Comparative Study of Hematological Parameters in Different Species of Malaria

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ABSTRACT
Introduction:-Malaria is a widely prevalent parasitic disease caused by the plasmodium species. The parasite mainly infects the erythrocytes and causes various hematological abnormalities like anemia, thrombocytopenia. Our aim was to study various hematological changes in malaria.
Methodology:- The present Prospective Observational study was conducted in Central Pathology laboratory of a tertiary care hospital SGMH/ GMH, Rewa, M.P. Blood samples from 780 patients between the ages of 2 to 70 years of either sex with history of fever were tested for malaria. The investigations were performed based on clinical suspicion of malaria in the patients who were admitted with the complaints of fever, chills, rigor, headache, nausea, vomiting, weakness, drowsiness and confusion. The study was done over a 1& ½ year from February 2018 to August 2019.
Result: - Total 100 smear positive malaria cases were taken and various hematological parameters were studied. Out of 100 smear positive cases, P.vivax was positive in 72 cases while P.falciparum was positive in 24 cases. Out of 100 cases, P.vivax was the most common observed species. Next common was P.falciparum. Most of the cases (70%) were in the adults between 21-40 years age group. There were 25% of cases below 20 years of age group. In this study, we observed several significant changes involving hemoglobin, RBC count, Hematocrit, leucocytes and RBC Indices. Low hemoglobin was seen in 48(66.6%) cases of P.vivax and 18 (75%) cases of P. falciparum. In this study 25(25%) of patients had Low RBC count. In P.falciparum 13(54.2%) had decresed RBC count and 12(16.6%) cases of P. vivax had low RBC count.
 Conclusion: - This study concludes that P.vivax infection was more common than P.falciparum infection in our area. Both can cause significant hematological changes includes- anemia, thrombocytopenia and leucopenia. These hematological parameters can be used as a reliable diagnostic marker for supporting malaria in presence of peripheral blood smear negative for malaria.

Keywords: malaria, p.vivax, p.falciparum

INTRODUCTION

Malaria is a morbid disease of Tropical countries like India, is now of global importance, because, it is responsible for 1.5 to 2 million of deaths yearly in the world[1], and three fourth of cases were suffered in India amongst 2.48 million of malarial cases of South– East Asia.[2] In Tropical countries, where malaria is endemic, it is very essential to differentiate malaria from other viral or bacterial infections by symptoms and signs[3] to prevent future fatal complications, like cerebral, renal and gastrointestinal. Hence in these areas, unnecessary antimalarial treatment to treat the possible cases before diagnosis is one of the cause of drug resistance.[4] According to the World Malaria Report

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2017, in the year 2016, more than half of the population (698 million) was at risk of malaria. According to the Report, India accounted for 6% of all malaria cases in the world, 6% of deaths, 51% of the global P.vivax cases. The Report estimates the total cases in India at 1.31 million (0.94-1.83 million) and deaths at 23990.[5]

Aims & Objectives:-

1. To detect the incidence of P.vivax infection.
2. To detect the incidence of P.falciparum infection.
3. To detect the incidence of mixed infection.
4. To compare hematological parameters – Hemoglobin, RBC count, and Hematocrit in different species of malaria.

Material & Methods:-

The present Prospective Observational study was conducted in central pathology laboratory of a tertiary care hospital SGMH/ GMH, Rewa, M.P.

Blood samples from 780 patients between the ages of 2 to 70 years of either sex with history of fever were tested for malaria. The investigations were performed based on clinical suspicion of malaria in a patient who were admitted with the complaints of fever, chills, rigor, headache, nausea, vomiting, weakness, drowsiness, confusion. The study was done over a 1& ½ year from february 2018 to august 2019.

2 ml of blood was collected in EDTA containing vacutainer tubes and tested for malaria in the central pathology laboratory, SGMG/GMH, Rewa by the malaria antigen Rapid test. The test device is coated with monoclonal antibodies to histidine rich protein-2 (HRP-2) antigen specific for P.falciparum and polyclonal antibodies specific to Lactate dehydrogenase (p LDH) pan specific to all Plasmodium species.

5 µl of blood was taken with a disposable specimen loop provided with the kit and placed in the sample well. Four drops of the assay diluents were added into the diluents well and results interpreted after 20-30 minutes. The test was considered valid only if the control color band appeared. The presence of color line at Pf region along with the control line was considered as test positive for P.falciparum and appearance of color line at the Pv region was considered as test positive for P. vivax. Presence of three color bands was taken as mixed infection.

All the positive samples were further confirmed by microscopic examination of peripheral blood smear study using venous blood, collected in EDTA tube. The species of Plasmodium was diagnosed by microscopy of Leishman stained blood films. Both Thick and Thin smears were prepared and stained with Leishmans stain and grading of parasitemia was done.

