

Correlation of Vitamin B12 Levels with Clinical and Laboratory Features in Patients of Dengue Fever

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Introduction

Dengue fever, sometimes known as break bone fever, is a virus-borne disease that is transmitted by mosquitos which causes fever, headache, muscle pain and cramps.¹ The world's subtropical and tropical regions are home to a large population of Aedes mosquitoes, which are responsible for the disease transmission. Estimates suggest that 40-50% of the world's population is now at risk for dengue in tropical, subtropical, and, especially recently, higher temperate regions due to the rapid rise in dengue prevalence in recent decades.² There are around 100 million new cases of dengue each year worldwide, affecting about 2.5 billion individuals who reside in dengue-risk areas.³ The global spread of dengue infection is increasing. Thrombocytopenia and platelet dysfunction, which cause severe bleeding in dengue patients and other life-threatening consequences, are symptoms of this virus.

Vitamin B12 aids in preventing thrombocytopenia and maintaining a normal level of thrombocytes⁴ Compounds having vitamin B12 action are generally referred to as cobalamins since vitamin B12 includes the element cobalt.⁵ It is crucial for the production and maturation of platelets in the bone marrow hence, a deficit might result in thrombocytopenia. The creation of DNA, the genetic information-carrying molecules found inside cells, as

well as the metabolism of cells, neuron function, and red blood cell development all depend on vitamin B-12.⁶ Measurements of serum or plasma vitamin B12 levels are commonly used to determine vitamin B12 status. However, most laboratories define subnormal serum or plasma readings as those lower than 200 or 250 pg/mL (148 or 185 pmol/L), which is the threshold between normal vitamin B12 levels and insufficiency.⁷

Thrombocytopenia and other symptoms associated with thrombocytopenia frequently prompt dengue patients to be hospitalized.⁸ Patients with dengue fever who were Vitamin B12 deficient experienced increased bleeding symptoms and mild to severe thrombocytopenia. These individuals required more platelet transfusions and spent longer time in the hospital.⁹ The link between severe dengue virus infection and a lack of vitamin B12 is not sufficiently supported by research. Research in this area is required to determine the precise makeup of the biocomponents that increase platelet count and prevent dengue. The purpose of this cross sectional study was to evaluate the function of vitamin B12 in dengue fever patients.

Methodology and Results

This cross-sectional study was carried out at the Department of Gastroenterology, Medicare Cardiac and General Hospital in Karachi between May and October 2022. Patients who have been diagnosed with dengue fever and tested positive for the NS1 antigen, IgM antibody, or IgG antibody were included in the study. Patients with a history of malignancy, autoimmune disorders, or those receiving chemotherapy were excluded. The study had also not included patients who have sepsis, hematological disorders, or are taking medications that cause thrombocytopenia. Patients were categorized into groups based on their vitamin B12 level, with normal vitamin B12 being defined as 190 to 950 pg/ml and deficient vitamin B12 being

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AAR conceptualized the project did the literature search, statistical analysis, data collection along with drafting, revision & writing of manuscript..

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defined as less than 190 mg/ml. The sample size was calculated by Open Epi, keeping 95% confidence interval with an 80.5% reported prevalence of dengue fever.¹⁰ The results were statistically evaluated using SPSS version 20. The relationship between categorical data was examined using the chi-square test, and the mean difference between continuous data was analyzed using the independent sample t-test. A *p*-value of 0.05 or less was considered as significant.

The ethical approval was obtained from the Ethical Review Committee, Sohail University, Karachi vide letter no. 000210/22.

