Red Sea University
Faculty of medicine and health sciences
Community medicine department

Hematological changes in Malaria

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This research is Submitted For Partial Fulfillment of the requirement for MIBBS 2014
بسم الله الرحمن الرحيم

قال تعالى:

إن الله وملائكته يصلون على النبي يا أيها الذين آمنوا صلوا عليه وسلموا تسليما

سوره الأحزاب الآية 56
Dedication

For all people whom palm up their hands praying for us.
For our beloved mothers
For our beloved fathers
For our teachers
For each person who love the sea of science
For all doctors
ACKNOWLEDGMENT

Thanks god for all the blessing which never end.

Special thanks to our supervisor Dr. Amal Aziz Malik consultant of peadiatric who help us and guide us in This research.

For guidance which has great significant on lighting the way for the researcher Dr. Abdallah Ahmed Omer the head of department of community in Red Sea university.

Finally we wish to thanks every one who help and support us.
Abstract

Malaria is most important of all tropical disease. It is associated with high mortality and morbidity.

This study was done in patient with malaria in Port Sudan in 2014.

The study population was 100 patient with malaria diagnosed by positive malaria parasitein peripheral blood film.

The data was collected directly from patient with malaria and laboratory investigation.

The objectives of this study is to identify malaria cases in port sudan. hematological features of malaria cases and to identify area of malaria and route transmission.

The study revealed that patients between 6 month-5 years were more affected with male predominance (54%).

Hadandwa tribe was the mostly affected tribe (60%).

The most affected people in Port Sudan live in Al Wehda.

We found that the most common precipitating factor for malaria is cearin localites in port sudan with possible breeding sites of mosquito.

plasmodium falciparum (60%) of cases of malaria. Although plasmodium Vivax was rare in Sudan it was found in (40%) of the study group. The rest

Hyper Parasitemia was found in (56%) of cases, so its sever form of malaria presentation.

CBC at diagnosis :-

We found sever malaria with

hyper parasitemia in 65% of cases

low platlet count less than 150.00 in 43% of cases
low Hb less than 60% in 44% of cases.

So severe malaria is found in Port Sudan especially in Alwehda with increase vivax transmission in Red Sea State.

So malaria elimination should have to be implemented in Port Sudan through Malaria control program.

Community mobilization in combating mosquito breeding site should have a priority in Red Sea government and the Ministry of Health.

Further research is need in this areas.
- هذه الدراسة أجريت في مرضى الملاريا في مدينة بورتسودان في الفترة مابين
(يناير - مايو) 2014م.

- هذه الدراسة تحليلية وقد استعملنا فيها استبان لجميع العينات حيث اخترت
المعلومات من مرضى الملاريا من جميع مستشفيات بورتسودان وبعض العينات اخترت
من المكمل. وتمت دراسة 100 مريض من مختلف الاعمار وقد تم تشخيصهم عن
طريق نتائج الفحص المكمل موجبة.

- من الهدف من هذه الدراسة هو معرفة الأسباب المؤدية للمرض ونتائج التحليل
المكمل والمعالجات اللازمة للحد والقضاء على المرض.

- من النتائج وجدنا أن الفئة العمرية مابين 6 أشهر و 15 سنة هي الأكثر عرضة
للإصابة بالمرض، وغالبيتهم من الذكور 54%، وقبله الهندو هو أكثر القبائل ضربة
بالمرض 60% من الحالات، ومعظم المرضى من منطقة الوحدة.

- وجدنا أن أكثر الأسباب المؤدية لمرض الملاريا هي:

- هطول الأمطار، والمياه الراكدة، ودرجة الحرارة اهم الاسباب التي تساعد على انتشار بعرض
الاندوفليس وهي المسبب الرئيسي للملاريا.

