Alanine Transaminase levels in Patients of Dengue Fever in the Suburbs of Islamabad

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Author's Contribution

[1,3,6] *Conception of study*
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[2,4] *Analysis/Interpretation/Discussion*
[3,6] *Manuscript Writing*
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Abstract

Objective: This study was carried out to observe hepatic damage in patients with dengue fever (DF) by measuring alanine transaminase levels.

Materials and Methods: A cross-sectional study of three months duration was carried out in the Department of Medicine, Dr. Akbar Niazi Teaching Hospital affiliated with Islamabad Medical & Dental College, Pakistan. The sampling technique was Non-Random consecutive sampling and 118 patients were included in our study. Serum Alanine Transaminase (ALT) (normal = 7-56 IU/L), serum Aspartate Transaminase (AST) (normal = 10-40 IU/L) were determined and ultra-sound abdomen was performed. Statistical analysis was done using SPSS Version 24. The Chi-square test was used to observe the relationship between categorical variables. Phi, Cramer's V, Pearson's, and Spearman's Correlation tests were used to study the association of age and gender with ALT levels.

Results: There were 72% males (n=85) and 28% females (n=33). Patients were grouped according to age and mean ALT (95+86 IU/L) and AST (134.7+ 98 IU/L) levels were calculated in the different age groups. These levels were found to be significantly raised (P=0.00) in the age groups of 9-18 years and 19-25 years as compared to the other age groups. Moreover, males had high ALT levels as compared to females, however, a significant difference was not observed. There was also no association seen of gender with raised ALT levels (P=0.564), Phi & Cramer's V=0.56, and Spearman's correlation coefficient=0.320.

Conclusions: ALT and AST levels were elevated above the normal in our sample indicating hepatic involvement.
Keywords: Dengue, Serum Alanine Transaminase, Serum Aspartate Transaminase, Hepatic Dysfunction.

Introduction

Dengue is a widespread infectious illness seen in countries located in the tropics and is fast spreading in all zones of WHO worldwide.[1] This disease is viral in nature and is mosquito-borne. Dengue virus spreads by the bite of female mosquitoes, mainly of the Aedes aegypti species, which also transmits chikungunya, yellow fever, and Zika infections and, to some extent, by another species of mosquito, the Aedes albopictus. Dengue infection is prevalent in the tropics, with local disparities in risk depending on temperature, rain, and unexpected fast migration of people to urban areas.[2]

In the 1950s, documentation of severe dengue was done, during a dengue epidemic in the Philippines and Thailand. Presently, most Asian and Latin American countries are affected by it and have become a major reason for hospitalization and death, particularly among children. It has been assessed, that every year approximately 0.39 billion cases of dengue are observed and out of these, about 25% of patients present with clinical manifestations of this disease.[2] In South-East Asia, the fatality rate is about 1%, but in India, Indonesia and Myanmar higher rates (3%-5%) have been recorded.[3]

In Pakistan, the initial documented outbreak of dengue fever occurred in 1994. Thereafter, an explosive occurrence of dengue cases, at the end of the year 2005 in Karachi, led to it being recognized as a yearly epidemic trend.[4,5] An epidemic of dengue fever has afflicted Pakistan since the year 2010. The city of Lahore recorded 257 fatalities and 16,580 patients were confirmed positive. Moreover, from the remaining parts of the country, the number of reported cases was 5000, while some sixty people died due to dengue complications. In Pakistan, the epidemic has affected mainly the provinces of Punjab, Sindh, and Khyber Pakhtunkhwa.[4,5]

Clinically, the illness of Dengue fever (DF) ranges from an asymptomatic form to a wide range of syndromes with serious clinical manifestations. Symptomatic infection may present as a mild but incapacitating DF to a highly fatal Dengue haemorrhagic fever (DHF), as well as a Dengue Shock Syndrome(DSS) condition due to plasma escape in DHF patients.[1] In some cases, hepatic and central nervous system damage has also been seen.[6] Observed hepatic dysfunction ranges from minor damage reflected by raised transaminases to extensive injury and failure of the hepatic cells, with patients exhibiting jaundice.[6] Deranged functioning of the liver has been observed more commonly in patients of DSS and DHF.[7,8]

Thus, in order to reduce associated morbidity and mortality, this ailment should be diagnosed at the earliest possible so that appropriate therapy may be instituted. There is a minimal data record of altered liver activity in such patients in Pakistan. The purpose of our study was to assess the spectrum of hepatic disorder in patients suffering from Dengue Fever.

Materials and Methods

This cross-sectional study, with a duration of three months, was carried out in the Department of Medicine, Dr. Akbar Niazi Teaching Hospital affiliated with Islamabad Medical & Dental College, Bharakahu Islamabad, Pakistan.

WHO calculator was used to calculate the sample size. The estimated minimal sample size required for this study was 111 cases of Dengue infection with absolute precision required to be 0.07. Non-Random consecutive sampling was performed. As per WHO guidelines, all clinically suspected patients between 9 and 70 years of age presenting at the OPD, from July 2019 to Oct 2019 were screened. Serologically confirmed cases by Dengue NS1 Antigen, Dengue Virus IgG, and IgM were included in our study. All cases were subjected to detailed history taking, followed by a thorough clinical examination. In addition to routine investigations, Serum Alanine Transaminase (ALT) (normal = 7-56 IU/L), serum Aspartate Transaminase (AST) (normal = 10-40 IU/L), and ultra-sound abdomen were performed for detection of liver pathology.

Patients suffering from other liver diseases e.g. Hepatitis, Alcoholic Hepatitis, Drug-Induced Hepatitis, etc. were excluded from our study.

