ORIGINAL RESEARCH PAPER

Pathology

"ASSOCIATION OF ABO BLOOD GROUP AND MALARIA IN A TERTIARY HEALTH CARE CENTRE"

KEY WORDS: ABO blood group, *Plasmodium falciparum, Plasmodium vivax,* febrile

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ABSTRACT

Malaria is a mosquito borne disease caused by the plasmodium parasite. It is transmitted to human through the bite of the Anopheles mosquito and Multiplies in the host liver cells before infecting and destroying red blood cell. Malaria parasite spends a substantial part of life cycle invading red blood cells and growing within them, they have evolved specific receptor - ligand interactions to facilitate RBC binding.

The interplay between malaria parasite and blood group antigen remain a fascinating subject with potential to contribute to the development of new intervention to reduce the global burden of malaria.

In this study we tried to assess the distribution of ABO blood group and its relationship with malaria among febrile patients who attended Assam Medical College and hospital over a period of one year and this study showed that 'B' group is more prone to the infection followed by 'O', 'A' and 'AB' group respectively.

From this study we have found that 39 (26%) febrile patients were found to be infected with Plasmodium parasites, amongst which 61.5% were males and 38.4%were females, of these 74.3% and 17.9% were found to be infected with P. falciparum, and P. vivax respectively, The present findings indicate that males are more susceptible to malarial infection than female and P. falciparum is the commonest type of plasmodium infection in this region beside this the prevalence of malaria was found to be the highest among young adults as compared to children and the elderly patients

1.Introduction :

Malaria is endemic in North East india and P. falciparum is the most predominant species, of the total burden of malaria in India, north east states contribute 10% of Malaria, 11% of P. falciparum cases and 20% of malaria deaths[1]. Gradually the transmission of P. falciparum is seen to occur throughout the year from post monsoon season to extreme winter to spring to summer[2].

Malaria transmission in North Eastern region is governed by many climatic and physiological risk factors[3]. Lot of work related to malaria epidemiology and control is reported from Assam[4]. In Assam malaria cases are detected throughout the year and peaks during the rainy months. During this period malaria is seen in all age groups.

Malaria parasite passes a significant period of its life inside the red blood cell. Therefore many red cell proteins and their genes were studied for polymorphic variants which offer protection against malaria.

A number of studies were conducted to investigate the association between ABO blood group system and some disease conditions[5]-[10]. The ABO blood groups consist of A, B and H carbohydrate antigens which can regulate protein activities during infection and antibodies against these antigens[11],[12]. Some of these studies reported significant associations, suggesting that ABO blood groups have an impact on infection status of the individuals possessing a particular ABO blood group[5]-[8].

It is known that parasitized RBCs form rosettes. They are formed more readily with either A, B or AB groups than with those belonging to O group[13]. However contradictory conclusions have been drawn by various groups working on the effects of ABO blood groups on different forms of malaria which have been reviewed by[1] and Uneke (2007). Preliminary evidence suggested that group A might be detrimental and group O protective (Pahirana et al 2005). Two recent case control studies have shown that blood group O confers resistance to severe malaria [14,15].

2. Materials and methods :

2.1. Study area and population :

A total of 150 febrile outpatients were subjected to do malarial test and exclusion criteria was as follows: individuals who took antimalarial drugs within two weeks before blood test and who refused to participate in the study. The target populations were almost from the same ethnicity

2.2. Ethical Clearance:

Ethical clearance was received before start of the study from Institutional Ethics Committee for Human Research

2.3. Clinical and laboratory diagnosis :

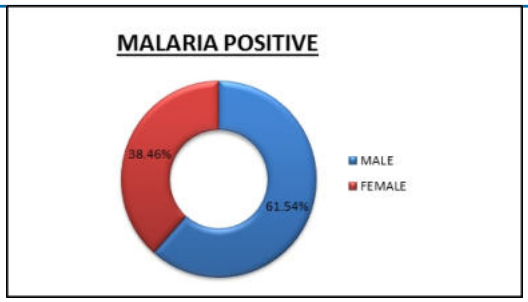
Before collecting blood sample, explanation about the study was given and a written informed consent was obtained from every participant and in the cases of children guardians consent was taken. Blood samples were collected both for ABO grouping and serum grouping in EDTA vial and clotted vial respectively, the blood film was stained with Giemsa. Finally, the films were examined under an oil immersion microscope objective for the presence of the parasite. Malaria *optiMAL kit* test was also performed for rapid diagnosis of *Plasmodium vivax* and *Plasmodium falciparum*

parallelly along with the blood examination the blood groups of the study participants were determined by tube method, using agglutinating A and B and AB Monoclonal ERYCLONE® anti-sera.

Result :

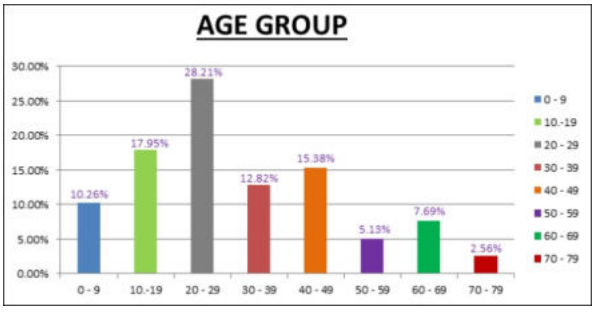
A total of 150 outpatients who attended with fever at Assam Medical College were examined for malaria and also tested for ABO blood groups for a period of one year (November 2016to November 2017). The blood specimens were collected in EDTA vial, stained with Geimsa, and examined microscopically. Positive cases of the parasitemia were counted. ABO blood groups were determined by agglutination tube method using Eryclone antisera, and serum grouping using blood pool cells for further confirmation.

