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Association of ABO and Rh blood group with Dengue Hemorrhagic Fever in Northern Sudan 2020

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Abstract: BACKGROUND: *Dengue fever (DF) has been steadily increasing in Northern Sudan with outbreaks in certain areas include Al Dabaa, Merowe, Dongola and Kareema. Along with secondary dengue, several risk factors predispose to dengue hemorrhagic fever and dengue shock syndrome. Very few studies associating the relationship between dengue and its severity with ABO blood group have been documented.* ***AIMS:*** *The aim of this study was to determine the association between distribution of ABO and Rh blood groups and DF.* ***SETTINGS AND DESIGN:*** *This was a retrospective descriptive study conducted at the clinical laboratory of the department of blood bank on the Military Hospital.* ***MATERIALS AND METHODS:*** *Dengue patients whose case record contained information on blood group in Merowe Military hospital and Specialized Warranty hospital were screened for details of blood group and confirmed dengue diagnosis. 1100 case records were selected divided into cases who were admitted cases of dengue (1100 sample, 828 males, 272 females) and controls (400 sample, 360 males, 40 females) who were attending outpatient department for various other ailments, and demographic data (age, gender and blood group) were collected from them. The risk of acquiring dengue disease and severity and its association with factors such as blood group, gender and age were analyzed statistically.* ***STATISTICAL ANALYSIS USED:*** *P value was calculated using the Chi-square test. Odds ratio were calculated using the Fisher's exact test.* ***RESULTS:*** *DF was higher in 70.7% of individuals with O +ve blood group as compared to 29.3% of controls (P = 0.019), whereas patients with blood group B -ve were significantly less affected with DF (P = 0.019).* ***CONCLUSIONS:*** *Individuals with O+ blood group are more prone to DF, whereas individuals with blood group B-ve are less prone.*

Keywords: ABO blood group, dengue fever, Sudan.

INTRODUCTION:

Dengue fever is caused by a virus transmitted primarily by (*Aedes aegypti)* mosquitoes. These mosquitoes bite during the day, usually just after sunrise and around sunset.**1)** According to the World Health Organization, dengue fever is the most critical and the most rapidly spreading mosquito borne disease in the world. There has been a 30- fold increase in global incidence over the past 50 years.[2)]

Dengue fever can develop into dengue hemorrhagic fever, or severe dengue, which is a more acute form of the disease that includes symptoms such as bleeding under the skin and constant vomiting. It continues to be a dangerous threat to global health. Dengue viruses can be grouped into four serotypes, all of which can cause disease. Prior infection with one dengue serotype is believed to make people more likely to develop severe dengue in later infections.[3), 4)] In Sudan, dengue cases were identified for the first time in 1906 from patients at Port Sudan city and Swakin port, Dengue cases have been reported from 12 Sudanese states between 1984 and 2015, Most dengue cases were diagnosed in Port Sudan and Kassala states in eastern Sudan[5)]. By studying the relationship of human blood type with virus infection, it is possible to determine the susceptibility to the virus of people with different blood types [6)], many blood group antigens facilitate intracellular uptake, signal transduction, or cell adhesion through the organization of membrane micro domains , in addition Blood group antigens can modify the innate immune response to infection[7)], some previous study that conducted by (Siripen Kalayanarooj, *et al*) demonstrated that association between ABO blood group and the severity of dengue diseases [8)], also study conducted by (Periyavan .S, *et al*),identified the O blood group as a potential risk factor in predicting clinical severity in dengue patient.[9)] All-previous study mentioned was conducted in different areas of world which the genetic diversity is differ from country to another .

The aim of this study was determine the association between distribution of ABO Rh blood groups and DF in Sudan.

MATERIALS, PATIENTS AND METHODS:

Retrospective descriptive study was conducted in Northern state with a surface area 15000Km and population of about 4 million inhabitants, Patient record enrolled in this study were from Merowe Military hospital during Sep 2017to Dec 2019.

Study population and Sample size:

1100 Sudanese (828 male ,272 Female) Case report diagnosed and confirmed as DF and include ABO B.G information ware recruited as case and in contrast 400 (360 males 40 female , Who were attending outpatient department and Negative for DF and their Symptoms were selected as control Group

Data collection:

Standard questionnaire was used to obtain the clinical data for each case report and each participant in this study.

Statistical Analysis:

All data were analyzed using SPSS (statistical packages for social science), version 11.5. Descriptive statistics, Chi-square test. Odds ratio were calculated using the Fisher's exact test, P-value < 0.05 was considered significant.

RESULTS:

One thousand and hundred patients, aged 39–87 years, with a confirmed diagnosis of DF were included in this study. The distribution of the patients in correlated to gender was (75.3%) of the patients were males and (24.7%) were females. The majority of the patients were adult's males.

Out of the 1100 cases and 400 controls, 30 were blood group A -ve, 318 were blood group A +ve, 33 were group AB +ve, 10 were group B –ve, 181 were group B +ve, 52 were group O –ve and 476 were group O +ve [Table 1]. The frequency and percentage of blood group among the control group is represented in [Table 1]. The DF were more common in positive group than negative, and it was observed that dengue infections were higher in individuals with O blood group (476 cases) when compared with controls (197), *P. value* = 0.019. Blood group B -ve considerably less affected with DF had *P* = 0.019 [Table 1].

