

Association of Dengue Disease with ABO RH Blood Group

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ABSTRACT

Background: Dengue viral infection is a global public health issue. Several viral and other host factors are the contributed factors including the ABO blood group for transmission of dengue virus (DENV). ABO blood groups have been shown to involve in the intensity of DENV. This study aims to find the association ABO and Rh blood group with DENV infection.

Methods: This cross-sectional study was conducted in tertiary care hospital. All DENV NS-1 positive patients were included irrespective of age and gender. The blood group of all DENV-infected patients was determined through ABO and Rh anti-sera (forward blood grouping). Descriptive data were analyzed through SPSS and Microsoft Excel.

Results: Among a total of 105 dengue-infected patients, male were 68 patients and female were 37 patients. The highest number of cases were found in the age group 21-30 years and 11-20 years. The predominant blood group was found A positive in dengue viral infected patients while AB negative blood group was found common in Rh negative blood groups.

Conclusion: Blood group A positive and AB negative patients in Rh positive and Rh negative blood groups had more risk of dengue viral infection as compared to other blood groups. Further studies are necessary to find the severity of patients with different blood groups. Based on their differential distribution in the community and their correlation with mosquito performance, it can be deduced that the risk of contracting dengue infection differs with the ABO and Rh blood groups. Additional study is necessary to determine whether HLA, dengue serotype, and ABO are experimental/predictor factors, and whether certain blood subgroups are associated with a disproportionately higher risk of dengue virus infection.

Keywords: Dengue viral infection, Serotype, Anti-A, Anti-B, Anti-D, ABO, Rh blood group

INTRODUCTION

Although DENV infections can also be asymptomatic, the four DENV serotypes can cause a wide range of illnesses in people. From undifferentiated acute febrile sickness, or classical dengue fever (DF), to the fatal disorders DHF/DSS, the illnesses vary in severity¹. being a member of the genus *Flavivirus* and family *Flaviviridae*. Malaria virus. *Aedes* mosquitoes like *Aedes albopictus* and *Aedes aegypti* transmit these positive-sense single-stranded RNA viruses to people. Around 50% of the world's population is susceptible to contracting this arboviral disease².

DENVs are transmitted in the Eastern Mediterranean, America, South-East Asia, the Western Pacific, and Africa, with new cases emerging and spreading to non-endemic locations in the United States and Europe³. There is no specific treatment in the form of drugs or vaccines for dengue fever⁴. Early and quick diagnosis is important for the management of infected patients⁵. These are dependent on the laboratory tests and clinical manifestations which is used in the prognosis and diagnosis of dengue-infected patients⁶. Several factors could affect dengue severity such as genetics, age, gender, viral strain, nutritional level, and secondary infections⁷. Genetic factors such as ABO blood group and human leucocytes antigen (HLA). It is observed that different ABO blood groups differ in their resistance or susceptibility to bacterial, viral, and other infectious diseases⁸. In the year 1960, Kaipainen and Vourinin developed an association between ABO blood groups and different diseases⁹. Reported studies suggest that blood groups are associated with cancers, infectious diseases, and cardiovascular diseases⁹. In the year 1917, the relationship between blood group and tuberculosis was published⁹. Other studies also show that cholera, *E. coli*, *H. pylori*, and malaria infections are also related to ABO blood groups^{10, 11}.

A few reports also focused on the relationship between blood groups and dengue infection^{6, 12}, whereas some reported studies also show that high prevalence of dengue in specific blood group patients^{13, 14}. Moreover, some studies also suggested that blood groups are associated with the severity of dengue^{15, 16}.

The human ABO and Rh blood groups were then thought to have a connection to dengue.

One of the dengue-related susceptibility factors may be blood type. When determining an infection's susceptibility, blood group

antigens are helpful. Blood types are distributed differently depending on the population. Proper preparation for the challenge can motivate us to take proactive action, and this can only be done by conducting numerous studies on the problem. Therefore, this study was conducted to determine the association between blood group and dengue in our region which can prove vital for the prevention and management of dengue viral infection.

