iJETRM
International Journal of Engineering Technology Research & Management
(IJETRM)
https://ijetrm.com/issue/?volume=November~2025

COVID JN .1 VIRUS VARIANT

D.K. Awasthi[1],
Department of chemistry Sri Sharda Group of Institutions Lucknow U.P. India
Archana Dixit[2]
Department of chemistry Dayanand Girls PG College Kanpur U.P. India
Vivek Mishra[3]
Department of Management Sri Sharda Group of Institutions Lucknow U.P. India

ABSTRACT:
The JN.1 virus is a subvariant of the Omicron variant of COVID-19 that spreads easily and has an extra mutation in its spike protein, which may affect its transmissibility and immune system interaction. While it appears to spread more quickly than some earlier variants, most infections are mild, causing symptoms similar to other Omicron subvariants, such as fever, cough, and a sore throat., runny nose, fatigue, and headache. Some people may also experience gastrointestinal issues like diarrhea or nausea. Treatment typically involves rest, hydration, and over-the-counter medications for symptoms; severe cases may require hospitalization and medical interventions like those used for other COVID-19 variants.

INTRODUCTION:

The COVID-19 pandemic impacted lives around the world, and even though the worst is behind us, the virus has continued to mutate into new variants. Over the past few years, variants such as Alpha, Delta, and Omicron have shaped different waves of the COVID-19 pandemic. Among these, Omicron and its sub variants have shown a higher tendency for rapid spread and immune evasion, even in previously vaccinated or infected individuals. In recent weeks, a fresh wave of concern has emerged as health authorities begin reporting increasing cases of infections caused by the JN.1 variant of COVID-19. Believed to be a sub-lineage of Omicron, this new strain is drawing attention due to its potential to spread rapidly, and its implications for public health. While JN.1 shares much of its genetic structure with the Omicron strain, it carries specific mutations in the spike protein that may influence how it behaves, particularly in terms of how easily it spreads or bypasses immunity. Understanding these mutation trends is essential for monitoring disease patterns, refining vaccine strategies, and guiding clinical care.JN.1 descends from the BA.2.86 variant and carries distinct spike protein mutations, which may enhance its ability to spread and partially evade immunity from previous infections or vaccinations.

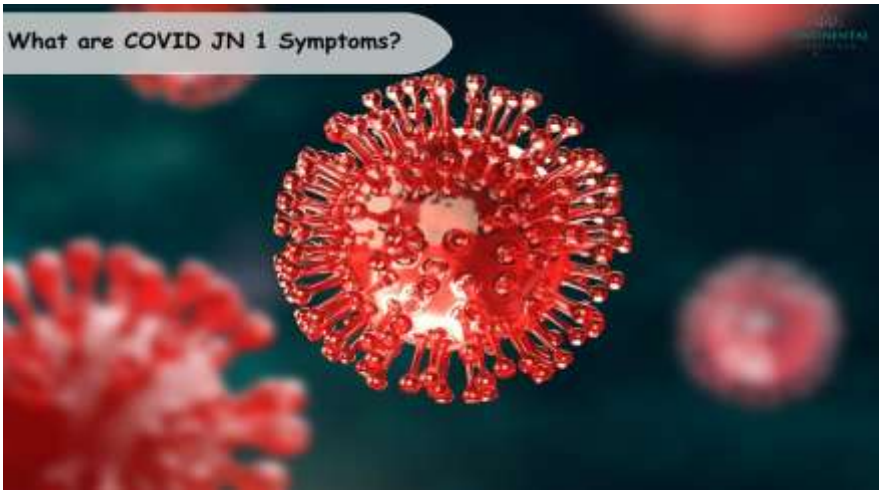

Fig-1

The symptoms are observed in JN.1 variant are largely similar to other Omicron sub variants, commonly observed symptoms are

iJETRM
International Journal of Engineering Technology Research & Management
(IJETRM)
https://ijetrm.com/issue/?volume=November~2025

- Sore throat
- Runny or congested nose
- Dry cough
- Fatigue or body aches
- Mild fever or chills
- Headache

In some cases, gastrointestinal discomfort such as nausea or diarrhoea has also been reported. Notably, symptoms such as loss of taste or smell, which were more common in earlier COVID-19 waves, are now less frequently seen.

While many individuals recover with minimal intervention, those with pre-existing health conditions or weakened immunity should monitor for worsening signs such as shortness of breath or prolonged high fever, which may warrant timely medical attention.

