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Original Article

Assessment of the association of ABO blood group in dengue fever diagnosed patient in tertiary care hospital.

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Abstract

Background: A serious worldwide medical and public health concern occurs with the dengue virus, which is also an emerging health threat. A victim can be vulnerable and acquire dengue because of his age, genetics, nutritional status, viral strain and secondary infections. Our objective was to identify the ABO blood group system's distribution and relationship in dengue fever (DF) patients.

Methodology: The current study was conducted at Dr. Ishrat ul Ebad Institute of Blood Diseases Department between September 2019 and September 2020. The research work was viewed and accepted by the ethics and research committees. Case records of patients with blood systems and their relation among dengue nonstructural protein 1 (NS1) antigen /dengue immunoglobulin M (IgM) and immunoglobulin G (IgG) were included in this study.

Results: Among 204 cases, 82 were blood group O positive, 59 were B positive, 38 were A positive, 16 were AB positive, 4 were O negative, and 2 were blood group A negative. The association of the ABO blood group with dengue was statistically significant (p=0.046). Blood group O+ has the highest number of cases, 66 (42.9%), than controls, 16 (32%).

Conclusion: This study overall consummates that blood group O is linked with a greater possibility of acquiring DF in comparison with different other blood group types. There is a significant relationship between blood group and DF observed.

Keywords

Dengue Fever, ABO Blood Group, Immunoglobulin M (IgM), Immunoglobulin G (IgG).

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Introduction

A serious worldwide medical and public health concern occurring is with dengue virus, which is also an emerging health threat[1]. It is regularly found in exceeding 100 countries including America, Southeast Asia, and Western Pacific regions of World Health Organization (WHO)[1]. Aedes mosquitoes is the culprit to transmit this arboviral infection having "DENV -1," "-2," "-3," and "-4," strands[2]. These hands can cause varied effects, including being asymptomatic to diverse effects of consistent fever, DF, dengue-shock syndrome (DSS) and dengue hemorrhagic fever (DHF). Above mentioned last two pathologies can get very severe hence can be fatal[3, 4].

The incubation period is 2-7 days, and the fever occurs almost suddenly with the onset of a high fever, which is generally complemented with headache, nausea, vomiting, joint and muscle pain and a rash[5]. A remission can be noticed after 3 to 4 days, and then the symptoms exaggerate before reverting after one week. After the 6"' day of inception of fever, the IgM antibodies can only be detected, after that, whereas the NS1 antigen is the basis of early diagnosis of dengue[6]. After clinical signs manifest from the first to the fifth day, NS1 antigen, a glycoprotein, can be seen. It can either be detected by immune-enzymatic technique or immune-chromatographic[7,8]. A victim can be vulnerable and acquire dengue because of his age, genetics, nutritional status, viral strain and secondary infections[1,2]. For the elimination of viral infections from the body, an individual's genetic factors and innate immunity play a crucial role in the first and second line of defense system[9,10].

The first time Kaipainen et al. was hypothesized an association amongst disease and blood groups in 1960[11]. In 1990 the genetic material involved in blood systems was exposed, and it was perceived that the ABO system is included in the innate immune system[11]. Varied ABO groups modify their vulnerability or resistance to bacterial and viral infections, and disorders have been witnessed[12]. human leukocyte antigen (HLA) and ABO blood groups are two genetic factors that have been seen to play a distinctive role in susceptibility to infectious diseases[13]. Every blood group has a different capability to fight back pathogenic infections and other illnesses. The severity of infection can be directly linked to ABO phenotype[14].

A chemical arrangement that is a long chain of sugar named fukosa is present on the upper layer of RBC due to which different types of blood such as type AB, type A, type B, or type O are determined. ABO blood type system classifies human blood based on the genetic gain of RBCs by the presence or absence of this antigens[14]. The antigens on blood groups are made up of various carbohydrates depending on the ABO blood group. On determinants A, N-acetyl-d-galactosamine is the immunodominant sugar, while d-galactose for B determinants. These carbohydrates require an enzyme galactosyltransferase for the synthesis[15]. Naturally occurring IgM is the antibody that identifies these carbohydrates. Cross-reaction with host cells in patients affected with dengue viral infection has shown antibodies, mainly IgM produced against glycosylated dengue viral proteins. Therefore, combining the extent of naturally occurring IgM and ABO blood group in persons should be investigated properly to explore any effect on dengue disease[11].

