

# Dengue Hemorrhagic Fever in Bima City: A Study

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Received: April 12, 2023

Revised: June 15, 2023

Accepted: June 25, 2023

Published: June 30, 2023

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DOI: [10.29303/jppipa.v9i6.4787](https://doi.org/10.29303/jppipa.v9i6.4787)

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**Abstract:** Cases of Dengue Hemorrhagic Fever (DHF) in Bima City are of concern because of its widespread spread and the number of sufferers continues to grow. The Municipal Government of Bima, West Nusa Tenggara, has established an Extraordinary Event (KLB) status for DHF. This status was assigned as a response to the high increase in DHF cases over the past two months, namely January and February 2023. Although vector control efforts have been made, DHF cases continue to fluctuate and increase significantly in early 2023. Therefore, researchers have conducted a Quick Response Analysis of DHF cases in Bima City with the aim of providing information about DHF cases and analyzing this information, as well as developing recommendations for alternative solutions in preventing an increase in DHF cases in Bima City. Through the descriptive method, it was found that the incidence of DHF in Bima City tends to increase significantly at the beginning of 2023 compared to the previous two years, with 172 positive cases and 4 of them leading to death as of February 10, 2023. One of the things of concern based on the case analysis is the understanding and attitude of the community regarding environmental sanitation. Meanwhile, solutions that can be recommended are in the form of short, medium, and long term recommendations which can be used as a reference for consideration in establishing regulations to control dengue fever.

**Keywords:** Bima; Dengue Hemorrhagic Fever; Larvae Free Figures; Quick Response Analysis.

## Introduction

Dengue Hemorrhagic Fever (DHF) is one of the cases of concern in Bima City because of its increasingly widespread spread and resulting in an increasing number of cases or sufferers every year. The findings of DHF cases in Bima City in 2020 revealed that there were 164 cases and 5 of them died. In 2021, case findings decreased and only 57 cases were found with 1 person dying (Fitra et al., 2022). A year later in 2022, 93 cases were found and 1 person died. At the beginning of 2023, starting up to the second week of February 2023, there was a significant increase in case detection, in which 172 suspected and suspected DHF cases were found and 4 people died. Information that 4 patients died consisted of 2 people who were in the working area of the Paruga Health Center, 1 person in the working area of the Jatibaru Health Center and 1 other person who was in the working area of the Mpunda Health Center.

Meanwhile, the larva-free rate (known with ABJ) in Bima City in 2022 has only reached 75% of the ABJ target of 95% nationally.

The government of the City of Bima, West Nusa Tenggara (known with NTB), has finally set the status of an Extraordinary Event (known with KLB) for Dengue Hemorrhagic Fever (DHF) in early 2023 (Widiarti, et al., 2006). The status determination follows the high number of DHF cases during the last two months, namely in January and February 2023. From January to 10 February 2023, the total number of residents infected with DHF reached 172 people (Rubianti, 2023). As many as 19 of them are still undergoing intensive care at hospitals and puskesmas, while 4 people have died, and the rest have recovered.

Dengue Hemorrhagic Fever Control in Bima City in general has been carried out a lot as the Mayor of Bima has appealed to the whole community regarding Mosquito Nest Eradication (known with PSN) activities

## How to Cite:

Asryadin, A., Aqwam, A., Khairunnisa, R., Endang, H.K., Rosita, R., Annas, F., & Hasan, H. (2023). Dengue Hemorrhagic Fever in Bima City: A Study. *Jurnal Penelitian Pendidikan IPA*, 9(6), 4869–4879. <https://doi.org/10.29303/jppipa.v9i6.4787>

such as environmental cleaning activities, providing education in the form of outreach to, using larvicides with 3M plus (draining and brushing bathtubs, closing water reservoirs, closing used goods) to the last alternative by fogging with the aim of killing adult mosquitoes (Ariyanto et al., 2021).

Although various vector control efforts have been made, cases of dengue hemorrhagic fever from year to year tend to fluctuate and tend to increase and experience a very significant increase at the beginning of the year (Notoatmodjo, 1993). According to Helm et al (2016), some of the obstacles in managing DHF may be due to the presence of asymptomatic cases (asymptomatic) and screening up to severe conditions, the occurrence of trans-ovarial transmission (the virus is passed on to offspring through eggs), the occurrence of resistance of the *Aedes aegypti* vector to insecticides, behavior and the community that supports the existence of mosquito habitats (Ranjit & Kissoon, 2011). Based on this, the researcher intends to conduct a Quick Response Analysis / rapid study of DHF cases in Bima City which aims to provide information related to DHF cases and analyze information on DHF cases as well as formulate recommendations for alternative solutions for preventing an increase in DHF cases in Bima City.

