

## **The Challenges of Handling Dengue Hemorrhagic Fever during the COVID-19 Pandemic: Literature Review**

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**Abstract :** SARS-CoV-2, as the causative agent of COVID-19, has spread throughout the world after becoming a pandemic in March 2020. In the midst of the ongoing COVID-19 pandemic, we are also faced with another serious health problem, namely Dengue Hemorrhagic Fever (DHF). Changes in weather patterns due to the transition from the dry season to the rainy season contribute to the large number of cases of DHF. The COVID-19 pandemic has put pressure on efforts to prevent DHF. With the recommendation to stay at home, people cannot carry out activities to eradicate mosquito nests massively. Water reservoirs, such as at hotels and resorts, are also not properly maintained because some workers are not on duty. These conditions contribute to the breeding of mosquitoes. Meanwhile, the clinical symptoms of the early stages of these two diseases have several similarities. This can cause misdiagnoses that can lead to patient fatality and community transmission. This article review aimed to identify the challenges of handling DHF during the COVID-19 pandemic. WC:165

**Keywords:** COVID 19 Pandemic, Dengue Hemorrhagic Fever, SARS-CoV-2, Coinfection.

### **I. Introduction**

Coronavirus Disease 2019 (COVID-19) is a severe acute respiratory syndrome disease caused by the SARS-CoV-2 virus [1]. COVID-19 is mostly characterized by fever and cough [2]. SARS-CoV-2 was first identified in Wuhan, Hubei Province, China in December 2019 [3]. The number of cases of COVID-19 rapidly increased throughout China and eventually spread throughout the world and was declared a global pandemic outbreak. As of December 31, 2021 with more than 4.1 million new cases and over 45,000 new deaths reported, globally there have been nearly 285 million cases and more than 5.4 million deaths [4]. During this pandemic, cases of Dengue Hemorrhagic Fever (DHF) have increased in many countries, especially in countries where dengue fever is endemic. This includes several countries in Southeast Asia and South Asia such as the Philippines, Malaysia, Singapore, Thailand, Indonesia, Myanmar, India, Bangladesh, Pakistan, and in South America such as Brazil, Paraguay, and Colombia [5]. DHF cases continues to increase in many countries, including Indonesia. Cases of DHF in Indonesia have increased in 2020 compared to the previous year 2019. In Indonesia, out of a total of 513 districts/cities, 481 (93.58%) districts/cities were infected with dengue fever with an Incidence Rate of 51.48 per 100,000[6].

Dengue Hemorrhagic Fever is an arboviral infection that often occurs in tropical and subtropical areas. It is estimated that every year there are 96 million infections by dengue virus with 21,000 deaths worldwide [7]. Fever, headache, arthromyalgia, retro-orbital discomfort, and rash are all symptoms of dengue infection. Because the clinical and laboratory signs of COVID-19 are similar to those of DHF, the COVID-19 pandemic in DHF endemic areas is an additional health concern. The similarities in symptoms make identifying and treating the two diseases difficult [3]. Despite the similarities in clinical symptoms such as fever, headache, and body pains, as well as test findings such as thrombocytopenia and leucopenia, the patient management of these two diseases is very different [8,9]. Accordingly, the use of Reverse Transcription Polymerase Chain Reaction (RT-PCR) and Enzyme-linked Immunosorbent Assay (ELISA) tests are needed as the basis for confirming the diagnosis.

The rainy season has always contributed to an increasing number of DHF cases. This is a challenge for health workers, especially those in the emergency room who will be faced with an increase in cases of DHF where previously they had to identify cases of suspected or confirmed COVID-19. In this situation, a complete

history, physical examination and appropriate laboratory examinations are vital in confirming the diagnosis of DHF and COVID-19.

There are reports of coinfection between SARS-CoV-2 and the dengue virus (DENV) which raise serious concerns about the handling of the two viruses [10,11]. For example, recent reports from Singapore identified two cases of COVID-19 which were misdiagnosed as DHF due to clinical manifestations and hematological profiles, showing false positive dengue and DENV IgM antibodies using rapid diagnostic tests (RDT) [12]. Therefore, this review aimed to map the challenges of managing DHF during the COVID-19 pandemic.

