Thrombocyte counts in malaria patients at East Kalimantan

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Abstract. Malaria still becoming a serious health problem in Indonesia. Beside disorders of erythrocytes, there are some data that Plasmodium caused the other blood cells like leukocyte and thrombocyte. In malaria, changes of thrombocyte is thrombocytopenia that would be a complication from malaria vivax or malaria falciparum. The aim of this study is to know the thrombocyte count of malaria patients in East Kalimantan. Design of this study is descriptic retrospective from medical record’s data from 2011-2016 in 7 hospitals (AW Syahranie at Samarinda, Kanudjoso at Balikpapan, Penajam Paser Utara at Panajam, AM Parikesit at Tenggarong, Taman Husada at Bontang, Kudungga at Sangata and Abdul Rivai at Tanjung Redeb. We collected the data from June-August 2017. There are 1041 malaria patients with male and female respectively 88.2% and 11.2%. The etiology of malaria were Plasmodium falciparum, Plasmodium vivax and mixed infection (P.f and P.v) respectively 62.6%, 38% and 6.1%. We found thrombocyte count was normal, decrease and increase respectively 11%, 85% and 1.7%. The degree of thrombocytopenia in malaria patients were mild (100.000-150.000/µl) 31.8%, moderate (50.000-100.000/µL) 45.6% and severe (<50.000/µl) 33.6%. The thrombocyte count in malaria patients at East Kalimantan was thrombocytopenia with moderate degree of thrombocytopenia.

1. Introduction
Malaria still becoming a serious health problem in Indonesia. There are 12 provincies that have Annual Parasitic Index (API) more than national API, one of them is East Kalimantan. Plasmodium as an infectious agent of malaria will destroy the erythrocytes. Beside disorders of erythrocytes, there are some data that Plasmodium caused the other blood cells like leukocyte and thrombocyte. In malaria, changes of thrombocyte is decrease of thrombocyte count or thrombocytopenia that would be a complication from malaria vivax or malaria falciparum. In clinical practice, we found late diagnosis of malaria because thrombocytopenia with infectious disease have relationship with viral infection like dengue infection. Thrombocytopenia has been reported to be associated with malaria but have been not studied well. The aim of this study is to know about thrombocyte count in malaria patients at East Kalimantan.

2. Materials and Methods
This study design was descriptive retrospective from medical record’s data from 2011-2016 in 7 hospitals at East Kalimantan. That hospitals are Abdul Wahab Syahranie at Samarinda, Kanudjoso
Djatiwibowo at Balikpapan, Penajam Paser Utara at Panajam, Aji Muhamad Parikesit at Tenggarong, Taman Husada at Bontang, Kudungga at Sangata and Abdul Rivai at Tanjung Redeb. We collected the data from June-August 2017. The sample are inpatients and outpatients who diagnosed malaria and have positive blood thick smear in that hospital and have thrombocyte counts in complete blood count results. The variable was sex, type of Plasmodium, thrombocyte counts and degree of thrombocytopenia. The variable of thrombocyte counts were normal, thrombocytosis if >450,000 cells/µL and thrombocytopenia if <150,000 cells/µL. We classified the thrombocytopenia into three degree. Mild thrombocytopenia if 100,000-150,000 cells/µL, moderate if 50,000-100,000 cells/µL, severe <50,000 cells/µL.

3. Results and Discussion

Our study found a total of 1041 malaria patients from 2011-2016 in 7 hospitals in East Kalimantan consists of 918 males (88.18%) and 113 (10.85%) females (table 1).

Table 1. Sex distribution of malaria patients in East Kalimantan from 2011-2016

| Hospital                          | Total Patients (%) | Male (%)       | Female (%)    |
|-----------------------------------|--------------------|----------------|---------------|
| Abdul Wahab Sjahranie Samarinda   | 152 (14.60)        | 139 (91.45%)   | 13 (8.55)%    |
| Kanujojo Djatiwibowo Balikpapan   | 64 (6.15)          | 57 (89.1)      | 7 (10.94)%    |
| Panajam Paser Utara Penajam      | 286 (27.47)        | 247 (86.37)    | 39 (13.63)%   |
| AM Parikesit Tenggarong          | 181 (17.39)        | 170 (93.92)    | 11 (6.08)%    |
| Taman Husada Bontang             | 15 (1.44)          | 14 (93.33)     | 1 (6.67)%     |
| Kudungga Sangatta                | 46 (4.42)          | 38 (82.61)     | 8 (17.39)%    |
| Abdul Rivai Tanjung Redeb        | 297 (28.53)        | 263 (88.55)    | 34 (11.45)%   |
| **Total**                        | **1041 (100)**     | **918 (88.18)**| **113 (10.85)**|