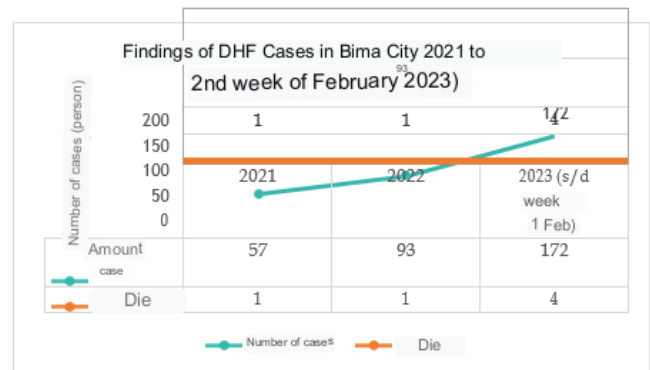
**Method**

This study used a descriptive method in analyzing the development of DHF cases in Bima City based on some secondary data obtained from the P2PL field of the Bima City Health Office. The data obtained include (1): Time series data on findings of DHF cases in Bima City for two years and six weeks, namely from 2021, 2022, to data for the second week of February 2023; (2) Cross section data on the number of DHF cases per sub-district area from five sub-districts in Kota Bima in 2023 (up to the first week of 2023); (3) as well as time series data on the number of DHF cases by sex from 2021 to the second week of February 2023. Meanwhile, the study was conducted for two weeks at the end of February 2023.

The research was carried out starting with (1): Collecting data on DHF cases in Bima City; (2) Case analysis with descriptive method; (3) Identification of the causes of DHF based on related data; (4) Compilation of recommendations for solutions in the short term, medium term and long term in handling DHF cases in Kota Bima.

**Result and Discussion**

Data on findings of Dengue Hemorrhagic Fever (DHF) cases in Bima City from 2021 to early February 2023 can be presented through a line chart in Figure 1.



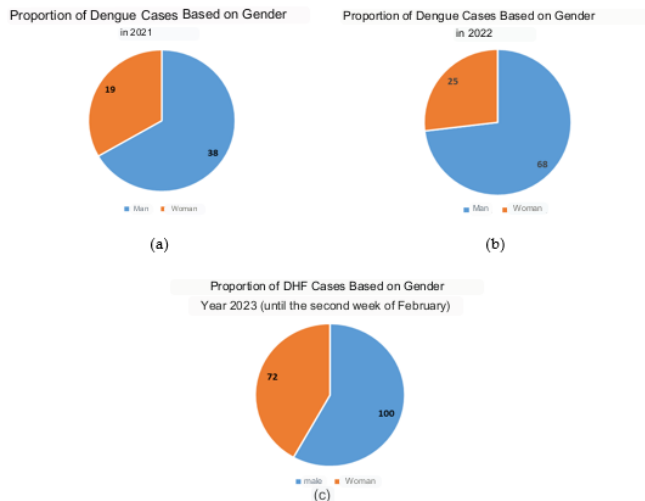
**Figure 1.** Graph of the increasing trend of DHF case findings in Bima City

Based on Figure 1 which shows the development of DHF cases in Bima City, information is obtained that during the last 3 years Bima City has had a trend of increasing numbers of DHF cases. Especially in comparison to the number of cases that have soared from the previous year. Throughout 2022 until early 2023, namely the first week of February, there was a very significant increase in DHF cases so that 172 cases were found and 4 people died. When compared with the difference in the increase in cases throughout 2022 with the incidence in 2021, the comparison of data on the number of DHF cases at the beginning of 2023 and 2022 has a very high increase in cases. Meanwhile, based on data on the number of DHF cases per sub-district area from five sub-districts in Bima City in 2023, it was found that the total findings of DHF cases in Bima City were 172 cases spread across 30 out of 41 sub-districts in Bima City. The highest number of DHF case findings in Bima City from January to the first week (10th) of February 2023 occurred in Tanjung Subdistrict, Rasanae Barat District with 12 cases, while cases of death occurred in 4 sufferers, the highest cases of death were found in Sarae Village with 2 deaths in the RT. 04 RW. 02 and on RT. 16 RWs. 05, one case of death occurred in RT. 01 RW. 01 West Jatibaru Village, as well as one other case of death occurred in a patient located in Penatoi Village. Data on the distribution of cases per village can be seen in Figure 2.



