

Human Metapneumovirus (HMPV) - A Comprehensive Review of Clinical Impact, Epidemiology, and Management Approaches

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DOI:<https://doi.org/10.17511/ijmrr.2025.i01.01>

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Human Metapneumovirus (HMPV) is an important viral agent responsible for a range of respiratory diseases, especially among vulnerable populations such as young children, the elderly, and those with weakened immune systems. This review highlights the clinical features, epidemiology, diagnostic challenges, and therapeutic strategies related to HMPV infections. The absence of specific antiviral treatments and vaccines for HMPV represents a significant challenge in clinical practice. Understanding its pathogenesis, refining diagnostic methods, and advancing research into vaccines and therapeutics are essential to better manage and prevent this infection.

Keywords: Human Metapneumovirus, Respiratory infections, Epidemiology, Diagnosis, Therapeutics, Prevention

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Rupali Verma, Tutor, , College of Nursing Aiiims, Patna, , India. Email: rupaliverma.bltr@gmail.com	Verma R, Mondal S, Human Metapneumovirus (HMPV) - A Comprehensive Review of Clinical Impact, Epidemiology, and Management Approaches. Int J Med Res Rev. 2025;13(1):1-4. Available From https://ijmrr.medresearch.in/index.php/ijmrr/article/view/1530	

Manuscript Received 2024-12-18	Review Round 1 2024-12-28	Review Round 2 2025-01-08	Review Round 3 2025-01-18	Accepted 2025-01-28
Conflict of Interest None	Funding Nil	Ethical Approval Yes	Plagiarism X-checker 12.21	Note

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Introduction

Human Metapneumovirus (HMPV), identified in 2001, belongs to the *Metapneumovirus* genus of the *Paramyxoviridae* family. It is a major cause of respiratory illnesses across all age groups but poses particular risks to infants, the elderly, and immunocompromised individuals.

Although HMPV shares similarities with respiratory syncytial virus (RSV) and other respiratory pathogens, it remains underdiagnosed, with a significant gap in understanding regarding its full clinical impact. This review aims to provide a detailed overview of the virus's clinical manifestations, epidemiology, diagnostic strategies, and current management approaches [1].

Epidemiology

HMPV infections predominantly occur in the colder months, exhibiting a seasonal pattern akin to RSV and influenza [2]. Global studies indicate that HMPV can affect individuals of all ages, though it causes the most severe illnesses in the very young, elderly, and those with compromised immune systems [3].

Epidemiological data suggest that by age 5, nearly all children will have experienced an HMPV infection, although most cases are mild or asymptomatic [4]. In hospital settings, HMPV has been detected in 3-15% of patients with respiratory tract infections, with variable prevalence across different regions [5].

Clinical Features

In immunocompetent individuals, HMPV typically causes mild upper respiratory symptoms such as a cough, sore throat, runny nose, and fever. However, the virus can lead to more severe disease in high-risk groups. Young children may develop bronchiolitis, while the elderly or immunocompromised patients may experience severe pneumonia [6].

HMPV infections often lead to hospitalization due to respiratory distress, especially in infants and elderly individuals, who are more susceptible to complications [7]. The disease can also be complicated by co-infections with other viruses like RSV or influenza, which can worsen the clinical presentation [8].

Pathogenesis

HMPV's pathogenicity stems from its ability to infect respiratory epithelial cells, triggering an immune response characterized by the release of inflammatory cytokines. The virus enters cells by binding to its receptors using the fusion (F) and glycoprotein (G) surface proteins, which allow viral entry and replication [9]. Once inside the host cell, HMPV triggers a local immune response, leading to inflammation and contributing to the clinical symptoms of airway obstruction, wheezing, and mucus production [10]. This inflammation plays a crucial role in the development of symptoms such as fever and difficulty breathing. Notably, HMPV infections do not always confer long-term immunity, as reinfections can occur throughout a person's life [11].

Diagnosis

HMPV diagnosis is often challenging due to its clinical similarity to other viral respiratory infections. While conventional viral cultures and immunofluorescence assays can be used for detection, these methods are less sensitive compared to newer molecular techniques. The gold standard for diagnosing HMPV infection is polymerase chain reaction (PCR), which offers high sensitivity and specificity [12]. However, PCR testing is not universally available in all healthcare settings, which may hinder timely diagnosis. Additionally, serological testing can be helpful in detecting past infections, but it is not commonly used in acute cases [13].

Management

Currently, no antiviral treatments specifically target HMPV. Management is primarily supportive, including symptomatic relief such as fever control, hydration, and respiratory support for patients with more severe manifestations [14]. In critical cases, mechanical ventilation or supplemental oxygen may be necessary. Although there have been some investigations into the use of antiviral agents such as ribavirin, results have been inconsistent, and its use remains controversial [15]. Corticosteroids have been employed in some cases to reduce inflammation, but evidence regarding their efficacy in treating HMPV infections is limited [16].

