DETERMINATION OF SERO-PREVALENCE OF DENGUE AND ITS ASSOCIATION WITH BIOCHEMICAL AND HEMATOLOGICAL PARAMETERS

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Abstract:
Objectives: The purpose of this study is to find out the incidence of acute Dengue in Holy Family Hospital Rawalpindi and its association with the biochemical as well as haematological parameters.
Methodology: The duration of this research work was from March 2016 to December 2019. We diagnosed the patients serologically suffering from acute Dengue if there was reactive dengue virus antigen of NS-1, IgG or IgM.
Results: Out more than 2000 patients suspected to present with Dengue, we diagnosed 1153 patients serologically with acute Dengue, causing a Sero-prevalence of 64.9%. There was a lower average count of platelets 89 x 109/L in the patients who were Dengue positive in comparison with the patients who were dengue negative (171.0 x 109.0/L) (P < 0.00010). Average total count of white blood cells was also less in the patients who were Dengue positive (4.7 x 109/L vs 7.2 x 109/L; P < 0.00010). There was a high average hematocrit in the patients suffering from acute Dengue (42.5% vs 40%; P < 0.00010). Likewise, there was a higher level of serum alanine transaminase among patients suffering from acute Dengue (108 U/L vs 54 U/L; P < 0.00010).
Conclusions: There was much high prevalence of acute Dengue in our institute in these three years of study duration. The most critical parameter which was strongly associated with the acute Dengue was count of platelets. Count of platelets was much low in the patients suffering from Dengue.
KEYWORDS: Count, Platelets, White Blood Cells, Parameter, Serum, Prevalence, Acute, Dengue,

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INTRODUCTION:

Dengue is the result of a virus born by a mosquito of Flaviviridae family. There are four serotypes of Dengue Virus. The infection due to single serotype of Dengue Virus provides the immunity against that particular serotype for a complete life, but it is not able to give the immunity everlasting for other three types of serotypes [1]. The range of its clinical spectrum is sub-clinical infection to the fatal Dengue Shock Syndrome [2]. This disease is not new but is the serious health issue of public since 1950 [3]. Various countries in Asia are significantly vulnerable to acquire the infection of dengue virus, and this disease is also endemic in our country in seasons. About fifty thousand patients of dengue virus have been reported in our country till yet [4]. This was a rapid increase in its occurrence with time since 2000 [4]. This complication increases typically in April to November every year [5]. There is a recommendation of the identification of viral non-structural protein-1 (NS-1) in serum for the patients appearing in early-stage (day one to seven of illness) [6]. The specific antibodies of Dengue for diagnostic are immune-globulins G & M (IgG & IgM).

In primary infections, IgM specific to Dengue can be identifiable as early as day four of onset of illness and IgG specific to Dengue by 14 days [6, 7]. Both of these immune-globulins appear as soon as day two of disease in secondary infections [7]. The epidemic of dengue virus Dengue has an association with some abnormalities in particular biochemical and haematological features. There can be the presence of leucopenia, enhanced level of serum transaminases and thrombocytopenia in the case of acute Dengue [8]. The primary rationale of this research work was to find out the Sero-prevalence of severe Dengue in our regions and its association with the specific biochemical and haematological parameters.

METHODOLOGY:

This transverse research work carried out in Holy Family Hospital Rawalpindi from March 2016 to December 2019. We included 1774 patients suspected to be suffering from acute Dengue in the duration of this research work for examination. All these patients were suffering from febrile illness. We retrieved the data about the status of acute Dengue, the total count of white blood cells, count of platelets, hematocrit and ALT level for each patient from the laboratory of the hospital.

We detected the antibodies of dengue virus in the serum of the patients with the utilization of Panbio Dengue Duo Cassette. The availability of the IgM of dengue virus separately would show primary infection and IgG will show the secondary infection of the disease. We detected the NS-1 of the antigen in the serum of the patients with the utilization of the die xi Dengue NS-1 Antigen Test. We considered the patients to have suffered from acute Dengue if there was at least one antigen was in a reactive condition. We calculated the average total count of the white cells, the average count of platelets, average hematocrit and the average level of ALT for the dengue virus-positive & dengue virus-negative groups. We used the Student T-test for the analysis of means. P-value of less than 0.05 was significant.

RESULTS:

We diagnosed 1153 patients suffering from acute Dengue among total 1774 patients with a Sero-prevalence rate of 64.9%. Male patients outnumbered female patients in quantity, with a ratio of 1.6: 1. Among these 1153 patients detected with acute dengue virus, 44.8% (n: 516) patients were present with serological poofs of primary Dengue only, 40.8% (n: 471) patients were current with secondary Dengue, and 14.4% (n: 166) patients were not in a condition to be categorized.