**Figure 2.** Map of Distribution of DHF T-shirts and Deaths from DHF Kota Bima 1 January - 10 February 2023

In Figure 2, which is a map of the distribution of DHF cases in Bima City, it can be seen that DHF cases in early 2023 have spread to almost all urban villages in Bima City. The high cases of death, namely 4 cases spread over 3 sub-districts namely Penatoi, Sarae, and Jatibaru sub-districts. Meanwhile, the proportion of dengue case findings based on gender is visualized in the pie chart in Figure 3.



**Figure 3.** Proportion of dengue hemorrhagic fever case findings in Bima City by gender in 2023.

Based on Figure 3 section (c) it is known that the proportion of DHF cases based on gender at the beginning of 2023 is more likely to occur in men, namely 100 people (58.1%) have been infected with DHF while the number of cases counted in women or female sufferers reaches 72 people (41.9%). The number and percentage comparison of cases between the two sexes did not have a large enough difference when compared to the DHF cases in the previous two years. From figure 3 part (a) it is known that the number of cases that

occurred in 2021 totaled 57 cases, 38 men (66.7%) who were infected with DHF and 19 women (33.3%). Meanwhile, based on the frequency of DHF in 2022, the dominant sex exposed to DHF is male, namely 68 people (73.1%), while DHF cases that occur in women reach 25 people (26.9%).

From the frequency and percentage of DHF based on gender, it can be said that men are more exposed to DHF than women. However, based on figure 3, the proportion of case findings for women tends to fluctuate and then increase rapidly in 2023. This shows that from the spread of the dengue virus there is no significant difference in susceptibility to infection with dengue virus based on gender or sex, in other words, each sex has a susceptibility that is not much different for dengue virus infection. Santosa, et al (2011) found in his research that men have a higher tendency to be infected with the virus that causes DHF than women because in their body metabolism, men are less efficient at producing hemoglobin (Hb) and antibodies against dengue virus in their lymphoid system.

**Case Analysis Geographical Conditions, Demographics and Population Density of the City of Bima**

Bima City has an area of 222.3 km<sup>2</sup> which consists of 5 districts and 41 villages. These sub-districts include the sub-districts of Mpunda, Raba, Asakota, West Rasanae and East Rasanae. The population of Bima City at the end of 2022 based on registration data was recorded at 187,780 people, with details: Asakota District 32,710 inhabitants, Raba District 46,900 inhabitants, Mpunda District 45,489 inhabitants, East Rasanae District 17,715 inhabitants and West Rasanae District 44,966 inhabitants. In detail, the population of Bima City is presented in Table 1.

**Table 1.** Total Population, Number of Households and City Population Density Milky Way 2022.

Subdistrict	Wide Territory (Km <sup>2</sup> )	Number of Villages	Total population (soul)	Number of Houses Ladder	Population density (per Km <sup>2</sup> )
Asakota	10.1	6	32.710	7.637	463.8
Raba	15.3	8	46.900	4.159	270.6
Mpunda	63.7	10	45.489	10.651	2913.9
Rasanae Timur	64.1	11	17.715	10.986	720.3
Rasanae Barat	69.0	6	44.966	10.525	4340.3
Kota Bima	222.3	41	187.780	43.994	827.0

The order of population density is in a row the District of West Rasanae, District of Mpunda, District of East Rasanae, Asakota District and Raba District with the most densely populated sub-district being Rasanae Barat District with a density of 4,340 residents in 1 km<sup>2</sup>.

