Original Article

Analysis of Hematological and Biochemical Parameters as Diagnostic Test for Malaria in Patient with Acute Febrile Illness

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Introduction : Malaria is one of the important causes of Febrile Illness in the World. We analysed the Hematological and Biochemical parameters in patients of Acute Febrile Illness.

Material and Methods : This study was carried out at GMC Kota, Rajasthan in Department of General Medicine. We included 200 patients of Acute Febrile Illness from April, 2018 to January 2020. Diagnosis of malaria was confirmed by both thin and thick film smear. Hematological and Biochemical parameters were done in all patients.

Results : Total 200 patients were included in which 100 were Malaria negative and 100 were malaria positive cases in which P Vivax (55%) were more than P falciparum (38%), 7% of cases were positive for both. Anaemia was present in 69% of cases, Leukopenia in 26% of cases, Thrombocytopenia in 78% of cases, Hyperbilirubinemia in 74% of cases, SGOT was raised in 70% of cases, SGPT was also raised in 62% of cases, S LDH was increased in 86% of cases, RDW-CV was increased in 28% of cases.

Conclusion : Our study indicate that Anaemia, Leukopenia, Thrombocytopenia, increased S LDH, Hyperbilirubinemia, SGOT/SGPT >1.5 and RDW-CV may be useful tool in diagnosis of Malaria.

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Key words **: Malaria, Hematological, Biochemical, Febrile illness.**

Malaria is a protozoan disease transmitted by bite of infected female Anopheles mosquitoes. It is transmitted in 91 countries containing 3 billion people and causes approximately 1200 death each day[1]. Six species of genus plasmodium cause nearly all malarial infection these are P falciparum, P vivax, 2-morphological identical species of P.ovale, P malariae & in Southeast Asia Monkey Malaria parasite P knowlesi[2]. The clinical diagnosis of Malaria is challenging because of non-specific nature of signs & symptoms, which overlaps considerably with other Febrile Illnesses common in Tropical region. Hematological and Biochemical changes enable the Clinician to establish an effective & early therapeutic intervention in order to prevent the occurrence of major complications. Hematological abnormalities that have been reported to invariably accompany with Malaria infection include –Anaemia, Leukopenia and Leukocytosis (In some cases) and Thrombo-cytopenia[3].

Common Biochemical alterations are-Hyperbilirubinemia, increased level of SGOT, SGPT and S LDH.

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Editor's Comment :

- Hematological and Biochemical Parameters help us to diagnose malaria in endemic zone.
- Anaemia, Thrombocytopenia, SGOT>SGPT & Indirect bilirubin > Direct bilirubin are the Indirect evidence for Starting anti-malarial treatment.

So the present study was carried out to analyse and statistically evaluate Hematological and Biochemical changes in patient of acute febrile illness with Malaria positive and Malaria negative report and wheather they could guide Physician to institute specific Anti-malarial Treatment.

Material and Methods

Our study was carried out on patients admitted with Acute Febrile Illness in the Department of General Medicine, GMC Kota, Rajasthan from April 2018 to January 2020. Total 200 patients were included in which 100 were Malaria positive and 100 were malaria negative. Written consent was taken for all patients to participate in the study. Hematological and biochemical investigations were done for all patients. Diagnosis of Malaria was confirmed by both thin and thick blood smear.

Results

In Malaria positive (case) group females (56%) were more than males (44%) whereas in Malaria negative [control] group male > female ie, 54% & 46%. Most commonly involved age group was 18-30 years in both case & control group. Anaemia was seen in 69% of

cases & 55% of controls Leukopenia in 26% of cases and 4% of controls, Thrombocytopenia in 78% of cases and 35% of controls, Hyperbilirubinemia in 74% of cases and 59% of controls, indirect bilirubin was more than direct bilirubin, SGOT was raised in 70% of cases and 50% of controls, SGPT was raised in 62% of cases and 51% of controls, SGOT was more raised than SGPT, S LDH was raised in 86% of cases and 65% of controls, RDW-CV was raised in 28% of cases and 10% of controls, Splenomegaly was seen in 50% of cases and 15% of controls, Hepatosplenomegaly in 9% of cases and 2% of controls. Most common associated symptom with fever in case group was chills and rigors- in 64% of cases, vomiting in 58% of cases, headache in 44% of cases. 55% cases were positive for P vivax, 38% cases for P falciparum and 7% cases for both.

Parameters	Cases (%)	Controls (%)
Anaemia	69%	55%
Leukopenia	26%	4%
Thrombocytopenia	78%	35%
Raised Total Bilirubin	74%	59%
Raised Direct Bilirubin	72%	54%
Raised Ind. Bilirubin	60%	36%
Raised SGOT	70%	50%
Raised SGPT	62%	51%
Raised S LDH	86%	65%
Raised RDW-CV	28%	10%
Chills and Rigors	64%	58%
Vomiting	58%	60%
Headache	44%	16%
Unconsciousness	18%	12%
Splenomegaly	50%	15%
Hepatosplenomegaly	9%	2%
P vivax positive	55%	-
P falciparum positive	38%	-
Both positive	7%	-

Discussion

In our study females were more in number than males ie, 56% females & 44% male. Our study correlates with Ashwini Kumar Nigam *et al*[4] who found 52% females and 48% males.

In our study maximum number of positive cases were in the age range of 18-30 years ie, 48%. Similar results were found in the study done by Prashant Khuraiya *et al*[5] with 43% cases in this age range.