Peripheral blood smear positive for malaria parasite was taken as a gold standard for the diagnosis of malaria.

Hematological investigations included study of Complete blood count, Total and Differential leucocyte count, RBC count, Hemoglobin (HB), Platelet count, Hematocrit (HCT/PCV) and red blood cell indices including Mean corpuscular volume(MCV), Mean Corpuscular hemoglobin(MCH) and Mean corpuscular hemoglobin concentration(MCHC). The complete blood counts were done with the automated three part differential counter.

Results:- In this study total 100 smear positive malaria cases were taken and various hematological parameters were studied. Most of the cases (70%) were in the adults between 21-40 years age group. There were 25% of cases below 20 years of age group.

Out of 100 smear positive cases, P.vivax was positive in 72 cases while P.falciparum was positive in 24 cases. Out of 100 cases, P.vivax was the most common observed species. Next common was P.falciparum.

**Table 1:- Distribution of species in Malaria positive cases (n=100)-**

S.NO.	Species	Number	Percentage
1.	P.Vivax	72	72%
2.	P.Falciparum	24	24%
3.	Mixed infection	04	04%
	Total	100	100%
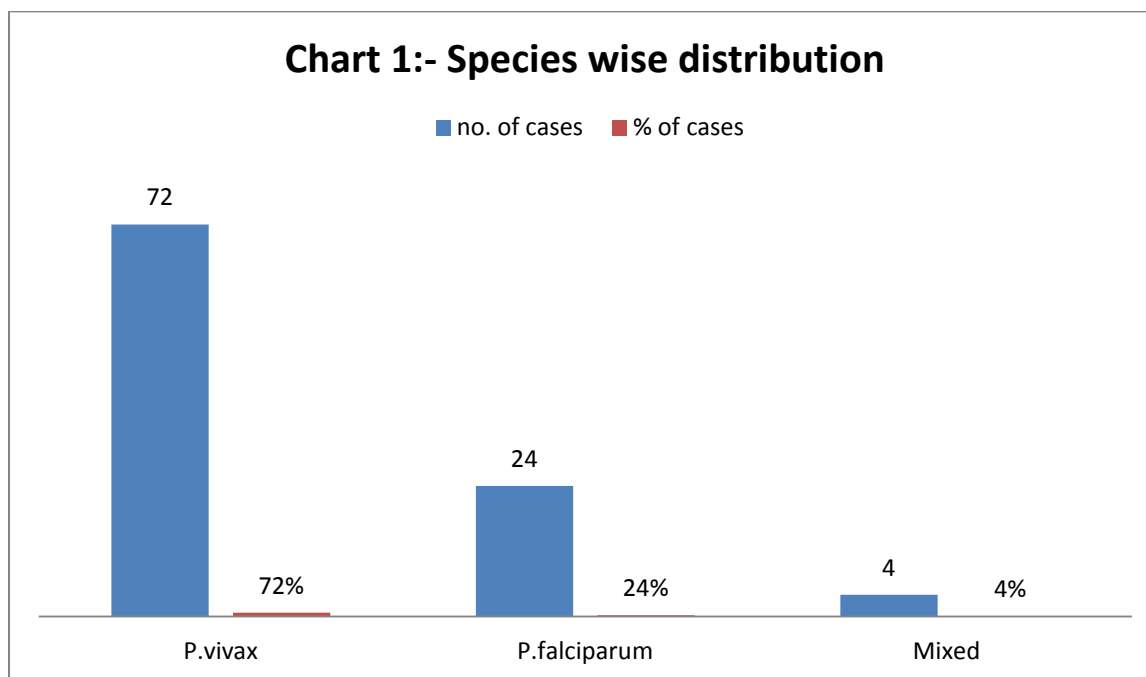
Chart 1:- Species wise distribution

Most of the cases (70%) were in the adults between 21-40 years age group. There were 25% of cases below 20 years of age group. Peoples of all age group were seen. Youngest was 8 year old male child while P.vivax infection and oldest was 45 year male with P.falciparum infection. Vivax cases were almost equal in both sexes while P.falciparum infections were found more common in male. Male:Female ratio was 1.5:1.