As of the second week of February 2023, the highest cases of DHF were in West Rasanae District with the highest sub-district finding cases in Tanjung Sub-District

with 12 confirmed positive cases of DHF, while the highest cases of death occurred in Sarae Sub-District, Rasanae Barat District with 2 deaths. Two DHF patients who died were aged 11 and 7 years. Tasanae Barat sub-district is a sub-district with the highest population density in Bima City, thus providing a greater possibility of spreading the virus through the Aedes aegypti mosquito vector. In general, the observations were made

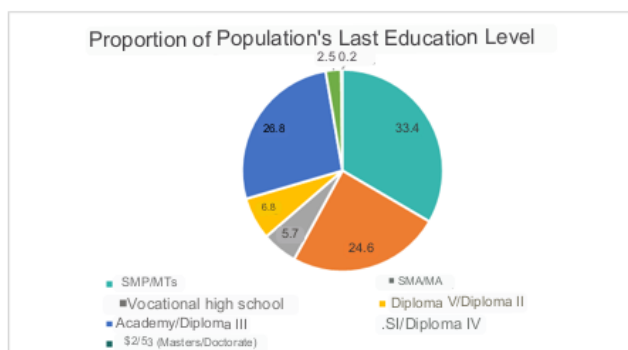


around the location of the patient's residence or activity location. Environmental conditions generally appear to have good sanitation, but in several locations open water containers were found which provided opportunities for mosquito vectors to live and breed (Jusuf & Lalu, 2020).

Meanwhile, the high number of cases found in the Asakota Subdistrict, especially in the Jatibaru and Jatiwangi Subdistricts, can mainly be caused by environmental sanitation and community activities with high mobility related to the type of work, even though the Asakota Subdistrict has a population density that tends to be low, namely 463.8 people/km<sup>2</sup>.

*Type and level of education of the population*

The proportion of the last education level of the population can be seen in the pie chart in Figure 4.



**Figure 4.** The proportion of the last education level of the population of Bima City in 2022.

Based on Figure 4 regarding the level of education, the majority of the population in Kota Bima are junior high school graduates (33.4%), followed by academy/Diploma III graduates (26.8%) and high school graduates (24.6%). The level of education is important and relates to the knowledge and attitude of an individual in understanding an event including the DHF event, especially one's understanding of the dangers of dengue virus, how dengue virus is transmitted and how effective prevention measures are against the spread of DHF (Mukhtar, et al., 2021).

*Health Facilities*

Health service facilities in Bima City consist of public hospitals, private hospitals, health centers and their networks, other service facilities and pharmaceutical production and distribution facilities which can be seen in Table 2. In general, the spread of health service facilities is sufficient in all areas in Bima City, this makes it easier to handle DHF. However, in addition to the availability of these health service facilities, there are several service weaknesses such as the existence of the Bima City General Hospital which in general does not yet have adequate infrastructure to support treatment, especially in cases of illness with

severe symptoms. Limited health personnel and also uneven distribution and placement of tasks.

**Table 2.** Number of Bima City Health Service Facilities in 2022

Medical facility	Amount	
Regional Government/BUMN/TNI		Other
Police		
Hospital	1	2
Public health center	7	0
Primary Clinic, Lab	5	1
Pharmaceutical production and distribution facilities	1	68

In addition to infrastructure facilities, optimizing the role and presence of health cadres in each sub-district is very important. The participation and performance of cadres is urgently needed as a backup and as a community outreach team that is closest to the community and plays a role as a companion, extension worker and monitoring the state of public health, especially before, during and at the end of the rainy season. Together with the community and government officials, especially village officials, cadres act as initiators of environmental-based infectious disease control activities including dengue hemorrhagic fever (Winder-Smith et al., 2000).

The existence of blood component provider facilities also needs serious attention from the Municipal Government of Bima. Until now, the existence of an independent Blood Transfusion Unit (UTD) belonging to the Bima City Government has not been operationalized optimally in ensuring the availability of blood for patients who need it. In DHF cases with a risk of decreased hemoglobin levels leading to anemia, the presence of UTD and the availability of blood through blood banks is an urgent thing to do. DHF is a disease whose treatment must be fast considering the natural course and fast incubation period of the virus in the body which if not treated as soon as possible has a high chance of becoming severe (severe).

*Frog Free Number (ABJ) of Aedes aegypti mosquitoes*

The larvae-free rate (ABJ) data obtained from the Bima City Health Office conducted by health workers at 7 puskesmas in Bima City in 2022 shows low numbers and does not meet the national larvae-free rate (ABJ) target. ABJ City of Bima in 2022 is 75% and lower than the national target of 95% (P2 DBD Health, 2022).