Table 2 showed the distribution of malaria patients based on Plasmodium type in East Kalimantan from 2011-2016. We found that Plasmodium falciparum was the majority caused of our malaria patients (62.63%) followed by P. vivax (31.32%) and mixed infection (6.15%).

Table 2. Distribution of malaria patients based on Plasmodium type in East Kalimantan from 2011-2016

| Hospitals                          | P.falciparum (%) | P.vivax (%) | P.ovale (%) | P.malariae (%) | MixedP.f +P.v | **Total** |
|------------------------------------|------------------|-------------|-------------|---------------|--------------|----------|
| Abdul Wahab Sjahranie Samarinda    | 88(57.89)        | 57(37.5)    | 0(0)        | 0(0)          | 11(7.24)     | 152      |
| Kanujojo Djatiwibowo Balikpapan   | 34(53.12)        | 22(34.38)   | 0(0)        | 0(0)          | 8(1.25)      | 64       |
| Panajam Paser Utara Penajam       | 149(52.1)        | 112(39.16)  | 0(0)        | 0(0)          | 24(8.39)     | 286      |
| AM Parikesit Tenggarong           | 151(83.42)       | 29(16.02)   | 0(0)        | 1(0.55)       | 0(0)         | 181      |
| Taman Husada Bontang              | 2(13.33)         | 13(86.67)   | 0(0)        | 0(0)          | 0(0)         | 15       |
| Kudungga Sangatta                 | 29(63.04)        | 17(36.96)   | 0(0)        | 0(0)          | 0(0)         | 46       |
| Abdul Rivai Tanjung Redeb         | 199(67)          | 76(25.59)   | 0(0)        | 1(0.33)       | 21(7.07)     | 297      |
| **Total**                         | **652(62.63)**   | **326(31.32)**| **0(0)**   | **2(0.19)**   | **64(6.15)** | **1041** |

Distribution of thrombocyte counts in malaria patients at East Kalimantan was showed on table 3. We found 885 patients got thrombocytopenia (89.66%), 100 patients got normal thrombocyte count (10.13%) and only 2 patients got thrombocytosis (0.20%).
Table 3. Distribution of thrombocyte counts in malaria patients at East Kalimantan from 2011-2016

| Hospitals                        | Thrombocytopenia | Normal | Thrombocytosis | Total |
|----------------------------------|------------------|--------|----------------|-------|
| Abdul Wahab Sjahranie Samarinda  | 93(86.91)        | 13(12.15) | 1(0.93)     | 107   |
| Kanujoso Djatiwibowo Balikpapan  | 58(90.63)        | 6(9.37) | 0(0)          | 64    |
| Panajam Paser Utara Penajam     | 252(20.49)       | 30(10.6) | 1(0.35)     | 283   |
| AM Parikesit Tenggarong         | 170(93.92)       | 11(6.01) | 0(0)         | 181   |
| Taman Husada Bontang            | 12(85.71)        | 2(14.29) | 0(0)         | 14    |
| Kudungga Sangatta               | 43(95.55)        | 2(4.44)  | 0(0)         | 45    |
| Abdul Rivai Tanjung Redeb       | 257(87.71)       | 36(12.29) | 0(0)        | 293   |
| **Total**                       | **885(89.66)**   | **100(10.13)** | **2(0.20)** | **987** |

Out of 885 patients with thrombocytopenia, 404 patients (45.65%) had moderate thrombocytopenia, followed with 281 patients with mild thrombocytopenia (31.75%) and 200 patients with severe thrombocytopenia (22.60%).