Table 2:- Comparison of Hemoglobin Concentration in different species of Malaria-

| Hemoglobin concentration	P. Vivax (n=72)	P. falciparum(n=24)	Mixed infection(n=4)	Total %
Anemia(Hb less than 12gm/dl)	48(66.6%)	18(75%)	01(25%)	67%
Normal hemoglobin(more than 12 gm/dl)	24(33.3%)	06(25%)	03(75%)	33%

Chart 2:- Comparison of Hemoglobin Conentration
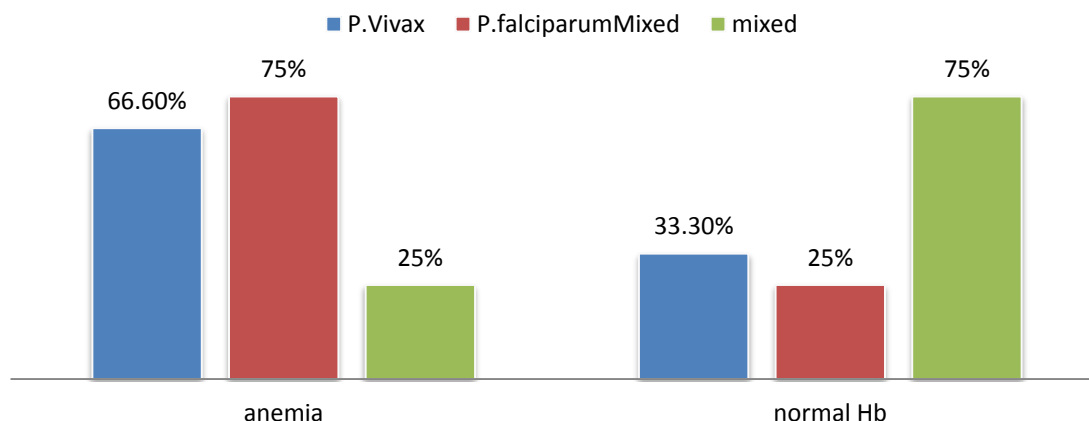
Table 3:- Comparison of RBC count in different species of Malaria-

RBC count	P.Vivax (n=72)	P. falciparum(n=24)	Mixed infection(n=4)	Total%
Low RBC Count(< 4 million/cumm)	12(16.6%)	13(54.2%)	01(25%)	26%
Normal RBC Count(4-6 million/cumm)	60(83.4%)	11(45.8%)	03(75%)	74%

Chart 3:- Comparison of RBC Count
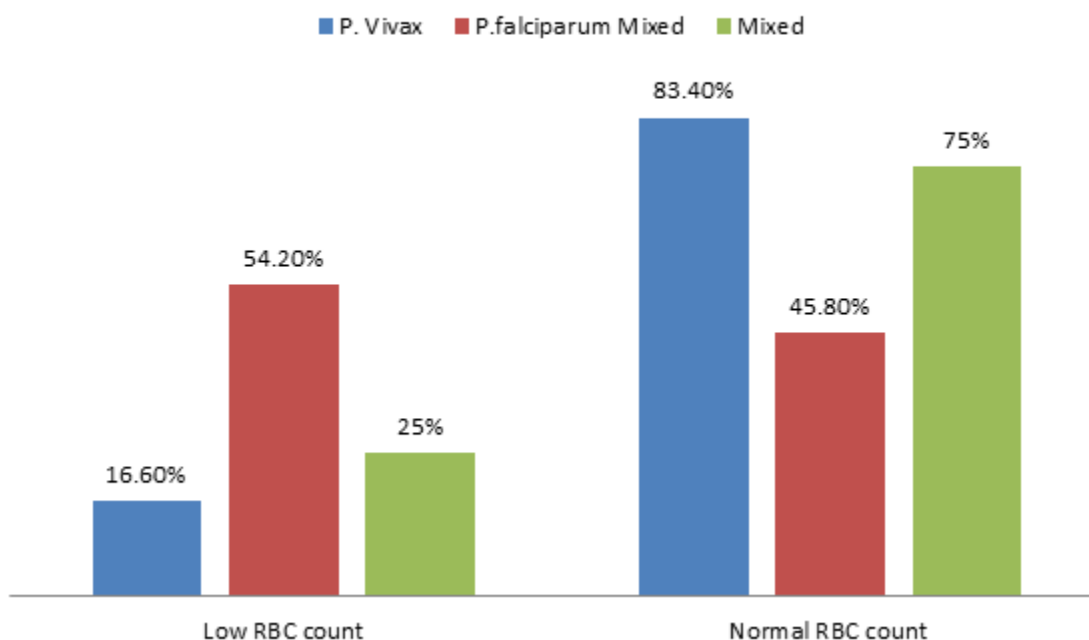
Table 4:- Comparison of Hematocrit (HCT)/Pack Cell Volume (PCV) in different species of Malaria-

Hematocrit	P.Vivax(n=72)	P. Falciparum (n=24)	Mixed infection (n=4)	Total % (n=100)
Low hematocrit (<40%)	48(66.6%)	17(70.8%)	01(25%)	61%
Normal hematocrit (40%-50%)	24(33.3%)	7(29.2%)	03(75%)	39%

