Journal Of Medical Science And Clinical Research
IGM Publication
An Official Publication Of IGM Publication

Original Research Article

A comparative study of hepatic dysfunction and platelet count abnormalities in aedes vector-borne viral fever in outbreak season of mosquito bites

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Abstract
Background: *Emerging viral infections have become a serious problem in recent years. Emergence or reemergence of severe arboviral fevers caused by mosquito borne viruses, such as Dengue virus and Chikungunya (CHIK) virus, have been frequently reported in the Indian subcontinent in the past few years. From the clinical perspective, these infections have similar clinical manifestations and are difficult to distinguish from one another.*

Objective: *To compare the laboratory features of confirmed cases of Chikungunya and Dengue fever.*

Study Design: *A Laboratory-based retrospective study was conducted on confirmed cases of Chikungunya and Dengue fever, who were visited in Medicine and Orthopaedics Department of SGRRIM&HS for a period of 5 month from July17 to Oct17. A total number of 50patients (26Female+24Male).Range of age group was 4 to 80 years. Exclusion criteria was co-infective cases.*

Methods: *Data has been compared between 25(8Male+17Female) Chikungunya (RT-PCR positive) patients group and 25 (16Male+9Female) dengue (NS1antigen positive) patients group for platelet count, Liver Function Test (SGOT and SGPT) and Renal Function Test (urea & creatinine) was compiled and studied.*

Results: *Females were found to be more affected in Chikungunya, while in Dengue Fever males were more affected. Chikungunya patients had significantly higher platelet count ($193.5 \times 10^9/L \pm 84.25 \times 10^9/L$) than Dengue Fever ($101.79 \times 10^9/L \pm 42.51 \times 10^9/L$). Transaminases were found to be higher in Dengue Fever (SGOT 158.25U/l ±77.14U/L, SGPT 89.87U/L±32.5U/L) than Chikungunya (SGOT 45.37U/L±18.82U/L, SGPT 42.63U/L±18.22U/L).*

Discussion: *Most apparent differences at laboratory presentation are thrombocytopenia and elevated transaminases levels in DF. Single platelet count is not discriminating parameter between Chikungnya and Dengue Fever. Elevated transaminases are more in Dengue Fever indicating dengue related hepatic involvement.*

Conclusion: *Dengue and Chikungunya infections continue to co-exist in many tropical countries. Our study has shown that it is possible for clinician to use simple laboratory tests to predict these infections for appropriate management even substantial overlap in clinical presentation.*

Keywords: *Dengue, Chikungunya, arbovirus, thrombocytopenia, transaminases, aspartate transaminase (AST), alanine transaminase (ALT).*

Background

Dengue fever is a massive health threat throughout the world, Currently, the WHO reports its presence in more than 125 countries[1] and recent data suggest as many as 390 million infections occur annually[2]. Global distribution map of dengue has estimated and predicted India to be the worst affected. In India dengue contributes about 34% of the total global infections making it a transmission hub.[3]

Chikungunya virus poses a serious threat to public health with spread to many parts of the globe. In the Indian sub-continent, while as many as 1.2 million individual were affected by Chikungunya in 2006, recent trends have shown it to be declining, though numbers are still large.[4, 5]

Introduction

Emergence or reemergence of severe arboviral fevers caused by mosquito borne viruses, such as Dengue virus and Chikungunya (CHIK) virus, have been frequently reported in the Indian subcontinent in the past few years. Dengue virus and Chikungunya virus are the rapidly spreading RNA virus.[6] both pathogens are transmitted by the same Aedes spp. mosquitoes and so there is a reasonable expectation that the epidemiology of Chikungunya and dengue infections is temporally and spatially related.[7]

From the clinical perspective, these infections have similar clinical manifestations and are difficult to distinguish from one another.[8] management of dengue and Chikungunya fever is entirely based on supportive therapy, and platelet transfusion is used for specific indications only, in dengue.[9]

These two diseases now co-circulate in many countries and pose a challenge to clinicians because they may require different clinical management even though their manifestations can be similar.

In developing country like India where resources are less and population is high, it is very difficult to get all confirmatory test for both diseases at all areas. Keeping this point in mind we did comparative study of simple laboratory parameters in confirmed cases of dengue and Chikungunya to find out significant differences in both fever and there clinical significance.

Aim and Objectives

The aims of this study were to: To compare the laboratory features of confirmed cases of Dengue fever and Chikungunya.

