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Study of Iron Status and Free Radical Activity in Plasmodium Falciparum and Plasmodium Vivax Malaria Infection

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ABSTRACT

The iron deficiency Anemia is one of the important complications in pathogenesis of Malaria. Oxidative stress plays an important role in the development of malarial anemia. Malaria turns out to be the major disease with the higher number of annual deaths. In a case control study, 51 subjects with Plasmodium Falciparum and Plasmodium Vivax malaria infection (aged 7 to 61 years) and 58 uninfected volunteer subjects (aged between 6-70 years) were screened. Iron status was evaluated using biochemical parameters like serum iron, total iron binding capacity, unsaturated iron binding capacity, transferrin saturation and hematological parameter like hemoglobin while lipid peroxidation product like malondialdehyde was used to enumerate degree of oxidative stress. Serum iron status was analyzed by using Atomic Absorption Spectrophotometer, Perkin Elmer Model 3030. Serum lipid peroxidation product like malondialdehyde was estimated by kei satoh method.

Significant alternations in above result were noted in both groups of malaria patients. Hematological parameters were found to be lower in malaria patients but not significantly. The serum iron, total iron binding capacity, unsaturated iron binding capacity, transferrin saturation were decreased significantly ($p < 0.001$) in both groups of malaria patients. Substantial rise in serum lipid peroxide was noted in plasmodium Falciparum malaria patients ($p < 0.001$).

Our finding suggest that reduction of iron and its related parameters were more likely due to dietary deficiency coupled with moderate amount of hemolysis. Increase in serum Lipid peroxidation was due to over activity of free radical, which corresponds with severely tissue damage. It is been hypothesized that iron and antioxidants supplementation provide beneficial effect to trim down the malarial anemia and oxidative stress.

Keywords : Malaria, Iron deficiency anemia, Lipid peroxidation

Introduction:-

Malaria is a disease caused by protozoa of the genus Plasmodium. It is a one of the oldest and greatest health problem in tropical and subtropical areas. Worldwide more than 300-500 million people are affected by malaria. 1 India contributes about 70% of malaria in the South East Asian region of WHO. Annually 2 million cases and 1000 deaths attributable to malaria. There is an increasing trend in the proportion of Plasmodium Falciparum as the agent. 2

Anemia is a major and pressing problem around the world. Recent who statistics indicate a worldwide prevalence of about 30% with higher figures in developing countries. Iron deficiency anemia is the main nutritional deficiency in the world. 3 Iron is an essential micronutrient necessary for transportation of respiratory gases via hemoglobin in the red blood cells. Iron also intervenes in the constitution of enzymatic systems such as peroxidase, catalase and cytochrome oxidase that play as essential role in cellular respiratory mechanisms in mitochondrial respiratory channel.

Iron status of human is affected by the quality of the diet, the physiological and pathological status. Many infections among others schistosomiasis, ankylostomiasis and malaria are able to modify iron status. 4 One of the major reason for development of malarial anemia seems to be oxidative stress 5 even as changes in micronutrient metabolism alter disease progression and severity. 6 Malaria parasite also stimulates certain cell in production of reactive oxygen species (ROS) thereby resulting in hemoglobin degradation. 7 Recently it is observed that free radicals play important role in the acute phase of malaria. Superoxide radicals is main reactive oxygen species (ROS) generated by malaria parasite which particularly attack on polyunsaturated fatty acid of the cell mem-

brane and damage the membrane structure. Peripheral blood phagocytes can be activated by plasmodium components in vitro to generate ROS. Circulating plasma lipids are therefore exposed to the oxidative stress and are vulnerable to ensuing lipid peroxidation. 8

The biochemical consequences in malaria are under estimated. It is known that free iron (Fe^{++}) is prooxidant and cause production of free radicals. The knowledge of iron in planning proper strategies in clinical management of the disease is imperative. The specific goal the study was to scrutinize the iron status and free radical activity in malaria patients.

Material and methods: -

This study was carried out in the Department of Biochemistry, Pad. Dr. V. Vikhe Patil Foundation's, Medical College & Hospital, Ahmednagar. On the basis of study and Prevalence of Statistics we have selected 109 subjects, out of which 58 subjects were regarded as age and sex matched healthy controls (aged between 6-70 years) and 51 were patients with malaria (aged 7 to 61 years). Patients have diagnosed by physicians on the basis of clinical finding and positive peripheral blood smear for malaria parasites. They had not also been on iron therapy or treatment. Blood samples were obtained from these patients after informed written consent. The study was approved by the institutional Ethics committee and almost care was taken during experimental procedure according to declaration of Helsinki 1964. All the controls with no history of any complication, having normal Hemoglobin level and no abnormality in clinical examination particularly in the context of the metabolic and nutritional disorders were included in the present study. None of the patients had evidence of Ischemic Heart Diseases, Rheumatoid Arthritis and any Malignancy etc. which could cause an increase oxidative stress.

