Characteristic Suspect Related Incidence Of Dengue Hemorrhagic Fever (DHF): Cross Sectional Study On Suspect In Endemic Area Semarang City, Indonesia

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ABSTRACT

Objectives Semarang city is one of the areas in Central Java Province with increasing number of DHF cases from 2011-2015. The aim of this was to describe the epidemiology based on virus strain and host characteristics of Dengue Hemorrhagic Fever (DHF)’s suspect on three health facilities in Semarang City.

Methods This cross sectional design used variables of virus strain, patient characteristic, blood type, domicile, and the result of diagnose. The samples were 67 respondents with . The number of 21 respondents who were detected DHF examined by PCR to know dengue virus strain. The data was analyzed using frequency distribution and bivariate analysis.

Results The result showed that respondents who were diagnosed with DHF were mostly male 34.3%; age range around children 35.3%; blood type O, 8 out of 21 respondents and the dengue virus stereotype that was found was DEN-2, DEN-3, and DEN-4.

Conclusions The DHF incidents are mostly found in males than females, but the ratio was not too visible. Meanwhile based on the age, many suspects of DHF were children with the range between 0-14 years old. The result found that the proportion of the respondents diagnosed with DHF was mostly the respondents with the AB type, and the dengue virus strain type that is detected using PCR were DEN-2 and DEN-3.

Keywords: DHF, Dengue virus, RT-PCR


INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is one of the health problems in Indonesia, and its cases tend to increase and widely spread [1]. DHF disease is caused by virus and transmitted by Aedes aegypti, Aedes albopictus and Aedes scutellaris, but recently the main vector of DHF disease is Ae. aegypti. This virus belongs group B Arthropod Borne Virus (Arboviruses), a group of flavivirus from the flaviviridae family. The family consists of four stereotypes, DEN 1, DEN 2, DEN 3, and DEN 4 [2]. The symptoms of DHF is flu-like, such as fever, headache, muscle and bone pain. Then main clinical symptom is referred to as dengue fever (DF). However, severe dengue hemorrhagic fever/dengue shock syndrome (DHF/DSS) may occur, with pathogenesis vascular (plasma) leakage, thrombocytopenia, and coagulopathy [3].
World Health Organization estimated that 50-million-dengue infection takes place every year with 500,000 cases, and 22,000 deaths, the infected are mostly children. During the early year of epidemic in every country, DHF disease mostly infected children and the reported cases in ages less than 15 year old. Children are a group of high risk to the DHF disease incident and mostly causing epidemic [4]. In some Asian countries, DHF is one of the main factors of inpatients and the death of children in hospital. In Indonesia, DHF includes in the big ten of inpatient disease in hospital. The cases In 2013 were 112,511 with 871 death cases (Incidence Rate 45.85 per 100,000 population and CFR =0.77%) [5,6].

Semarang, capital city of Central Java Province, is endemic area of DHF. The Incidence Rate (IR) of DHF in Semarang City in 2015 was 98.02/100.000 population (CFR=1.21%). However, earlier semester in 2019, DHF increasing with 17.02/100.000 population (CFR=3.89%). The increase and spread of DHF was probably caused by the high mobility of people, the development of urban area, climate change, density change and the population distribution and another epidemiological factors which needed a further research [7, 8]. Further research is needed concerning with DHF, with one of the aspects is the characteristics of human (host) with a bigger risk of being infected by DHF disease, so a prevention and tackling can be done quickly and on target. The general purpose of this study was to describe the epidemiology of host characteristics and dengue virus strain in the suspects of Dengue Hemorrhagic Fever (DHF) in Semarang City.

METHODS

The research design used was cross sectional study. The population study in this research was suspect of Dengue Hemorrhagic Fever (DHF) in Semarang City. Samples in this research were patients from three health facilities located in Semarang City from 2016-2017. Total samples were 67 suspect of DHF. The variables in this research were age, gender, virus strain, blood group, and DHF diagnose by clinician. The characteristic suspect measured based on medical record, while blood group were tested by agglutination method. Clinician diagnosed the suspect and classified dengue based on clinical manifestation, also supported by serology/NS1 test. Some samples sent to laboratory to detect dengue virus strain by PCR. The data were collected from survey and laboratory examination. The data were analyzed descriptively using frequency distribution and descriptive bivariate analysis.

Ethical Considerations

The study was registered by ethical committee of Public Health faculty of Diponegoro University, number : 238/EC/FKM/2016.

RESULTS

The suspect dengue recruited from this study were coming from the health centers in Semarang City. The source of the samples were from health center (68%) and other coming from hospital (16%). The description of the respondents’ characteristics shows that the male respondents are 52% and female respondents are 48%. The most respondent in the age group of children with 51% and the fewest are teenagers at 19%. The youngest
respondent is 10 months and the oldest is 76 year old. Most of the respondents have O type, approximately 57% of them, and the fewest are AB with 9%. All respondents lived in the area in Semarang City (100%) and the respondents with positive DHF were 31% (21 suspects out of total DHF suspect (Table 1).

