

Assessment of Biochemical and Hematological Changes in Pregnant Malaria Patients and Pregnant Non-Malaria Women: A Comparative Study.

Anjali Agarwal¹, Mahavir Prasad Agarwal²

¹Principle Specialist, Department of Obstetrics & Gynaecology, District Hospital, Dhoulpur, Rajasthan, India.

²MD (Pathology & Microbiology), District Hospital, Dhoulpur, Rajasthan, India.

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ABSTRACT

Background: During state of pregnancy females are highly susceptible to infection which gravely affect both maternal and foetal outcome. At present, diagnosis of malarial parasite is basically by microscopic counting of the amount of parasites present in the red blood cells of the suspected patients. Therefore, the aim of the present study was to determine the alterations in hematological and biochemical parameters in pregnant individuals with malaria and pregnant subjects without malaria. **Methods:** The present prospective study was conducted in Department of Obstetrics & Gynecology, District Hospital, Dhoulpur, Rajasthan, India. All the subjects with typhoid were ruled out using widal test. Subjects with no evidence of parasite on smear examination were excluded from the study. All the subjects were given a predesigned questionnaire to obtain information about the demographics, age and residential status. Anticubital vein was used to withdraw blood samples in completely sterile manner. All the data was arranged in a tabulated form and expressed as mean +/- Standard deviation. Unpaired student t test was used as a test of significance. **Result:** The study enrolled a total of 50 subjects, of which 25 had malaria and 25 were controls. The mean transferrin level in Group I and Group II was 3.23 ± 0.55 and 4.62 ± 0.55 . There was a significant difference between the two groups. Total serum cholesterol and triglycerides level showed a significant difference between the two groups. **Conclusion:** In our study, serum iron level, transferrin level and triglyceride and cholesterol showed a significant difference between the two groups.

Keywords: Biochemical, hematological, pregnancy.

INTRODUCTION

During state of pregnancy females are highly susceptible to infection which gravely affect both maternal and foetal outcome.^[1] The chances of adverse outcome like prematurity, death, spontaneous abortion and stillbirth can upsurge during malarial attack (World Health Organization, 1993). Apprehension has been expressed as according to most studies conducted in sub-Saharan Africa, which show that approximately 25 million pregnant females are at risk of Plasmodium falciparum infection every year and one in four Females have placental infection at the time of birth.^[2] According to a study in South-east Nigeria, the incidence of malaria and anemia was found to be 215 and 327 per 1000 pregnant females respectively whereas the incidence of anemia due to malaria was

observed amongst 571 per 1000 pregnant women.^[3] Managing malarial infection amongst pregnant females is challenging to public health especially due to the emergence of resistance strains to antimalarial drugs. This is due to the danger involved in the management of pregnant females with most anti-malarial drugs. frequent infection, amongst people in malaria endemic regions has impacted partial immunity to the disease. Unfortunately, pregnant females who lose much of this immunity while pregnancy are at elevated risk of malaria.^[4] At present, diagnosis of malarial parasite is basically by microscopic counting of the amount of parasites present in the red blood cells of the suspected patients. Quite frequently a subject may have symptoms of malaria like chills, fever, and splenomegally but the laboratory results and investigation may not be able to confirm the diagnosis due to absence of appropriate tools for malarial parasite detection.^[5] Therefore, the aim of the present study was to determine the alterations in hematological and biochemical parameters in pregnant individuals with malaria and pregnant subjects without malaria.

Name & Address of Corresponding Author

Dr. Mahavir Prasad Agarwal,
MD (Pathology & Microbiology),
District Hospital, Dhoulpur,
Rajasthan, India.

MATERIALS AND METHODS

The present prospective study was conducted in Department of Obstetrics & Gynecology, District Hospital, Dhoulpur, Rajasthan, India. The study included subjects between 20-45 years of age. Ethical committee clearance was obtained by the institutional ethical board and the subjects were informed about the study and a written consent was obtained from all in their vernacular language. Subjects presenting with the symptoms of malaria like headache, fever, weakness and nausea were included. All the subjects were confirmed having malaria by the detection of Plasmodium falciparum parasite via microscopic smear examination. All the subjects with typhoid were ruled out using widal test. Subjects with no evidence of parasite on smear examination were excluded from the study. Females with past iron therapy of on hematinic drugs for 1 month were also excluded from the study. Healthy pregnant females without malaria were categorized into controls. All the subjects were given a predesigned questionnaire to obtain information about the demographics, age and residential status. Anticubital vein was used to withdraw blood samples in completely sterile manner. It was divided into two parts. One part was used for the estimation of the iron levels and the other half was used for hemoglobin estimation. Estimation of serum transferrin level and iron binding capacity was done indirectly. Method given by Dogmas et al was used for estimation of serum protein. Cyanomethemoglobin method was used for estimation of hemoglobin level. All the data was arranged in a tabulated form and expressed as mean +/- Standard deviation. Unpaired student t test was used as a test of significance. Probability value of less than 0.05 was considered as significant.