Table 1: Characteristics of enrolled patients. (n=100)

Variables	Frequency (n)	Percentage (%)
<i>Gender</i>		
Male	56	56%
Female	44	44%
<i>BMI</i>		
Below average	33	33%
Normal	31	31%
Above Average	36	36%
<i>Occupation</i>		
Student	23	23%
Job person	28	28%
Businessman	28	28%
Labor	21	21%
<i>Vitamin B12</i>		
Normal	44	44%
Deficient	56	56%
<i>Dengue Profile</i>		
NS1 antigen	43	43%
IgM antibody	32	32%
IgG antibody	25	25%
<i>Features</i>		
Fever	23	23%
Cough	25	25%
Vomiting	20	20%
Myalgia	32	32%
<i>Bleeding</i>		
Epistaxis	20	20%
Bleeding gums	16	16%
Hematuria	8	8%
Melena	20	20%
None	19	19%
Age (years) (mean ± SD)	36 ± 11	
Platelet count (mcL) (mean ± SD)	31999 ± 8574.9	
Hospital stay (days) (mean ± SD)	6.9 ± 1.9	

BMI: Body Mass Index, SD: Standard Deviation

The mean age of 100 patients was 36±11 years ranging from 18-55 years with 56 (56%) males and 44 (44%) females. The dengue profile of these patients was assessed and the details are given in Table-1, along with the status of bleeding manifestation and other demographic of patients. Most common clinical feature was myalgia in 32 (32%) patients and 64% had bleeding manifestation.

Among 100 patients, 56 (56%) were vitamin B12 deficient and 44 (44%) had normal vitamin levels.

A statistically significant association was seen in the vitamin B12 level of the patients associated with their body mass index and clinical feature (*p*-value = 0.03 and 0.001 respectively) (Table-2).

Table 2: Association between vitamin B12 and clinical profile of patients.

	Vitamin B12 Level		<i>p</i> -value
	Normal (n=44)	Deficient (n=56)	
<i>BMI</i>			
Below average	17 (38%)	32 (57%)	0.030*
Normal	12 (27%)	17 (38%)	
Above Average	15 (34%)	7 (12.5%)	
<i>Clinical Features</i>			
Fever	12 (27%)	36 (64%)	0.001*
Cough	12 (27%)	13 (23%)	
Vomiting	6 (13%)	3 (5%)	
Myalgia	14 (32%)	4 (7%)	
<i>Bleeding</i>			
Epistaxis	5 (11%)	15 (26%)	0.141
Bleeding gums	6 (13%)	10 (18%)	
Hematuria	4 (9%)	4 (7%)	
Melena	13 (29%)	7 (16%)	0.008^
None	16 (36%)	20 (35%)	
Platelet Count (mean±SD)	602973.18 ± 254209.84	467560.66 ± 243150.39	

*Statistically significant results by Chi-square test. ^Independent sample t-test.

The mean platelet count of all patients was assessed and a comparative analysis was done on the basis of vitamin B12 levels. The mean platelet count in individuals with vitamin B12 deficiency was 467560.66±243150.39 whereas the mean platelet count in patients with normal vitamin B12 levels was 602973.18±254209.84. There was a significant difference in mean platelet count between individuals who were vitamin B12 deficient and those who were not (*p*-value 0.008).

Comments

Vitamin B12 deficiency might lead to greater healthcare expenses, a longer hospital stay and platelet transfusions.⁸ A study found a statistically significant link between vitamin B12 and the severity of thrombocytopenia⁹ due to the substantially more severe thrombocytopenia that the individuals with vitamin B12 deficiencies had. When compared to a group with vitamin B12 levels greater than 300 pg/L (1.361.2860), the SDP which is a platelet transfusion method in which platelets are prepared from a single donor by an apheresis machine, was high (3.0± 1.41) in the group with vitamin B12 levels less than 100 pg/L, but this difference was not

statistically significant. Given that SDP was only administered in the current trial if platelets persisted below 10000/ μ l, this shows that severe B12 insufficiency may extend the severity of thrombocytopenia.¹¹ Recent research conducted in 2022 by Vidya et al. showed that dengue patients with normal vitamin B12 levels had significantly higher mean platelet counts than those with vitamin B12 deficiency.⁹

The study concluded that the patients with dengue fever who lacked Vitamin B12 reported moderate to severe thrombocytopenia and increased bleeding episodes. Because such individuals required more platelet transfusions, serum Vitamin B12 levels in dengue patients with severe thrombocytopenia can be examined. Vitamin B12 supplementation in these individuals may enhance platelet count, decrease bleeding manifestations, and platelet transfusion. More information is needed to corroborate and support this.

Conflict of interest: None declared.

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