Approximately 6 ml venous blood was collected by vein puncture from antecubital vein of the forearm of each subject under aseptic conditions and immediately divided into two portions. 3/4th part was placed in plain tube, allowed to clot at ambient temperature for 1 to 2 hrs. Serum was obtained after centrifuging at 3000 rpm for 10 minutes. Remaining 1/4th placed in an EDTA tube (yucca diagnostics) and gently mixed to prevent clotting. This was used for the determination of blood hemoglobin. All glassware's used for assays were similarly acid washed and rinsed with double deionised water to minimized contamination with iron.

Analysis of all the biochemical parameters were done using the chemicals of Qualigens fine Chemical co. Mumbai. Serum Iron and Total iron binding capacity (TIBC) were estimated by Atomic Absorption Spectrophotometer (AAS), Perkin Elmer Model 3030. Transferrin saturation and Unsaturated iron binding capacity (UIBC) were calculated by using values of serum Iron & TIBC. Hemoglobin of whole blood sample was estimated by Cyanomethemoglobin method using Drabkins reagent.^{9, 10, 11, 12} Serum lipid peroxidation products like malondialdehyde was estimated by kei satoh method.¹³

Values were expressed as mean \pm Standard Deviation and difference between control and test group were analyzed using unpaired students t-test with SPSS statistics software (version 10). Probability value of $P < 0.001$ was considered as the level of significance.

Result:-

“See Table 1 before References”.

For an overview of table 1 shows that age, male/female ratio of subjects, and mean values of the biochemical and hematological indices in malarial patients and control groups. Mean values of serum iron were significantly declined ($P < 0.001$) in malarial patients compared to healthy controls. The biochemical parameters in iron status such as TIBC, UIBC were significantly decreased ($P < 0.001$) in the plasmodium Vivax & plasmodium Falciparum malarial patients as compared with controls. Mean values of serum Transferrin saturation were also significantly lower ($P < 0.001$) in malarial patients as compared to controls. The mean values of hemoglobin were smaller in the plasmodium Vivax and plasmodium Falciparum malaria patients as compared with controls.

The table 1 also shows, mean levels of biochemical indices of free radical metabolism such as Serum Lipid peroxidation product (MDA) in the malaria patients and the controls. Significantly increased ($p < 0.001$) serum MDA was noted in malaria positive patients as compared to controls. The patients with Plasmodium Falciparum infection presented highest levels of MDA compared to Plasmodium Vivax malaria patients.

Discussion:-

After the general analysis of the result we have observed that serum Iron, TIBC, UIBC, Transferrin saturation were highly affected by malaria ($P < 0.001$). These differences seen between two groups of individuals (malaria patients and controls). Serum Iron was significantly reduced in plasmodium Vivax and plasmodium Falciparum malaria patients. Iron deficiency is prevalent in all age groups of any community on nutritional status, parasitic infection, dietary habits, and socio-economic factor.³ Previous studies have confirmed that, in chronic malaria, iron deficiency may be associated with an impairment hematopoiesis and other mechanism such as parasitic destruction of red cells and complement mediated immunohemolytic process.¹⁴ Das DB et.al. Reported that hemolysis is the prime cause of the iron deficiency in acute Falciparum malaria.¹⁵ The decline of serum iron level in malaria due to the dietary deficiency coupled with impaired absorption, Due to shifting of iron to other compartments or Hemoglobin released after red cell destruction undergoes polymerization to form β -hematin that is malaria pigments at acidic pH. ¹⁶ So released iron in hemolysis may be easily sequester in β -hematin and serum iron level decrease.