In total biochemical & haematological parameters, the average count of platelets and the average level of LAT were low. They increased in the patients suffering from acute Dengue correspondingly, as shown in Table-1 & 2.

Table-I: Hematological Parameters in Patients with And Without Acute Dengue

Parameter	Dengue-Positive (n=1134)		Dengue-Negative (n =591)		P-Value
	Mean $\pm$ SD	Range	Mean $\pm$ SD	Range	
Total white cell count x 109/L	4.7 $\pm$ 3.9	(1.0 - 87.1)	7.2 $\pm$ 5.2	(0.5 - 61.5)	< 0.010
Platelet count x 109/L	89 $\pm$ 69	(5 - 668)	171 $\pm$ 100	(10 - 778)	< 0.010
Hematocrit	42.5 $\pm$ 5.4	(21.7 - 60.8)	40 $\pm$ 5.8	(16.2 - 63.5)	< 0.010

The average count of white blood cells and hematocrit were in usual limitations. But, when we compared to the patients present without any infection of dengue virus, the averages of all these four parameters were much different in the patients of both groups of dengue virus-positive and dengue virus-negative.

Table-II: Alanine Transaminase Level in Patients with And Without Acute Dengue

Parameter	Dengue-Positive (n=1049)		Dengue-Negative (n = 467)		P-Value
	Mean $\pm$ SD	Range	Mean $\pm$ SD	Range	
Alanine transaminase level in U/L	55 $\pm$ 63	(6 - 609)	108 $\pm$ 151	(6 - 2521)	< 0.010

DISCUSSION:

From the past few years, there is an increase in the amounts of dengue patient's despite different programs by our health care services as campaigns for dengue awareness. There was an increasing trend in the last half-year in our country. Dengue is the infectious complication having an association with the thrombocytopenia [6]. This current research work studied the relationship between Dengue & thrombocytopenia, also with other investigations [6, 9]. Reduced production and development of platelets from bone marrow, enhanced peripheral platelets destruction and the immuno-complex lysis are three main contrivances of thrombocytopenia in cases of acute Dengue [9]. There are some dengue virus-positive patients in this research work present with thrombocytosis. The most probable reasons are co-morbidities like myeloproliferative complications, different fatalities, as well as Hyposplenism [10].

There are reports which state that leucopenia has a better predictive value in patients of acute Dengue [11]. This research work discovered that the average count of white blood cells was much low in the patients who were dengue virus-positive. The average count of leucocyte was present in the normal range in both groups of patients. There is the postulation that there is the occurrence of leucopenia in the febrile duration of the infection of Dengue as a result of the destruction of precursor cells of bone marrow by dengue virus [12]. A patient suffering from acute Dengue had the leukocytosis (87.1x109/L). As a consequence, he had myeloid leukaemia of severe nature. Another probable justification for the leukocytosis is the co-infection of bacteria in the presence of infection due to acute dengue [13].

Hemo-concentration is another critical marker of leakage of plasma in some kinds of Dengue. This research work discovered that the average level of hematocrit was present in the normal range in the patients who were dengue virus-positive. However, this average was much high in comparison with the patients who were dengue virus-negative. The most probable reasons are normal hematocrit in the early stage of the infection of acute Dengue [14]. Hematocrit is not an adequate diagnostic marker for the disease of the acute Dengue. The epidemic of acute Dengue has an association with the mild to an average increase in the levels of serum ALT [15].

Much consistent with the investigations of other research works, this research work discovered that patients suffering from acute Dengue tend to have high levels of normal ALT in comparison with the patients who were dengue virus-negative. The increased level of ALT is responsible for the hepatic injury resulted from the direct infection of kupffer cells and hepatocytes by dengue virus [15].

Hepatic involvement is much frequent in the infection of dengue virus [16]. There are some limitations of this research work as this research work did not provide the correlation of various parameters. There is a need for other research works to consolidate the findings of this research work in different regions of the country to determine its exact prevalence in the whole country.

CONCLUSION:

There was a high prevalence of acute Dengue in our hospital. The diagnosis of this complication is essential to start its proper treatment and identification of the signs of this disease. There was only one parameter of the count of platelets which was abnormal in the patients suffering from acute Dengue. There should be an investigation of all the patients serologically who are suffering from fever or thrombocytopenia to identify the prevalence rate of this complication in our regions.

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