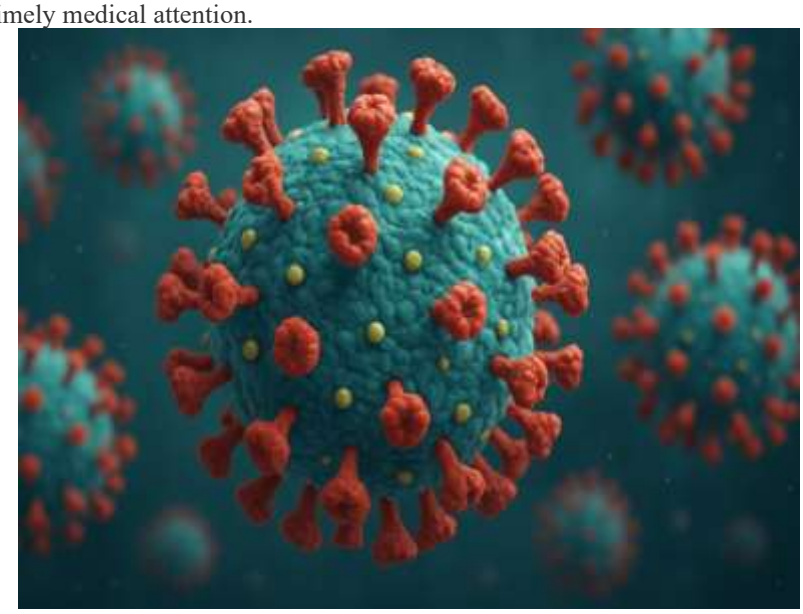

Fig-2 change in spikes

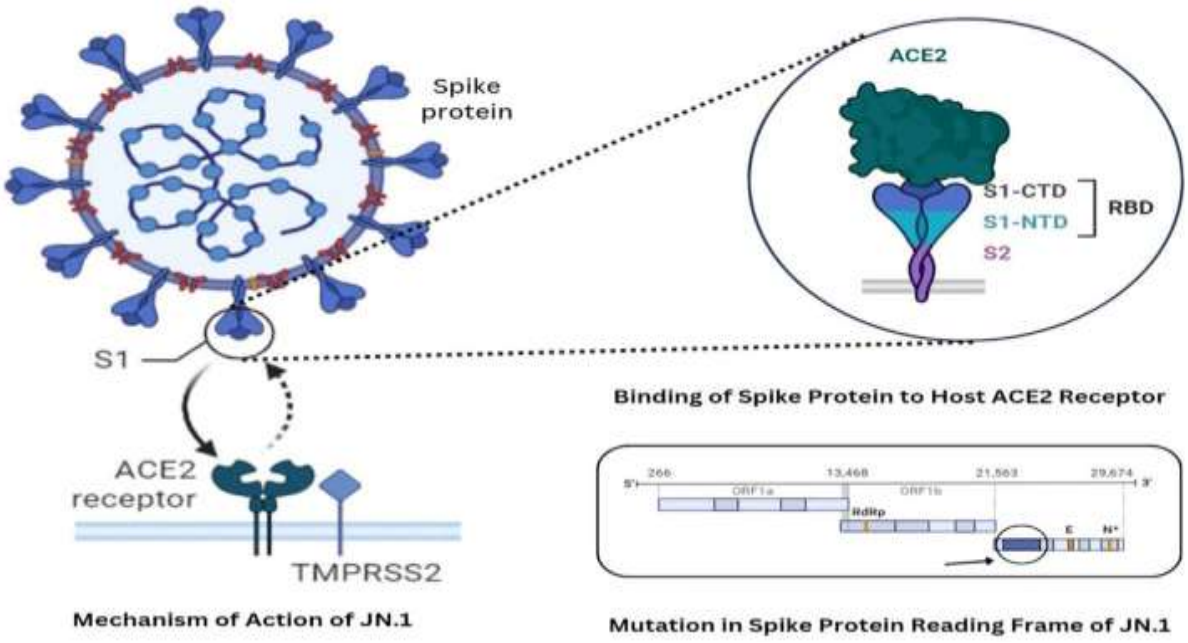

Fig-3

iJETRM
International Journal of Engineering Technology Research & Management
(IJETRM)
https://ijetrm.com/issue/?volume=November~2025

Transmission Rate:
The JN.1 variant has demonstrated a notably high transmission rate, making it one of the fastest-spreading sub variants of Omicron to date. In several regions, including parts of India, it has quickly overtaken other circulating strains to become the dominant lineage within weeks. Epidemiologists suggest that JN.1's rapid spread may be due to its enhanced ability to bypass existing immunity, including that from prior infections or vaccination. However, this immune escape does not necessarily translate into increased severity. While exact reproduction numbers (R0) are still under investigation, early trends indicate that JN.1 spreads efficiently through close contact, especially in indoor or poorly ventilated settings. Its growth advantage over other variants reinforces the need for continued genomic surveillance and timely public health responses to prevent further waves of infection.