RESULTS

The study enrolled a total of 50 subjects, of which 25 had malaria and 25 were controls. The mean age of the subjects was 30.53 ± 3.44 in Group I and 29.79 ± 6.81 years in Group II. The age range in Group I and Group II was 19 – 41 years and 20 – 42 years respectively. The mean gestational age in Group I and Group II was 13.6 ± 0.86 years and 13.4 ± 0.75 years respectively. There was no significant difference in the demographic between the two groups. [Table 1]

[Table 2] shows the hematological parameters amongst the study subjects. The mean transferrin level in Group I and Group II was 3.23 ± 0.55 and 4.62 ± 0.55 . There was a significant difference between the two groups. The total iron binding capacity and serum iron also showed a significant difference between the two groups. The transferrin saturation in Group I was 26.31 ± 6.34 and in Group II was 25.79 ± 3.38 . There was no significant

difference in the transferrin saturation and hemoglobin levels between the groups.

[Table 3] shows the biochemical parameters amongst the study subjects. The mean serum proteins level amongst the Group I subjects was 6.51 ± 1.02 and amongst Group II subjects was 6.21 ± 0.61 . There was no significant difference between the two groups. Total serum cholesterol and triglycerides level showed a significant difference between the two groups. Triglyceride level amongst Group I subjects was 1.16 ± 0.30 .

Table 1: Demographic characteristics of the subjects

Variable	Pregnant non-malaria subjects (Group I)	Pregnant malaria subjects (Group II)	P value
Age (Mean +/- SD)	30.53 ± 3.44	29.79 ± 6.81	>0.05
Range (years)	19 - 41	20 - 42	>0.05
Gestational age (Mean +/- SD)	13.6 ± 0.86	13.4 ± 0.75	>0.05
Range (years)	12 -16	12 - 13	>0.05

Table 2: Hematological parameters amongst the study subjects

Parameter	Pregnant non-malaria subjects (Group I)	Pregnant malaria subjects (Group II)	P value
Transferrin (g/L)	3.23 ± 0.55	4.62 ± 0.55	<0.05
TIBC ($\mu\text{mol/L}$)	81.70 ± 11.72	112.43 ± 14.13	<0.05
Serum Iron ($\mu\text{mol/L}$)	21.35 ± 2.42	29.65 ± 2.67	<0.05
Transferrin saturation (%)	26.31 ± 6.34	25.79 ± 3.38	>0.05
Hemoglobin (g/100 ml)	11.61 ± 1.42	11.93 ± 1.38	>0.05

Table 3: Biochemical parameters amongst the study subjects

Parameter	Pregnant non-malaria subjects (Group I)	Pregnant malaria subjects (Group II)	P value
Serum protein (g/100ml)	6.51 ± 1.02	6.21 ± 0.61	>0.05
Total serum cholesterol (mmol/L)	2.98 ± 0.70	4.29 ± 1.20	<0.05
Triglycerides (mmol/L)	1.16 ± 0.30	1.55 ± 0.39	<0.05

DISCUSSION

Pregnancy is a condition that carries a lot of stress and physiological changes in the female physiological functioning. A female has to undergo through different hormonal imbalances during that period. It is further complicated by the presence of infection occurring during that period. The only method of detection of malarial parasite is through microscopic smear examination. Often it has been seen that in complicated malaria the malarial parasite

is present deep in the tissues and hence can often go undetected. So, there is a requirement to come up to biochemical and hematological investigations that can help detect the presence of malaria in such patients. So that maternal outcome can be improved. The present study was conducted with the same aim. Different studies have shown alterations in hematological Indices like serum transferrin and iron concentration amongst humans with hemolytic anemia as commonest complication of malaria.^[6,7] In our study, the mean transferrin level in Group I and Group II was 3.23 ± 0.55 and 4.62 ± 0.55 . There was a significant difference between the two groups. The total iron binding capacity and serum iron also showed a significant difference between the two groups. The transferrin saturation in Group I was 26.31 ± 6.34 and in Group II was 25.79 ± 3.38 . There was no significant difference in the transferrin saturation and hemoglobin levels between the groups. As per the study by Mendez et al.^[8] have shown elevated serum transferrin levels and increased concentration of transferrin receptors amongst subjects with malaria parasitaemia. Transferrin plays a key role in metabolism of iron and is also crucial for carrying iron in blood of all the vertebrate species. Iron supplementation during pregnancy favors better maternal and foetal outcome.^[9] It plays a pivotal role in defense mechanism of the body against infectious agents.^[10] Malaria affects the pharmacokinetics of iron metabolism, level of hemoglobin and serum protein level. This can be considered as iron from haemoglobin formed by lysis of red blood cells during the course of malaria attack is transported in bound form with transferrin, while the globin portion of the hemoglobin degraded into amino acids for proteins synthesis. In our study, the mean serum proteins level amongst the Group I subjects was 6.51 ± 1.02 and amongst Group II subjects was 6.21 ± 0.61 . There was no significant difference between the two groups. Total serum cholesterol and triglycerides level showed a significant difference between the two groups. Triglyceride level amongst Group I subjects was 1.16 ± 0.30 . Alterations in various other parameters in malaria have also been seen.^[11] Elevation in cholesterol and triglycerides have been seen as indicators of the malarial severity in retrospective study conducted by Parola et al. (2004).^[12] The present study contained fewer subjects and elaborative descriptive study needs to be conducted to determine the exact reference range amongst pregnant females with malaria.

CONCLUSION

From the above study we can conclude that hematological and biochemical parameters may act as useful parameters in detection of malaria amongst pregnant females with parasite deep in the tissues that are difficult to detect using microscope. In our

study, serum iron level, transferrin level and triglyceride and cholesterol showed a significant difference between the two groups.

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