The proportion of DHF diagnosed to be positive in two places of the blood samples source from hospitals at 81.2%, far more excessive compared with the samples from health service with only 6.7%. The proportions of DHF diagnosed to be positive to male respondents are 34.5%, higher than the proportion of female respondents with 28.1%. The proportion of DHF diagnose positive the highest are in the children (0-14 year old) age group for 35.3% while the lowest proportion in the teenagers (15-21 year old) age group at 23.1%. The proportion of DHF diagnose positive are the highest in the respondents with AB type at 66.7%, whereas the lowest are on respondents with O type at 21.1%. The whole result of the dengue virus strain from 21 samples diagnosed with DHF resulting two samples that could be identified the type of dengue virus strain, they were DEN-2 and DEN-3.

Table 1. The DHF diagnose of Suspect visiting Health Service in Semarang City

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>DHF diagnose</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive (n=21)</td>
<td>Negative (46)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>Age Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children (0-14 year old)</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Teenagers (15-21 year old)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Adult (≥ 22 year old)</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Blood Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>AB</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>O</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

DISCUSSION

Indonesia is a tropical country, according to the geographical location. This case cause Indonesia has potential high risk transmission virus of dengue. That is why Indonesia being endemic areas of DHF, one of which was Semarang City. Height was one of the main factors that could affect the existence of mosquitoes as a vector.
which brings dengue virus. That factor caused the temperature and the humidity of a place that could affect to the growth of vector mosquitoes as well as dengue virus.

This study describe epidemiology based on gender, age and blood group, and correlated with DHF. The most suspects of this research were found that the characteristic were males (52.2%), children (50.8%), and blood group were O (56.7%). Based on DHF diagnose, the highest proportion with DHF was male (34.3%), children (35.3%), almost comparable in adult (30%), and blood group was AB (66.7%). Characteristic of responden has correlation with DHF, every variable has different mechanism influencing DHF.

Not few of the research result that was conducted about the DHF patients based on the age group, it was found that the greatest result was in the age group of 5-14 year old, which was in the school age group. Children in the school age could be infected by DHF in the house environment and the school environment. In the morning the children were doing activities in school, while in the evening they were at home. This pattern matched with the mosquitoes behavior that spreading the DHF virus, which infected human. The previous study showed that DHF cases could find in 38.7% elementary schools in Semarang. School positively larvae was almost 30% [9]. Wearing pants/long skirts could prevent to mosquitos bite [10]. Local Health of Semarang City have implemented this program to control DHF in this area.

The age group of less than 14 years old was more susceptible to the DHF disease. It is because of the differences in the micro vascular maturity level of the children, in which children in the younger age have a tendency to have the capillary vessel more permeable to the water and protein compared with the younger ages especially if compared with the adults [10]. In addition, the research conducted by Sitio in 2008, stated that most of the DHF patients are coming from the age group of 10 and below, which is possibly caused by the weak immunity, factor of napping habit, and the low awareness to the danger of mosquito bite [12].

During the past decade, there was a proportion displacement of DHF disease patients tend to come from the adult age group. The result of study note 30% cases in this aged period. Exposure to dengue and vector viruses in a population is certainly comparable between age groups, gender and other characteristics. Proportion of DHF in this study was higher (34.3%) in male than female (28.1%). The mechanism of secondary infection is more representative in this incident. The patient that is recovering from the infection with one type of serotype will give a homolog immune for a life time, but did not give the same protection to the infection of different serotype [13].
Based on type of the blood and DHF incident, the result showed that the proportion of respondent diagnosed with DHF were the biggest from AB type (66.5%) and the lowest were from O type (21.1%). However based on the number of respondents diagnosed with DHF, which were 21 respondents, most of them were O type, 8 (38.1%) respondents. This fact was affected by haemostatic abnormality, which became the core of pathogenesis and pathophysiology DHF. The fever which is accompanied with hemorrhage is a result of vasculopathy and thrombocytopenia [14]. Haemostatic must be in normal state so that the patient’s condition will not be worse. Haemostatic is divided into two; primary and secondary. The core function of the hemostatic is clogging the blood vessels quickly by forming fibrin froze when the hemorrhage occurs [15]. The state of haemostatic is influenced by both primary and secondary von Willebrand factor (vWF). Von Willebrand factor (vWF) is glycoprotein consisting of some oligosaccharide in which the dose depends on the ABO-system blood type [16].

ABO- blood type system is one of the immunity natures and it shows that individuals with different ABO-blood groups have different resistance toward virus infection and diseases [17,18]. The other finding is that AB-blood-type is vulnerable to dengue fever with serotype types 2, 3, and 4 compared to serotype dengue 1 [19]. One characteristic of AB blood type is that it possessed antigen A and B in its red blood cells, but it did not have antibody A and B in its blood plasma. AB blood type had antigen and antibody, which experienced cross-reaction toward dengue infection so that this blood type was much resistant to dengue fever.

Based on the result of laboratory examination, the study was found the result of the blood type and the virus strain type. The result of blood type examination was the blood type of all respondents diagnosed with DHF the more from the O blood type. Then for the result of virus strain type from 21 samples diagnosed with DHF then a molecular examination was conducted and obtained two samples detected with the virus strain, which were DEN-1 and DEN-3. The observation that was conducted in Indonesia about the dengue virus since 1975 in some hospitals showed that from the four serotypes, DEN-1, DEN-2, DEN-3 and DEN-4 that were found and circulated around the year. Resulting in information, that serotype DEN-3 is the dominant serotype and assumed to show many heavy clinical manifestation [20,21].

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REFERENCES