We have also noticed that malaria patients had low levels of hemoglobin. That is line with WHO data which consider hemoglobin as a true marker of iron deficiency anemia and that infants are more affected than adults.¹⁷ Low blood hemoglobin levels in cases of malaria have been reported by other workers such as Das B.S, Nanda N.K. et al.¹⁵ S. Abdulla found significantly decreased blood hemoglobin in plasmodium Falciparum malaria.¹⁸ Some workers have reported that by iron supplementation to malaria patients the hemoglobin levels recover within few days.¹⁹ Hemoglobin levels depend on hemoglobin synthesis, red cell maturation, release of red cell into circulation, immune mechanism or some nutritional defects. Hematological values were lower but not significantly in malaria patients indicating hemolysis, which was due to erythrocyte destruction to release malaria parasite. Both the factors i.e. hemolysis & Hemoglobin degradation by malaria parasite contribute for anemic status in malaria patients or some of the above possibilities could due to iron deficiency in malaria.¹⁸

TIBC is a measure of the maximum concentration of iron in serum bound to protein. Transferrin saturation is nothing but present of saturation value with iron. Menendez et al studied the effects of iron supplementation during pregnancy on the prevalence of anemia and malaria. It is found that TIBC was significantly lower in women who had recovered by iron supplementation.²⁰

Our study also revealed oxidative stress level assessed by biomarker of lipid peroxidation (MDA) in patients infected with plasmodium Falciparum and plasmodium Vivax malaria to be significantly higher than controls. Highly increased MDA Activity found in this study in malaria. This finding is in agreement with the finding of several previous studies where those with malaria parasite have been shown to have a higher MDA level.^{21, 22}

The oxidative stress originates due to destruction of red cells which cause imbalance between the generation of ROS and the antioxidant defense system. ⁸ Malaria parasite is sensitive to oxidative stress and the level of oxidative stress is influenced by the severity of malaria infection as measured from plasma parameters. ²³ which also agree with present study. The availability of free hemoglobin and iron could be involved in production of excess free radical by fenton reaction which enhance Lipid peroxidation in plasmodium Falciparum malaria.²⁴ Though oxidative stress destroys malaria parasites but may also render host tissue such as erythrocytes more vulnerable to oxidative damage and thereby resulting to anemia in malaria infected individuals. ²⁵

Finally from this biochemical studies it can be concluded that there was iron deficiency due to intake of iron deficient diet. In addition, the serum lipid peroxidation product like malondialdehyde level in human Falciparum malaria infection is significantly higher than Vivax malaria infection which indicates more oxidative stress in malaria and this can be corrected by proper dietary management. It is suggested that iron and antioxidants provide protection against malarial anemia and oxidative stress.

Table 1:- Shows Iron Status and Malondialdehyde level in Plasmodium Vivax and Plasmodium Falciparum malarial patients compared to controls

Parameters	Malaria Patients (n=51)		Controls (n=58)
	Plasmodium Vivax (n=29)	Plasmodium Falciparum (n=22)	
Age (Yrs.) (mean \pm SD)	18.11 \pm 1.1	15.98 \pm 1.0	24.08 \pm 1.58
Age Range	6 - 60	6-60	7-65
Male / Female Ratio	18/11	10/12	32/20
Iron (μ g%)	23.14 \pm 8.5*	49.50 \pm 15.9*	164.98 \pm 0.57
TIBC (μ g%)	120.25 \pm 35.19*	146 \pm 57.74*	392.94 \pm 46.51

Transferrin saturation (%)	17.9 ± 4.8*	31.11±4.4*	48.88±3.5
UIBC (µgm%)	98.85 ± 30.8*	112.2±28.9*	238.86±25.46
Hemoglobin (gm%)	11.30 ± 1.2*	10.64±3.00*	11.93±1.17
Lipid Peroxide (n mol/ml)	5.3 ± 0.1*	6.7 ± 0.01*	3.47 ± 0.7

The values are mean ± SD. *p< 0.001 highly significant compare to the controls.