Mean Hemoglobin level of case group was 9.90±2.96 gm/dl and of control group was 10.33±2.09 gm/dl and the difference was statistically non-significant (p-value 0.23). Similar results were found in the study done by Mohammed Al-Salahy *et al*[6] with mean Hemoglobin level of case group & control group was 9.4±0.28gm/dl and 10.02±0.42 gm/dl and the difference was statistically non-significant with p-value 0.082.

Mean TLC of the case group was 7.14±4.49 and of control group was 9.03±3.26 and the difference was statistically significant with p-value of 0.0008. Similar results were seen in study of Zeeba Shamim Jairajpuri *et al*[7] with mean TLC 4.9±2.62 in case group and 7.1±3.6 in control group with significant p-value of 0.001.

Mean platelet count of case group was 126.98±105.05 (10^3/cu mm) and of control group was 186.65±71.31 (10^3/cu mm) and the difference was statistically significant with p- value of 0.0001. Similar results were found by Mohamed Al-Salahy *et al*[6], with mean platelet count 116.6±7.03 and 353.4±18.72 in case and control group respectively and the difference was statically significant with p-value of 0.0001.

Mean Total bilirubin of case group was 2.23±2.51 mg% and of control group was 1.57±0.96 mg% and the difference was statistically significant with p-value of 0.01. Our study correlates with Sudha Jha *et al*[8], who found mean Total bilirubin of case group 1.63±2.27 mg% and of control group 0.67±0.08 mg% and this difference was statistically significant (p-value 0.001).

Mean direct bilirubin level of case group was 0.89±1.14 mg% and of control group was 0.49±0.47 mg% and the difference was statistically significant with p-value of 0.001. Similar results were found by Gagan Deep *et al*[9] with Mean direct bilirubin level of 0.48±0.43 mg% in case group and 0.13±0.031 mg% in control group with significant p-value of 0.0001.

Mean indirect bilirubin level in case group was 1.24±1.45 mg% and of control group was 1.08±0.77 mg% but the difference was statistically non-significant with p-value of 0.11.Similar results were found by Ratendra Bisht *et al*[10] who found Mean indirect bilirubin level in case group 1.65±2.67mg%.

Mean SGOT level of case group was 81.05±75.91 (IU/L) and of control group was 64.84±43.32 [IU/L] but difference was statistically non-significant with the p-value of 0.06. Similar results were found by Rajesh Deshwal *et al*[11], who found Mean SGOT level 83.92±43.71IU/L.

Mean SGPT level of case group was 65.35±64.18 (IU/L) and of control group was 51.67±32.70 (IU/L) and the difference was statistically significant with the p-value of 0.05. Similar results were found by Dr T Anil Kumar *et al*[12] who found Mean SGPT level 64.4±2.6 IU/L in case group and 18.2±1.3 IU/Lin control group with significant p-value of 0.05.

Mean of SGOT was more than Mean of SGPT in case group as well as in control group.

Mean S LDH level of case group was 1196.3± 994.34 (IU/L) and of control group was 832.77±489.73 (IU/L) and the difference was statistically significant with the p-value of 0.001. Similar results were found by Mohammad Ali Pir *et al*[13] who found Mean S.LDH 1276.41±263.2 IU/L in case group and 266.06±22.5 IU/L with statistically significant p-value of 0.0001.

Mean RDW-CV of case group was 16.37±3.97% and of control group was 14.33±1.38% and difference was statistically significant with p-value of 0.0001. Only one such type study was found which was done by Zeeba Shamim Jairajpuri et al[7] with Mean RDW-CV of case group 16.4±4% and of control group 15.2±1.23% and difference was statistically significant with p-value of 0.001.

USG findings were as- splenomegaly in 50% cases and in 15% controls, Hepato- splenomegaly in 9% cases and in 2% controls. Our study correlates with study done by Ashwini Kumar Nigam *et al*[4] who found USG findings as- splenomegaly in 52% cases and in 14% controls, Hepatosplenomegaly in 7% cases and in 4% controls.

Fever was present in 100% of cases and controls, chills & rigors in 64% cases and in 58% controls, vomiting in 58% cases and in 60% controls, headache in 44% cases and in 16% controls, unconsciousness in 18% cases and in 12% controls. Our study well correlates with study done by Ketaki Motram Surve *et al*[14] who found fever in 100% of cases, chills & rigors in 52% cases and in 46% controls, vomiting in 51% cases and in 49% controls, headache in 36% cases and in 22% controls , unconsciousness in 15% cases and in 6% controls. 55% cases were positive for P vivax, 38% cases for P falciparum and 7% cases for both. Similar results were found by Dr Kalavathi GP *et al*[15] who found 57.14% cases positive for P vivax, 37.14% cases for P falciparum and 5.72% cases for both.

Conclusion

Overall the Hematological and Biochemical aspects of Malaria constitute a very interesting area. We observed that Hematological changes such as Anaemia, Leukopenia, Thrombocytopenia and Red Cell Distribution Width, Biochemical changes like- Hyperbilirubinemia, indirect bilirubin more than direct bilirubin, SGOT/SGPT ratio >1 (almost 1.5 time), Raised S LDH level & splenomegaly showed a statistically significant correlation with malarial infection. So these parameters can provide a diagnostic clue in a patient with acute Febrile illness in Malaria endemic areas thus increasing the probability of correctly diagnosing malaria and enhancing prompt initiation of Anti-malarial treatment. Because of limitation of resources and trained health personnel in much of the Malaria infested areas, presumptive clinical diagnosis seems a relevant option.

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