MATERIALS AND METHODS

This cross-sectional study was carried out in a tertiary care hospital for six months. All patients were recruited in the study after taking proper informed consent. Under 10 years of children were excluded from the study. All patients of age and above irrespective of gender were included in the study.

All suspected of dengue viral infection were included. Serological testing for dengue was performed on combo strips having NS1, IgM/IgG by rapid card procedure. After confirmation of NS1-positive patients, blood groups were determined on slide method (Forward blood grouping) with Anti-D, Anti-A, and Anti-B sera. A total of 105 confirmed dengue-positive patients were randomly selected.

All the collected data were entered and analyzed through Microsoft Excel 2020. Descriptive data were analyzed as mean and standard deviation.

RESULTS

The ABO and Rh blood groups of 105 patients (n=105) who tested positive for dengue were assessed. There were 68 and 37 male and female dengue-positive individuals overall, respectively (Table 1). All dengue virus-infected patients were divided up according to age, with the age group of 21 to 30 years having the highest number of cases (55), followed by the age groups of 11 to 20 years (21 cases), 31 to 40 years (19 cases), and 41 to 50 years (10 instances) (Table 2).

The blood group of all the participants has been checked through forward blood grouping. Among the total, the highest number of patients identified with the Rh-positive blood group (97 patients) while only eight patients were found with the negative Rh blood group. ABO blood group also determined in which A positive (A+ive) blood was found more in patients (40 cases), followed by O

positive (O+ive) blood group (30 cases), B positive (B+ive) blood groups (25 cases), and AB positive (AB+ive) blood group (02 cases). Among negative blood groups, AB negative (AB-ive) was found more as compared to AB+ive and other blood groups (Table 3).

Table 1: Gender-based distribution of dengue virus-infected patients

Gender	Number of Patients
Male	68
Female	37
Total	105

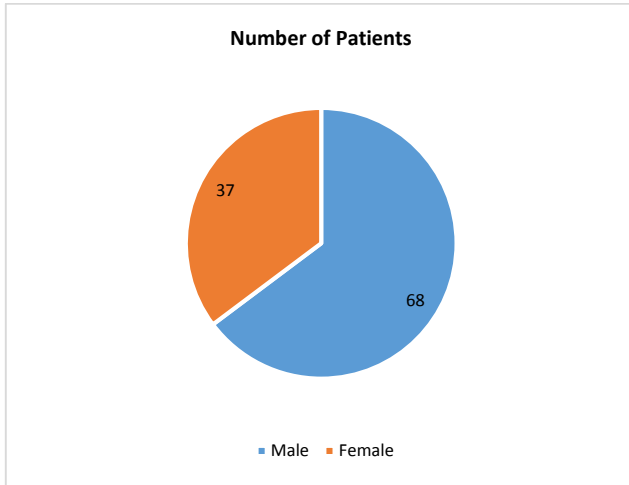


Figure 1: Gender-based distribution of dengue virus-infected patients

Table 2: Gender-based distribution of dengue virus-infected patients

Age (years)	Number of Patients
11-20	21
21-30	55
31-40	19
41-50	10
Total	105

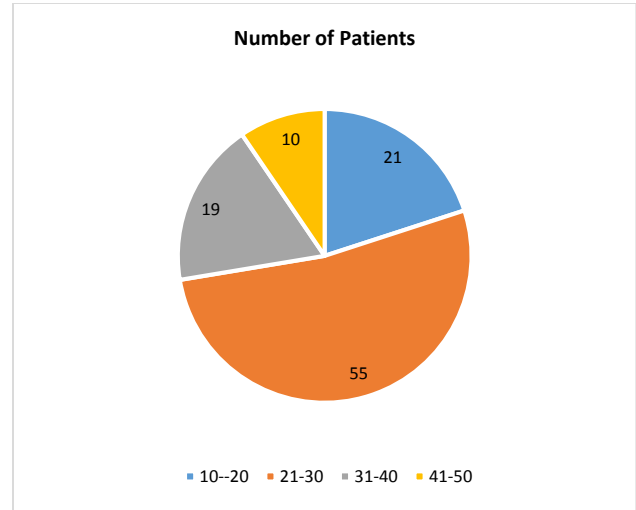


Figure 2: Gender-based distribution of dengue virus-infected patients

Table 3: Different age categories with ABO and Rh blood groups.