Figure: 1 Sex Distribution of Malarial Patients



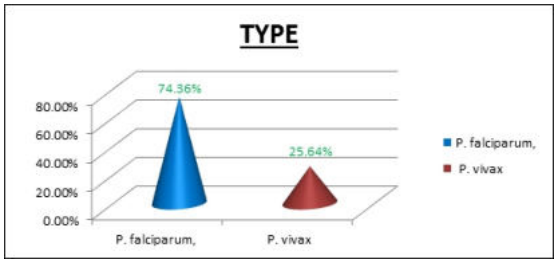
Out of a total of 150 participants, 39 (26%) febrile patients were found to be infected with *Plasmodium parasites,* among which 61.5% are male and 38.4% are female.

Figure 2: Age Distribution of Malarial Patients



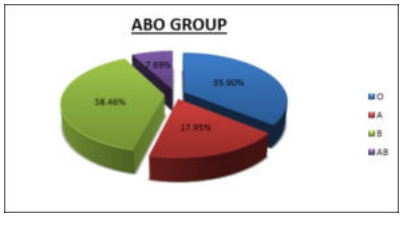
20-29 age group is predominantly found to be infected with malaria parasite.

Figure 3: Type of malaria infection



This bar diagram indicates that 74.3% and 17.9% are infected with *P. falciparum,* and *P. vivax respectively,*

Figure 4: ABO Blood Group Distribution



This Pie diagram shows the phenotypic frequency distribution of blood groups 'B' was found to be highest at 38.4% followed by 'O' 'A' and 'AB' 35.8%, 17.9 %, and 7.6% respectively

Pictures:

Gametocytes

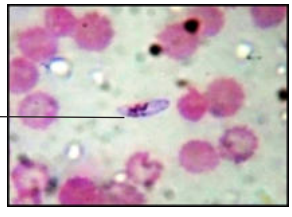


Figure 5: Blood smear showing P. falciparam

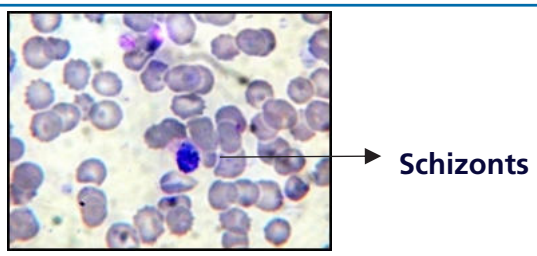


Figure 6: Blood smear showing P. vivax

Discussion:

Blood groups are hereditarily determined for which they are found to be associated with susceptibility of malaria with a particular blood group[20] . The present study comprises of 39 cases of malarial infection with mean age of 20.5 years and shows high percentage of B blood group phenotype was observed among the study participants followed by O , A , and AB. This agrees with some previous studies that also reported high frequency of group 'B' and 'O' and low frequency of group 'A' phenotypes in tropical regions where malaria is rampant [16]-[18s]

On the other hand, other studies reported high prevalence of blood group 'A' and low prevalence of blood group 'O' phenotypes [16],[20]. Hence, the present finding seems to contradict the hypothesis about a selective survival advantage of P. falciparum infection on blood group 'A' cells compared with other blood group types (O, B or AB) in areas where malaria is endemic[19].

The findings of the study matches with the reports of Gupta & Chowdhuri , where they also had observed a higher incidence of malaria in group 'B' individuals. [21]

The higher percentage of 'O' blood group after 'B' group was obtained in this study was in line with the findings of Fisher and Boone [22] where the study shows higher percentage of group 'O' phenotype in tropical regions where malaria is prevalent It has been observed that malaria was detected mostly in males than in females which were consistent with the findings of most Malariologists. The age of the youngest malaria infected patient in the study was found to be 3years and eldest one was 73 years. The young adults of age group of group 20-29 had the highest prevalence of malaria infection.

The results of our study suggest that subjects with different blood groups have different susceptibilities to malarial infection.

Conclusion:

Several studies have been carried out on blood group antigen and malaria parasites and lead researcher to understand the how malaria parasites interact with their human host and various studies also have reported the association of ABO groups in India. But no studies are available from this part of country. ABO groups are genetically controlled for which relatively large data is required to compare with severity of the infection The present study has some major limitations such as small sample size, lack of information on types of malaria infection and level of clinical severity caused by *Plasmodium falciparum.*

Nevertheless, the present paper paves a way for further investigation on the role of host immunological properties with respect to pathological progression as well as regression of malaria parasite covering large samples especially of Indian tribal communities. In addition to the above, the underlying social and environment factors contributing to outbreak of malaria in the community have to explore. The timely attention of the concerned authorities could be drawn for prevention and eradication of such diseases.

It is presumed that blood groups are genetically determined and thus cannot be modified so it is imperative and of paramount importance to look upon the factors like environmental

determinants responsible spreading of malaria.

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