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Dengue Hemorrhagic Fever in West Sumatera, Indonesia, 2009

Jontari Hutagalung[1,*], Halim W[2], Koto A[2]

[1] Field Epidemiology Training Program (FETP), Gadjah Mada University, Agam District Health Office, West Sumatera Province, Indonesia

[2] Agam District Health Office, West Sumatera Province, Indonesia

* Corresponding author, email address: jontarihutagalung@yahoo.com

Abstract

In December 2009, 23 people were diagnosed with dengue fever in a village in Western Sumatera, Indonesia. This was unusual because in Indonesia, dengue fever usually occurs in the rainy season and December is in the dry season; dengue usually occurs in low elevations and these villages are in the highlands; and the area was dengue free for the past five years. We conducted a case-control study to determine the risk factors, with cases matched by age, village and gender. Eighteen cases (78.3%) were hospitalized and there were deaths. Most cases lived in Tigo Balai and Matur Hilir Villages, and had an incidence of 2.1/1,000 population. Fever (≥38°C), nausea, vomiting and intense headache were the most common signs and symptoms. All cases had thrombocytopenia and a 20% drop in hematocrit. The strongest risk factor was no activity to eliminate mosquito breeding sites, with adjusted OR 4.8, 95% CI 3.3-7.8 and p-value 0.04.

Keywords: dengue, fever, risk factor, Indonesia

Introduction

Dengue fever begins with a sudden onset of high fever, intense headache and muscle pain. About five percent develop a hemorrhagic form because of severe bleeding. A single bite from an *Aedes aegypti* mosquito contains enough virus to cause dengue.[1,2] Dengue Hemorrhagic Fever (DHF) is a major public health issue in Indonesia. The national incidence rate was 27 cases per 100,000 population with case fatality rate of 1.5%.[2,3] DHF is endemic in the Agam District. In 2005-2009, more than 143 cases were reported and five outbreaks occurred in five Sub-districts with no deaths (Figure 1).[3,4] In October-December 2009, after 5 years of no reports of DHF, 23 people who lived in the Matur Sub-district contracted DHF. The Matur Sub-district had a population of 18,685. The most common occupations were farmers and workers at sugarcane plantation.

Occurrence of dengue in the Agam District is unusual because the area is at a high elevation (1,250m above sea level) and the date of onset occurred after the rainy season (April to July). In addition, the last report of dengue in the area was five years ago. To understand the etiology of this outbreak, we conducted a case-control study to describe distribution of cases[5], to identify risk factors and to recommend control measures.

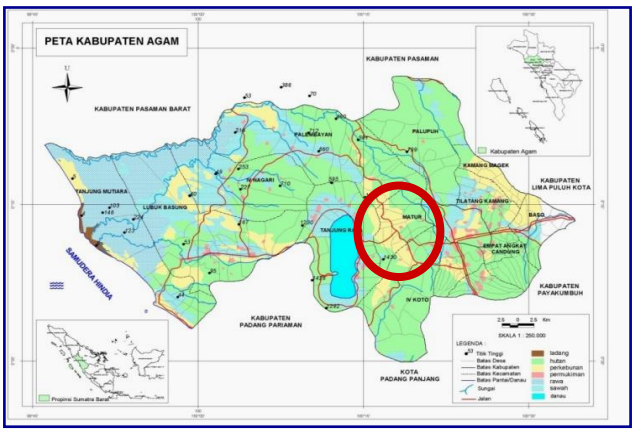

Figure 1. Location of Matur Sub-district, Agam District, West Sumatera, Indonesia

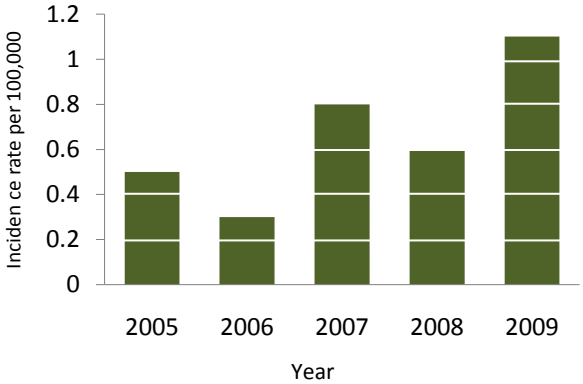

Figure 2. Incidence rate of Dengue Hemorrhagic Fever in Agam District, West Sumatera, Indonesia, 2005-2009

