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Literature Review on Human Metapneumovirus: Updates, Trends and Emerging Concerns in Indonesia, Southeast Asia

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ABSTRACT

Introduction Human Metapneumovirus (HMPV), is an RNA virus contributing to the pathogenesis and severity of Acute Respiratory Infection (ARI) in vulnerable populations globally. Despite recent reports of increasing HMPV cases in China, research on HMPV in Indonesia remains scarce compared to studies conducted in other Southeast Asian countries.
Content: HMPV as a pathogen is accidentally discovered in concurrent with the study of other causative agents. HMPV infection can cause severe respiratory tract infection, especially in vulnerable populations such as the elderly and children with underlying disease. Therefore, research in respect to HMPV epidemiology, morbidity and mortality of the disease generated by HMPV infection in Indonesia should be continuously conducted.
Conclusion: This study aims to review findings of HMPV in Southeast Asia region countries such as, Malaysia and Singapore. Understanding HMPV seasonality patterns, clinical features, surveillance and public health responses could improve readiness for the upcoming emergence.

Keywords: Human meta pneumovirus; acute respiratory infection; children

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Introduction

In early January 2025, there was information about the escalation of HMPV infection in China and globally. The Indonesian Ministry of Health also issued a statement regarding the rise in infection, urging the public to actively follow the hygiene protocol as a preventive measure[1]. A previous unpleasant experience of COVID 19 pandemic has led the public to feel distress of the new emerging HMPV infection. In addition, the preliminary information stated that HMPV infection could lead to severe lower respiratory infection and act as a life-threatening infection. Circulating reports are also misleading due to limited data regarding HMPV infection in Indonesia.

HMPV was first detected in the Netherlands in 2001 and infected children in the early years. The symptoms are various from as light as flu-like symptoms to a life-threatening symptoms[2]. HMPV is discovered as the common causative agent of respiratory infection alongside with the more common pathogens such as seasonal influenza, respiratory syncytial virus (RSV) and the less common, mycoplasma pneumonia[3]. Another study stated that lower respiratory infection is accounted for global burden of disease [4], emphasizing the need to further investigate and if applicable, produce a vaccine to prevent the transmission and disease progression. Compared to other Southeast Asia members such as Malaysia, Thailand, and Singapore, studies focusing on HMPV in Indonesia are insufficient.

Epidemiological Trends

Global and Regional Context

In late 2024 and early 2025, an upward trend in HMPV infections was observed across multiple regions, with China experiencing a significant spike, however, this surge is within the expected range during the winter seasonality pattern. No reported overwhelmed hospital occupancy rate during these upward trends [3]. This increase led to intensified surveillance efforts and strengthened public health preparedness measures throughout Asia, including Indonesia[5,6,7].

Indonesia

By early 2025, Indonesia had not observed a notable surge in HMPV cases; however, proactive measures were undertaken, including strengthened surveillance at ports of entry and monitoring of international travelers exhibiting influenza-like illness (ILI) symptoms[5]. Indonesia's Ministry of Health acknowledged the detection of HMPV cases within the country, clarifying that the virus is not novel and generally presents with symptoms similar to those of the common flu. The majority of identified cases were among children, with no indications of significant severity or associated mortality[8].

HMPV as a causative agent in Indonesia, was discovered concurrently with findings on ARI pathogenes. The research conducted by *Virology Laboratory of the Center for Biomedical Research and Development and Basic Health Technology*, in Deli Serdang Hospital, Wonosari Hospital, and Kanudjoso Djati Hospital during August-September 2016 stated that among the positive findings, HMPV was found to be the highest number of virus findings. Although the study was conducted outside the peak season for ARI, which typically occurs during the rainy season from October to March, and involved only 30 samples, the findings remain noteworthy and warrant further attention[910].

The study is similar to the finding in RS Moewardi Solo. HMPV was found to be the second highest virus cause after influenza H3 in 32 sample patients visited RS Moewardi Solo during May – June 2010[11]. Another study conducted in Tabanan, Bali, which included patients ranging in age from 8 months to 80 years, also identified HMPV as one of the causative agents of ARI[12]. A study to investigate viruses generating ARI held in Bandung, West Java in 2010, showed that viral pathogens to cause ARI from PCR were HRV, RSV A, HMPV and RSV B[13]. Another study measuring the causative agents of 188 hospitalized children in several cities in Indonesia (Semarang, Yogyakarta, Tangerang) causing Pneumonia (Community Acquired Pneumonia) in children 2-59 months. Pneumonia is caused by mostly bacteria, but several results show mixed causative agents, and HMPV was one of the causative agent[14].

