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Original Research Article

Impact of blood group in dengue: a study

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ABSTRACT

Background: Dengue can result in high mortality. Several studies have shown an association of blood groups with the severity of dengue. In our study we attempt to associate the prevalence of blood groups with the known hematological prognosticators and thus derive its impact on the severity of dengue. We aim to study the patterns and prevalence of different ABO blood groups in dengue fever.
Methods: A total of 100 serologically proven dengue cases over a month's period in November 2016 were recruited for our study. Their relevant hematological data (obtained by automated haematology analyser and peripheral smears) and blood grouping results were recorded and analyzed.
Results: The age range was 5 months to 65 years with a slight male predominance. Analysis of the blood group patterns showed prevalence of O group (42%) followed by A and B group (27% each). B group was more prevalent in children (34%) and females (31%) with dengue.
The patients with B group showed increased derangement in hematological parameters namely higher number of cases with B group showed rise in haematocrit (59%), an increased number of cases with leucopenia (56%), higher proportion of cases with lymphocytosis (45%) and severe thrombocytopenia (74%) when compared to the other blood groups.
Conclusions: Our study shows that blood groups can impact severity of dengue and that B group is a risk factor for severity hence, such individuals warrant close supervision especially in the presence of other risk factors.

Keywords: Blood counts, Blood group, Dengue, Prognosticator

INTRODUCTION

Dengue is an arboviral infection (DENV 1-4) transmitted by the Aedes mosquito. It has a wide clinical spectrum from asymptomatic to undifferentiated fever and Dengue hemorrhagic fever.[1] Also being categorized as Non severe Dengue with or without warning signs and Severe Dengue (WHO 2009).[2]

It has been estimated that globally around 50-100 million individuals get infected by dengue annually, with 2-5 lakh cases being that of Dengue Hemorrhagic Fever/Dengue Shock Syndrome.[3] Dengue fever is self-limiting but severe dengue may be lethal if not treated promptly. As currently there is no specific treatment or vaccine for dengue, early and rapid diagnosis is crucial for patient management and this is dependent on clinical features and laboratory tests which not only aid in the diagnosis but in the prognosis of the disease as well.[1-6]

Factors which could serve as prediction for severe dengue include age, genetics, nutritional status, viral strain, secondary infections and certain laboratory tests.[3,7] Genetic factors include HLA and ABO blood group. Individuals with different ABO blood groups differ in

their susceptibility or resistance to viral, bacterial infections and other diseases. Kaipainen and Vuorinin in 1960 first hypothesized the relationship between blood groups and diseases.[3] Many reports have suggested an association of blood groups with cardiovascular diseases, cancers and infectious diseases.[8]

In 1917, the association of blood group with tuberculosis was published.[8] Since then various studies have linked blood groups with various bacterial, parasitic and viral diseases like malaria, cholera, *E. coli* and *H. pylori* infections.[9,10] Some studies have linked the severity of infection to the blood group.[3,7,8,10,11] A few studies have focused on association of Dengue infection and blood groups, while some have reported increased prevalence of certain blood groups in dengue, others have noted an association of certain blood group with severity of Dengue.[3,7,9,12-14]

However, reports are varied among the different studies, none of which have correlated the blood group with each of the hematological parameters which are affected in dengue. Our study focuses on the association of blood group and dengue, its prevalence and severity as knowledge of risk factors can prove to be vital for prevention and management.

The aim of our study was to analyse patterns and prevalence of different ABO blood groups in dengue and to find an association between ABO blood groups and severity of dengue.

METHODS

This is a prospective study done on 132 patients with positive Dengue serology in Hematology Department over a one month period during November 2016.

All patients with serological confirmation of Dengue (NS1, IgM/IgG positivity) by Rapid Card Method (Standard Diagnostics-Bioline Alera) with hematology data (obtained by hematology automated analyzer Sysmex 1800 c) that is blood counts, packed cell volume (PCV) and peripheral smear examination stained by Leishman stain and blood grouping tests were included in the study.