Methods

We conducted a case-control study to determine whether occupations, breeding places of mosquito and selected environment conditions were risk factors for DHF in Matur Sub-district. A case was defined as a person who lived in Matur Sub-district and had the following clinical symptoms: temperature more than or equal to 38°C that lasted 2-7 days, intense headache, myalgia, arthalgia, retro-orbital pain, anorexia, nausea, vomiting, or rash, and at least one of the following hemorrhagic manifestations: positive tourniquet test, petechiae, ecchymoses, purpura, hematemesis, melena or other overt bleeding. Because the Agam District had limited laboratory capacity, the supporting tests available were platelet counts for thrombocytopenia (less than 100,000/mm^3) and hematocrit for blood loss (20% rise from average for age and sex, or 20% drop in hematocrit).[6] A control was a person who did not have any signs or symptoms of DHF and lived in one of the five villages in Matur Sub-district. Cases and controls were matched for age (within 3 years difference), village and gender. Cases and controls were interviewed at their homes and information on signs and symptoms and risk factors were collected by a standardized questionnaire. Home visits also allowed observation of study participants' living environment.[7] We used SPSS 15.0 to calculate crude Odds Ratio (OR). To identify risk factors for DHF, we used multivariate analysis (logistic regression).[8,9]

Results

We identified 23 people with DHF and recruited 23 matched controls in five villages in Matur Sub-district (Table 1). Cases were mostly female (57%), had a median age of 52 years old (range 5-60 years), and the age group with the most cases was more than 50 years (26%). Eighteen cases (78%) hospitalized and there were no patient had Dengue Shock Syndrome (DSS) or died of DHF. Tigo Balai and Matur Hilir villages had seven cases each (30.4%) and Matur Mudik had five cases (21.7%). No case lived in Kelok-Kelok village. Tigo Balai and Parit Panjang villages had the highest attack rate (Table 2). All cases had a temperature ≥38.0°C, intense headache and GI symptoms such as nausea and vomiting. No case had overt bleeding and diarrhea because all cases were immediately treated in health centers.

Table 1. Univariate analysis of Dengue Hemorrhagic Fever in Matur Sub-district, Agam District, West Sumatera, Indonesia, 2009

Characteristic	Cases (%) n=23	Controls (%) n=23	Total (%)
Gender:			
Male	10 (43)	10 (43)	20 (43)
Female	13 (57)	13 (57)	26 (57)
Age (years):			
0-10	2 (9)	2 (9)	4 (9)
11-20	5 (22)	5 (22)	10 (22)
21-30	2 (9)	2 (9)	4 (9)
31-40	3 (13)	3 (13)	6 (13)
41-50	5 (22)	5 (22)	10 (22)
>50	6 (26)	6 (26)	12 (26)
Villages:			
Tigo Balai	7 (30)	7 (30)	14 (30)
Matur Mudik	5 (22)	5 (22)	10 (22)
Parit Panjang	1 (43)	1 (43)	2 (43)
Matur Hilir	7 (30)	7 (30)	14 (30)
Panta Pauh	3 (13)	3 (13)	6 (13)
Kelok-Kelok	0 (0)	0 (0)	0 (0)
Signs and self-reported symptoms:			
Fever (≥38°C)	23 (100)	0 (0)	23 (100)
Tourniquet test (+)	20 (87)	0 (0)	20 (87)
GI symptoms (nausea and vomiting)	23(100)	0 (0)	23(100)
Retro-orbital pain	13 (56)	0 (0)	19 (83)
Myalgia	19 (83)	0 (0)	0 (0)
Arthralgia	10 (44)	0 (0)	10 (44)
Intense headache	23 (100)	0 (0)	23 (100)
Other overt bleeding	0 (0)	0 (0)	0 (0)
Diarrhea	0 (0)	0 (0)	0 (0)
Laboratory tests:			
Thrombocytopenia	23 (100)	Not done	23 (100)
More than 20% decrease in hematocrit	23 (100)	Not done	23 (100)

Table 2. Attack rate of Dengue Hemorrhagic Fever per 1,000 population in Matur Sub-district, Agam District, West Sumatera, Indonesia, 2009

