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To investigate the relationship between the ABO blood group description and the cases of dengue hemorrhagic fever

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Abstract
Aim: The aim of the present study was to investigate the relationship between the ABO blood group description and the cases of dengue hemorrhagic fever.
Methods: Using a case-control design, this research used observational analytics. Only one method of data collection was used. Patients experiencing a certain impact or condition are called cases in a case-control study, whereas a control group does not experience any effects. The goal is to find out whether a certain risk factor really affects the illness. To do this, we compare the case group's and control group's exposure frequencies to the risk factor.
Results: Both experimental and control groups included 42% under-21 individuals. Men outnumbered women in this survey. Most participants had finished elementary school, with 30 (61% of the total) and 27 (54% of the total) in the control group. Thirteen control group participants and twenty-one case group participants had blood type O, showing that this was the most common blood type. With 13 and 15 B-type responders, the case group had 13% and the control group 30% blood type B. Nineteen percent of case study participants had AB blood type, compared to eleven percent in the control group. Seven case participants (14% of the total) had A blood type, whereas fourteen control participants (28% of the total) did. Comparison to DHF showed no significant variation in percentage between blood types O and A (p=0.142).
Conclusion: Dengue illness is quite prevalent in India. The majority of cases exhibit no symptoms or rather minor symptoms, while severe cases have a significant mortality rate. Therefore, it is essential to comprehend studies that aid in anticipating the progression to a more severe state. There was no discernible link between blood types and the occurrence of dengue hemorrhagic fever.

Keywords: Dengue hemorrhagic fever, blood type, aedes aegypti

Introduction
The dengue virus is an arbovirus classified under the Flaviviridae family. The four serotypes are DENV-1, DENV-2, DENV-3, and DENV-4 [1]. The classification of Dengue, according to the World Health Organisation (WHO) in 2009, includes two categories: non-severe Dengue (with or without warning signals) and Severe Dengue [2]. Dengue fever is prevalent in around 100 nations, with greater concentrations in the American, Southeast Asian, and Western Pacific areas. A significant number of states in India exhibit a substantial incidence of Dengue, leading to hospitalisation [3]. Approximately 390 million individuals are infected on a yearly basis, with roughly 96 million exhibiting symptoms of the condition [4]. In 2017, India documented a total of 188,401 instances of dengue infection and 325 fatalities [5]. Globally, around 50-100 million individuals get dengue, with roughly 200,000 to 500,000 of them experiencing severe manifestations [6].

The susceptibility to DHF or DSS is influenced by the human leukocyte antigen (HLA) haplotype, as shown by several studies. However, there is yet no definitive description of any distinct polymorphisms associated with this tendency [7]. The ABO blood type is a component of the body's natural defence system, known as innate immunity. It has been observed that people with various ABO blood groups exhibit varying levels of vulnerability or resilience to viral and bacterial infections and illnesses [8, 9].

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The hypothesis of a correlation between blood types and sickness was first proposed by Kaipainen and Vuorinen in 1960, and the gene responsible for ABO blood groups was identified in 1990 [8, 10]. The ABO blood type significantly influences an individual's susceptibility or resistance to illnesses such as malaria, cholera, Helicobacter pylori, and chikungunya infections [11-14].

The vascular permeability and plasma leakage caused by the Dengue virus are believed to be associated with the activation of endothelial cells via the immune system. Since blood group antigens are a component of the body's natural defence system, it is theorized that the antibodies generated against Dengue virus proteins (known as natural IgM) have the ability to react with the cells of the host. Consequently, various ABO blood types exhibited distinct vulnerabilities to contracting infections [15]. There is a scarcity of research on the correlation between Dengue illness and blood types [16]. While some studies have shown a greater occurrence of certain blood types in cases of Dengue infections, other research has found a correlation between particular blood groups and the severity of Dengue sickness. Nevertheless, there are inconsistencies in the available academic publications and a notable variation in their findings [17]. Seventeen Joshi *et al*. reported that the prevalence of blood Group-B in DF was 27% [18].

The objective of this research was to evaluate the ABO blood type classification and its correlation with the occurrence of dengue hemorrhagic fever.

Materials and Methods
The study was conducted using a case-control group design in conjunction with an observational analytics technique. The data was collected using a single method that did not involve any repetition.

Research that is based on the case-control method involves the identification of people who are showing certain symptoms or diseases (referred to as cases) and a comparison group that does not exhibit similar effects (referred to as controls).

On the other hand, the control group consisted of a neighbour of a DHF patient who did not have a previous history of DHF and who had similar characteristics, such as age and gender.

In both the case group and the control group, there were fifty individuals who participated in the survey.