- وقد وجدنا اثناء الدراسة أن معظم نتائج التحليل المكمل ان:

- طفل الفالسيفيوم هو الأكثر شيوعا يوجد في 60% من المرضى.
- 56% من المرضى لديهم نسبة عالية من الطفيلي في الدم.
- وفي نتائج الدم المكمل وجدنا ان:
- 44% من المرضى نسبة الهيموقلوبين لديهم (40 - 80%).
- 57% من المرضى نسبة كريات الدم البيضاء لديهم (أكثر من 4000).
- 43% نسبة الصفائح الدموية لديهم (50.000 - 150.000).
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**Chapter one**

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<td>Reference</td>
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**abbreviation**

- Hb: Hemoglobin
- P: Plasmodium
- WBC: White blood cell
- I.V: Intravenous fluid
Introduction

Malaria is a serious disease and sometimes fatal disease caused by a parasite that commonly infected certain type of the mosquito (like anopheles) which feeds on human.

People who get malaria are typically very sick with high fever, chills, shaking and flu-like illness.

Although malaria can be a deadly disease, illness and death from malaria can usually be prevented.

Medicines usually can treat the illness. But some malaria parasites may survive because they are inside the liver or they are resistant to the medicine.
Justification

During our study in hospitals and labs we saw many cases of malaria and we had found that in the period of January to May 2014 the high percentage of cases is malaria cases.

And some of the patients developed severe malaria which needed blood transfusion and admission.

So we decided to study malaria in Port Sudan. To our knowledge there are few studies addressing malaria cases in Port Sudan.
Objective :-

1- To study malaria cases in port Sudan.

2- To study hematological features in malaria cases.

3- To study mosquito breeding site and malaria treatment.
Chapter Two

Literature review
Definition

Malaria is the most important parasitic disease of human, causing hundreds of millions of illness and probably over a million deaths each year. The disease is endemic in most of the tropics, including much of South and Central America, Africa, the Middle East.

Transmission, morbidity, and mortality are greatest in Africa, where most deaths from malaria are in young children. Malaria is also common in the travelers from non-endemic areas to tropics. Four species of the genus Plasmodium classically cause human malaria. Plasmodium falciparum is responsible for nearly all severe disease. Plasmodium vivax is about as common as P. falciparum.

P. ovale and P. malariae are much less common causes of the disease and generally don’t cause severe illness.

Life cycle:

Malaria is transmitted by the bite of infected female anopheline mosquitoes during feeding. Mosquitoes injected sporozoites, which circulate to the liver and rapidly infect hepatocytes, causing asymptomatic liver infection.

Merozoites are subsequently released from the liver, and they rapidly infect erythrocyte to beginning the asexual erythrocytic stages of infection that is responsible for human disease. Multiple rounds of erythrocytic development with production of merozoites that invade additional erythrocytes leading to large numbers of circulating parasite and clinical illness. Some erythrocytic parasite also develop into sexual gametocytes which are infectious to the mosquitoes, allowing completion of the life cycle and infectious of the others.

Pathogenesis

Malarial pathogenesis is still not fully understood. Hepatosplenomegaly, thrombocytopenia and anemia usually occur as malaria develops, particularly in children. Increasing cyclic fever, recurrent headaches, fatigue, nausea, and musculoskeletal pain are other clinical signs. Malarial deaths follow from coma, kidney failure, or other complications. Hyper-reactive malarial splenomegaly arises from an aberrant immune response to malarial parasites and can be exacerbated via co-infection with schistosomes or HIV. Placental malaria and cerebral malaria in children are not fully understood and each presents very serious additional clinical challenges. The cellular and molecular causes of this wide array of clinical symptoms are complex. Laboratory and/or animal models
to determine these causes, against which candidate drugs can be conveniently screened, are severely limited, both in number and in scope.

The initial site of parasite invasion is the skin, when sporozoites are injected via a mosquito blood meal. These quickly localize to the liver, invade hepatocytes, differentiate, and divide. Very little is known about liver stages, but new tools and approaches, particularly intravital imaging techniques and recombinant parasites expressing green fluorescent protein (GFP), are rapidly defining additional key concepts. Sequestration and egress from the liver vary for different *Plasmodium* sp., but for *P. falciparum*, new merozoites emerge within approximately 2 weeks as large clusters called merosomes. Free merozoites are then disseminated in the blood, where a multitude of cellular and molecular events that occur upon red blood cell invasion have been documented and characterized in great detail by many laboratories.