Village	Population	Cases (%)	Attack rate
Tigo Balai	3,266	7 (30.4)	2.1
Parit Panjang	477	1 (4.3)	2.1
Matur Hilir	4,428	7 (30.4)	1.6
Panta Pauh	1,954	3 (13.0)	1.5
Matur Mudik	5,164	5 (21.7)	1.0
Total	15,289	23 (100)	1.5

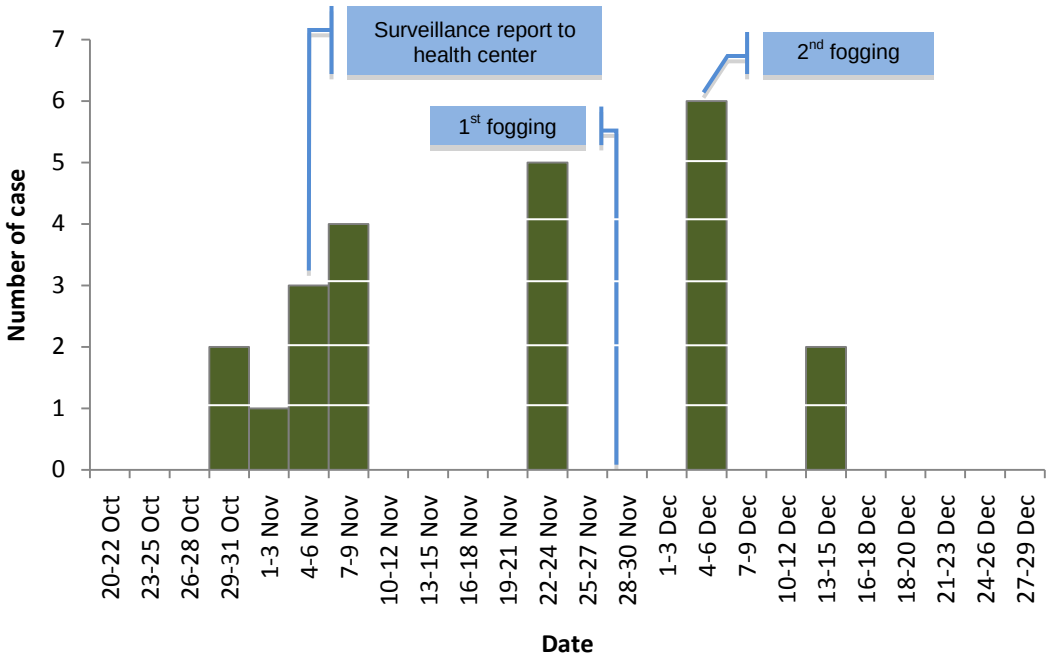

Figure 3. Epidemic curve of Dengue Hemorrhagic Fever in Agam District, West Sumatera, Indonesia, October to December 2009

The index case was a 42-year-old male farmer who lived in Matur Sub-district. According to his medical record, his first visit to the health service occurred at Matur Sub-district health center on 29 Oct 2009; he was diagnosed with typhoid fever. On 1 Nov 2009, the man was hospitalized at the Public Bukittinggi Hospital. On the third day of hospitalization, doctor diagnosed him with DHF and the hospital reported this case to the Agam District Health Office. The peak of the outbreak occurred on 4 Dec 2009 and the last case occurred on 16 Dec 2009. Fogging was done for two times on 28 Nov 2009 and 5 Dec 2009.

Table 3. Multivariate analysis of outbreak surveillance and response of DHF in Matur Sub-district, Agam District, West Sumatera, Indonesia, October to December 2009

Variable	Adjusted OR	95% CI	P-value
No activity to remove, destroy or manage habitats of mosquitoes larva	4.8*	3.3 – 7.8	0.03*
Work as a farmer and employee in sugarcane plantation	1.9*	1.0 – 3.2	0.04*
Breeding site or place less than 150m from home	1.2	0.1 – 2.5	0.12
Environmental risk (sugarcane plantation) 150m from house	1.1	0.5 – 2.1	0.33
Live near wet rice field	0.1	0.3 – 0.8	0.45

* *Statistically significant*

To calculate adjusted odds ratio, we used multivariate analysis (logistic regression) and included variables with p-value ≤0.25 from the bivariate analysis. All variables in the model had a normal distribution. The regression used a forward stepwise approach. No behaviors to eliminate mosquito breeding sites had the highest OR and thus, it was the strongest risk factor for DHF outbreak in Matur Sub-district.

