Evaluation of the Effect of *Plasmodium falciparum* on Platelets Count among Sudanese Patients at Khartoum State, Sudan

**Abstract**

**Background:** Malaria is a serious vector-borne tropical disease that remains one of the primary reasons for death in several developing countries. In Sudan, almost 75% of the population is at risk of developing malaria. The infection could have several serious complications if not treated properly and data are needed to establish an effective prevention and treatment protocols.in our study we spot light on the relationship between malaria infection and platelets numbers in infected subjects.

**Objective:** This research aims to study the effect of *Plasmodium falciparum* infection on platelets count.

**Methods:** a total of 100 subjects, half of which (50 subjects) were malaria infected individuals as a study group and the other half (50 subjects) were healthy control. Both case and control groups were of the same age group (5-65 years old) from both genders (40% were females and 60% were males). *Plasmodium falciparum* was detected using rapid diagnostic tests and confirmed by microscopic examination.Platelets were estimated using an automated hematology analyzer, the kits supplied by (Sysmex, Japan)

**Results**

Platelets count in infected males was 25% less than that of infected females, such difference was found to be statistically significant and suggests that P. falciparum has greater impact on platelets count in males than females. However, this is in contract to another study conducted in Nigeria which found that male malaria patients had higher platelets counts than female patients.

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**Conclusion:** In conclusion: Malaria infection with *Plasmodium falciparum* was found to reduce platelets count.

**Keywords:**:, **Asymptomatic Heterozygous, Malaria, Parasite, platelet,**

**I. INTRODUCTION**

Malaria is caused by protozoan parasites belonging to the genus *Plasmodium* and is one of the deadliest diseases affecting the human population (1). Of the four species of human malarial parasites (*Plasmodium falciparum, P*. *vivax, P*. *malaria and P*. *ovale),* (2), *P*. *falciparum* is the predominant species threatening the human population in endemic areas. The 2016 World Health Organization (WHO) report stated that 212 million new cases and 429,000 deaths were due to malaria (3) occurred in 2015, with the majority of the cases and deaths recorded in the Sub-Saharan African region. This was followed by South-East Asia and the Eastern Mediterranean region (3).

Malaria has many symptoms similar to the common cold and, with the hallmark pathological feature being fever, it often resembles viral infections. Symptoms beside fever include nausea, chills, headaches and vomiting. For that it becomes difficult to pinpoint a malarial diagnosis(4). The clinical symptoms manifest during the asexual blood stage of the life cycle (5). After a period of symptoms where severity can vary, parasite load is controlled by the host’s immune response, although symptoms recur at intervals over weeks and months, associated with rises in parasitaemia (6).

During acute malaria, thrombocytopenia is most probably associated with the binding of parasite antigens to the surface of platelets to which antimalarial antibodies also bind, leading to the formation of immune complexes (7).

To reduces and prevents malaria transmission in endemic areas, vector control has been implemented either by implementation of insecticide-treated mosquito nets, or indoor residual spraying (8). In Sub-Saharan Africa, insecticide-treated mosquito nets were heavily used with an estimated 53% of the population at risk of malaria sleeping under a net in 2015 compared to 30% in 2010 (9). Furthermore, 106 million people world-wide were protected from malaria transmission by indoor residual spraying including 49 million people in Africa, with the proportion of the population at risk declining from a peak of 5.7% globally in 2010 to 3.1% in 2015 (9).

**II. MATERIALS AND METHODS**

**Design of Study**

This is a retrospective analytical case control study.

**Study population**

Patients infected with *Plasmodium falciparum*. The numbers infected people was 34 males and 16 females while in control group it was 26 males and 24 females.

**Sample size**

The study was conducted on 100 subjects, 50 of which were patients suffering from malaria as a case group and the other half (50 subjects) were healthy individuals serving as a control group.

**Inclusion criteria:**

Individuals tested positive for P. falciparum through RDTs and confirmed by microscopic examination, ages range between 5 to 65 years from both genders were enrolled in this study.

**Exclusion criteria:**

Subjects suffering from liver diseases, aplastic anemia, leukemia were not included in this study. Individuals who are under medications that affect platelets count such as vancomycin or heparin were excluded from this study.

**Data collection**:

A structured questionnaire was designed to provide personal and medical information about the study subjects.

**Methodologies**

Blood samples were obtained using venipuncture from each enrolled subject. 2.5 ml of venous blood was collected into blood containers with EDTA as an anticoagulant.

**Malaria detection:**

*Plasmodium falciparum* was detected using rapid diagnostic tests and confirmed by microscopic examination.