Dengue, "a break-bone fever," is a frequently occurring infection cognate of disability and death. South-East Asian and western Pacific region's majority of countries belonging to WHO along with other global organizations are working on a global strategy which is dependent on the available infrastructure and resources. More preventive and control programs are being designed to address the concern and are being merged in their running programs. Blood group could be one of those susceptible determinants which are related to dengue. The antigens of blood groups assist during the establishment of the vulnerability of infections. Allocation of blood groups differs from one population to another. Appropriate planning to address the challenge can make us act proactively,

and this can only be achieved by doing various researches regarding the subject. Our objective was to identify the ABO blood group system's distribution and relationship in DF patients.

Methodology

The current study was carried out between September 2019 and September 2020 in Dr. Ishrat ul Ebad Institute of Blood Diseases Department. The study was viewed and accepted by the ethics committee and research institute (Ref: IRB-1647/DUHS / Approval 2020). The names and detail of the patients were kept confidential. Besides, no harm was done to anyone whosoever was conducting this research.

The patient's medical record with the blood system and its alliance with dengue NS1 antigen /dengue IgM and IgG were included in this study. The study participants were split into dichotomous clusters. Cluster 1 contained cases of DF with platelet count > 50,000, while admitted cases of DF with decreased count of platelets < 50,000 were included in Cluster 2. The Control group comprised subjects in which dengue had been ruled out and whose blood grouping to be done.

Laboratory investigations included complete blood count, blood groups, NS1 antigen of IgG, and IgM were included. A total of 5 ml of blood was collected from the patients. Estimating hemoglobin and blood indices like red blood cell count, platelet count, and total leukocyte count was measured using a hematology automated analyzer. The identification of NS1 antigen and for the detection of IgM antibodies plasma was analyzed by using a combo dengue NS1-IgG/IgM rapid test. IgM and IgG antibodies against dengue virus were confirmed using an in-house indirect ELISA assay. Complete details were filed in Microsoft Excel, and then statistics were evaluated.

Both genders, any age and all dengue patients that are coming to the blood bank for arranging platelets were included in this study. However, The Bone marrow failure patients and Cancer patients were excluded from this study.

Statistical analysis was done by using SPSS 20.0 version. We had applied correlation and chi-square tests for analysis of the blood groups with DF.

Results

Out of 204 cases, 82 (40.2%) were the blood group O positive, 59 (28.9%) were B positive, 38 (18.6%) were A positive, 16 (7.8%) were AB positive, 4 (2%) were O negative, and 2 (1.0%) were A negative (Table 1).

Table 1: Frequency of ABO Blood groups

Variable		n	%
Blood Group	A+	38	18.6
	A-	2	1.0
	B+	59	28.9
	B-	3	1.5
	O+	82	40.2
	O-	4	2.0
	AB+	16	7.8
	AB-	0	0.0

Out of 204 sample, male patients outnumber female patients, 102 (66.2%) and 52 (33.8%). No association was observed in males and females among dengue cases and controls (p= 0.773). All the clinical parameters are not statistically significant among dengue cases and controls except Platelets (p=0.002), Dengue IgM (p≤0.001), Malaria (p≤0.001) and Typhidot (p=0.034) which were statistically significant. (Table 2)

Table 2: Association of General characteristics and clinical parameters with dengue

Variable		Dengue Negative	Dengue Positive	p-value
Age (Years)		32.64±19.31	37.40±19.03	0.127
Gender	Male	32(64.0)	102(66.2)	0.773
	Female	18(36.0)	52(33.8)	
Hemoglobin		11.87±2.66	12.29±2.89	0.366
Total leucocyte count		6.94±3.13	7.24±7.62	0.786
Platelet		87.64±50.99	62.09±50.84	0.002*
IgM	Negative	38(76.0)	24(15.6)	<0.001*
	Positive	12(24.0)	130(84.4)	
IgG	Negative	30(60)	114(74.0)	0.059*
	Positive	20(40.0)	40(26.0)	
Malaria	Negative	34(68.0)	154(100.0)	<0.001*
	Plasmodium	8(16.0)	0(0.0)	
	P. Falciparum	8(16.0)	0(0.0)	
Typhidot	Negative	44(88.0)	148(96.1)	0.034*
	Positive	6(12.0)	6(3.9)	
PLT Arranged	1	2(4.0)	8(5.2)	0.301
	2	2(4.0)	2(1.3)	
	3	0(0.0)	10(6.5)	
	4	12(24.0)	46(29.9)	
	5	2(4.0)	4(2.6)	
	6	28(56.0)	66(42.9)	
	7	2(4.0)	4(2.6)	
	8	2(4.0)	4(2.6)	
	9	0(0.0)	4(2.6)	
	12	0(0.0)	5(3.9)	

Values are given as Mean±SD or n(%)

*p<0.05 is considered statistically significant

The association of the ABO blood group with dengue was statistically significant (p=0.046). Blood group O+ has the highest number of cases, 66 (42.9%), than controls, 16 (32%) (Table 3).