Discussion

From October to December 2009, 23 people living in Matur Sub-district, Indonesia, were diagnosed with DHF. The diagnosis was based upon their clinical symptoms and presence of hemorrhagic symptoms. Confirmatory laboratory tests for dengue fever were not done because of limited funds and lack of laboratory capacity; platelet counts and tourniquet tests were done to confirm the hemorrhagic component of DHF.

While the outbreak lasted for three months, the epidemic curve showed an absence of cases between 7 and 23 Nov 2009. This 16-day period is more than three times the average incubation period of two to seven days. We suspect that transmission was occurring and the absence of reports may be due to people not seeking health care or under-reporting to the surveillance system.

This outbreak was unusual because it occurred in the dry season while DHF in Indonesia usually occurs in the wet season, the cases lived at high altitudes while DHF usually occurs below 12,500m in Indonesia, and

absence of DHF in the past five years in the area.[10] Unfortunately, no viral cultures were done to identify whether a novel dengue virus caused this unusual outbreak.

Although the location, time and appearance of the outbreak were unusual, the symptoms reported were characteristics of DHF -- a sudden onset of fever with intense headache, myalgia and retro-orbital pain followed by rash and overt bleeding.[10] Most hospitalized persons were treated at government hospitals following the Standard Operating Procedure for DHF. This included supportive therapy of crystalloid and colloid fluid, intensive care, antipyretic and analgesic.[11,12] The government covered all costs for hospitalized DHF patients. The Standard Operating Procedure for DHF also covered public health activities such as case finding, surveillance and health promotion. In this outbreak, more adults had DHF than children. This was not similar to other outbreaks in Indonesia.[13]

The factors most associated with the DHF outbreak in Matur Sub-district were working on a plantation or farm and presence of mosquito breeding sites. Both factors are related to increased contact with the *A. aegypti* mosquito. Many people who live in Matur Sub-district are farmers and sugarcane plantation employees. These occupations spend much of their time outdoors during the biting times (daytime) of the mosquito.

Public Health Actions and Recommendations

A community survey determined the presence of large water containers and an abundance of *A. aegypti*. This prompted public health officials and villagers to eliminate the breeding places. Larvicides were placed in potential *A. aegypti* habitats and community water containers. Fogging was done on 30 Nov and 5 Dec 2009. Other preventive actions included educating the public about sources of dengue and promoting behaviors to remove, destroy or manage mosquito larva habitats. This reflected national regulation dealing with removal of water-holding containers close to or inside human habitation (e.g. flower pots, discarded containers for food or water storage and old tires).

Recommendations to reduce the dengue burden in these villages include identifying areas of high mosquito density and prompt launching of appropriate prevention and control activities.[14] Intensified surveillance and control of mosquitoes during periods with high temperature and high humidity are recommended. Good hygiene and sanitation should be maintained, and there should be a regulation to eliminate of *A. aegypti* breeding sites. Adult and larva indices should be calculated and manage containers that contain water.[2,14] Villagers should be advised to protect windows adjacent to nursery with nets and rub skin lotion, and spray insecticides to decrease contact with mosquitoes in Matur Mudik, Tigo Balai and Matur Hilir villages.

Active and passive surveillance should be conducted for dengue fever. A new system to comprehensively review and investigate every fatality from DHF as well as analyze surveillance data for trends of an outbreak should be established. When an outbreak occurs, an investigation should be conducted to identify etiological agents and risk factors and to guide control and prevention measures. Finally, villagers must take an active role in eliminating breeding places for mosquitoes.

Limitations

One major challenge faced by health care workers in this outbreak was social panic among villagers. They were afraid of being infected with dengue and thus, public health officials conducted a health promotion campaign about dengue.

This investigation was limited by the small number of DHF cases that limited the analytic analysis, few human resources for investigating the outbreak and the lack of confirmatory laboratory tests for dengue.

DHF still represents the global society health problem, especially in developing countries inclusive of Indonesia.[9,15] DHF may occur in an area that had no reported cases and in a geographic area and season that do not support dengue transmission.

Acknowledgments

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Suggested Citation

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