The low ABJ value for Kota Bima indicates that the *Aedes aegypti* population is quite high in each sub-district in Bima City. Based on the results of a larva survey both conducted by puskesmas health workers and other teams in the community's environment with the discovery of positive cases and deaths due to DHF, it was found that there were still many water containers which were potential habitats for mosquito larvae. The

low ABJ illustrates the lack of community participation in eradicating mosquito nests (PSN) thereby increasing the *Aedes aegypti* mosquito population.

The condition of low ABJ and the distribution of cases in clusters, especially in densely populated residential areas, reflects that DHF transmission is more due to the behavior of mosquito vectors than humans who are suitable for the environment and provide suitable habitat for their breeding (Boewono, D.T, et.al, 2019). There is an increase in the *Aedes aegypti* mosquito population caused by a lack of community participation and eradication of mosquito nests (PSN), or it can also be caused by the use of less effective insecticides.

In general, the insecticide used in Bima City until now is the use of larvicide (abate) which is available free of charge at each health center and its network, as well as the use of Malathion insecticide in fogging activities which has an estimate of causing resistance to *Aedes aegypti* mosquitoes, especially when using the wrong formula and concentration. Hamid et.al (2017) stated that the use of insecticides in controlling *Aedes aegypti* mosquitoes needs to be rotated with alternative insecticides.

It is necessary to develop *Aedes aegypti* vector control activities to suppress the spread of DHF. This activity can be carried out by involving all OPD and related parties, especially village officials and the community as a whole who coordinates with the PKK Mobilization Team with the core of socialization and counseling activities on how to eradicate mosquito nests (PSN), as well as optimizing larva monitoring. This effort is intended to create a healthy community independently and avoid dengue (Marcombe, et al., 2018).

#### *Physical Environment Conditions*

##### a. Climate

Climate influences the development of *Aedes aegypti* mosquito larvae. In the rainy season and the availability of containers that can collect rainwater, it is a potential breeding facility for *Aedes aegypti*. In Bima City every year, DHF cases increase, especially during the rainy season and reach a peak in early 2023. During observations at the DHF case locations, rainwater containers were found with mosquito larvae.

##### b. Rainfall

Rainfall is one of the climate variables that can be used as an "early warning" for controlling Dengue Hemorrhagic Fever. In addition, other climate variables are also related, namely temperature and humidity. Christopher, 2011 suggests that increasing the intensity of rainfall will increase humidity, and accompanied by an appropriate air temperature will increase the life of the mosquito vector but also support mosquito activity as a whole.

##### c. Temperature

The rainy season and the dry season have an influence on the environmental temperature level. This influence tends to be local with a certain time period, this is because the temperature and humidity levels are more complex and are influenced by global, regional and topographical phenomena and vegetation. When the rainy season changes to the dry season. Air temperature conditions range from 23°C-31°C, and this is the optimum temperature range for mosquito breeding (24°C - 28°C). High rainfall is followed by an increase in the number of cases at the end to the beginning of the year and air temperatures in the range of 27°C are the optimal temperatures for mosquito growth. This shows that the interaction between rainfall and temperature greatly determines the breeding of *Aedes aegypti* mosquitoes.

##### d. Humidity

According to (WHO, 2003), the age of mosquitoes is influenced by air humidity, i.e. at humidity <60% the lifespan of mosquitoes will be shortened, they cannot become vectors because there is not enough time for the virus to transfer from the stomach to the mosquito's salivary glands before being transmitted to humans.

##### e. Place altitude

Altitude is one of the environmental factors that affect the development of mosquitoes. Adult *Aedes aegypti* mosquitoes are able to fly and explore up to a distance of 100-200 m above sea level from their breeding sites (Ministry of Health RI, 2003).

##### f. Residential Density Conditions

An increase in population density will affect the factors that cause the degree of dengue virus transmission, namely: vector density, population mobility, population density, and the susceptibility of the population. Population mobility plays an important role in the transmission of the dengue virus, because the flight distance of the *Aedes aegypti* mosquito is very limited, which is 100 m. Meanwhile, potential places for DHF transmission to occur are: areas with high DHF incidents and public places which are gathering places for people who come from various regions, which allows for a large exchange of several types of dengue virus.

#### *Environmental Sanitation Conditions*

##### *Clean water supply*

The problem of adequacy of clean water in households is very important in relation to vector (intermediary) control, including the *Aedes aegypti* mosquito. Water acts as a breeding ground for mosquitoes of various genera/species (Sumirat, 2007). Based on the results of field observations, *Aedes aegypti* mosquito larvae are generally found in clean water,

especially in water reservoirs in open places where attention is usually neglected. Increased public understanding regarding mosquito vector breeding, waste management and the utilization of healthy latrines are very important factors in controlling mosquito vector breeding.

