IIHMR UNIVERSITY | SD GUPTA SCHOOL of PUBLIC HEALTH

Factsheet human METAPNEUMOVIRUS (hMPV)

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Quick Facts

The Human Metapneumovirus (hMPV) is one of the several respiratory viruses that can infect people of all ages. Along with RSV and Measles, hMPV was originally classified under the Paramyxoviridae family of RNA viruses but later on reclassified into the Pneumoviridae family in 2016.

The infections are most common during winters and early spring. hMPV infections are mostly mild and self limiting, with symptoms resolving on their own in 5-7 days. According to a phylogenetic study, this virus evolved from bird metapneumovirus 200–400 years ago, although being first described as late as 2001. (Febbo & Ketai, 2021), It demonstrates that the phenomena of viral sickness transmission between species is not unique to the 20th or 21st centuries, but has existed for much longer.

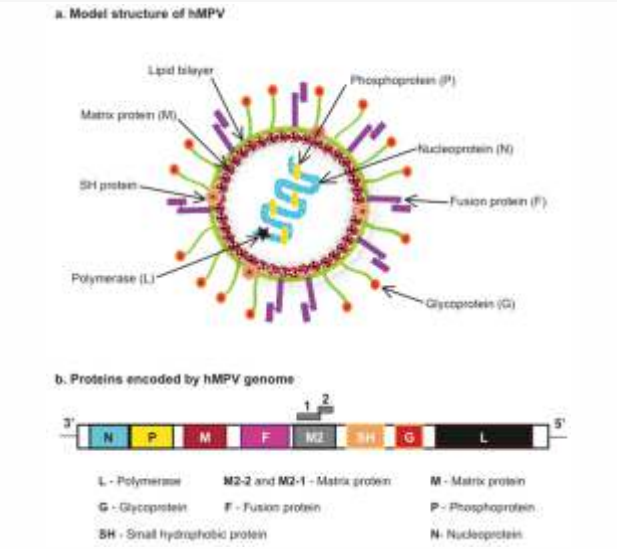
Strikingly, hMPV demonstrates an excellent adaption to human host because of which vast majority of the human population is already infected by age 5.

The two genotypes of hMPV, A and B, are further categorized into four distinct lineages: A1, A2, B1, and B2, determined by the structural configuration of surface glycoproteins G and F. (Panda et al., 2014)

Infection in early life is extremely common and and reinfection is frequent throughout life. Children most commonly complain of cough, fever, and running nose (rhinorrhea), but may also inflammation of upper airways, exacerbations of asthma, or pneumonia.

The signs and symptoms are similar and often indistinguishable from other respiratory infections like RSV. As stated before the disease is usually self-limiting. It may however run a more serious course in immunocompromised individuals as well as elderly and very young infants leading to diffuse pneumonia and rarely death.

Treatment primarily involves supportive care, although Ribavirin has been reportedly used in severe cases.



Introduction

hMPV is an RNA (single-stranded) virus belonging to the genus Metapneumovirus under the Pneumoviridae family.

Since being discovered in the Netherlands in 2001, hMPV has established itself as a notable cause of upper and lower respiratory tract infections in persons of all ages, with a predilection for children, the elderly, and those with weakened immune systems.

Premature birth, pre-existing nosocomial infections, and primary cardiac, pulmonary and nervous system diseases or complications predispose to severe disease with hMPV.

There are two primary genotypes of hMPV: A and B. Genotypes A and B are further separated into subdivisions A1 and A2 and B1 and B2, respectively, by phylogenetic assessment of the nucleocapsid (N) and fusion (F) gene sequences. While lineage B2 is divided into B2a and B2b, lineage A2 is further differentiated into subclusters A2a, A2b, A2b1, and A2b2.(Hindupur et al., 2022). Till now there is no documented difference in severity of infection or any specific predominance of a subgroup.

Globally, infants under one year old have been found to be disproportionately at risk for severe human metapneumovirus (hMPV) infections. Specifically, compared to older children and those in developed nations, Infants under 6 months of age in low- and lower-middle-income countries face a high risk of death after acute lower respiratory infections (ALRI) caused by hMPV.(Wang et al., 2021)

Asthma and chronic lung disease were among high-risk underlying diseases observed in about 40% of children hospitalised for hMPV contamination. The annual hospitalization rate for children under 6 months old was about three times higher compared to children aged 6 months to 5 years. Nosocomial infections have been identified as a mode of transmission in several studies. The annual hospitalisation rate

for hMPV contamination is similar to influenza and parainfluenza viruses.

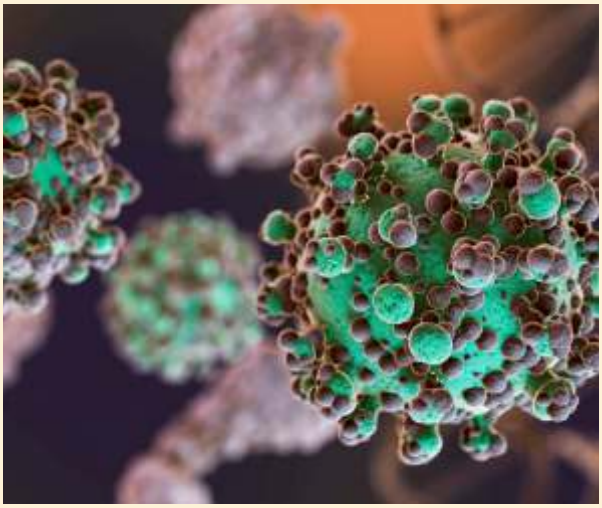
History of the Human Metapneumovirus (hMPV)

hMPV was initially detected in the Netherlands in 2001.(van den Hoogen et al., 2001) Interestingly, the serological studies provide evidence that the virus has been in circulation in Netherlands since 1958. The virus is found globally, affecting all continents. (Uddin & Thomas, 2024)

While hMPV infections can occur year-round, peak activity in the northern hemisphere typically happens in winter and spring.