Fig-4 Mutant Strain in JN.1 Virus

TESTING:

1.Reverse Transcription Polymerase Chain Reaction: RT-PCR continues to be the gold standard for COVID-19 testing, including for JN.1. It detects viral RNA with high sensitivity and is often used to confirm infection in symptomatic individuals or those with known exposure. Some RT-PCR assays may also indicate variant-specific markers, which are further confirmed through genomic sequencies

2.Rapid Antigen Tests
Rapid tests offer results within minutes and are useful for quick screening, especially in home settings or during community outbreaks. However, they may be less sensitive to low viral loads and may not always detect early-stage infections with JN.1.

3.Multiplex PCR Tests
These are advanced diagnostic panels capable of detecting multiple respiratory viruses, including influenza, RSV, and SARS-CoV-2, in a single test. They are particularly helpful in differentiating COVID-19 from other infections with similar symptoms during flu seasons or outbreaks. For confirmed cases, genome sequencing may be conducted at select laboratories to identify the specific variant, including JN.1, as part of broader public health surveillance. So far, JN.1 infections in children have largely been mild. However, young children with underdeveloped immunity may still require close observation. Data on the impact in pregnant women remains limited, but standard COVID-19 precautions and timely care are advised, especially in the third trimester.
Prevention and Protective Measures to Follow: While COVID-19 variants like JN.1 continue to emerge, many preventive strategies remain effective in reducing the risk of infection and community transmission.
Practising basic precautions can significantly curb the spread of infection. This includes:

- Wearing masks in crowded or enclosed spaces
- Regular hand washing or using alcohol-based sanitizers

iJETRM
International Journal of Engineering Technology Research & Management
(IJETRM)
https://ijetrm.com/issue/?volume=November~2025

- Maintaining physical distance in public areas
- Ensuring good indoor ventilation

Vaccination and Booster Doses:
Vaccination remains the most effective defence against severe illness and hospitalisation. Individuals who are eligible for booster doses, especially senior citizens, healthcare workers, and those with comorbidities, should stay up to date with their shots. Government advisories continue to support booster administration based on evolving data.

Nutrition and Immunity:
A balanced diet rich in vitamin C, zinc, and dietary fiber can support immune health. Adequate sleep, hydration, and regular physical activity also contribute to building overall resistance to infections. In some cases, doctors may recommend supplements to help improve immunity in vulnerable individuals.

CONCLUSION:

The emergence of the JN.1 variant is a reminder that COVID-19 remains a dynamic public health challenge. While most infections are currently mild, vulnerable groups may face higher risks if early signs are ignored. Staying informed, following preventive measures, and acting promptly when symptoms appear can make a significant difference.

REFERENCES:

1) Bogoch, I. I., Watts, A., Thomas-Bachli, A., *et al.* (2020). Pneumonia of unknown aetiology in Wuhan, China: Potential for international spread via commercial air travel. *Journal of Travel Medicine, 27*(2), taaa008. https://doi.org/10.1093/jtm/taaa008
2) Centers for Disease Control and Prevention (CDC). (2024, April 24). *COVID-19 activity increases as prevalence of JN.1 variant continues to rise.* https://www.cdc.gov/ncird/whats-new/JN.1-update-2024-01-05.html
3) Centers for Disease Control and Prevention (CDC). (2024, April 24). *COVID-19 data tracker.* https://covid.cdc.gov/covid-data-tracker/
4) Centers for Disease Control and Prevention (CDC). (2024, June 24). *COVID-19 and your health.* https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html
5) Centers for Disease Control and Prevention (CDC). (2024, April 24). *Update on SARS-CoV-2 variant JN.1 being tracked by CDC.* https://www.cdc.gov/ncird/whats-new/SARS-CoV-2-variant-JN.1.html
6) Crabb, B., Pakula, E., Turville, S., *et al.* (2024, April 24). The emergence of JN.1 is an evolutionary "step change" in the COVID pandemic: Why is this significant? *The Conversation.* http://theconversation.com/the-emergence-of-jn-1-is-an-evolutionary-step-change-in-the-covid-pandemic-why-is-this-significant-220285
7) Eshraghi, R., Bahrami, A., Karimi Houyeh, M., *et al.* (2024). JN.1 and the ongoing battle: Unpacking the characteristics of a new dominant COVID-19 variant. *Pathogens and Global Health, 118*(6), 453–458. https://doi.org/10.1080/20477724.2024.2403287
8) GISAID. (2024, April 24). *hCov19 variants.* https://gisaid.org/hcov19-variants/
9) GISAID. (2023, December 25). *hCov19 variants.* https://gisaid.org/hcov19-variants/
10) Hemo, M. K., & Islam, M. A. (2024). JN.1 as a new variant of COVID-19 – Editorial. *Annals of Medicine and Surgery (London), 86*, 1833–1835. https://doi.org/10.1097/MS9.0000000000001833
11) Jackson, C. B., Farzan, M., Chen, B., *et al.* (2022). Mechanisms of SARS-CoV-2 entry into cells. *Nature Reviews Molecular Cell Biology, 23*(1), 3–20. https://doi.org/10.1038/s41580-021-00418-x
12) Johnson, B. A., Xie, X., Kalveram, B., *et al.* (2020). Furin cleavage site is key to SARS-CoV-2 pathogenesis. *Nature, 591*(7849), 293–299. https://doi.org/10.1038/s41586-020-3026-2
13) Lambrou, A. S., South, E., Ballou, E. S., *et al.* (2023). Early detection and surveillance of the SARS-CoV-2 variant BA.2.86 – worldwide, July–October 2023. *MMWR. Morbidity and Mortality Weekly Report, 72*(45), 1162–1167. https://doi.org/10.15585/mmwr.mm7245a2
14) NBC News. (2024, January 17). *COVID symptoms caused by JN.1 variant: What to know as cases rise.* https://www.nbcnews.com/health/health-news/covid-symptoms-jn1-variant-spreading-rcna130765
15) Pawelec, G. (2020). The conundrum of human immune system "senescence." *Mechanisms of Ageing and Development, 192,* 111357. https://doi.org/10.1016/j.mad.2020.111357