*Factor Knowledge, Attitude*

The pattern of community habits that are detrimental to health and pay little attention to environmental hygiene such as the habit of hanging clothes, the habit of taking naps, cleaning the Final Disposal Site (TPA), cleaning the yard, and also the lack of community participation in PSN will pose a risk of DHF transmission. Communities who have difficulties in obtaining clean water tend to store water in water reservoirs which can be a potential container as a breeding ground for *Aedes aegypti* mosquitoes.

*Vector Resistance to Insecticides*

Lima et al 2003 stated that the continuous use of insecticides will have a detrimental impact, namely the emergence of resistant insects. The insecticide used in fogging is malathion. As a chemical, malathion works as a stomach poison, contact poison and inhalation poison which works by inhibiting cholinesterase which causes insects to become paralyzed and eventually die (Boewono, D.T et al 2006). Uncontrolled use of malathion will result in resistance to the *Aedes aegypti* mosquito. As is the case in Bima City, until now, the main insecticide used in fogging activities is malathion, thus giving the possibility of mosquito vector resistance to malathion occurring.

*Environmental Sanitation*

Environmental sanitation aims to eliminate food preferences, breeding places and resting places which are urgently needed by vectors and nuisance animals. Some of the things that are of concern are: Settlement, clean water supply, latrines, as well as physical,

environmental and socio-cultural parameters that influence the spread of dengue hemorrhagic fever.

*Biological Control*

*Predators*

Larvae-eating fish can be used as natural predators, for example: tinhead fish (*Aplocheilus panchax*) and cetul fish (*Poecilia reticulata*).

*Bacteria*

Two bacterial species that contain endotoxins and are capable of killing larvae are *Bacillus thuringiensis* and *B. sphaericus*.

*Chemical Control*

Larvicides are used to kill mosquito larvae. In general, the larvicides that are commonly used are temephos and metophrene which are sprinkled on water reservoirs that work specifically so that they are effective within 2-3 months.

*Repellant is used to prevent mosquito bites. aerosol repellant, lotion or cream.*

Mass chemical control uses pressurized spray equipment such as fogging and can only kill adult mosquitoes. Fogging is greatly influenced by weather conditions, especially the air temperature should not be hot and the wind speed is not very strong. Fogging is usually done if a case of a patient who died is found in an area. Effective fogging is done in the morning when the wind is not so strong and when the mosquito biting activity is at its peak. Fogging is done inside and outside the house but not in the gutters (Sigit and Hadi, 2006).

*Policy Recommendations in Control of DHF*

Various solutions that can be recommended including suggestions for short, medium and long term actions that can be considered in the development of regulations to control dengue fever are listed in Table 3.

Table 3. Recommended solutions that can be applied in controlling DHF

No.	Recomen- dation	Type of activity	Place of execution	Implementation Procedure
A.	Short-term	1. Activating the role and performance of the Rapid Action Team (TGC) that has been formed within the scope of the Bima City Government work unit;	In every OPD/ Units that have TGC	a. TGC of each unit receives information/reports indicating outbreaks/outbreaks/food poisoning b. Conducting rapid action team (TGC) briefings c. Prepare for field trips by adjusting the type of incident and Gold Time of the case d. Receive information on the results of incident verification from surveillance officers and other team members e. Receive information on the results of determining incident cases from

