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Study Of Alterations in Hematological and Biochemical Parameters in Cases of Malaria

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ABSTRACT

Background: Malaria is a disease with a great global burden. It is one of the most prevalent parasitic infection common in tropical, subtropical countries, particularly Asia and Africa. Malaria causing plasmodia is parasites of blood and hence induces hematological and biochemical alterations. The laboratory parameters that have been changed due to malaria include hemoglobin, total leucocyte count, platelet count, neutrophil, monocyte ,lymphocyte and eosinophil count. Hence, the present study is undertaken to evaluate the various laboratory parameters affected in malaria and to observe the variations, if any, in Plasmodium falciparum, Plasmodium vivax, and mixed infections.

Materials and Methods: The present study was carried out in the Department of Pathology at GMERS medical college and hospital,Gandhinagar from May,2022 to August,2022.A total of 6265 peripheral smears were analyzed, out of which 430 smear positive malaria cases were evaluated.Various laboratory parameters were studied.

Results: Out of 430 smear-positive cases, P. vivax was positive in 70% of cases, P. falciparum was positive in 27.7% of cases and mixed infection in 2.3% of cases. Most of the cases were seen in the age group of 21–40 years and mainly in males. Anemia was seen in 52% of cases. Thrombocytopenia in 85% of cases. Leucopenia in 62% of cases. In the present study most common system involved was Haematological (70%) followed by Hepatic (31%), Renal (19%).

Conclusions: Malaria though potentially treatable, still kills many patients every year in India. The most common presentation of malaria is fever, so in endemic region malaria may be considered as a leading differential diagnosis in all patients presenting as acute febrile illness, especially patients who also have organomegaly, fall in hemoglobin level, thrombocytopenia and altered liver function tests. Therefore, it is vital to know and perform laboratory investigations to detect early complications and to treat them effectively.

Keywords: Malaria, Laboratory parameters, Biochemical alterations, Anemia, Thrombocytopenia

I. INTRODUCTION:

- Malaria is a disease with a great global burden. It is one of the most prevalent parasitic infection.It is a disease caused by protozoan parasites of genus Plasmodium , transmitted by the bite of infected Anopheles mosquito, and the incubation period varies from 8 to 30 days depending on species.[1]
- The five Plasmodium species well known to cause human malaria are; Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, and Plasmodium knowlesi. P. falciparum is responsible for most malaria deaths. The infection can develop suddenly and produce several life-threatening complications.
- About 241 million cases of malaria and 6,27,000 deaths were reported globally in 2020.[2]
- Malaria causing plasmodia are parasites of blood and hence induce hematological alterations.
- The hematological changes that have been reported to accompany malaria include anemia, thrombocytopenia , leucopenia and sometimes , leucocytosis, mild to moderate atypical lymphocytosis, monocytosis, eosinophilia and neutrophilia also seen. During malaria infection , Some biochemical parameters also get changed like liver and renal function test.

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- Thrombocytopenia is common occurrence in acute malaria and it is observed in vivax and falciparum malaria to varying degrees.
- The high mortality rate in malaria infection is usually associated with heavy parasite load, anemia, low platelet count, jaundice, and delay in diagnosis.[3]

AIMS AND OBJECTIVES:

- To investigate the effect of malarial parasite on different hematological ,biochemical liver and renal parameters and to observe the variations, if any, in Plasmodium falciparum, Plasmodium vivax, and mixed infections.
- Early detedtion of malaria on the basis of laboratory parameters alterations and prevent morbidity and mortality due to malaria.

II. MATERIALS AND METHODS :

- The present study was carried out in the Hematology lab, GMERS medical college,Gandhinagar from May,2022 to August,2022.A total of 6265 peripheral smears were analyzed, out of which 430 smear positive malaria cases were evaluated.
- Study Design : cross-sectional descriptive study
- Inclusion Criteria : smear-positive malaria cases from May,2022 to August,2022 were included in this study
- Routine laboratory work, thin, and thick blood films were prepared , stained and examined for identification of plasmodium species . Minimum 200 oil immersion field were examined to label the smear negative.
- Complete blood count using five part cell counter (Sysmax 350 XN).
- Anemia and thrombocytopenia were labeled when hemoglobin was <11.0 gm% and platelets were <1.5 lac / mm^3, respectively.
- Leukopenia and leukocytosis were labeled when the total WBC count was < 4.0×10^3 /mm^3 and >11.0×10^3 / mm^3, respectively.

III. RESULTS:

- Total 430 smear positive cases were examined . Out of them ,301 (70 %) had infection due to p.vivax . 119 (27.7 %) had p.falci and other 10 (2.7%) had mixed infection .
- There were 288 (67 %) malaria positive cases in males , while 142 (33%) malaria cases in females.
- Most of cases were observed in age group of 21 to 40 years (55%).
- Out of total of 430 cases, the majority – 366 cases (85 %) were having thrombocytopenia. Out of which, 278 cases (75.95%) were affected by P. vivax, 85 cases (23.2 %) were affected by P. falciparum, and 03 cases (0.82 %) were affected by mixed infection .
- Anemia was seen in 224 cases (52 %) , Out of them , 168 cases (75 %) due to P. Vivax , 53 cases (23.66 %) due to P. Falciparum and 03 cases (0.33 %) due to mixed infection.
- Leucopenia was seen in 267 cases (62 %) , Out of them, 175 cases (65.54 %) due to P. Vivax , 92 cases (34.46 %) due to P. Falciparum.
- In biochemical tests , High Serum total bilirubin in 30 % of malaria positive cases. High CRP level in 40 % of cases .Majority of cases in which biochemical tests are altered were infected by Plasmodium Falciparum.