**Rapid diagnostic tests:**

5 µl of blood was added into test pad. Buffer reagent was added to perform three functions: to induce cell lysis and allow binding to colloidal gold-labeled antibodies, to help blood and immune complex to migrate up the test strip and cross monoclonal antibodies line, to clear blood from the membrane and facilitates reading. The test was considered valid if the control line was visible and positive if the HRPII and/or pan malarial antigen were visible. An immunochromatographi test diagnosis of *Plasmodium falciparum* was made if HRPII was visible, with or without the pan malarial antigen.

**Platelets estimation:**

Platelets were estimated using an automated hematology analyzer, the kits supplied by (Sysmex, Japan).

**Data analysis:**

The analysis of results was done using SPSS Vs.20 and the Microsoft excel computer program.

**III. RESULTS:**

This study included a total of 100 subjects, half of which (50 subjects) were malaria infected individuals as a study group and the other half (50 subjects) were healthy control. Both case and control groups were of the same age group (5-65 years old) from both genders (40% were females and 60% were males).

**Comparison of platelet count between malaria and control groups:**

The platelet mean count in *P. falciparum* infected individuals was (155 ± 66) while in control group it was (287 ± 54) (Table 1). There was a significant difference between the two groups (P value 0.000).

**Table (1) comparison of platelet count between malaria group and control group.**

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Case mean | Control mean | *P*. value |
| platelet (× 103 cell/µl) | 155 ± 66 | 287 ± 54 | 0.0001\*\* |

\*\*: significant at or less than 0.05.

Figure (1) comparison of platelets count between malaria group andcontrol group.

**Comparison of platelets count between males and females malaria patients:**

The platelet mean count in *P. falciparum* infected males was (139 ± 60) while in females it was (187 ± 68) (Table 2). There was a significant difference between the two groups (P value 0.015).

**Table (.2) comparison of platelet count between males and females among malaria patients.**

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Male mean | Female mean | *P*. value |
| platelet (× 103 cell/µl) | 139 ± 60 | 187 ± 68 | 0.015\* |

\*: significant at 0.05 level of significance.

Figure (2.) comparison of platelets count between males and females among malaria patients.

**Comparison of platelets count among different age groups:**

The platelet mean count in *P. falciparum* infected people according to age is illustrated in Table (.3). There was no significant difference between different age groups (P value 0.587).

**Table (3) Comparison of platelet among different age groups.**

|  |  |
| --- | --- |
| Age group | Platelets |
| 5 – 25 years | 145 ± 76 |
| 26 – 45 years | 165 ± 59 |
| 46 – 60 years | 147 ± 66 |
| P value | **0.587** |

Analyzed by one-way ANOVA.

Figure (3) mean platelet numbers among different age groups.

**V. Discussion:**

Malaria is considered to be one of the most fatal diseases in developing countries. This study intended to assess platelet count in *Plasmodium falciparum* patients and control groups.

The mean platelets count in *P. falciparum* infected people was lower than non-infected people. Results show that platelets count in healthy people was twice as much as in infected people, such difference was found to be statistically significant and indicates that *P. falciparum* induces reduction in platelets. This finding came in agree with Kumar (10), Patel (11), Khan (12), Jairajpuri(13), Narayan (14), Yadav (15), Rasheed (16), Giti(17), Utuk(18), Ansari (19), Elnasri(20).

The mean platelets count in *P. falciparum* infected males was lower than that of infected females. Results show that platelets count in infected males was 25% less than that of infected females, such difference was found to be statistically significant and suggests that *P. falciparum* has greater impact on platelets count in males than females. However, this is in contract to another study conducted in Nigeria which found that male malaria patients had higher platelets counts than female patients (21).

When it came to age, mean platelets count in the youngest group (5 – 25 years) was the lowest, followed by the eldest group (46 – 60 years) while the highest platelets count was of the age group (26 – 45 years). However; it is statistically insignificant and suggests that the effects of *P. falciparum* on platelets is independent of age.

**VI.. CONCLUSION**

Malaria infection with *Plasmodium falciparum* was found to reduce platelets count. During acute malaria, thrombocytopenia is most probably associated with the binding of parasite antigens to the surface of platelets to which antimalarial antibodies also bind, leading to the formation of immune complexes

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**Recommendation**

Platelets count should be estimated whenever malaria infection has been established and more studies can be applied to correlate severity of malaria infection with platelets count.

**Ethical Approval and consent:**

Ethical approval was obtained from research committee of the university. Written informed consent was obtained from each enrolled subject.

**Disclaimer (Artificial intelligence)**

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1.

2.

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