Chart 4:- Comparison of hematocrit
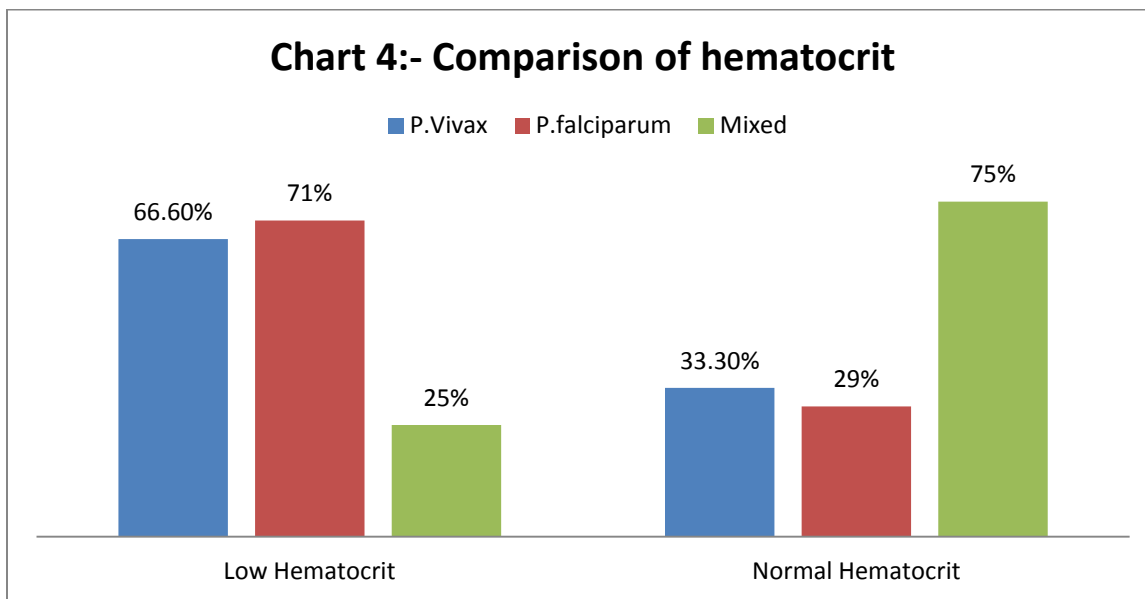
Discussion:-

The Present Study **''Comparative Study of Hematological parameters in different species of Malaria''** was conducted in the Central Pathology Laboratory, SGMH/GMH, Rewa (M.P.) from february 2018 to august 2019. During the period of 1 & ½ years, 100 cases had been studied. Results of present study were analyzed, on the basis of study conducted by other authors.

Table 6-Comparison of distribution of malaria species –

	Dr shamim akhtar et al study[6]	Dr subhashish saha et al study[7]	S. Sumthi study[8]	P.L. Prasad et al study[9]	Present study
P.vivax	36.48%	78.37%	92%	52.04%	72%
P.falciparum	52.71%	16.21%	8%	36.73%	24%
Mixed infection	10.81%	0.54%	0%	11.22%	4%

Table 7:- Comparison of distribution of anemia between different species of malaria-

	Hussain Haroon et al study[10]	Gaurav I patel study[11]	Rakesh ku. Yadav et al study[12]	Present study
P.vivax	18.8%	87.6%	80.7%	75%
P.falciparum	80.8%	87.1%	81.3%	66.6%
Mixed infection	0.45%	9%	73.3%	25%

In present study 26% cases show low RBC count and 74% cases show normal RBC Count. In case of P. Vivax show 16.6% cases, P.Falciparum shows 54.2% & Mixed infection shows 25% cases of Low RBC Count. **Agravat et al(2010)[13]** shows low RBC Count in 83.5% cases of P. Falciparum and 50.8% cases of P.vivax.

In present study total 61% cases show low hematocrit/pack cell Volume and 39% cases show normal hematocrit.In case of P.Vivax, P.Falciparum & Mixed infection 66.6%,70.8% & 50% cases show low hematocrit/Pack cell volume respectively. **Agravat et al (2010)[13]** shows 91% had low hematocrit/Pack cell volume and 9% had normal hematocrit/Pack cell volume. **Shraddha gondaliya et al (2015)[14]** shows low Hematocrit/Packcell Volume in 85.5% cases of P.Vivax & 90% cases of P. Falciparum

Conclusion:-

This study concludes that P.vivax infection was more common than P.falciparum infection in our area. Both can cause significant hematological changes. These hematological parameters can be used as a reliable diagnostic marker for supporting malaria in presence of peripheral blood smear negative for malaria.

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