No.	Recomen- dation	Type of activity	Place of execution	Implementation Procedure
				surveillance officers and other team members
				f. Collecting specimens at the incident location or other specified location if necessary
				g. Conduct local inspections (in situ) if necessary
				h. Pack specimens before bringing them to the laboratory if necessary
				i. Examine the specimen according to the type of test if necessary
				j. report the results of laboratory tests on the test specimens to TGC and carry out the next follow-up
		2. Carry out more comprehensive monitoring of <i>Aedes aegypti</i> mosquito larvae by Health Officers, cadres and village/kelurahan officials.	At the location found the incidence of dengue.	a. Health workers receive information on the incidence of cases and the whereabouts of suspected DHF sufferers
				b. The health worker conducts a briefing on the health center surveillance team
				c. Health officers coordinate with local village/kelurahan officials regarding visits to the incident location
				d. Health workers together with regional cadres monitor and measure the <i>Aedes aegypti</i> mosquito larvae-free index (ABJ)
				e. Report ABJ measurement results to the surveillance team and to the Health Office for further follow-up
		3. Providing education and information regarding the dangers of the disease and appropriate prevention efforts for the whole community, especially in areas with the highest incidence of cases.	In each region found cases of dengue fever.	a. The Health Office, Village/Kelurahan officials and each work unit prepare socialization and educational materials related to DHF
				b. Providing education and information related to DHF and more effective promotion and prevention efforts.
				c. Report the results of activities for the next follow-up.
		4. Carrying out integrated and mass environmental sanitation, especially eradicating mosquito nests (PSN) and 3M plus.	In all areas of the City of Bima.	a. Village/kelurahan officials in coordination with the relevant OPD inform the entire community to carry out PSN and 3M plus activities
				b. Carry out PSN and 3M plus activities:
				c. • Draining the tub/ water reservoir
				d. • Close places/containers that may become breeding grounds for mosquitoes
B.	Medium-term.	1. Optimizing the availability of donor blood for patients with anemia by activating PMI and Blood Transfusion Units.	Bima City Blood Transfusion Unit (UTD).	a. Take inventory of the facilities and infrastructure of the Bima Municipal Government's Blood Transfusion Unit
				b. Improving the competence of blood transfusion services for officers through Education and Training activities, On The Job Training (OJT) and In house Training (IHT)
				c. Take inventory of blood transfusion needs for sufferers/prospective sufferers in each area of Bima City

No.	Recomen- dation	Type of activity	Place of execution	Implementation Procedure
				d. Report the results of activities for the next follow-up.
2.	Strengthening appeals and directions to village/kelurahan and community level government officials regarding community-based total sanitation;		Bima City Government	a. Conducting an academic study on the incidence of DHF in the last 5 years b. Prepare recommendations for promotive and preventive activities in an integrated and integrated manner c. Prepare a circular/appeal letter from the Bima City government
3.	Strengthening the reporting system and tracing contact cases to prevent the spread of transmission.		Civil, Health Service, Environment Service	a. Record case finding data in the appropriate reporting format b. Carry out local examinations and laboratory confirmation of case contacts showing symptoms of DHF c. Conduct visits in the context of contact tracing cases d. Input and report case findings in real time
4.	Formation of working groups (POKJA) for each village/kelurahan with the main task of ensuring that community-based total sanitation runs optimally.		District and Ward	a. Identify and inventory devices and teams b. Carrying out the preparation of SK POKJA for DHF control c. Carry out coordination meetings of the POKJA team in the framework of preparing work plans d. Report the results of activities for the next follow-up.
5.	Improvement and Optimization of infrastructure and the role of the Bima City Hospital in handling DHF		HOSPITAL Bima City	a. Conduct an inventory of hospital facilities and infrastructure in the management of DHF patient care b. Prepare and submit a budget plan for facilities and infrastructure for treating DHF sufferers c. Carry out activities to increase the capacity and competence of health workers d. Monitor and evaluate the implementation of maintenance procedures
6.	Optimizing the operational performance of the Blood Transfusion Unit and Blood Bank		Bima City Blood Transfusion Unit (UTD).	a. Arrange, activate and ensure the Bima City UTD management and technical team b. Conduct inventory and fulfillment of UTD operational infrastructure c. Increase the capacity and competence of officers through training, OJT, IHT etc d. Monitor and evaluate the implementation of maintenance procedures
7.	Preparation of integrated guidelines, technical instructions and implementation instructions for DHF control programs			a. Review the management of the latest DHF control program b. Develop guidelines, technical instructions and implementation instructions for a comprehensive DHF control program c. Disseminate the guidelines, technical instructions and implementation instructions for the DHF control