Statistical analysis was performed using SPSS Version 24. The Chi-square test was used to observe the relationship between categorical variables. Phi, Cramer's V, Pearson's, and Spearman's Correlation tests were used to study the association of age and gender with ALT levels.

Results

A total of 118 patients were enrolled in our study, with 72% males (n=85) and 28% females (n=33) (Figure 1). Patients were grouped according to age (Figure 2) and mean ALT (95+86 IU/L) and AST (134.7+ 98 IU/L) levels were calculated in the different age groups (Table 1). These levels were found to be significantly raised (P=0.00) in the age groups of 9-18years and 19-

25 years as compared to the other age groups (Table 2). Thus, younger age was found to be positively associated with raised ALT levels (Table 3).

In addition, more males had high ALT levels as compared to females; however, there was no significant difference. There was also no association or relationship seen of gender with raised ALT levels (P=0.564), Phi & Cramer's V = 0.56, and Spearman's correlation coefficient =0.320.
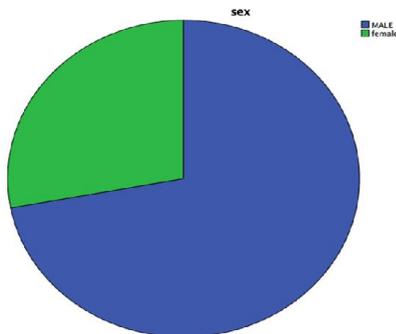

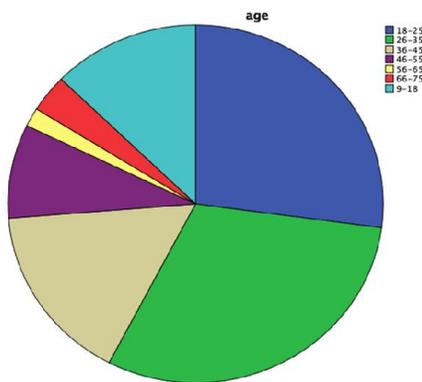**Figure 1: Distribution of Dengue patients according to sex**

Figure 2: Distribution of Dengue patients according to age

Table 1: ALT and AST levels in different age groups

Age groups(yrs)	Number of patients=n	ALT IU/L (mean $\pm$ SD)	AST IU/L (mean $\pm$ SD)
9-18	15	117.9$\pm$108	186.1$\pm$120
19-25	32	101.2$\pm$112	133.7$\pm$124
26-35	36	84.5$\pm$59	118.1$\pm$65
36-45	19	89.2$\pm$73	127.6$\pm$83
46-55	10	70.2$\pm$135	96.1$\pm$41
56-65	2	212.5$\pm$152	276.5$\pm$173
66-75	4	85.50$\pm$77	158.0$\pm$98

Table 2: Relationship between age groups and ALT levels

Chi-Square Tests	Value	df	Asymptomatic Significance (2-sided)
Pearson Chi-Square	132.132	72	**0.001**
Likelihood Ratio	71.966	72	.479
Linear-by-Linear Association	1.426	1	.232
N of Valid Cases	118		

*** *Highly significant*

Table 3: Association and relationship of age and ALT levels

			Value	Significance
Nominal by Nominal	Phi		1.058	**0.001**
	Cramer's V		.432	**0.0001**
Interval by Interval Pearson's R			.110	.234
Ordinal by Ordinal Spearman Correlation			.096	.300
N of Valid Cases			118	

Discussion

We witnessed in our study that in Pakistan, the spread of dengue infection mainly occurred in August and September and we found our results to conform to a national report published previously. The probable reason for this being that this is soon after the rainy season, when the environment is extremely humid and thus, favourable for the breeding of mosquitoes.[9]

In our present study, we observed that mostly the younger age groups were affected as compared to the older ones, which might be due to their greater exposure to the outdoor environment. It was observed that most of our patients were in the 15-35 year age bracket. Another interesting finding was that twice as many males were affected as females, owing probably to females being confined indoors, as compared to males who take on most outdoor work and responsibilities. Similar results have been observed in previous studies.[10]

Hepatic dysfunction is a common occurrence in Dengue infection, as it is believed to attack the reticuloendothelial system of the patient.[9,11,12] Hepatic damage could be a result of either the virus directly attacking the cells or, because of an excessive immune reaction of the host to the viral antigens.[9] Some studies conducted in other countries, like Thailand and India

have shown that the foremost reason for sudden liver failure in the younger age group, was dengue infection in about 34% and 18% of the cases, respectively.[13] Another previous study observed that complications and deaths due to acute Dengue fever were significantly associated with abnormal liver function and high levels of aminotransferases. Patients with Dengue Hemorrhagic Fever, Dengue Septic Shock, hepatic and respiratory failure, as well as patients with encephalopathy, all had significant elevation of AST. Moreover, AST levels were found to be raised twice as much as ALT, in contrast to other viral infections. Similarly in another study carried out in Alexandria Hospital.[10] from November 2003 till December 2004, showed that 90.6% of patients had raised AST and 71.7% had raised ALT levels. Raised aminotransferases were also reported by Souza et al.[14], Wong[15], Chinh, and colleagues.[16] It was found that AST level was raised more than ALT.[14,16,17]

In a similar study conducted by Trung and colleagues in South Vietnam, 650 DF patients were recruited and raised transaminases were found in all patients. This was also associated with the severity of illness in terms of vascular leakage and bleeding.[15]

Conclusion

Thus, we can conclude that raised ALT level can be considered an important parameter in determining morbidity and mortality in young patients suffering from Dengue, and as such can be employed as an early marker for assessment of disease severity.

The limitation of our study was that our data was limited to just a suburb of Islamabad and our sampling was not done at a national level.

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