The findings imply that available studies suggest that HMPV infection is not a recent occurrence in Indonesia. HMPV has been identified as a causative pathogen alongside other major etiologies of ARI. However, research specifically focusing on HMPV, including its epidemiology, clinical characteristics, and public health response remains limited. The research gap on HMPV in Indonesia primarily stems from limited molecular diagnostic and surveillance capabilities and the low national research priority given to this virus.

Other Southeast Asian Countries

In Malaysia, a chaotic situation during HMPV emergence in this early year was also recorded, public health measures have been widely informed due to the awful experience of COVID-19 pandemic [6]. Compared to Indonesia, Malaysia has been focusing on HMPV research. A molecular epidemiology study conducted by Yew et al. found that among the 4 major causeS of ARI HMPV, was one of the causative agents [15]. One epidemiology study, HMPV was found children below 4 years during one year in 2012, the study concluded that the younger the age, the more susceptible to be infected by HMPV. The study also found that the number of cases were higher in November and December 2012, presumably because of Monson period. Fifty-three cases were identified in children under 4 years of age, indicating a high incidence in this age group [16]. A study conducted in Malaysia by Bhassu from February 2010 to March 2012, showed that HMPV infection symptoms are fever, cough, rhinorhoea, wheezing, sore throat,

lethargy and shortness of breath[17]. A further study focusing on phylogenetic analysis has also been conducted by Chow et al in 2016 ([18], resulting in mapping of HMPV sublineage which causes ARI in Malaysia during 2014-2015 and started to observe the possible pandemic risk of HMPV.

A 2011 study in Thailand, paralleling research from Malaysia, explored the molecular prevalence of HMPV in samples that were Influenza A negative[19]. One study discovered that HMPV accounted for 9% of ARI causative agent, after COVID pandemics [20].

Recent studies on HMPV in Singapore indicate an increasing prevalence in recent years. Given its potential to cause severe illness, these findings underscore the importance osustained surveillance and strengthened public health preparedness [7]. HMPV cases peaked in 2018 and subsequently declined during the COVID-19 pandemic. Nonetheless, a marked uptick was recorded again in late 2024 [21]. Due to its mutational dynamics and rising resistance to neutralizing antibodies, HMPV can undermine immune protection and increase the risk of reinfection in previously exposed individuals [22].

Result

Symptoms and Severity

HMPV is commonly associated with respiratory tract infections that vary in severity, from mild symptoms resembling the common cold—such as cough, nasal congestion, fever, and sore throat—to more serious illnesses including bronchitis, pneumonia, and acute respiratory distress syndrome (ARDS). These severe outcomes are predominantly observed in high-risk populations, including young children, the elderly, and individuals with compromised immune systems [1724]. Although the majority of infections are mild and resolve without medical intervention, severe disease can still occur, particularly among vulnerable groups[25].

Genotypes and Seasonality

HMPV is divided into two principal subgroups, A and B, each encompassing multiple genetic clades. These subtypes commonly co-circulate, although seasonal dominance by one subgroup is occasionally observed[723]. In subtropical regions, including Southeast Asia, HMPV outbreaks are more frequently reported during the winter months [16].

Surveillance and Public Health Response

Indonesian's Response

Following the increase in HMPV cases reported in China, the Indonesian government has intensified surveillance measures and issued public health guidance promoting hygiene and remaining calm during

the rise of HMPV cases[8]. Authorities have also implemented screening protocols at entry points and coordinated with international health agencies to track the virus's progression[5].

Regional Preparedness

Studies in Malaysia, Thailand, Singapore emphasize the epidemiology, clinical features, public health responses to emergence. The governments have enhanced monitoring systems for respiratory viruses and conducted preparedness exercises to ensure swift and effective responses to potential surges in HMPV or other respiratory infections [6,7].

Conclusion

HMPV, since its first recognition in the Netherlands as pathogens causing ARI infection in children, a wide range of HMPV research across the globe has risen alongside the rising trends of HMPV globally. Research activity on HMPV has been increasing across the Southeast Asia Region.

However, in Indonesia, even though HMPV can lead to prolonged infection and immune-mediated tissue damage contributing to acute lower respiratory tract infections in immunocompromised individuals, the role of HMPV as a causative agent remains largely underrecognized. Given the increasing transmission trends and its capacity to impair immune function, strengthening surveillance systems is essential, particularly in resource-limited settings such as Indonesia. Integrating HMPV surveillance into the national ARI system would be a valuable initial step to monitor HMPV trends. Looking ahead, the development of vaccines should be prioritized, drawing lessons from previous pandemics like COVID-19 and Ebola[7].

In the future, research in the significance of studying HMPV in Indonesia, highlighting the epidemiological context, impact on health systems and hospitalization rates, is also a crucial aspect. Whether HMPV could lead to greater problems similar to COVID-19 remains unclear and needs further investigation and research.

Conflicts of Interest

There is no conflict of interest.

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