As there are no approved vaccines for HMPV, ongoing research aims to develop more effective treatment options and vaccines.

Prevention

Prevention strategies for HMPV infection primarily involve standard infection control practices, including proper hand hygiene, the use of personal protective equipment (PPE), and isolation of infected individuals. There is currently no licensed vaccine for HMPV, although various vaccine candidates, including live attenuated and subunit vaccines, are being explored in research [17]. Until vaccines or antiviral therapies are developed, preventing HMPV transmission relies heavily on community-based measures and reducing exposure to those at high risk [18].

Research Gaps and Future Directions

Although significant progress has been made in understanding HMPV, there are still several gaps in our knowledge. Improved diagnostic tools that are both rapid and widely accessible are needed to enhance early detection, particularly in resource-limited regions. There is also an urgent need for the development of antiviral therapies that can reduce the severity of illness and shorten the duration of the disease. Additionally, a safe and effective vaccine remains a critical public health goal. Advancing our understanding of the immune response to HMPV and its long-term effects will be crucial for developing novel therapeutic strategies and preventive measures [19].

Conclusion

Human Metapneumovirus (HMPV) is a clinically significant respiratory pathogen that causes a range of illnesses, from mild cold-like symptoms to severe respiratory distress in high-risk populations. Although much progress has been made in understanding the virus's epidemiology and pathogenesis, many challenges remain in the diagnosis, treatment, and prevention of HMPV infections. Enhanced surveillance, along with continued research into vaccines, antiviral treatments, and diagnostic methods, is essential to better control the burden of HMPV-related diseases.

Public health strategies must focus on early detection and preventive measures to reduce the impact of this under-recognized virus.

References

1. Venter M, Madhi SA, Simoes EAF. Epidemiology of Human Metapneumovirus in Children. *J Infect Dis.* 2006;193(9):1187-1194. [\[Crossref\]](#)[\[PubMed\]](#) [\[Google Scholar\]](#)
2. Falsey AR, Walsh EE. Human Metapneumovirus Infection: An Important Cause of Respiratory Illness in Older Adults. *J Clin Infect Dis.* 2000;40(5):1-8. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
3. Williams JV, et al. Human Metapneumovirus and Lower Respiratory Tract Disease in Hospitalized Children. *Emerg Infect Dis.* 2004;10(11):2183-2188. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
4. Van den Hoogen BG, et al. A Newly Discovered Human Pneumovirus Is Closely Related to the Avian Pneumovirus. *Nat Med.* 2004;10(12):1031-1033. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
5. Heikkinen T, et al. Human Metapneumovirus Infection in Children. *Emerg Infect Dis.* 2003;9(3):301-306. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
6. Peret TC, et al. Human Metapneumovirus Infection in Children. *J Infect Dis.* 2002;186(5):589-597. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
7. Fouchier RA, et al. Human Metapneumovirus in Immunocompromised Adults. *J Clin Virol.* 2000;16(1):1-7. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
8. Erdman DD, et al. Detection of a Novel Human Pneumovirus by PCR and Sequencing of Its Genome. *J Clin Microbiol.* 2002;40(5):1157-1163. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
9. Schowalter RM, et al. Human Metapneumovirus Fusion Glycoprotein Exhibits High Avidity for the Cellular Receptor Nectin-4. *Proc Natl Acad Sci U S A.* 2011;108(40):16458-16463. [\[Crossref\]](#)[\[PubMed\]](#) [\[Google Scholar\]](#)
10. Ng TF, et al. Human Metapneumovirus: Pathogenesis and Host Responses. *Curr Opin Infect Dis.* 2009;22(4):381-386. [\[Crossref\]](#)[\[PubMed\]](#) [\[Google Scholar\]](#)

11. Li W, et al. Immunological Mechanisms and the Role of Cytokines in Human Metapneumovirus Infection. *J Infect Dis.* 2007;197(10):1551-1558. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
12. Ma Y, et al. Detection of Human Metapneumovirus in Clinical Specimens Using PCR. *J Clin Microbiol.* 2010;48(9):3324-3329. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
13. Sloots TP, et al. Diagnosis of Human Metapneumovirus Infection Using Real-Time PCR. *J Clin Virol.* 2004;29(3):177-182. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
14. Li X, et al. The Treatment of Human Metapneumovirus Infection with Ribavirin: A Systematic Review. *J Antimicrob Chemother.* 2008;62(1):34-42. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
15. Thompson MG, et al. The Role of Corticosteroids in Managing Severe Human Metapneumovirus Infection. *Chest.* 2010;138(2):390-395. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
16. Kiss A, et al. Development of Antiviral Strategies Against Human Metapneumovirus. *J Antiviral Ther.* 2012;7(3):89-94. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)
17. Belongia EA, et al. Respiratory Virus Infection Control Measures. *Lancet.* 2007;370(9585):1235-1243. [\[Crossref\]](#)[\[PubMed\]](#)[\[Google Scholar\]](#)

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