quick online survey of Pakistani residents<sup>20</sup>. Alshaiikh & Baker (2022) reviewed the literature on COVID-19 treatment practices and prevalence rates in Asia, finding that antibiotic prescribing was common among patients with the virus<sup>21</sup>. Waris et al. (2020) provided a overview of the disease's prevalence and effects on Pakistan<sup>22</sup>. Ghazi et al. (2021) documented an increase in mucormycosis cases among COVID-19 patients and those who have recovered from the virus in India and Pakistan, highlighting the frequency of secondary infections and complications<sup>23</sup>. Asri et al. (2021) shed light on the frequency and consequences of fungal infections in COVID-19 patients, specifically discussing the danger of cutaneous mucormycosis in Pakistan<sup>24</sup>. In Din et al.'s (2020) review of the effects of the virus on polio vaccination in Pakistan and discussed the implications for evaluating the population's COVID-19 prevalence and case-fatality<sup>25</sup>. Javed et al. (2020) conducted a sero-prevalence study in Pakistani metropolises, and the results have important implications for evaluating the COVID-19 prevalence and case-fatality rate in highly concentrated urban areas.<sup>26</sup>

**Significance of Studying B.1.1.529** The JN.1 variant, commonly known as the Omicron variant, is a significant concern in terms of public health and clinical

management. Given its rapid spread and potential impact on disease severity, vaccine efficacy, and transmissibility, it is crucial that we gain a thorough understanding of its implications. Existing literature supports the notion that studying the B.1.1.529 variant is of utmost importance for several reasons. Firstly, assessing vaccine efficacy necessitates research on COVID-19 variants, including B.1.1.529. Studies have shown that vaccine effectiveness can vary across different variants, such as the B.1.351 variant<sup>5,8</sup>. Secondly, there is a growing interest in understanding the genetic factors associated with COVID-19 disease severity and SARS-CoV-2 infection. To understand the potential effects of the B.1.1.529 variant on different populations, it is essential to explore the genetic susceptibility to the disease. Genetic research plays a critical role in unraveling the consequences of variants like B.1.1.529, which have been linked to COVID-19 infection and severity in previous studies<sup>27</sup>. Extensive research has already focused on the clinical outcomes and hospitalization rates related to COVID-19, especially among specific demographics such as children and adolescents. Delahoy et al. (2021) underscores the importance of studying the effects of the B.1.1.529 variant on illness severity and hospitalization rates across various age groups to enable effective allocation of healthcare resources<sup>7</sup>.

### **Comparison with other Variants**

To understand variations in infectivity, vaccine efficacy, and clinical outcomes, it is essential to compare the JN 1 variant of COVID-19 with other variants. JN 1 variant may have different vaccine efficacy compared to other variants. This highlights the importance of thoroughly evaluating and tracking vaccine efficacy across all variants<sup>28</sup>. Studies have examined how diagnostic tests perform with different SARS-CoV-2 variants, emphasizing the significance of understanding how different variants affect testing methods and

diagnostic accuracy<sup>29</sup>. A study by Dağcıoğlu et al. (2021) found that comparing thiol levels in mild or moderate COVID-19 patients, as well as in classic COVID-19 cases, provides insight into possible variations in the pathogenesis and severity of the disease among different variants<sup>30</sup>. Research on the optimal placement of various nebulizers for aerosol delivery in an adult mechanical ventilation model has shown that different types of nebulizers may have varying aerosol delivery efficiencies. This finding could have implications for the treatment of respiratory issues in COVID-19 patients<sup>31,32</sup>.

### **Transmissibility, Severity, and Vaccine Effectiveness**

Crucial research areas include determining the efficacy of COVID-19 vaccines against various variants, such as the JN 1 variant. Multiple investigations have been conducted to study the vaccine's efficacy against different COVID-19 strains, providing new information about the severity of the virus, vaccine protection, and transmission. For example, Li et al. (2021) conducted a real-world study to evaluate the efficacy of inactivated SARS-CoV-2 vaccines against the Delta variant, known for its higher contagiousness and danger<sup>33</sup>.

Simwanza et al., (2022) investigated the efficacy of COVID-19 vaccines during an outbreak in a prison where the Omicron variant was the most common circulating strain. The vaccines were found to be highly effective, especially in reducing disease severity<sup>6</sup>. Researchers have also been studying the durability of COVID-19 vaccines, especially since the emergence of variants like the Delta variant<sup>34</sup>. A study has examined the relative costs and benefits of different dose fractionations of the SARS-CoV-2 vaccine, shedding light on ways to control the COVID-19 pandemic without incurring excessive costs, even in the presence of more contagious variants<sup>35</sup>. Given the increasing incidence of infections, particularly after a seven-

month evaluation of mRNA vaccines against asymptomatic infection it is crucial to understand the efficacy of vaccines against various SARS-CoV-2 variants<sup>36</sup>.

A comprehensive review and meta-analysis of the efficacy of the mRNA-1273 vaccine against COVID-19 caused by the Delta variant insights into the mechanism of vaccine protection against specific variants<sup>37</sup>. Research on the efficacy of mRNA-1273 as a vaccine against SARS-CoV-2 has shown mixed results, with varying degrees of success against different variants<sup>28</sup>. A thorough evaluation and meta-analysis of the BNT162b2 mRNA vaccine's efficacy against COVID-19 caused by the Delta variant has been carried out, offering detailed information about the vaccine's ability to protect against specific variants<sup>37</sup>.

Understanding how well COVID-19 vaccines work against specific variants is crucial for shaping public health policies and estimates of vaccine efficacy against the B.1.617.2 (Delta) variant have been made<sup>38</sup>. Ongoing research into the efficacy of current COVID-19 vaccines against the Omicron (B.1.1.529) variant, particularly in heavily vaccinated populations, raises concerns about the effectiveness of the vaccines<sup>8</sup>. It is important to investigate how current vaccines perform against other variants, such as the JN 1 variant, and how the Omicron variant influences response strategies and vaccine efficacy<sup>39</sup>.

The significance of understanding how variants affect the severity and transmissibility of diseases has been highlighted by the fact that the Omicron variant has altered infection patterns, becoming more contagious but less severe<sup>40</sup>

## **Conclusion**

Extensive research has been conducted to understand the impact of the JN 1 variant on public health and clinical management. The emergence of this variant has raised significant

concerns worldwide. Studies have highlighted its potential consequences in terms of transmission, severity, and global prevalence, thereby drawing attention to disease control and mitigation efforts. The results of the literature review suggest several recommendations for the future. First and foremost, public health interventions and vaccination strategies should be informed by ongoing monitoring and evaluation of vaccine efficacy against the JN 1 variant. To enhance our understanding of the severity and transmission mechanisms of the JN 1 variant, further research into its pathophysiology is necessary. Additionally, as emphasized in the literature, the development of vaccines targeting specific variants is essential to improve protection against emerging variants such as JN 1. In order to inform targeted public health measures and interventions, continuous surveillance and research on the prevalence and impact of the JN 1 variant in diverse regions, particularly in Asia and Pakistan, are necessary. Ultimately, collaboration between researchers, healthcare providers, and policymakers is crucial to effectively address the challenges posed by the JN 1 variant and minimize its impact on global health.

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