RESEARCH ARTICLE

Garlic Extract to Increase Platelet Levels in Dengue Hemorrhagic Fever Patients

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ABSTRACT

The case of DHF in Central Java is quite high. Nearly all blood lab results of patients with DHF are reported to show significant decreases in platelet count. Garlic extract is known to inhibit platelet aggregation induced by Adenosine diphosphate (ADP), epinephrine, collagen and arachidonate, and may inhibit prostacyclin biosynthesis. Diallyl disulphide (DADS) and diallyl trisulphide in garlic can prevent thrombus formation. The essential compounds contained in garlic are thought to increase the blood platelet count in DHF patients. The purpose of this study was to add non-pharmacological treatment reference to increase platelet count in DHF patients. This study used a true experimental design. The sample of this study were 22 DHF patients in "Nakula 2" and "Nakula 3" Disease Hospital Semarang City Hospital. The data were analyzed using T-test. The results showed that garlic extract could increase platelet count in DHF patients.

Keywords: DHF, garlic extract, platelet

INTRODUCTION

Dengue hemorrhagic fever (DHF) is an annual disease in many countries and always has a high incidence rate. The pathophysiology of DHF is a major pathophysiological phenomenon that determines the severity of the disease and distinguish dengue hemorrhagic fever from classical dengue. These differences consist of permeability of blood vessel walls, decreased plasma volume, occurrence of hypotension, thrombocytopenia and hemorrhagic diabetes. Increased levels of hematocrit in patients with shock resulted in suspicion that shock occurred as a result of plasma leakage to extra-vascular spaced regions through damaged capillaries, resulting in decreased plasma volume and increased hematocrit levels. Several studies have concluded that in DHF patients there is a decrease in production, increased destruction and excessive platelet usage resulting thrombocytopenia especially on day 3 and 4 after fever down. Thrombocytopenia usually results in bleeding, although not all thrombocytopenia in DHF is manifested by hemorrhage (Yuwono, et al., 2007).

DHF cases are commonly found in tropical and sub-tropical regions. Asia is ranked first in the number of DHF sufferers in each year. Meanwhile, from 1968 to 2009, the World Health Organization (WHO) listed Indonesia as the country with the highest DHF case in Southeast Asia (Sasmito, et al, 2010).

In 2006, total DHF cases in Indonesia reached 104,656 and in 2007 reached 140,000 cases. As one of the most populous cities in Indonesia, Semarang always has a high incidence of DHF. Almost all blood lab results of DHF patients showed significant decrease in platelet count (Yuwono, et al., 2007). Bleeding is common in DHF patients. The most common types of bleeding are skin bleeding such as tourniquet test with positive results, petechiae, purpura, ecchymosis, and conjunctival bleeding. These signs appear in the early days of fever, but can also be found on the third, fourth or fifth day of fever (Purnama Dewi & Wirawati, 2013).

The management of DHF patients in hospitals is adapted to the current evolving science. However, non-pharmacologic treatment with natural ingredients available around our homes can also help speed up the healing of DHF patients. Garlic (*Allium sativum*) has long been known to have many positive effects for the human body, such as antioxidant, antibacterial, anticarcinogenic, reducing platelet aggregation, and anti hyperlipidemia. Essential oil content in garlic has many properties such as anti thrombus (Davi & Patrono, 2007). Thus, it should be investigated about the effect of garlic extract on the increase of platelet count in DHF patients.

METHODS

This experimental study used Randomized Pre Test and Post Test design to study the effect of garlic extract on increasing platelet count in DHF patients. The sample was selected by purposive sampling technique,

with criterion: the patient on the second or third day of treatment, platelet count <150000 / mm3 (on the second or third day), positive IgGM test result, not getting blood transfusion therapy, willing to be research respondent, 20-50 years. The sample size was 40 patients with details of 20 patients for experimental group who were given garlic extract and 20 patients as control. Measurement of platelet count in collaboration with Semensary Clinic of Semarang. The data were analyzed using T test.

RESULTS

Table 1. Differences in the number of platelets in the treatment group

	Mean	p-value
Pre	1.50	0.000
Post	11.48	

T test results (Table 1) showed that the mean score of platelet counts in the treatment group before being given a garlic extract was 1.50, while the mean platelet count score after being given a garlic extract was 11.48. P-value = 0.000 so it is concluded that there is difference of platelet count between before and after giving of garlic extract.