REFERENCES

- Berman J.G., Alilio M.S., and Millo A. (2004). Conquering the intolerable burden of malaria: what new what's needed: A summary. *Am.J.Trop.Med.Hyg.* 1, 1-15. | 2. Dash A.P., Valecha N., Anvikar A.R. and Kumar A. (2008). Malaria in India: challenges and opportunities. *J. Biosci.* , 33, 583–592. | 3. Andrew M., Prentice, (2008). Iron Metabolism, malaria and other infections: what is all the focus about? *The journal of nutrition.* 138, 2537-2541. | 4. Gouado Inocent, Djuidje Marceline N., Pankoui M.J., Bertrand and Fotso K. Honore. (2008). Iron Status of malaria patients in Douala – Cameroon. *Pakistan Journal of Nutrition.* 7(5), 620-624. | 5. Upadhyay D.N., Vyas R.K., Sharma M.L., Soni Y. and Rajnee. (2011). Comparison in serum profile peroxidants (MDA) and non enzymatic anti oxidants (vitamins E and C) among patients suffering from Plasmodium Falciparum and Vivax Malaria. *J.PMI.* 25, 96-100. | 6. Singotamu L., Hemalatha p., Madhusudhan Chary and M. Seshachanyula.(2006). Cytokines and micronutrients in plasmodium vivax infection. *J.Med.Sci.* , 6, 962-967. | 7. Pardines B., Ramiandrason T., fusai A. Hammadi and Henry M et.al. (2005). Generation of free radical and enhancement of hemin induced member damage by a catechol iron chelator in plasmodium falciparum. *J.Biological sci.* , 5, 463-471. | 8. Mendis K., Sina B.J., Marchesini P. and Carter R. (2001). The neglected burden of plasmodium vivax malaria. *Am.J.Trop.Med.Hyg.* , 64,97-106. | 9. Olson A.D., Hanlin W.B. (1969). A new method for serum iron and TIBC by AAO. *Clin. Chem.* 15, 438. | 10. Buffone G.J., Lewis S.A., Tosefsohn M. (1978). Chemical and immunochemical measurement of total iron binding capacity. *Clin. Chem.* 24, 1788-1791. | 11. International committee (1978) for standardization in hematology the measurement of total and unsaturated iron binding capacity. *Br. J. Heamato.* , 38, 81-290, 291-294. | 12. Fielding J., (1980). Iron in, method in hematology J.D. cook.ed, New York, churchil levingstone. 15-43. | 13. Kai satoh.(1978). Estimation of lipid peroxide by thiobarbituric acid reactive substances (TBARS). *Clin. Acta*90; 37. | 14. Simon T. (1998). Low dietary iron availability is a major cause of anemia a nutrition survey in the lined district of trazania. *Am. J. Clin. Nutr.* 68, 171-178.18 | 15. Das B.S., and Nanda N.K. (1999). Anaemia in acute plasmodium falciparum malaria in children from Orissa state india. *Ann trop med parasitol.* 9(2),109-118.13 | 16. Menendez C., Kahiqua E., Hirt R. et. al. (1997). Randomised placebo controlled trial of iron supplementation and malaria chemoprophylaxis for prevention of severe anemia and malaria in Tanzania infants. *Lancet.* ,350, 844-850.19 | 17. Mungala-Odera V. Snow R.W.and C.R.J.C.Newton.(2004).the burden of the neurocognitive impairment associated with p.falciparum malaria in sub-saharan Africa.*Am.J.Trop.Med.Hyg.*,71,64-70. | 18. Abdulla S., Weatherall D.J., Wickramasinghe S. N. (1980). Annual journal of haematology. 46, 171-183.15 | 19. Stephanie A., Richard, Nelly zavaleta, Laura E., et.al. (2006).Zinc and iron supplementaion and malaria, diarrhea and respiratory infections in children in the Peruvian amazon.*Am.J.Trop.Hyg.* 75(1), 126-132. | 20. Menendez C., Todd J., Alonso P.L.(1994). The effect of iron supplementation during pregnancy given by traditional birth attendants on the prevalence of anemia and malaria. *Trans. Roy. Soc. Trop.Med. Hyg.* , 88, 590-593.16 | 21. Akanbi O.M., Badaki J.A., Adeniran and Olotu O.O.(2010). Effect of blood group and demographic characteristic on malaria infection,oxidative stress and hemoglobin levels in south western Nigeria. *Afr.J.Microbiol.Res.* 4,877-880. | 22. Idonije O.B., Festus O., Okhiai O., and Akpamu U.(2011). Comparative study of the status of biomarker of lipid peroxidation (Malondialdehyde) in patients with plasmodium Falciparum and plasmodium vivax malaria infection.*Asian journal of biological sciences.* , 4 (6), 506-513. | 23. Sibmoon N.,Yamanout P., Krudsood S. Leowattana W. G.,Brittenham G., et.al. (2004). Increased fluidity and oxidation of malarial lipoproteins :relation with severity and induction of endothelial expression of adhesion molecules. *Lipid Health Dis.* , 3, 1-5. | 24.Das B.S., Patnaik J.K., Mohanty S.(1993). Plasma antioxidant & lipid peroxidation products in falciparum malaria. *AM J.Trop. Med. Hyg.* , 49(6), 720-725. | 25 Egwunyenga A.O, Isamah G, and Nmorsi O. (2004).Lipid peroxidation and ascorbic acid levels in Nigeria children with acute Falciparum malaria. *Afr.J.Biotech.* , 3,560-563. |



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