Table [1]: Result of ABO group with case and control:-

ABO		Sample		P. value
		Case	Control	
A-	Count	30	15	**0.019**
	%	66.7%	33.3%	
A+	Count	318	82	
	%	79.5%	20.5%	
AB+	Count	33	19	
	%	63.5%	36.5%	
B-	Count	10	2	
	%	83.3%	16.7%	
B+	Count	181	62	
	%	74.5%	25.5%	
O-	Count	52	23	
	%	69.3%	30.7%	
O+	Count	476	197	
	%	70.7%	29.3%	
Total	Count	1100	400	
	%	73.3%	26.7%	

P. value <0.05 is consider significant
SD= stander deviation

Dengue cases were more in males compared to females. The frequency and percentage of gender in blood group among the control group is represented in [Table 2], these result show significant coloration between gender with case and control group in all blood group with (p. value 0.5).

Table (2): Result of ABO group with case and control among gender:-

ABO / gender		Case		Control		P. value
		F	M	F	M	
A-	Count	9	21	0	15	
	%	30.0%	70.0%	0.0%	100.0%	

A+	Count	83	235	4	78	
	%	26.1%	73.9%	4.9%	95.1%	.5
AB+	Count	8	25	1	18	
	%	24.2%	75.8%	5.3%	94.7%	
B-	Count	4	6	0	2	
	%	40.0%	60.0%	0.0%	100.0%	
B+	Count	49	132	7	55	
	%	27.1%	72.9%	11.3%	88.7%	
O-	Count	12	40	7	16	
	%	23.1%	76.9%	30.4%	69.6%	
O+	Count	107	369	21	176	
	%	22.5%	77.5%	10.7%	89.3%	
Total	Count	272	828	40	360	
	%	24.7%	75.3%	10.0%	90.0%	

P. value <0.05 is consider significant
SD= stander deviation

There was insignificant coloration between blood group with case and control among age with p. value for all results 0.6 in table (3).

Table [3]: Result of ABO group with case and control among age:-

ABO / age		Case			Control			P.value
		< 20	20 - 40	> 40	< 20	20 – 40	> 40	
A-	Count	1	24	5	0	15	0	
	%	3.3%	80.0%	16.7%	0.0%	100.0%	0.0%	
A+	Count	6	242	70	1	79	2	
	%	1.9%	76.1%	22.0%	1.2%	96.3%	2.4%	
AB+	Count	2	26	5	0	19	0	
	%	6.1%	78.8%	15.2%	0.0%	100.0%	0.0%	
B-	Count	0	8	2	0	2	0	.6
	%	0.0%	80.0%	20.0%	0.0%	100.0%	0.0%	
B+	Count	9	136	36	1	59	2	
	%	5.0%	75.1%	19.9%	1.6%	95.2%	3.2%	
O-	Count	1	41	10	0	21	2	
	%	1.9%	78.8%	19.2%	0.0%	91.3%	8.7%	

O+	Count	18	371	87	5	184	8
	%	3.8%	77.9%	18.3%	2.5%	93.4%	4.1%
Total	Count	37	848	215	7	379	14
	%	3.4%	77.1%	19.5%	1.8%	94.8%	3.5%

P. value <0.05 is consider significant
SD= stander deviation

DISCUSSION:

The results of the present study show that blood group O may be a risk factor predisposing for dengue disease. There are many predisposing factors which are allied with dengue, one of which could be blood group. Blood group antigens help in determining the susceptibility to infections.[10]

The resent study show that blood group O +ve was associated with dengue disease when compared to the control group and was statistically significant, which was in contrast, a study by Khode *et al*. suggested that blood group O is possibly a risk factor predisposing for dengue disease.[11] In the current study, there was an association between O blood group and DF and also with gender of individual (males more than females), but no association between were found to be unambiguously associated with age of individual. Blood group distribution in controls was consistent with those in the general South Sudan population.

Our study suggests that there is association of dengue disease with blood group O, but blood groups are not associated with severity of infection. Therefore, whether the combination of ABO blood group and the level of natural IgM antibody circulating in individuals have an effect on dengue disease has to be elucidated. DHF has been documented in infants during their first dengue-virus infection.[12] Presumably the enhancement of dengue disease in infants is due to preexistent dengue antibody that is passively acquired, via cord blood, from mothers immune to dengue-virus infection.[13] Since infants contain preexistent dengue antibodies, we excluded infants from our study. Factors contributing to DHF in children are unknown; perhaps individual genetic background may play a critical role.[14, 15] additionally, a correlation between HLA and dengue disease has been reported; but no specific polymorphisms have been found to be unequivocally associated with disease severity.[16]

CONCIUSION:

- The results of the present study suggest a strong association of blood group O +ve with the development of DF among patients in the Northern Sudan. Patients with blood group AB were less likely to have clinically apparent DENV infections in the present study sample.
- One of the strength of our study was that it was a case-control study. Previous articles studied blood group distribution only in dengue patients. Because of the limitations of the sample parameters in the present study to discover association with disease severity, further studies will be necessary to determine whether dengue severity and ABO are independent variables and whether some blood subgroups are associated with a particularly high risk of dengue-virus infection.

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