## **II. Material & Methods**

We thoroughly reviewed publications regarding the challenges of handling Dengue Hemorrhagic Fever during the COVID-19 pandemic. The challenges found were the presence of signs and symptoms of similarities between dengue hemorrhagic fever and SARS COVID-2, the challenges of changes in temperature/weather during the SARS COVID-2 period and the increase in DHF cases and Coinfection between dengue fever and SARS Covid-2.

## **III. Signs and Symptoms of Dengue Hemorrhagic Fever and SARS COVID-2**

The patients with DHF in general will suddenly experience a high fever. Face flushing, skin erythema, body pains, myalgia, arthralgia, and headache are all symptoms of the acute febrile phase, which can last 2-7 days [8]. Some patients may experience sore throat, inflammation of the pharynx and inflammation of the conjunctiva. In general, anorexia, nausea and vomiting may also occur. It is difficult to differentiate clinically in the early stages of dengue fever from non-dengue fever. At this time, a positive tourniquet test raises the risk of confirmed dengue fever [8]. In addition, these clinical signs cannot be distinguished between severe and non-severe cases of dengue. As a result, monitoring of warning signs and other clinical parameters is very important to recognize the disease progression to a critical phase. If the dengue phase continues, it can cause mild bleeding manifestations such as petechiae and mucous membrane bleeding (e.g., nose and gums) [13]. Massive vaginal bleeding (in women of reproductive age) and gastrointestinal bleeding are possible but unusual at this stage. After a few days of fever, the liver is frequently swollen and painful. Furthermore, there can be a progressive decrease in white blood cells which indicates that there is a high probability that dengue fever has occurred [8].

In patients with COVID-19, the disease can cause various signs and symptoms in different people in different ways. Most people who become infected will have a mild to moderate illness or recover on their own without hospitalization. The most common symptoms of COVID-19 include fever, cough, fatigue, and loss of taste or smell. In addition, less common symptoms may occur, including sore throat, headache, aches and pains, diarrhea, skin rash, or discoloration of fingers or toes, with red or irritated eyes [14].

COVID-19 and DHF are very difficult to distinguish in the early stages because the two diseases have very similar clinical and laboratory features [3]. General clinical symptoms such as fever, headache, and cough are present in the majority of patients with a confirmed diagnosis of COVID-19 infection [15]. Similarly, clinical symptoms of fever, skin rash is a clinical symptom of dengue fever [11]. Clinical symptoms in the early stages such as fever, myalgia, and headache are commonly seen in patients infected with COVID-19 and DHF. However, symptoms related to breathing such as sore throat, cough and loss of smell and sense of taste need to be confirmed by laboratory tests to confirm COVID-19 infection [16].

The differential approach to early diagnosis between DHF and COVID-19 patients can be guided by neutrophil and lymphocyte counts, NLR, and thrombocytopenia in the first week of symptoms. Thrombocytopenia is more common in patients with DHF, and it can occur without a fever. Meanwhile, the patients with COVID-19 will usually have a low platelet count a few days after that, followed by a clinical course of fever. The patients with DHF tend to be admitted to the emergency room earlier because of the fever response that appears earlier than COVID-19 [17–19].

## **IV. Changes in temperature/weather, SARS COVID-2 And increase in DHF cases**

Weather and temperature factors have been shown to be important for the dynamics of DHF transmission. Understanding the empirical association between weather and temperature conditions and DHF is critical for

disease warning systems. [20,21]. Environmental risk factors have an effect on the area of dengue incidence. Environmental factors known to have an effect on dengue virus transmission, include ineffective vector control, climate change, temperature, rainfall, humidity, and mobility of people or residents [22]. Additionally, changes in climate and temperature have an impact on the *Aedes* spp. mosquito's life cycle, including larval development, adult survival, and the distribution of the *Aedes aegypti* mosquito [23,24].