**Clinical presentation:**

**Include:**

-Fever

-flue-like illness including (shaking chills, muscular pain and tiredness),

- nausea,

-vomiting and

-diarrhea may also occur

-anemia and jaundice because destruction of white blood cells. If not treated become sever and may cause renal failure, seizures, mental confusion and death

**Diagnosis:**

-Clinically, based on the patient's symptoms and on physical findings at examination.
- **Microscopic**, can be identified by examination under microscope by taking blood smear from patient, which stained by giemsa stain to give the parasite distinctive appearance.

- **Molecular**, by polymerase chain reaction (PCR), which is slightly more sensitive than microscopic diagnosis.

- **Serology**, by using either indirect immunofluorescence, enzyme-linked immunosorbent assay (ELISA). Serology doesn't detect current infection but measure past exposure.

**Risk factors:**

- Live in or travel to tropical areas where the disease is endemic.

- Infected mother can transmit malaria to her infant before or during delivery.

- Poverty

- Lack of knowledge

- Little or no access to health care.

**Treatment:**

Medicine choice is based on:

- The specific parasite causing the infection.

- How bad the infection is.

- Condition (such as age, pregnancy, allergies, or health problems).

- Medicine resistance of the parasite found in the geographic area where you were infected.

**Pregnancy and malaria:**

Pregnant women, especially primigravid women, are up to 10 times more likely to contract malaria than nongravid women.

Artemether is contraindicated in first trimester, quinine is drug of choice in treatment of malaria it given I.V with dextrose to prevent hypoglycemia.
Pediatrics and malaria:-

In children, malaria has a shorter course, often rapidly progressing to severe malaria. Children are more likely to present with hypoglycemia, seizures, severe anemia, and sudden death, but they are much less likely to develop renal failure, pulmonary edema, or jaundice.

Most antimalarial drugs are very effective and safe in children, provided that the proper dosage is administered. Children commonly recover from malaria, even severe malaria, much faster than adults.

Medical therapy of choice:-

- Artemether
- Quinine
- Artesenate

Complication:-

Cerebral malaria

The parasite-filled blood cells block the small blood vessels of the brain, causing swelling or brain damage. Also may cause coma.

Severe anemia

Malaria damage red blood cells, which can cause severe anemia.

Organ failure:-

Malaria can cause kidneys or liver failure, or spleen rupture, and any of these conditions can be life threatening.

Breathing problems

Cause accumulation of fluid in lungs (pulmonary edema), and this can make difficulty of breathing

Low blood sugar

Severe forms of malaria itself can cause low blood sugar, as quinine one of the most common medications used to combat malaria. Very low blood sugar can result in coma and death.
Prognosis:

If not treated malaria become sever and may cause renal failure, seizures, mental confusion and death.
Chapter Three

Methodology
Methodology

Nature of study :-

This is hospitals and labs based study done in patient with malaria in all Port Sudan hospitals and some labs.

Study area :-

Port Sudan consider as capital of Red Sea boarding from north by Egypt, Red Sea from east, north state and Nile river from west and Kassala from south.

Surface area of Port Sudan city about 102 Km and The number of population about 517,338, the majority from eastern tribes like (Hadandwa, BniAmmer, Rashida ...), each one has subtypes and most of them are low socioeconomic status and they are unskilled that explained that why they are free worker and merchant.

The health services comprise 4 public hospital, 16 health center and private clinic.

Temperature: maximum is 45C and minimum is 25C.

Humidity: average is 60%.

Study duration:

Our research is done at interval from January – May of 2014.

Study population and criteria of selection:-

All people with malaria and all age groups.

Sample size:-
Sample was collected by questionnaire filled from patient file and lab information.

Study technique:-
Information of questionnaire included, age, sex, tribe, residence, type of organism, type of treatment, parasitemia, platelet count, WBCs count, Hb concentration.