• hMPV in India

In 2004, Pune reported the first case of hMPV in India.(Hindupur et al., 2022). Since then virus has been in circulation across the country and many studies of hMPV infection in children have been reported from India , particularly from Lucknow, New Delhi, and Vellore.



With the recent rise of interest in hMPV infections, five cases have tested positive from various parts of India as of 11 Jan 2025, with cases being reported from Bangaluru, Puducherry, Kutch, Ahmadabad and Assam. Ministry of Health and Family Welfare, Government of India has clarified that these cases have been picked up by the routine surveillance and there is no need for concern.

Mode of Transmission

The human metapneumovirus is transmitted by respiratory droplets. Individual differences may exist, although the incubation period usually lasts between three and five days.

The virus can quickly spread to the respiratory system after penetrating the nasopharyngeal mucosa.

Monocytes and lymphocytes also penetrate the airway endothelium as a result of the inflammatory response. Together, these reactions cause pulmonary inflammation, which results in respiratory symptoms as fever, coughing, mucus production, and dyspnoea. (Uddin & Thomas, 2024)

Signs and Symptoms

hMPV is commonly associated with symptoms:

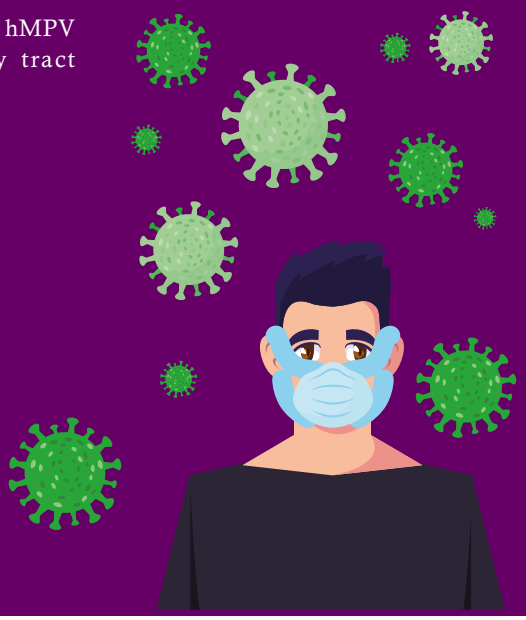
- Fever
- Coughing
- Nasal congestion
- Sore throat

More severe symptoms of hMPV include lower respiratory tract symptoms such as:

- Croup
- Bronchiolitis (like RSV)
- Pneumonia
- Asthma exacerbation

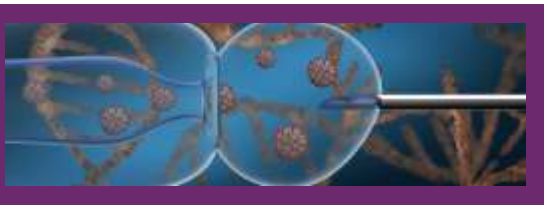
HMPV is frequently observed in the pediatric population, with children under 2 years old being particularly susceptible. In adults, hMPV infection typically presents with mild flu-like symptoms. (Panda et al., 2014)

Cough, fever, nasal congestion, and shortness of breath are the most common symptoms of HMPV infection. In some cases, the infection may proceed to bronchitis or pneumonia, and its clinical presentation closely resembles that of other viruses causing upper and lower respiratory infections.



Infection of HMPV usually confirmed by:

- Nucleic Acid Amplification Test (NAAT) directly detect viral genome, and
- By using immunofluorescence or enzyme immunoassay viral antigens in respiratory secretions can be detected. (CDC)



Prevention

The majority of infections in adults are mild but still general preventive measures for respiratory infections i.e. the respiratory hygiene and cough etiquette can be very useful in prevention:

- Washing hand Regularly with soap and water or using a sanitizer (Alcohol based).
- Mouth and nose should be covered with your elbow when coughing or sneezing.
- Staying away from other people when having symptoms of cold and flu and wearing a mask when moving around .

Avoid touching the face , nose and mouth especially when having cold and flu like symptoms.

Treatment of hMPV

Treatment for hMPV infection is primarly supportive.

In severe cases, higher oxygen levels and hospital-based assisted ventilation may be necessary. In case of vomiting, diarrhoea, or an inability to tolerate oral fluids due to tachypnea or dyspnoea occurs, intravenous fluids are administered to hydrate the patient. hMPV-related asthma or exacerbations of chronic obstructive pulmonary disease may be treated with bronchodilators and steroids. Antibiotics may also required in cases of bacterial superinfection, such as suspected community-acquired bacterial pneumonia or acute otitis media.(Schuster & Williams, 2013)

Some research suggests that use of antivirals including Ribavirin and some fusion inhibiting antiviral peptides as well as immunoglobulins and small interfering RNA (siRNA) have given promising results but none of these are yet established as specific and approved treatments for hMPV infection. More evidence is awaited.

As far as vaccination is concerned, several hMPV vaccine candidates have shown promising results in rodent and non-human primate models. However, not any has been tested in human volunteers to date. Challenges remain, as a heat-inactivated viral vaccine tested in mice resulted in enhanced lung disease.(Panda et al., 2014)

In non-human primates, hamsters, and rodents, a number of hMPV F subunit vaccinations have demonstrated strong protective benefits. The development of a live vaccination against hMPV infection has been significantly hastened by the introduction of plasmid-based reverse genetics techniques.(Panda et al., 2014)

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