Table 3: Association of ABO blood group with dengue

Variable		Negative n(%)	Positive n(%)	p-value
Blood Group	A+	8(16)	30(19.5)	0.046*
	A-	2(4.0)	0(0.0)	
	B+	18(36.0)	41(26.6)	
	B-	2(4.0)	1(0.6)	
	O+	16(32)	66(42.9)	
	O-	0(0.0)	4(2.6)	
	AB+	4(8.0)	12(7.8)	
	AB-	0(0.0)	0(0.0)	

*p-value<0.05 is considered statistically significant.

The majority of cases had a platelet count greater than 50,000, with the most being in blood group O+ with 46 cases. In terms of those with platelet count < 50,000, the blood group that had the most was also O+ with 34 cases.

Table 4: Allocation of ABO and Rh system in DF without and with thrombocytopenia

Blood Group	Platelet Count > 50,000	Platelet Count < 50,000
A+	24	16
A-	2	0
B+	34	26
B-	2	0
AB+	12	4
NA	0	2
O+	46	34
O-	0	4
Total	120	86

Discussion

Infection with dengue virus is a major evolving health risk and has charged significant medical and public-health concern internationally. Today, in terms of morbidity and mortality, dengue infection is the most critical arthropod-borne human viral disease[16]. There are various affecting factors associated with dengue, one of them could be a blood group. Blood group antigens help in establishing the vulnerability of infections.

It has been shown with the analysis of blood groups that there is an increased prevalence of blood group O (64%) followed by blood group B and A (42% and 30%) with some studies which were conducted in the general population of our neighbouring country India[17]. Some studies have claimed about the greater frequency of blood group O in dengue patients[18].

The investigation of demographic data in relationship with blood groups showed that the O group was uniformly prevalent at all ages while slightly higher predominance in males. A study by Khode et al, suggested that blood group O is possibly a risk factor predisposing for dengue disease[18]. Contrary to a short statement by Murugananthan et al, a considerably higher percentage of patients with blood group AB had DHF and DF when matched with the general population[19]. The results of the present study suggest that there is an association of DF with blood groups. A similar study conducted on blood group association among dengue hemorrhagic fever patients reveals a significant correlation between blood types and DF[18].

Thrombocytopenic cases with platelet count less than or greater than 50,000 /cu mm were included in our study. We recognized that a severe form of thrombocytopenia (≤ 50,000 /cu mm) was found in 39.5% cases of O group, followed by group B (31.4%), A (19.8%) and AB (4.7%). The distribution of each blood group among patients with DF was similar to that among patients with DF with thrombocytopenia (platelet count < 50,000). Ravichandran et al. reported similar results when conducting a blood group study and dengue in a tertiary care hospital[14].

Although there are limited studies available on the association of DF and blood groups, other studies have found an association between other disease's prevalence and severity with blood groups[20-22]. As dengue hemorrhagic fever is endemic in Pakistan, we encountered many hemorrhagic and serious complications of the disease during this outbreak. This study clearly shows the burden of DHF in different blood groups, identifies and predicting that the O group is probably a risk factor and can predispose to dengue disease.

This study's limitations are small sample size, deficiency of clinical correlation as some hematology markers were limited by its retrospective case record-based design where several parameters could not be investigated, and lack of similar studies to compare data with and confirm findings.

Conclusion

Overall, this study consummates that blood group O is linked with a greater risk of acquiring DF than those with different blood groups. There is a significant relationship between blood group and DF. Added research is required to conclude whether dengue serotype, HLA, and ABO are experimental/ predictor variables and whether some blood subgroups are allied with a predominantly greater possibility of dengue virus infection. Added research work is required to conclude that either HLA, dengue serotype and ABO would be experimental/ predictor variables and also either some blood subgroups are allied with a predominantly greater possibility of dengue virus infection.

Conflicts of Interest

None.

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