Data analysis:-
We filled 100 questionnaire from malaria cases in Port Sudan hospital. We analyzed it for using master sheet.
Chapter Four
Result
interpretation
### Tables & Figures

#### Percentage & Number of Sex

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Number</th>
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<tr>
<td>%54</td>
<td>54</td>
<td>male</td>
</tr>
<tr>
<td>%46</td>
<td>46</td>
<td>female</td>
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<td>%100</td>
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#### Percentage & Number of Age

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<tr>
<td>%2</td>
<td>2</td>
<td>month 6 &gt;</td>
</tr>
<tr>
<td>%38</td>
<td>38</td>
<td>month- 5years 6</td>
</tr>
<tr>
<td>%28</td>
<td>28</td>
<td>years 12-5</td>
</tr>
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<td>%32</td>
<td>32</td>
<td>More</td>
</tr>
<tr>
<td>%100</td>
<td>100</td>
<td>Total</td>
</tr>
<tr>
<td>Percentage</td>
<td>Number</td>
<td>Rib</td>
</tr>
<tr>
<td>------------</td>
<td>--------</td>
<td>-----</td>
</tr>
<tr>
<td>%60</td>
<td>60</td>
<td>Hadndwa</td>
</tr>
<tr>
<td>%20</td>
<td>20</td>
<td>Bniaamer</td>
</tr>
<tr>
<td>%20</td>
<td>20</td>
<td>Others</td>
</tr>
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<td>%100</td>
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<td>Total</td>
</tr>
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The tables and charts indicate a detailed breakdown of percentages and numbers for different categories, along with their respective residents.
### Parasitemia

<table>
<thead>
<tr>
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<tr>
<td>%25</td>
<td>25</td>
<td>+</td>
</tr>
<tr>
<td>%19</td>
<td>19</td>
<td>++</td>
</tr>
<tr>
<td>%56</td>
<td>56</td>
<td>parasitemia Hyper</td>
</tr>
<tr>
<td>%100</td>
<td>100</td>
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### Platelets

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Number</th>
<th>count Platelets</th>
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<tbody>
<tr>
<td>%4</td>
<td>4</td>
<td>Less than 30,000</td>
</tr>
<tr>
<td>%14</td>
<td>14</td>
<td>50,000 – 30,000</td>
</tr>
<tr>
<td>%43</td>
<td>43</td>
<td>50,000 – 150,000</td>
</tr>
<tr>
<td>%39</td>
<td>39</td>
<td>More than 150,000</td>
</tr>
<tr>
<td>%100</td>
<td>100</td>
<td>Total</td>
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### Percentage Distribution of WBC Count

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<th>WBC Count</th>
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<tbody>
<tr>
<td>%7</td>
<td>7</td>
<td>2,000 – 1,000</td>
</tr>
<tr>
<td>%36</td>
<td>36</td>
<td>4,000 – 2,000</td>
</tr>
<tr>
<td>%57</td>
<td>57</td>
<td>More than 4,000</td>
</tr>
<tr>
<td>%100</td>
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### Percentage Distribution of Hb Concentration

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<tr>
<td>%11</td>
<td>11</td>
<td>%40 – 20</td>
</tr>
<tr>
<td>%22</td>
<td>22</td>
<td>%60 – 40</td>
</tr>
<tr>
<td>%44</td>
<td>44</td>
<td>%80 – 60</td>
</tr>
<tr>
<td>%23</td>
<td>23</td>
<td>%100 – 80</td>
</tr>
<tr>
<td>%100</td>
<td>100</td>
<td>Total</td>
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![Bar chart for WBC count](chart1.png)

![Bar chart for Hb concentration](chart2.png)
<table>
<thead>
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<th>of treatment Type</th>
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<tr>
<td>%50</td>
<td>50</td>
<td>Artemether</td>
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<tr>
<td>%6</td>
<td>6</td>
<td>Artesenate</td>
</tr>
<tr>
<td>%32</td>
<td>32</td>
<td>Quinine</td>
</tr>
<tr>
<td>%5</td>
<td>5</td>
<td>Quartum</td>
</tr>
<tr>
<td>%7</td>
<td>7</td>
<td>Primquine</td>
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<td>%100</td>
<td>100</td>
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<table>
<thead>
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<th>of organism Type</th>
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<td>%60</td>
<td>60</td>
<td>Falciprum</td>
</tr>
<tr>
<td>%40</td>
<td>40</td>
<td>Vivax</td>
</tr>
<tr>
<td>%100</td>
<td>100</td>
<td>Total</td>
</tr>
</tbody>
</table>
Result:

Table(1):
Show male and female percentage in all age group, Male(54%), female(46%).