TABLE 1:-TOTAL MALARIA POSITIVE CASES

Total Case	Plasmodium vivax	Plasmodium falciparum	Mixed
430	301 (70%)	119 (27.7%)	10 (2.7%)

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FIGURE 1- AGE WISE MALARIA POSITIVE CASES

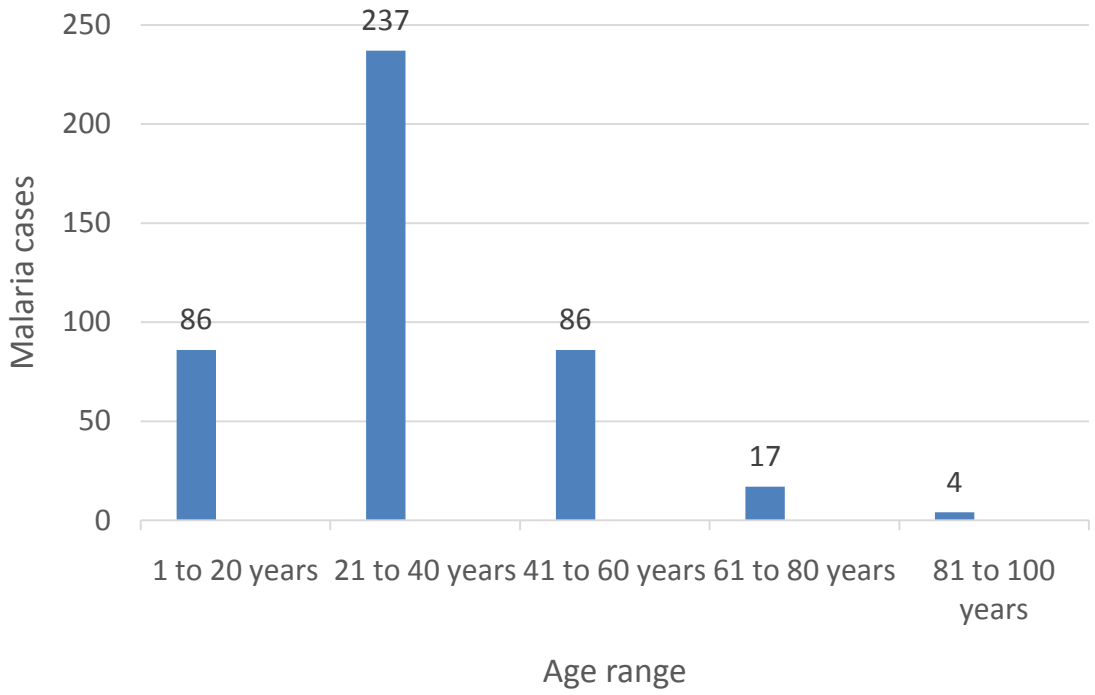

TABLE 2-HEMATOLOGICAL ALTERATIONS IN MALARIA CASES

Main alterations in malaria cases	Alterations seen in Cases (total numbers)	Percentage	Due to P.vivax		Due to P. falci parum		Due to mixed Infection	
Thrombocytopenia <1.5 lac / mm^3	366	85%	278	75.95%	85	23.2%	03	0.82%
Anemia <11.0 gm%	244	52%	168	75%	53	23.66%	03	1.34%
Leukopenia < 4.0 × 10^3 /mm^3	267	62%	175	65.54%	92	34.46%	00	0%

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TABLE 3-BIOCHEMICAL ALTERATIONS IN MALARIA CASES

Total cases in which levels are altered	
Altered Liver Function	
Total bilirubin	129(30%)
Direct bilirubin	120(28%)
Indirect bilirubin	172(40%)
Altered renal function	
Serum Creatinine	43(10%)
Serum Urea	22(5%)
Altered CRP	172(40%)

IV. RESULTS:

- Malaria is transmitted by the female anopheles mosquito, which causes clinical illness and pathological changes in various body organs with the parasites invading and multiplying in the circulating red blood cells.
- Malaria causes numerous hematological alterations, of which anemia and thrombocytopenia are the most important.[4]
- The most common species of malaria in the present study was P. vivax (70%) followed by P. falciparum (27.7%). Findings are compatible with studies done by Jadhav et al. and Ca et al.[5,6]
- In the present study, 55% of cases were in the age group between 21 and 40 years and were found to be similar with the studies done by Agrawal et al. [7] ,in which 75% of cases were in the age group between 21 and 40 years .
- In the present study, the percentage of patients showing thrombocytopenia is 85% , found to be similar with the studies done by Agrawal et al.[7] in which thrombocytopenia seen in 85.5% cases.

V. CONCLUSIONS:

- Malaria affects mostly adults with male predominance. P. vivax is more common than P. falciparum and mixed infection. Most of serious Complications are associated with P. falciparum and mixed infection.
- The malarial infection causes various hematological and biochemical changes. Anemia and thrombocytopenia of varying severity are the most frequently observed hematological findings.
- So, we can early diagnose case of malaria on basis of laboratory parameters changes , treat it and prevent its complications .
- Various hematological findings can help in early diagnosis of malaria which is essential for timely and appropriate treatment which can limit the morbidity and prevent further complications

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