LETTER TO EDITOR

Dengue Elimination Challenges in Bali: A One Health Perspective

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DOI: 10.55489/njcm.140820233034

Key words: Dengue, Elimination Challenges, Bali, One-Health Perspective

ARTICLE INFO

Financial Support: None declared
Conflict of Interest: None declared
Received:01-05-2023, **Accepted**: 14-06-2023, **Published**: 01-08-2023
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Sir,

Dengue virus infection (IVD) has resulted in significant mortality and morbidity in the past decade in Bali, Indonesia.[1,2] IVD case reports in 57 subdistricts in the period January–December 2022 reached 7,582 cases (distribution of cases between subdistricts in Figure 1), an incidence rate (IR) of 162/100,000 population (Figure 1), and mortality of 15 people (case fatality rate [CFR] of 0.2%). Cases were declared to have tripled from the previous year, and IR did not meet the national target (> 49/100,000 population).[3]

Various control and eradication efforts have been carried out but have not received the expected results. For example, the One Health approach is a collaborative, multisectoral, and transdisciplinary approach that related agencies have applied to reduce dengue cases in Bali. This approach seeks to recognize the interconnectedness of human, animal, and environmental health, including studying the dynamics of infectious diseases and designing effective control and eradication efforts.[4,5] In the context of dengue fever in Bali, the One Health approach can help identify factors contributing to dengue disease transmission and design comprehensive and integrated interventions to address the various dimensions hindering dengue eradication in Bali.

The urgency of dengue eradication in Bali aims to reduce morbidity and mortality due to DHF. We highlight the challenges and obstacles that make IVD cases in Bali increasingly concerning. Based on our review, climate variability is essential in increasing vector populations in the environment. However, a comprehensive study that studies the interrelationships of all climate elements, including temperature, air humidity, wind speed, air pressure, precipitation, rainy days, rain properties, the standardized precipitation index (SPI), and the length of solar irradiation in increasing abundance, population, and vector activity with increasing cases of IVD, has not been studied comprehensively.

The predisposition to climate variability significantly challenges the assumption of IVD from any pathway.[6] Unstable climate change is not conducive to environmental health and sanitation and is supported by increasing zoonotic diseases; it is a booster for vectors, including mosquitoes, to survive extreme weather. The impact of climate variability on dengue transmission in Bali is strongly felt, especially in urban areas with a high population burden. The findings showed the spread of *Aedes aegypti*, *Aedes albopictus*, and *Aedes* sp. mosquitoes and heterogeneous dengue cases in all subdistricts. Aedes mosquitoes can be found in both urban and rural areas, and their abundance and activity can vary

How to cite this article: Mertha Adnyana IMD, Utomo B. Dengue Elimination Challenges in Bali: A One Health Perspective. Natl J Community Med 2023;14(8):544-546. DOI: 10.55489/njcm.140820233034

www.njcmindia.com | pISSN09763325 | eISSN22296816 | Published by Medsci Publications

depending on local physical environmental factors such as temperature, humidity, and rainfall.[7]

Previous studies have demonstrated that climate variability significantly impacts the abundance and activity of Aedes mosquitoes. Temperature, precipitation, and relative humidity are essential climate predictors affecting mosquito life cycles and bioecology. Higher temperatures, lower relative humidity, and low wind speeds are associated with an increased incidence of IVD.[8] Therefore, understanding the relationship between climate variability and dengue transmission is critical to designing effective interventions using one-health approaches.[9] Despite the importance of climate variability, there needs to be more comprehensive, high-quality data on IVD cases and mosquito abundance in Bali. The nonstandardized IVD surveillance system in each subdistrict and inconsistent data collection and reporting are challenges to accelerating dengue eradication in Bali. We also found the unavailability of vector surveillance in all community health centers to inhibit vector surveillance in Bali. In addition to studying the impact of climate variability on dengue transmission, One Health approaches can also be used to design comprehensive, integrated interventions that address multiple dimensions of the problem. For example, interventions may include vector control measures such as larvicides, insecticide-treated bed nets, and source-based (household) control activities involving communities.[10]