No.	Recomen- dation	Type of activity	Place of execution	Implementation Procedure
				program that have been prepared to the relevant team
				d. Carry out DHF control based on the guidelines, technical instructions and instructions for implementing the DHF control program that have been prepared
				e. Report the results of activities for the next follow-up.
B.	Long-term	1. Compile and stipulate circular letters containing PSN appeals with 3M plus in the context of environmental sanitation that is more comprehensive, monitored and can be evaluated directly.	Bima City Government	a. Analyzing the results of studies and quick response analysis reports on DHF events in the City of Bima
				b. Compile a circular containing an appeal for PSN with 3M plus in the context of environmental sanitation
				c. Establish a circular letter containing an appeal for PSN with 3M plus in the framework of environmental sanitation
				d. Dissemination of a circular containing an appeal for PSN with 3M plus in the context of environmental sanitation
				e. Monitor and evaluate the implementation of DHF control as stated in the circular letter.
		2. Continue to maximize the participation of the community and all related parties to environmental sanitation through providing education and motivation for independent sanitation in the home environment where each resident lives;	Community environment	a. Carry out community-based total sanitation and environmental sanitation activities involving the entire community
				b. Monitor and evaluate the implementation of activities
				c. Report the results of activities for the next follow-up.
		3. Making zoning of DHF cases in each region	Office of Communication, Information and Statistics	a. Performing an inventory and updating of DHF case data consisting of: positive case data, patient care data and data on patients who died
				b. Make a map of the distribution of DHF events based on the coordinates of the distribution area
				c. Perform data updates on an ongoing basis
				d. Report the results of activities for the next follow-up.
		4. Formulate reward and punishment regulations on the implementation and monitoring of environmental sanitation starting from the basic level such as RT/RW/Kelurahan.	Bima City Government Scope	a. Establishing indicators of giving rewards and punishments for implementing and monitoring environmental sanitation
				b. Develop guidelines for giving rewards and punishments for implementing and monitoring environmental sanitation
				c. Establish a circular letter from the Mayor of Bima regarding the provision of rewards and punishments for the implementation and monitoring of environmental sanitation

No.	Recomen- dation	Type of activity	Place of execution	Implementation Procedure
				d. Conducting an assessment of the performance of implementing environmental sanitation at the RT/RW, kelurahan and sub-district levels
				e. Providing reward and punishment for implementing and monitoring environmental sanitation
				f. Report the results of activities for the next follow-up.
5.	Organize environmental health contests at the sub-district level on an ongoing basis.		Ward all over the City of Bima	a. Set indicators for village-level environmental health contests
				b. Prepare technical instructions and instructions for the implementation of environmental health contests at the sub-district level
				c. Disseminating and socializing village level environmental health competition activities
				d. Carry out a series of environmental health competition assessment activities at the sub-district level
				e. Report the results of activities for the next follow-up.
6.	Conduct research and innovations that are useful for DHF control programs		Bima City	a. Formation of a research team
				b. Submit a proposal for a research activity plan
				b. Make initial studies and preliminary studies
				c. Develop research proposals
				d. Carry out research
				e. Perform analysis of research results
				f. Reporting and presenting research results
				g. Follow up research results

## Conclusion

From the results of this study, it can be concluded that: (1) The incidence of Dengue Hemorrhagic Fever (DHF) in Bima City is likely to increase significantly in early 2022 compared to the previous two years with 172 positive cases found and four of them died as of February 10, 2023; (2) Several things of concern based on case analysis, namely: sufficient health facilities in each sub-district to facilitate the handling of DHF but there are several service weaknesses such as the existence of the Bima City General Hospital which in general does not yet have adequate supporting infrastructure for treatment, especially in cases of disease with severe symptoms, besides that the understanding and attitude of the community in environmental sanitation efforts is an important factor in preventing the transmission of the virus through mosquito vectors. Understanding of the possibility of mosquito vector resistance to insecticide application in all mosquito life tables as well as the participation and coordination of the City Government

down to the village/kelurahan level in making clear and strict regulations that involve all levels of society in controlling dengue fever; (3) Several alternative solutions that can be recommended in the form of short, medium and long-term recommendations that can be used as a reference for consideration in establishing more comprehensive regulations for dengue fever control.

### Acknowledgements

We express our gratitude to God Almighty and to our parents who have provided unending support in completing this research. We would also like to thank the Bima City Health Office for supporting this research by providing DHF case data in Bima City and to the Bima City Regional Research and Innovation Agency for the assistance and support provided in the preparation of this article.

### Author Contributions

Asryadin, Adhi Aqwan and Rizka Khairunnisa: preparation of the original text, results, discussion, methodology,

conclusions; Hetti Koes Endang, Rosita, Fahrul Annas and Hasan did analysis, proofreading, reviewing and editing.

#### Funding

Brida Kota Bima funded this research.

#### Conflicts of Interest

Conflict of interest related to environment and health.

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