Table 2. Differences in the number of platelets in the control group

	Mean	p-value
Pre	7.95	0.000
Post	136.32	

T test results (Table 2) showed that the mean score of platelet counts in the control group in pre-test was 7.95, while the mean platelet count score after being given a garlic extract was 136.32. P-value = 0.000 so it is concluded that there is difference of platelet count between pre-test and post-test.

Table 3. Differences in the number of platelets between treatment group and control group

	Mean	p-value
Treatment group	27.86	0.006
Control group	17.14	

The mean scores of platelet counts in treatment group after garlic extract therapy were 27.86, while the mean platelet count score in the control group was 17.14. P-value = 0.006 so it is concluded that there is a difference of platelet count between treatment group and control group.

DISCUSSION

Garlic has long been known to have many positive effects for the human body, among them are as antioxidant, antibacterial, anticarcinogenic, reduce platelet aggregation, and anti hyperlipidemia. Many studies have concluded that garlic has a great potential in inhibiting platelet aggregation. Garlic extract is known to inhibit platelet aggregation induced by ADP, epinephrine, collagen and arachidonate, and may inhibit prostacyclin biosynthesis (Werlena, 2009).

Yuwono, et al. (2007) describes the pathophysiology of DHF occurrence, among others, the main pathophysiological phenomenon that determines the severity of the disease and distinguish dengue hemorrhagic fever with the classic dengue that is the high permeability of blood vessel walls, decreased plasma volume, the occurrence of hypotension, thrombocytopenia and hemorrhagic diabetes. The elevation of hematocrit levels in patients with shock results in suspicion that shock occurs as a result of plasma leakage to extra vascular regions through damaged capillaries resulting in decreased plasma volume and elevated hematocrit values.

Potts, et al. (2010) explains that dengue virus infection causes a wide spectrum of dengue fever (DF), dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). DF is an acute febrile viral illness, characterized by headache, joint and bone pain, rashes and leukopenia. DHF is characterized by high fever, bleeding, thrombocytopenia, plasma leakage and hepatomegaly. DSS is a severe case of dengue virus infection caused by circulatory failure.

Gibson (2010) mentions two theories or hypotheses about immunopathogenesis from DHF and DSS are still controversial namely secondary heterologus infection and Antibody Dependent Enhancement (ADE). In theory or hypothesis of secondary infection is mentioned that if a person get secondary infection by a serotype

dengue virus, it will happen the process of formation of immunity to dengue virus serotype infection for a long time. But if the person gets secondary infection by other dengue virus serotypes, there will be severe infection. This condition occurs because the heterologous antibody formed in primary infection will form a complex with a new serotype dengue virus infection that can not be neutralized and even tends to form an infectious and internalized ophthalmic complex, which will then activate and produce IL-1, IL- 6, Tumor Necrosis Factor-Alpha (TNF-A) and Platelet Activating Factor (PAF). As a result there will be dengue virus infection enhancement. Candra (2010) reports that TNF-Alpha will cause leakage of blood vessel walls, seeping of plasma fluid to body tissues caused by endothel damage to blood vessels. Immune complexes that are formed will stimulate complement with pharmacological characters that are fast, short and vasoactive and procoagulant that cause plasma leak (hypolemic shock) and bleeding.

The results of this study indicate a difference in the number of platelets between the pre-test phase and post-test for the DHF patient group who were not given the garlic extract. Associated with this, platelets play an important role in hemostasis or cessation of bleeding. The mechanism of hemostasis begins with platelet aggregation in the walls of injured blood vessels. This aggregation occurs when platelets are activated by injury and induced by ADP (adenosine diphosphate), epinephrine, collagen, thrombin, arachidonate, PAF (Platelet Aggregation Factor) and ionophore A-23187 (Apitz-Castro et al., 1983).

The results showed that the group given garlic extract had a higher platelet count increase and when compared with the control group, this increase was significantly different. Many studies have reported that garlic has a great potential to inhibit platelet aggregation. Garlic extract is known to inhibit platelet aggregation induced by ADP, epinephrine, collagen and arachidonate, and may inhibit prostacyclin biosynthesis. DADS and diallyl trisulfide contained in garlic can prevent the formation of thrombus (Davi, 2007). Some of the medicinal benefits of garlic that are well known and already proven by research are antibiotics, anti-fungal, anti-oxidants, anti-cholesterol, anti hypertension, immunomodulators, anti atherosclerosis, and anti-aggregation platelets (Irwanto, 2013).

CONCLUSION

Garlic extract therapy proved more influential in reducing platelet count in DHF patients. It is recommended for hospitals to use the garlic extract as adjunctive therapy for DHF sufferers, in order to help reduce the severity and mortality rate due to DHF.

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