To explore the possibility of simple laboratory variables for prediction of these infections for appropriate patient management.

Material and Methods

A Laboratory-based retrospective study was conducted in the department of biochemistry on confirmed cases of Chikungunya (RT-PCR+ve) and Dengue Fever (NS1 antigen+ve), who were visited in Medicine Dept. and some cases Of Orthopaedics department of SGRRIM&HS for a period of 5 month from July17 to nov17. A total number of 50 patients (26 female+24 male) were taken. Range of age group was 4 to 80 years. Main exclusion criteria was co-infective cases. We collected data for total leukocyte count, platelet count, ASPARTATE TRANSAMINASE (AST), ALANINE TRANSAMINASE (ALT) and CREATININE.

All these investigation were carried out by automated electrical impedance, microscopy and dry chemistry. The patients presenting with co-infections were excluded from the study.All the data was subjected to statistical analysis using mean, standard deviation and student's t test etc. The results in each parameters under study were graded as follows.

Non significant   P>0.05
Significant   P<0.05

Results

A total number of 50 confirmed cases (26Female +24Male) in the age group 4 to 80 years were included in the study and assayed for total leukocyte count, platelet count, ASPARTATE TRANSAMINASE (AST), ASPARTATE

TRANSAMINASE (ALT) and creatinine. Mean age was 39.58 ± 16.82 in dengue fever and 43.74 ± 16.81 in Chikungunya. Females were found to be more affected in Chikungunya (8Male, 17Female), while in Dengue Fever (16Male, 9Female) males were more affected. Chikungunya patients had significantly higher platelet count(193.5X10⁹/L±84.25X10⁹/L) than Dengue Fever (101.79X10⁹/L ± 42.51X10⁹/L). Transaminases were found to be higher in Dengue Fever (SGOT 158.25U/l ±77.14U/L, SGPT 89.87U/L±32.5U/L) than Chikungunya (SGOT 45.37U/L±18.82U/L, SGPT 42.63U/L±18.22U/L)

Table-1 Comparison of Haematological & Biochemical Parameters in Dengue and Chikungunya Fevers

NAME OF PARAMETERS	MEAN±SD OF THE PARAMETERS		t VALUE	p VALUE & SIGNIFICANCE
	GROUP A (DENGUE FEVER)	GROUP B (CHIKUNGUNYA)		
TLC (/µL)	4953.58±2358.74	6552.30±2382.88	2.4029	0.0201 (SS)
Platelet count (X10³)/µL	101.76±42.51	193.5±84.25	6.3296	0.0001(ESS)
AST(U/L)	158.25±77.14	45.37±18.85	7.4966	0.0001 (ESS)
ALT(U/L)	89.87±32.58	42.62±18.22	6.6081	0.0001 (ESS)
Creatinine (mg/dl)	0.85±0.276	0.91±0.244	0.8401	0.4048 (NSS)

SS- Statistically Significant   ESS-Extremely Statistically Significant   NSS-Not Statistically Significant