Table 4. Distribution of thrombocytopenia in malaria patients at East Kalimantan from 2011-2016

| Hospitals                        | Mild 100,000-150,000/µL (%) | Moderate 50,000-100,000/µL (%) | Severe < 50,000/µL (%) | Total |
|----------------------------------|-------------------------------|---------------------------------|------------------------|-------|
| Abdul Wahab Sjahranie Samarinda  | 19(20.43)                     | 31(33.33)                       | 43(46.24)              | 93    |
| Kanujoso Djatiwibowo Balikpapan | 10(17.24)                     | 20(34.44)                       | 28(48.28)              | 58    |
| Panajam Paser Utara Penajam     | 78(30.95)                     | 124(49.2)                       | 50(19.84)              | 252   |
| AM Parikesit Tenggarong         | 85(50)                        | 65(38.24)                       | 20(11.76)              | 170   |
| Taman Husada Bontang            | 6(50)                         | 6(50)                           | 0(0)                   | 12    |
| Kudungga Sangatta               | 16(37.21)                     | 22(51.16)                       | 5(11.63)               | 43    |
| Abdul Rivai Tanjung Redeb       | 67(26.07)                     | 136(52.92)                      | 54(21.01)              | 257   |
| **Total**                       | **281(31.75)**                | **404(45.65)**                  | **200(22.60)**         | **885** |

We know that East Indonesia regions (Kalimantan, Sulawesi, Maluku, Irian Jaya, Nusa Tenggara) are endemic area for malaria. There are difference in number of malaria cases depend on region. Some area which known as malaria endemic area (Penajam Paser Utara, Tanjung Redeb district area) found as the most area of malaria cases in our study. In this study, *P. falciparum* is the most etiology of our malaria patients. This study found that thrombocytopenia affected in the majority of our malaria patients. We found that thrombocytopenia affected in 89.66% malaria patients, with moderate thrombocytopenia (45.65%) as the majority. Another study reported by Jadhav et al., in Bombay found that only 21.6% patients among malaria patients came with normal thromocyte count, with mean thromocyte count in malaria vivax 115.390/µL and malaria falciparum 100.900/µL [1]. Previous study by Morales et al., at Santos Anibal Dominicci Hospital in Venezuela between 2000-2002 found that 64.6% tertian malaria patients had decreased thromocyte count (<150.000/mm³), with 43% came with severe thrombocytopenia [2]. Ansari et al., found a decreased of thrombocytopenia (69.18%) among their malaria patients, and with the normal thromocyte count in 30.81%. Between the studies, thrombocytopenia were more often found in malaria caused by *Plasmodium falciparum* or *Plasmodium vivax*.
vivax [3]. Study by Chirag et al., from 781 malaria patients infected with Plasmodium falciparum, thrombocytopenia affected in 60%, while only 56% experienced with anemia [4].

Thrombocytopenia in patients also reported by Kumar et al., in their study at Sasaram District Bihar, India [5]. Consistent with study by Hafeez et al., that reported 88% patients of Plasmodium vivax malaria had ëthrombocytopenia [6]. Tangvarasittichai et al., reported that thrombocytopenia was the common feature in both P.falciparum and P.vivax malaria infection, which incidence varies from 60%-80% [7].

Patel et al., in their study reported that thrombocytopenia can be used to be a highly sensitive test for diagnosed malaria disease. Also they found that severe thrombocytopenia may be more likely caused by Plasmodium falciparum. Even not as a criteria of severa malaria, but thrombocytopenia could be a complicated of malaria vivax and falciparum [8]. D’Acremont et al., reported that the presence of thrombocytopenia could be a laboratory predictor for diagnosis malaria among traveler to tropical countries with acute fever disease [9].

There are some suggested mechanism involved in the evidence of thrombocytopenia in malaria disease. Thrombocyte destruction mediated immune process and coagulation disorders [10], sequestration of thrombocyte in spleen [11] and oxidative stress [12].

4. Conclusion
The thrombocyte count in malaria patients at East Kalimantan was thrombocytopenia with moderate degree of thrombocytopenia. The further study was needed to know about the mechanism of thrombocytopenia in malaria.

Acknowledgments
We sincerely thank Islamic Development Bank Project for Mulawarman University on 2017 for support this study and also all our medical students of Mulawarman University for collecting the data. We thanks to the director of the hospitals where become study site of the study.

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