Implementing the "One Health" approach to dengue virus infection control in Bali presents several challenges and opportunities. The challenges include (a) Cross-sector collaboration: Implementing the One Health approach requires coordination and collaboration between various sectors, such as public health, animal health, and environmental health. Ensuring effective communication and collaboration between these sectors can be challenging due to differences in priorities, language, and organizational structure. (b) Limited resources: The implementation of the One Health approach requires significant resources, including financial, human, and technical resources. More resources may help the adoption of this approach in Bali. (c) Social and cultural factors: Social and cultural factors can influence the application of the One Health approach. For example, traditional and cultural practices may conflict with modern health interventions. (d) Governance and policies: Implementation of the One Health approach requires strong governance and policy frameworks that encourage cross-sector collaboration and integration. Ensuring effective governance and policy frameworks can be challenging, especially in low- and middle-income countries such as Bali.

Furthermore, the advantages or opportunities of implementing the One Health approach for IVD control in Bali include (a) better disease control: The One Health approach provides a holistic and integrated approach to disease control.

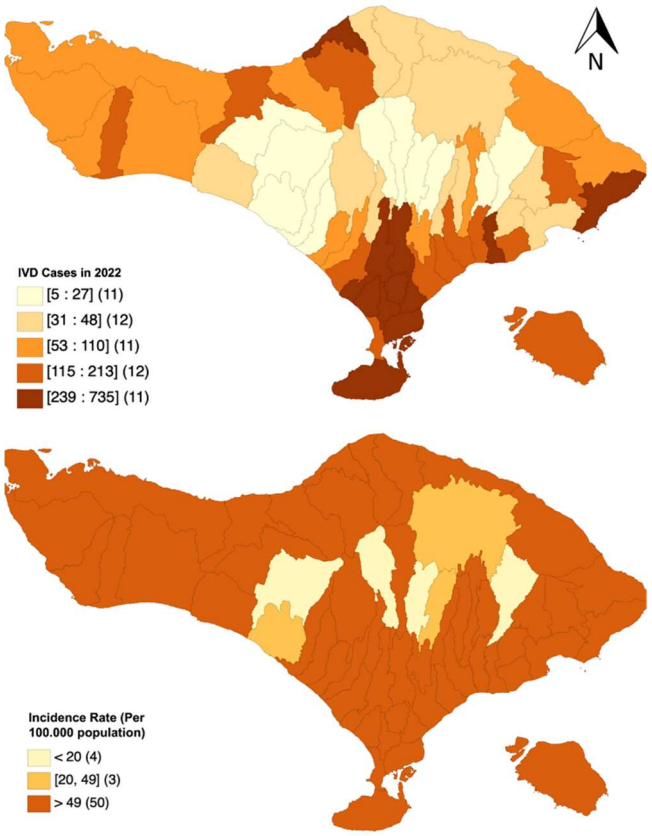

Figure 1: Dengue virus infection (IVD) cases and incidence rate (IR) in 57 subdistricts in Bali, 2022. Legend Information: top map, [number of cases interval] accompanied by (number of subdistricts); bottom map, [incidence rate] accompanied by (number of subdistricts)

This approach can increase the effectiveness of disease control efforts, especially for diseases such as dengue fever, which have complex transmission dynamics. (b) Increased cross-sectoral cooperation: Imple-menting the One Health approach can encourage cooperation and coordination among various sectors involved in dengue control. This collaboration can improve the effectiveness and efficiency of control efforts. (c) Sustainability: The One Health approach emphasizes sustainability and balancing human and environmental health. This approach can encourage sustainable disease control efforts that consider long-term impacts on human, animal, and environmental health. (d) Innovation: Implementation of the One Health approach can stimulate innovation in disease control strategies. This approach encourages interdisciplinary research and the development of new control measures.

ACKNOWLEDGEMENT

The author would like to thank Prodia Education and Research Institute (PERI) for providing funding for the author's megister program at the Faculty of Medicine, Universitas Airlangga.

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