Graph 1 Comparison of Haematological & Biochemical Parameters in Dengue and Chikununya Patients
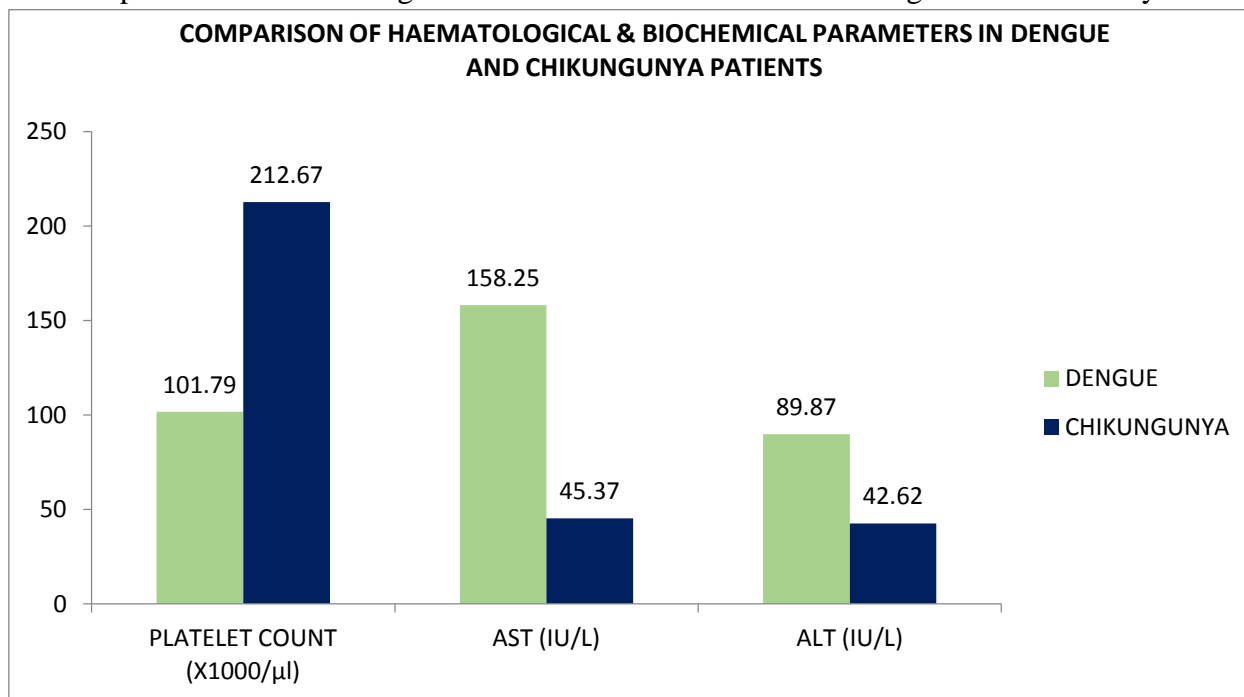
Discussion

Dengue and Chikungunya fever are important arboviral infections. The first outbreak of the Chikungunya was noticed in Kolkata (1963)[9] after that in Tamil Nadu, Andhra Pradesh, and Maharashtra.[10]By 2010, the disease had spread to more than 18 states/union territories within the country.[11]

Chikungunya and Dengue viruses belong to different families but share common mammalian host and vectors. Diagnosis of these two infections is difficult owing to overlapping clinical presentation leading to misdiagnosis. These viral infections have many common clinical features such as high-grade fever, rashes, nausea, headache, and body pain, so it is not always easy to differentiate the two infections clinically.

Chikungunya fever is often misdiagnosed as dengue viral infection. In most cases of mild infection, symptoms subside spontaneously because the viral titer decreases in about 10 days.[12] Dengue infections are divided on the basis of clinical criteria into Dengue Fever, Dengue Hemorrhagic fever, Dengue Shock Syndrome, and expanded dengue syndrome.[13] Expanded dengue syndrome includes atypical manifestations of dengue infection affecting the hepatic, gastrointestinal, neurological, pulmonary, and renal systems.[14-16]

In our study, we found that at the time of laboratory presentation, the most apparent differences in these two fevers were leucopenia, thrombocytopenia and elevated transaminases in Dengue fever. Elevated transaminases indicated dengue related hepatic involvement.

The mechanisms involved in thrombocytopenia in dengue infection are not fully understood. Dengue virus could directly or indirectly affect bone marrow progenitor cells by inhibiting their function to reduce the proliferative capacity of hematopoietic cells.[17]

Thrombocytopenia may also be due to platelet consumption during ongoing coagulopathy process, activation of the complement system or increased peripheral sequestration

Leucopenia in dengue fever may be caused by virus induced destruction or inhibition of the myeloid progenitor cells.

Other studies have also reported that liver involvement in Dengue Fever is extremely common. Increase in transaminases has been observed in 93.9%–97.7% of the cases, an important finding regarding transaminases increase in Dengue Fever is that AST levels tend to be greater than ALT levels.[18,19]

The mechanism for this is the excess release of AST from damaged monocytes during dengue infection.

Conclusion

From the findings of our study, it can be concluded that leucopenia, thrombocytopenia and elevated transaminases are significantly evident in Dengue fever as compared to Chikungunya fever, which may help the clinicians in proper management of the patients. These are the simple test and can be done in small city or places. Clinician of that city cannot send every patient for confirmation of diagnosis of dengue fever and Chikungunya fever. These differences could be helpful for treating doctor to differentiate between both arboviral infections.

Further validations of these investigations over a larger patient population may pave way to identification of distinct variables that could be exploited for differential diagnosis, thereby helping in better patient management.

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