Results

Table 1: Characteristic of Respondents

Variables	DHF Incidence			
	Cases		Controls	
	N	%	N	%
Age in years				
0-14 years old	21	42	20	40
15-49 years old	26	52	28	56
50-65 years old	3	6	2	4
Gender				
Male	26	52	21	42
Female	24	48	29	58
Education				
Primary school	30	60	27	54
Junior high school	5	10	10	20
Senior high school	11	22	11	22
College	4	8	2	4

Both the case and control groups included a similar proportion of respondents aged 0-14 (21 people, or 42% of the total). There were more men than women that participated in this survey. Of the total number of respondents, 30 (or 610%) in the case group and 27 (or 54% in the control group) had only completed elementary school.

Table 2: Distribution of Blood Type

Blood group	DHF incidence			
	Case		Control	
	N	%	N	%
O	21	42	10	20
B	13	26	15	30
AB	9	18	11	22
A	7	14	14	28
Total	50	100	50	100

With twenty-one participants (42%) in the case group and ten (20%) in the control group, blood type O is the most common kind of responder. Thirteen percent of the case group and thirty percent of the control group participants were B-type. Nineteen percent of those in the case group and eleven percent of those in the control group had blood type AB. Additionally, 7 participants (14% of the total) in the case group and 14 participants (28% of the total) in the control group had blood type A.

Table 3: Recapitulation of Blood Type Relations with Dengue Hemorrhagic Fever

Variable	Cases		Control		p-value	OR
	N	%	N	%		
O	21	42	10	20	0.142	3.333
B	13	26	15	30		
AB	9	18	11	22	0.812	1.389
A	7	14	14	28		

Blood types A and O were compared, and there was no discernible difference in percentage between the two groups when it came to DHF (p=0.142). There was no difference in percentage between blood types B and A with respect to DHF, as shown by the chi-square test on comparison between the two, which yielded a p-value of 0.812.

Discussion
The circulatory system carries oxygen, nutrients, hormones, and other substances from one cell to another and to the outside world [20]. Red blood cells (erythrocytes) are hereditarily classified according to the ABO blood group system, which is based on the fact that their surface antigen content is nonexistent [21]. Some laboratory tests, as well as factors including age, diet, genetics, virus strain, primary infection status, and secondary infection status, may predict the severity of dengue [22, 23]. The ABO and HLA blood types are examples of hereditary factors. Despite the lack of a conclusive description of individual polymorphisms, many studies have shown a link between human leukocyte antigen (HLA) haplotype and susceptibility to severe dengue [24]. A component of innate immunity is the blood group antigen. Some research suggests that people's vulnerability to certain illnesses and infections may vary according to their ABO blood type [16, 25].

Both the case and control groups included a similar proportion

of respondents aged 0-14 (21 people, or 42% of the total). There were more men than women that participated in this survey. Of the total number of respondents, 30 (or 610%) in the case group and 27 (or 54% in the control group) had only completed elementary school. With twenty-one participants (42%) in the case group and ten (20%) in the control group, blood type O is the most common kind of responder. Thirteen percent of the case group and thirty percent of the control group participants were B-type. In addition to isoleucine levels, the female Aedes aegypti relied on the triglyceride content of human blood for its survival. For their resting habits, female Aedes aegypti rely on triglycerides as their primary energy source. Female Aedes aegypti mosquitoes may produce triglycerides in human blood, but they don't often travel great distances; instead, they prefer to remain inside, where they can find hosts, males in pairs, and breeding grounds year-round [26]. The heat of carbon dioxide emitted from the body is of interest to Aedes mosquitos. Mosquitoes also like the scent of human flesh. This occurs because a molecule called sulcatone plays a significant role in the production of the smell, which, for mosquitoes, serves as a signal for the location of food sources [27].

Nineteen percent of those in the case group and eleven percent of those in the control group had blood type AB. Additionally, 7 participants (14% of the total) in the case group and 14 participants (28% of the total) in the control group had blood type A. Blood types A and O were compared, and there was no discernible difference in percentage between the two groups when it came to DHF (p=0.142). With a confidence range of 0.890 to 12.489, the OR value is 3.333. There was no difference in percentage between blood types B and A with respect to DHF, as shown by the chi-square test on comparison between the two, which yielded a p-value of 0.812. With a confidence range ranging from 0.373-5.172, the OR value is 1.389. The blood group antigens are carbs in a biological sense. The immunodominant sugar of the A blood group is N-acetyl-d-galactosamine, while the B antigen is d-galactose. The enzyme galactosyl transferases is involved in the production of both of these factors [25]. An IgM reaction is triggered by these antigens [28]. In reaction to the glycosylated dengue virus protein, the immune system releases IgM antibodies, which likely interact with the blood group antigen in a cross-reactive fashion. Prior study has shown a link between HLA type and dengue sickness; however, a particular variant that influences the severity of the disease has not been found [16].

Conclusion
Dengue fever is quite common in India. Severe instances may be deadly, while most people have no symptoms or minimal symptoms at all. Therefore, it is critical to have knowledge about studies that aid in forecasting severity progression. Blood types were not significantly related to dengue hemorrhagic fever.

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