Age(Years)	ABO and Rh Blood Group								Total
	A +ive	B +ive	AB +ive	O +ive	A -ive	B -ive	AB -ive	O -ive	
11-20	10	05	-	06	-	-	-	-	21
21-30	17	28	1	41	-	1	3	2	55
31-40	8	3	1	5	1	-	1	-	19
41-50	5	4	-	1	-	-	-	-	10
Grand Total	40	25	02	30	01	01	04	02	105

DISCUSSION

An illness called dengue is spread by mosquitoes in tropical and subtropical areas of the world. A wide range of clinical symptoms as well as hazy consequences and results are linked to dengue fevers. A variety of hematological, renal, and hepatic disorders are discovered in dengue patients¹⁷.

In our study, 105 dengue patients in total—68 men and 37 women—were assessed for various blood parameters. Similar to our study, a greater proportion of dengue-infected patients were male, as reported in several reports^{18, 19}. Few other studies also reported more dominant cases in the male population than in female patients²⁰. Sex-based variations in dengue prevalence in greater depth²¹. The size of the change was observed as being modest and inconsistent in young patients. However, there are disparities in the way men and women use health services, girls' wearing clothes that cover their entire body, and putting male children's needs at the top priority in Society may be the cause of the variations shown in our country^{22, 23}.

Given that blood is a variable, we discovered that A+ (n=40), O+ (n=30), and B-positive (n=25) had the highest number of dengue infections. Our study is inconsistent with a study reported from India in which blood group O patients were more susceptible to dengue viral infection⁸ and Khode et al.,⁶. Mast cells, NK cells, dendritic cells, macrophages, and B cells that produce antibodies, the complement system, and the host genetic factors make up the human innate immune system, which is known to play a part in the host's ability to fight off viral infections²⁴. The genetic variables are particularly important in defining an individual's propensity to be

susceptible to or resistant to particular phenotypes of an illness as well as the severity of their clinical manifestations²⁵.

We also divided up our participants based on age and gender, and we discovered that dengue illnesses were most common in those aged 21 to 30 and least common in people aged 41 to 50. We discovered that males had more infections than females. All ages and genders are susceptible to dengue infection, but older patients—those older than 30—have severe sequelae and poor prognoses. The biochemical form of carbohydrates used in blood group antigens N-acetyl-D-galactosamine, the immunodominant sugar of the A blood type, and galactose, the antigen of the B blood group, are different. The same enzyme needed to produce both of these determinants is galactosyl transferases²⁵. IgM reaction is induced by these antigens²⁶. Aside from IgM antibodies, which are likely to cross-react with the blood group antigen, the glycosylated dengue viral protein triggers an immunological response. The severity of dengue fever has been linked to a particular polymorphism, however, this has not yet been discovered, despite a prior study showing a tie between HLA type and the illness⁹.

Our study has several drawbacks. First, the ultimate sample size was quite modest. Because we were unable to include the specialist centers, our data collection was constrained. Due to the outbreak's tendency to change quickly, we also utilized a non-random convenience sampling technique to get as many replies as we could just before peak time. While interpreting our outcome, this should be kept in mind. Third, because our design was cross-sectional, the correlations between predictors and severity were generalized.

CONCLUSION

The dengue viral infection prevalence is high in our region. The incidence of dengue viral infection is predominant in blood group A, and O patients along with the Rh-positive blood group. Further studies are required including the HLA factor. Our findings would advance knowledge in the field of dengue research and aid in clinical management. It is advised to conduct additional randomized case-control and prospective studies with high sample sizes to characterize the specifics of dengue as well as its classification and consequences.

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