iJETRM
International Journal of Engineering Technology Research & Management
(IJETRM)
https://ijetrm.com/issue/?volume=November~2025

16) Quarleri, J., Delpino, M. V., & Galvan, V. (2024). Anticipating the future of the COVID-19 pandemic: Insights into the emergence of SARS-CoV-2 variant JN.1 and its projected impact on older adults. *GeroScience, 46*(5), 2879–2883. https://doi.org/10.1007/s11357-024-01089-7
17) Rijhwani, P. (2024, April 24). *JN.1 variant: Navigating the next phase of the COVID-19 challenge. The Daily Guardian.* https://thedailyguardian.com/jn1-variant-navigating-the-next-phase-of-the-covid-19-challenge/
18) Satapathy, P., Kumar, P., Gupta, J. K., *et al.* (2024). The emergence and implications of SARS-CoV-2 Omicron subvariant BA.2.86 on global health. *International Journal of Surgery, 110*(4), 2498–2501. https://doi.org/10.1016/j.ijsu.2024.2498
19) Statens Serum Institut. (2023, December 11). *Presentation at the WHO Technical Advisory Group (TAG-VE) meeting.*
20) Srivastava, S., Kumar, S., Ashique, S., *et al.* (2024). Fast-spreading JN.1: What you need to know about the latest COVID-19 subvariant. *Journal of Infection and Public Health, 17*(7), 102451. https://doi.org/10.1016/j.jiph.2024.102451
21) United Nations News. (2023, December 25). *WHO designates JN.1 'variant of interest' amid sharp rise in global spread.* https://news.un.org/en/story/2023/12/1145012
22) Wang, X., Lu, L., & Jiang, S. (2024). SARS-CoV-2 evolution from the BA.2.86 to JN.1 variants: Unexpected consequences. *Trends in Immunology, 45*(2), 81–84. https://doi.org/10.1016/j.it.2024.01.004
23) World Health Organization (WHO). (2023, April 24). *Coronavirus disease (COVID-19): Variants of SARS-CoV-2.* https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/coronavirus-disease-(covid-19)-variants-of-sars-cov-2
24) World Health Organization (WHO). (2024, April 24). *Tracking SARS-CoV-2 variants.* https://www.who.int/activities/tracking-SARS-CoV-2-variants
25) World Health Organization (WHO). (2024, April 24). *Why is COVID-19 data being presented as weekly statistics?* https://data.who.int/dashboards/covid19/cases?n=c
26) World Health Organization (WHO). (2024, October 26). *Weekly epidemiological record (WER).* https://www.who.int/publications/journals/weekly-epidemiological-record
27) Yajima, H., Anraku, Y., Kaku, Y., *et al.* (2024). Structural basis for receptor-binding domain mobility of the spike in SARS-CoV-2 BA.2.86 and JN.1. *Nature Communications, 15*(1), 8574. https://doi.org/10.1038/s41467-024-38574-0
28) Yang, S., Yu, Y., Xu, Y., *et al.* (2024). Fast evolution of SARS-CoV-2 BA.2.86 to JN.1 under heavy immune pressure. *The Lancet Infectious Diseases, 24*(2), e70–e72. https://doi.org/10.1016/S1473-3099(24)00023-4