Is stress level related to Dengue Hemorrhagic fever cases in Semarang?

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Abstract. Dengue Hemorrhagic Fever (DHF) is transmitted to humans by dengue virus harboring Aedes aegypti. Immune response against viral infection can be influenced by stress as stress could weaken immune response. Stress can cause illness through physiological changes and changes in immune function. The immunological changes associated with stress were adapted from the immunological changes in response to infection. The purpose of this study was to determine the relationship between DHF cases with stress level. We used a case control study with DHF sample cases from three hospitals in Semarang city (n=27) from the period of March to May 2017 and the control groups from healthy respondents with matched age, sex, and district location (n=27). The data was processed by Chi-Square test. Levels of stress were categorized into two namely high and low tress levels. The data was normally distributed. The frequency distribution in case group at high stress category were 15 respondents (55.6%) and low stress were 12 respondents (44.4%). Meanwhile, in control group there were 8 respondents (29.6%) at high stress category and 19 respondents (70.4%) at low stress category. The Chi Square Test revealed that the p value was 0,054 and OR was 2,969. In conclusion there was no relation between stress level and Dengue Hemorrhagic Fever cases.

1. Introduction
The number of Dengue Hemorrhagic Fever cases in Indonesia tend to show an increase. WHO noted that from 1968 to 2009, Indonesia was the country with the highest DHF cases in Southeast Asia [1]. DHF Incidence Rate (IR) in Indonesia in 2015 was 49.5/100.000 population. According to Health Profile Data of Semarang City in 2012, the number of DHF Incidence Rate in Semarang City was 70/100.000 population and DHF Case Fatality Rate (CFR) reached 1.1%. In 2013, there was an almost doubling number of DHF incidence from the previous year with 134,094/100,000 population, so that the number of deathloss in 2013 was 1.14%. In 2014, the number of DHF sufferers decreased by 31.1%, made the Incidence Rate number became 92,4257/100.000 population with the number of deaths as the previous year that was 1.66% . But then, the number increased again in 2015, made the DHF Incidence Rate reached 98, 61/100.000 population and the number of deaths 1.21%. In 2016
there was a decrease of DHF’s Incidence Rate number to 25,22/100,000, while the number of DHF Case Fatality Rate (CFR) has increased to 5.12%. For 6 consecutive years, Semarang City has always occupied the 3rd rank of the highest DHF Incidence Rate number in Central Java [2].

From an ecological point of view, there are three factors that can lead to a disability, morbidity, and death in humans called epidemiological triads, which are agents, human, and the environment. Stress has adverse health effects and is often associated with illness [3]. The mechanism of stress is characterized by increased Corticotropine Releasing Hormone (CRH) secretion, which acts as a regulator of large amounts of cortisol in the blood. High levels of cortisol can suppress and increase susceptibility to the immune system. From the research conducted by Jeany (2016) it is known that the proportion of high stress level in the group of DBD patients is 52.30% or more than the proportion of low stress levels of respondents in the group of DHF patients is 47.40% [4]. The purpose of this study was to analyzed the correlation between stress levels with DHF in Semarang and surrounding areas.

2. Method

This study used an observational analytic research with case control approachment. The case group were DHF patients whose hospitalized at three hospitals in Semarang City, which are RSUD K.R.M.T. Wongsonegoro, RSUP dr Kariadi, and RSUD dr. Adhiyatma, MPH in the period March to May 2017. The control group were people who did not suffer from DHF (the DHF’s neighbor) at the same time in Semarang City and surrounding areas.

The samples were collected with consecutive sampling technique. With those method, there were 54 subject samples consisting of 27 cases and 27 controls. The cases sample in this study were hospitalized DHF patients period March to May 2017 in three hospitals in Semarang City who had more than 13 years. The control samples were health people and live around the cases with the same characteristics. The samples Primary datas were obtained from interviews of respondents using questionnaires, while secondary datas was obtained from the Health Office of Semarang City. The Data was processed using univariate and bivariate analysis. Bivariate analysis using Chi Square (x2) and 2x2 Odds Ratio (OR).