Results of Dengue tests were retrieved from serology department and tabulated. The results of hematocrit and blood counts were also tabulated. The peripheral smears (done as per hospital protocol for visual check of platelet counts) were examined and the differential count pattern was established along with analysis of atypical lymphocyte count.

Blood grouping results (done by Forward Blood grouping -Slide method with Anti-A, Anti-B sera from Tulip diagnostics) were also recorded.

Patients with concomitant infections like Malaria & Typhoid were excluded from the study.

RESULTS

Our study analyzed 100 cases of dengue patients in the age range of 5 months to 65 years with an average of 32 years. There was a slight male predominance with a male to female ratio of 1.5:1 (Table 1).

Table 1: Age and sex distribution of patients.

	Age distribution		Sex	
	≤14 years	>14 years	Male	Female
Number	35	65	61	39
Percentage	35	65	61	39

An analysis of blood group distribution showed increased proportion of O blood group (42%) followed by A & B (27% each) and AB with 4%. The age and gender related distribution of blood groups is given in Table 2.

Table 2: Blood groups association with age and gender.

Blood group	Age				Gender				Total
	≤14 years		>14 years		Male		Female		
A	06	17	21	32	17	28	10	26	27
B	12	34	15	23	15	25	12	31	27
O	16	46	26	40	28	46	14	36	42
AB	01	03	03	05	01	01	03	07	04
	35	100	65	100	61	100	39	100	

Our study showed increased prevalence of B group in those with a rise in Hematocrit, that is 16 cases or 59% out of 27 cases (Table 3).

Our study revealed that of the 27 cases with B blood group, 15(56%) cases showed leucopenia (<4000 cells/cumm) (Table 4).

The association of blood groups with major differential white cell pattern categorised as normal pattern, lymphocytosis (>45%) and neutrophilia (>75%) was analysed (Table 5).

Table 3: Association of blood group and rise in hematocrit.

Blood Group	Total(n)	Number	Percentage
A	27	10	37
B	27	16	59
O	42	21	50
AB	04	02	50

Table 4: Association of blood group and total leucocyte count.

Blood group	Total (n)	<4000 cells/mm		≥4000 cells/ mm	
		Number	Percent	Number	Percent
A	27	10	37	17	63
B	27	15	56	12	44
O	42	15	36	27	64
AB	04	02	50	02	50

An analysis of blood group association with atypical lymphocytosis (≥10%) is shown in Table 6.

Thrombocytopenia's were categorized as ≤0.5 lakhs /cu mm (severe) and >0.5-1.5 lakhs /cu mm as non-severe. Severe thrombocytopenia (≤0.5 lakh /cu mm) was present in 74% of cases of B group, followed by A (67%), O (62%) and AB (50%) (Table 7).

Table 5: Association of blood group with differential count pattern.

Blood group	Total (n)	Normal pattern		Lymphocytosis		Neutrophilia	
		Number	Percent	Number	Percent	Number	Percent
A	27	12	44	11	41	04	15
B	27	07	26	18	67	02	07
O	42	12	28	27	64	03	08
AB	04	02	50	02	50	-	-

Table 6: Association of blood groups with atypical lymphocytosis.

Blood group	Total (n)	Atypical lymphocyte (10-20 %) <20%		Atypical Lymphocyte count ≥20 %	
		Number	Percent	Number	Percent
A	27	23	85	04	15
B	27	15	55	12	45
O	42	28	67	14	33
AB	04	03	75	01	25

Table 7: Blood groups association with platelet count.