Preventing or reducing dengue virus transmission is strongly influenced by mosquito vector control measures, including breaking contact with vectors. During a pandemic, public health personnel are diverted and focused on the pandemic, and as a result, the routine mosquito vector surveillance and control programs that have been carried out so far are automatically stopped in many countries. [25] This temporary hiatus in eradication programs can interfere with efforts to control and prevent DHF. An Indian study reported that the density of *Aedes* spp. mosquitoes increased dramatically during the COVID-19 period due to the temporary suspension of the vector control program [19]. In another study, Malaysia officials reported an increase in vector density during the COVID-19 period, which has led to an increase in dengue incidence [26]. When people's movement is limited and they stay at home during a pandemic, the opportunity for human-vector contact may increase, thereby increasing the risk of viral infection and transmission. This impact is likely to be more pronounced in the rainy season because of the potential for many used cans/bottles/used tires to become ideal places for mosquito larvae to breed.

## **V. Coinfection between dengue and SARS Covid-2**

As the whole world struggles to combat COVID-19, in countries with dengue endemic tropical and sub-tropical climates, this burden is increasing with increasing cases of DHF, which is transmitted by mosquito vectors [27]. Currently, it is strongly estimated that there will be co-infection of COVID 19 and DHF in dengue endemic countries. Similar clinical symptoms such as fever, pain and respiratory illness shared by the two viral diseases have caused serious concern in dengue-endemic countries with limited resources. It is certain that the occurrence of co-infection between DHF and COVID-19 has created an additional burden on health and public health workers in dengue endemic countries. [28]. Meanwhile, coinfection poses a major challenge for correct diagnosis and treatment where symptoms overlap. In addition, there are increasing numbers of cases and this needs attention because many medical workers make mistakes by not recognizing the possibility of false positive results [12].

Coinfection between DHF and COVID-19 has been reported in several dengue endemic countries, including Singapore [12], Thailand, India [29] and Bangladesh [30]. One confusing case report from Thailand found a patient with fever and petechiae [31], which are symptoms that are very common in DHF. In this patient, symptoms of thrombocytopenia were also found, which is also a common finding in DHF [32]. After some time, the patient developed symptoms of respiratory distress, and after an RT-PCR examination it was confirmed, the patient had a COVID-19 infection. In further evidence, it has been proven that SARS-CoV2 can give false positive results in the rapid dengue test adding to the challenges of RDT. Two cases of patients with fever in Singapore were found to be positive for DHF and later proven to have developed COVID-19 [12]. After a second test with RT-PCR, the DENV was later confirmed negative. From reports in Thailand, there were also cases of transmission of COVID-19 to health workers from patients suspected of having DHF [29]. These patients were treated without following the procedural respiratory precautions. At first the patient was treated as suspected DHF, then with the additional diagnosis of COVID-19, the patient became a false positive case of DENV coinfection.

Of the many similarities in the early stages between DHF and COVID-19, there are key differences that can help to distinguish the early signs of each of the two cases. COVID-19 is very typically identified as a respiratory tract infection, and cough symptoms will appear in >75%, and the remaining 25% will have a productive cough [33], which are very unlikely to be found in patients with DHF [32]. In addition, the symptoms of sore throat and nose that occur in COVID-19 [33] are not found in patients with DHF [32]. In addition, the laboratory results for DHF will show monocytosis, lymphopenia and thrombocytopenia [32] and this condition has not been the case in COVID-19 [33]. Therefore, considering the situation, the simultaneous infection of DHF and COVID 19 can be a major challenge during the current COVID-19 pandemic [27].

## **VI. Conclusions**

The coinfections with COVID-19 and DHF can peak during the rainy season in dengue endemic countries. In the pandemic era, diagnosing one infection does not rule out the possibility of other infections simultaneously, such as coinfection between DENV and COVID-19. Health workers should make extra efforts to confirm any suspected diagnoses and take proper precautions to safeguard themselves and the community



from the increased potential for disease transmission.

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### **Conflict of Interest**

All authors confirm there are no conflicts of interest related to this manuscript.

### **Author's Contribution**

All authors in this review contributed equally. All authors prepared, drafted, structured research, critically read and revised manuscripts and gave final approval for publication.

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