ABO BLOOD Group System as a Prognostic Indicator in Falciparum Malaria of Paediatric age Group

Dr. Satyajit Bagudai [1], Dr. Budhia Majhi [2], K.Satyanath Reddy[3]

ABSTRACT

Background: The association of ABO blood group with different diseases was being reported from time to time. Recent works from different parts of the world have shown that O blood group is less prone and AB and B group is more prone to develop severe falciparum malaria than other blood groups. In this part of India where there is a very high prevalence of P. *falciparum* malaria in Pediatric age group, this study was conducted to find if there is any association existing between ABO blood group and severe falciparum malaria. **Material and Method:** In this tertiary care hospital based case control study, we took 309 cases of diagnosed falciparum malaria Paediatric cases. 163 healthy controls were screened for ABO blood group. Clinical manifestations of the patients were recorded and classified as severe / complicated according to the WHO criteria. Statistical analysis was done to find out the P value and Odds ratio. **Results:** Frequency of severity in 'O' blood group patients was lower than A and B blood groups. Blood group B was significantly associated with severity when compared with uncomplicated ($P<0.05$, OR=0.56) and healthy controls ($P<0.05$, OR=0.56). Prevalence of O group in uncomplicated ($P<0.001$, OR=13.32) and healthy controls ($P<0.005$, OR=0.50) was significantly high compared to severe variety of O group. **Conclusion:** This study shows a relative immunity of O group for the severity of *falciparum* malaria and relative high propensity of B blood group for the severity of *falciparum* malaria in the pediatric age group in the southern Orissa.

Keywords: ABO blood group, P. *falciparum* malaria, pediatric subjects

[1]Tutor, Department of Physiology, [2]Assistant Professor, Department of Pediatrics
M.K.C.G Medical College, Berhampur, Orissa, India.
Corresponding author mail: sbagudai@gmail.com

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INTRODUCTION

The ABO blood group system is the best known as well as the most important system for blood group compatibility in clinical practice. There are a number of literature which associates ABO antigen with different diseases like sickle cell anaemia, gastric & salivary cancer [1,2,3] etc. Recently there are some reports[4, 5,6,7,8] showing a survival advantage of O group individuals in severe falciparum malaria cases. As Plasmodium falciparum malaria has remained as a potential killer disease in our country & to the best of our knowledge ,there are very few data existing in our country especially in paediatric age group patients which can show the relationship between p, falciparum malaria and ABO blood group, we started this study with an objective to find out if there is any survival advantage of O group in severe falciparum & any blood group is having a higher propensity for severe *falciparum* malaria in this part of the world.

MATERIALS AND METHOD

In this hospital based case control study with a prior permission from the institutional ethical committee, we took 309 cases of diagnosed falciparum malaria of paediatric age group (slide positive) from the department of paediatrics of MKCG medical college between Oct-Dec 2011. Under Leishman stain, peripheral smear examination was done for the type of malaria parasite and blood group assessment was done with the help of known antisera. Clinical manifestations of the patients were recorded and classified as severe / complicated according to the WHO criteria[10]. Uncomplicated and healthy children served as our control. Statistical calculation was done to find the P value and OR.

Exclusion criteria: Subjects associated with any bacterial infection (confirmed by specific tests) were excluded from the study.

RESULTS

Frequency of severity in ‘O’ blood group patients was lower in comparison to the severity in ‘A’ and ‘B’ blood group. Blood group B was significantly associated with severity when compared with uncomplicated ($P<0.05$, OR=0.56) and healthy controls ($P<0.05$, OR=0.56) of the group ‘B’. Prevalence of ‘O’ group in uncomplicated

(P<0.001, OR=13.32) and healthy controls (P<0.005, OR=0.50) was significantly high compared to severe malaria of O group (Table 1).

Table 1: Prevalence of ABO blood group in diff. P. falciparum malaria categories and healthy controls

Blood group	Severe malaria (n=160)	Uncomplicated malaria (n=149)	Healthy control (n=163)	Severe Vs uncomplicated P value, OR	Severe Vs healthy control P value, OR	Uncomplicated Vs healthy control P value, OR
O	54 (34%)	81 (55%)	82 (51%)	Ref.	Ref.	Ref.
A	52 (32%)	21 (14%)	29 (17%)	<0.001, 0.26	<0.001, 0.36	<0.5, 1.36
B	50 (32%)	42 (28%)	43 (27%)	<0.05, 0.56	<0.05, 0.56	>0.5, 1.01
AB	04 (2%)	05 (03%)	09 (05%)	>0.5, 0.83	>0.5, 1.48	<0.5, 1.77
Non O (A+B+AB)	106 (66%)	68 (45%)	81 (49%)	<0.001, 13.32	<0.005, 0.50	<0.5, 1.17

DISCUSSION

In our study population, out of 160 nos of severe *falciparum* malaria cases, 34 % (n = 54) cases were 'O' blood group in nature. This percentage is less in comparison to the number of 'O' group patients of uncomplicated (55%) and healthy control (51 %) variety. But the percentage of 'A' & 'B' group severe patient were more (32%each) than their uncomplicated (14% & 28 %) and healthy counterparts (17 % & 27 %), which shows the more propensity of *falciparum* severity in this blood groups. When we compared severe group with uncomplicated variety as well as severe group with healthy control taking O group as the reference,we found both 'A'and 'B' group has a statically significant association (<0.001 for 'A' and <0.05 for 'B') as well as high odds ratio (.26 and .36 for 'A' and .56 for 'B'). The value of odds ratio was higher for 'B' blood group, which gave us an indication that the strength of association of severity with 'B' group was more than even 'A' group. This supports the findings of Pathirana et al[5] and Panda et al[8]. We also

compared the severity between 'O' group with all non 'O' group & found that there is a statistically significant association ($P < 0.001$) exists where O group association with uncomplicated and healthy variety is more than the severe variety with a high odds ratio (13.32). This shows the protection of 'O' group against the severity of falciparum malaria similar to the findings by other researchers[4, 5, 7]. So prognostically a better situation exists in 'O' group paediatric patients, since severity is always associated with mortality in P. *falciparum* malaria. Similarly with an increased risk for development of severe malaria, a blood group B paediatric patient remains in a prognostically bad condition.

The influence of P. *falciparum* infection on the relative proportion of ABO antigen is mutually complex. Malaria is known who have affected many erythrocyte genes including those concerned with globin synthesis, membrane proteins, and RBC enzymes. With a high degree of importance of RBC in malaria, there is a strong possibility of the influence of malaria on the antigen of RBC membrane. It has been found that the world wide prevalence of group 'O' parallels with malaria region. This again gives a possibility that a single point mutation of the RBC membrane protein gene may be favoring 'O' group for the survival against P. falciparum. So though we have found out a relationship between blood group and severe falciparum in our part of the world, more studies are required from different parts of the globe, may be with higher sample size to investigate further and arrive at a definite conclusion.

CONCLUSION

In our study when we compared the association of different blood groups of paediatric falciparum patients with severity of disease, we found that the blood group B has the strongest association with the severity of the disease, which is also statistically significant. The second strongest association was of blood group 'A', which is statistically significant. The prevalence of 'O' blood group with severe falciparum was less in comparison to 'A' and 'B' blood groups. From these findings we conclude that there is a relative high chance of severity of falciparum malaria in 'B' blood

group and a relative protection of 'O' group in comparison to other blood groups in paediatric age group.

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