Table(2):
Show number of cases and percentage according to age group.

Table(3):
Show number of cases and percentage according to tribe distribution.

Table(4):
Show number of cases and percentage according to residence distribution.

Table(5):
Show number of cases and percentage according to type of treatment.

Table(6):
Show number of cases and percentage according to Type of organism.

Table(7):
Show number of cases and percentage according to parasitemia distribution.

Table(8):
Show number of cases and percentage according to platelets count distribution.

Table(9):
Show number of cases and percentage according to WBCs count distribution.

Table(10):
Show number of cases and percentage according to Hb concentration.

Concerning the sex distribution, male are affected more than female(68%), table(1).
Concerning age group, children between age 6 month to 5 years are more affected (38%), children less 6 month represent (2%), children between 5 - 12 years represent (28%), and age group more than 12 years (32%), table (2).

Concerning the tribe, Hadandwa tribe is more affected (60%), Bniaamer (20%), and other tribes (20%), table (3).

Concerning the residence, the most affected area are, Alwehda (43%), sallalab (14%), Arbaat (2%), slom (4%), other areas (37%), table (4).

Concerning the type of treatment, Artemether (50%), Quinine (32%), Artesenate (6%), Quartum (5%), and primquine (7%), table (5).

Concerning the type of organism, the most affected parasite are, p. falciprurn (60%), then p. vivax (40%), table (6).

Concerning the parasitemia, high parasitemia (56%), + (25%), and + + (19%), table (7).

Concerning the platelet count, most of cases their platelet count is (50,000 - 150,000) (43%), then more than 150,000 (39%), (30,000 - 50,000) (14%), and less than 30,000 (4%), table (8).

Concerning the WBCs count, most of cases their WBCs count is more than 4,000 (57%), (2,000 - 4,000) are (36%), (1,000 - 2,000) are (7%), table (9).

Concerning the Hb concentration, (60 – 80%) are high percentage (44%), (80 – 100%) are (23%), (40 - 60%) are (22%), and (20 - 40%) are (11%), table (10).
Chapter Five
Chapter Six
Conclusion:-

This study was done in Port Sudan hospital and labs to look in malaria disease all age group for (precipitating factor, laboratory finding and treatment) to control the disease.

Our data collection extended from January to may 2014.

For the analysis of data collected from 100 cases

Recommendation:-

- Early diagnosis of malaria could make a difference in management and outcome.

- Causes and risk factor should be studied very well to understand the exact pathogenesis of disease.

- Public health education about the disease

- Encourage participators of community leaders.

Reference


2- Clark IA, Alleva LM, Cowden WB. Pathogenesis of malaria and clinically similar condition.

3- WWW.Malaria.com
Red Sea University
Faculty of Medicine
Department of Community Medicine

Questionnaire in hematological Changes in malaria
At port Sudan labs from ..................... to .....................

Age : > 6 month( ) 6 m-5 years ( ) 5y - 12y ( ) more ( )
Gender : female ( ) male ( )
Tribe : ( ) يبني عامر ( ) هندوا ( ) آخر ( )
Residence : ( ) سلالاب ( ) الوحدة ( ) أربعات ( ) سلوم ( ) آخر ( )
Travel history :

Treatment :
Admission : yes ( ) no ( )
Receive blood : yes ( ) no ( )
Receive pcv : yes ( ) no ( )
L.V fluid :
Type of organism : falceprum ( ) vivax ( )

Cbc at diagnose :
Hb : ( )
Platelet : ( )
Wbc : ( )
Parasitemia + ( ) ++ ( ) hyper parasitemia ( )
Peripheral blood film : + ve ( ) -ve ( )