Blood group %	Total (n)	Platelet count ≤0.5 lakhs / cu mm		Platelet count >0.5 lakhs / cu mm	
		Number	Percent	Number	Percent
A	27	18	67	09	33
B	27	20	74	07	26
O	42	26	62	16	38
AB	04	02	50	02	50

DISCUSSION

Our study shows an age range of 5 months to 65 years with a slight male predominance, probably due to increased occupational exposure and recreational activities in concordance with few studies.[1]

The analysis of blood groups showed increased prevalence of O group (42%) followed by A and B (27% each) with few studies conducted in general population.[16] However a few studies have claimed increased prevalence of O group in dengue patients.[3]

The analysis of demographic data in association with blood groups showed that O group was uniformly prevalent at all ages but with slightly higher predominance in males.

There was a variation in prevalence of A and B blood groups. B group was more prevalent in children and females (34% and 31% respectively) in dengue in comparison to adults and males (23 and 25% respectively). A few studies have claimed increased severity of dengue in females and children.[17] A group was found predominantly in adults (32%) and males (28%). An assessment of all the main hematology parameters in association with blood group in dengue showed significant findings viz. 59% of cases with B group showed a rise in hematocrit followed O & AB (50% each). Only 37% with A group showed a rise in hematocrit.

Leucopenia was noted significantly in 56 % of those with B group as against 37% and 36% in A and O groups and 50% in AB group.

The analysis of differential counts showed that lymphocytosis was predominantly noted in B group followed by O group. A Group was mostly associated with normal patterns and neutrophilia. Atypical lymphocytosis (≥20%) was more prevalent in B group, being 45% as against 33% in O group, 25% in AB and 15% in A group.

Our study included cases of thrombocytopenia with counts less than 1.5 lakh /cu mm. We observed that severe thrombocytopenia (≤0.5 lakh /cu mm) was present in 74% of cases of B group, followed by A (67%), O (62%) and AB (50%).

Several studies have reported consistent changes in hematological parameters in dengue which aid as

diagnostic, prognostic and therapeutic tool and include mainly changes in hematocrit, total white cell count, differential count reflected as lymphocytosis with presence of atypical lymphocytes and platelet counts (thrombocytopenia).[1,5,18-20]

Thus, in our study we have attempted an analysis of blood group patterns in dengue especially in relation to the hematology prognostic markers with atypical lymphocytosis (≥20%). Our study revealed that blood group B showed the maximum number of cases with increased hematocrit, leucopenia, severe thrombocytopenia and lymphocytosis compared to other blood groups and thus was a predictor of severe dengue in accordance with claims of few studies.[9,13,14] While ours is the only study analyzing hematological findings and association with blood group, all the other studies derived its association by comparing prevalence of blood groups in Dengue fever and Dengue haemorrhagic fever and noted increased prevalence of B group in severe forms of dengue.

However few studies have claimed AB blood group to be a risk factor for severe dengue.[7,12] But the study was done mainly in children and cases of AB group available for this study is lower and hence can influence results as noted in our study, where with only 4 cases of AB group, it figures as the second risk factor for severity after B group . Other studies conclude that blood group does not impact the severity in dengue.[3]

A few studies have mentioned the mechanisms which influence risk for a particular disease. These include selectivity (Adhesion kinetics, Humoral dynamics & Molecular mimicry) and Host Response variability.[3,8,9,11,12]

While there are only limited studies on blood groups & severity in dengue , there are other studies which have been done associating other disease prevalence and severity with blood groups[9-11].Some have studied protection or low prevalence of certain blood groups in other diseases.[8,10]

Limitations of the study includes small study size, lack of similar studies to compare data with and confirm findings and lack of clinical correlation as it is mostly a hematology based study.

CONCLUSION

Dengue is an epidemic in India and while most cases are self-limited, severe forms have a high mortality. Warning clinical and laboratory findings aid in predicting progression to severity but lab tests have a turnaround time before results are given. Certain associated factors like age, sex, race and blood group also are prognosticators in dengue. Our study concludes that blood group B can be considered as a prognosticator in dengue and help reduce complications, however large scale studies are needed to support our findings.

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