3. Result

This study aimed to determine the correlation of stress level with the incidence of DHF by comparing stress level in case group of DHF and control group. Researchers used MSLQI questionnaire. Stress levels are classified into two categories, high stress level and low stress level. Respondents with high stress level were 15 respondents in the case group (55.6%), and 8 respondents in the control group (29.6%) so that the total respondents who had high stress level were 23 respondents (42.6%). While the remaining 12 respondents in the case group (44.4%) and 19 respondents in the control group (70.4%) had low stress levels. Based on these results it is known that case groups tend to have higher stress than the control group.

| Stress Category  | Case Group | Control Group | P value | OR  | 95% CI  |
|------------------|------------|---------------|---------|-----|---------|
|                  | f  | %  | f  | %  |        |         |
| High Stress level| 15 | 55.6 | 8 | 29.6 | 0.054 | 2.969 |
| Low Stress Level | 12 | 44.4 | 19 | 70.4 |        | 0.967–9.116 |
| Jumlah           | 27 | 100.0 | 27 | 100.0 |        |         |

Based on statistical test, the result p = 0.054 or p value> 0.05, which means, there was no correlation between stress level with incidence of DHF. Odds Ratio (OR) calculation result showed that the variable of stress level can not be said as risk factor to Dengue Hemorrhagic Fever case, because there is no evidence to be said as risk factor.
4. Discussion
Stress is a non-specific body response to disturbed body needs. Stress is an universal phenomenon that occurs in everyday life that can not be avoided and will be experienced by everyone. Stress gives a total impact on individuals such as physical, social, intellectual, psychological, and spiritual impact [5]. There are factors that can cause stress, such as physical, psychological and socioeconomic pressures. When the body is exposed to many stressful influences, there will be a set of physiological changes that are generally called stress responses. The ongoing stress can disrupt the workings of the entire immune system. Natural immunity, humoral immunity, and cellular immunity (Cellular Mediated Immunity) are involved in host defense so they make the host more susceptible to infection [6].

Stressors accumulates HPA axis, which is captured by the limbic system, causing conditioning stimuli in the limbic-hypothalamus-pituitary-adrenal (LHPA) pathways, then stimulating ACTH from the adrenal co-part. This causes an increase in cortisol secretion, resulting immunity changes. It happens because cortisol has imonosupressive properties. The properties of cortisol have an effect on the emphasis on protein synthesis, reducing the population of eosinophils, lymphocytes and macrophages/monocytes, then resulting an anthropy of lymphoid tissue, thymus, spleen and lymph nodes, affecting immune function and decreasing health status [7].

Furthermore, people's efforts to manage the demands of the stress sometimes get them involved in changes of behaviors such as alcohol consumption or sleep patterns, that can also modify the immune system's processes. Thus, behavior is a potentially important pathway that connects stress with the immune system. Maier and Watkins (1998) proposed a closer correlation between stress and immune function: that immunologic changes associated with stress are adapted from immunological changes in response to infection. Immunological activation produces a syndrome called disease behavior, which consists of behavioral changes such as activity reduction, social interaction, and sexual activity, as well as increased responsiveness to pain, anorexia, and depressed mood [8].

The findings of this study showed that there was no significant correlation between stress level with DHF. Nevertheless, the visible frequency of stress levels, especially high stress levels between case groups higher than the control group. The number of OR also found that stress levels tend to be the risk factors for Dengue Hemorrhagic Fever although there was not enough evidence to say so. This insignificant correlation may be due to the insufficient sample to prove the correlation between the two variables, so that it could affect the results.

Researchers have not found a similar study that analyzed statistically by linking stress levels with the incidence of DHF. However, the descriptive research by Raynaldi (2016) found similar results, that the proportion of excessive/high stress levels was more prevalent in the DHF case group than in the control group [9].

5. Conclusion
There is no correlation between stress levels with Dengue Hemorrhagic Fever in Semarang and surrounding areas. Although, Dengue Hemorrhagic Fever case groups tend to have higher stress than the control group.

6. Recommendation
The results of research can be forwarded by other researchers so that factors that have not been related can prove the relationship in accordance with the theory by increasing the number of sample research.

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