

Comparative Study of Hematological and Biochemical Changes in Patients Infected by Dengue Fever at Tertiary Care Hospital at Fatehabad, Haryana

Prachi Arun¹, Lata Sangwan², Amit Munjal³

How to cite this article:

Prachi Arun, Lata Sangwan, Amit Munjal. Comparative Study of Hematological and Biochemical Changes in Patients Infected by Dengue Fever at Tertiary Care Hospital at Fatehabad, Haryana. Indian Journal of Medical & Health Sciences. 2019;6(2):53-57.

Abstract

Introduction: Dengue viral infections are the most important mosquito-borne diseases of the Indian subcontinent and have become a major global public concern. World Health Organization (WHO) has estimated about 50 million cases of dengue infection every year worldwide. This disease caused by dengue ranges from a relatively minor febrile illness to a life-threatening condition characterized by extensive capillary leak. Apoptotic hepatocytes are found to be colocalized with dengue virus infected hepatocytes, suggesting that hepatocytes are the major site of dengue virus replication in the liver.

Objective: To evaluate hematological and biochemical changes in serologically proven patients with clinical manifestations of dengue fever.

Materials and Methods: The present study has been carried out in General Hospital Fatehabad, District Fatehabad, Haryana. Fifty patients suffering from fever were included in study. Blood samples of twenty-five febrile individuals belonging to each group, seronegative for Dengue (Group A) and seropositive Dengue subjects (Group B) were taken. Hb, TLC, Platelet count, SGOT and SGPT estimations were done of febrile patients seronegative for Dengue (Group A) and seropositive Dengue patients (Group B).

Result: It was found that in seropositive dengue patients the Hb values are low as compared to seronegative dengue patients, i.e. Hb ranging from 5.8-11.2 gm/dl in seropositive dengue patients and 10.2-15.6 gm/dl in seronegative dengue patients. TLC range in seronegative dengue patients is 5800-10800/cumm and in seropositive dengue patients it is recorded as 1300-4800/cumm. The study also depicted that platelet count is comparatively low among seropositive dengue patients, i.e. 20,000-80,000 cells/cumm as compared to seronegative dengue patients in which platelet count ranges from 1,58,000-3,32,000 cells/cumm. SGOT and SGPT values are raised in seropositive dengue patients as compared to seronegative dengue patients with SGOT ranging between 68-540 IU/L among seropositive dengue patients and 8-40 IU/L among seronegative dengue patients. The values of SGPT range from 12-30 IU/L in seronegative dengue patients and 63-480 IU/L in seropositive dengue patients.

Conclusion: Considering the results, it was concluded that in seropositive dengue patients Hb and platelet levels are low as compared to seronegative dengue patients whereas TLC levels show a decrease in seropositive Dengue patients but sometimes it may also be increased due to other bacterial infections. Biochemical markers, i.e. SGOT and SGPT were higher in seropositive dengue patients as compared to seronegative dengue patients.

Keywords: Dengue; Vector borne; Hemorrhagic; Platelet count; TLC; SGOT and SGPT.

Author's Affiliation: ¹Pathologist, ²Biochemist, ³Physician, Haryana Civil Medical Services, Civil Hospital Rd, Model Town, Fatehabad, Haryana 125050, India.

Corresponding Author: Lata Sangwan, Biochemist, Haryana Civil Medical Services, Civil Hospital Rd, Model Town, Fatehabad, Haryana 125050, India.

E-mail: sangwan.saharan.lata@gmail.com

Received on 08.07.2019 **Accepted on** 16.08.2019

Introduction

Dengue fever (DF) is the most common acute febrile viral disease among all the arthropod-borne viral diseases caused by a single-stranded RNA virus of Flaviviridae family. The term "dengue" is

derived from the Swahili “Ki dengapepo” meaning a sudden seizure by a demon. The term “Break Bone Fever” was coined during Philadelphia epidemic in 1780.¹ Dengue endangers 2.5 billion people worldwide. WHO has estimated about 50 million cases of dengue infection every year world wide. Case fatality rate is around 5%. After the incubation period of 4–7 days (range 3–14 days) symptoms appear with sudden onset of fever that lasts for 3–5 days with headache, myalgia, anorexia, gastrointestinal tract infection and rash. It is caused by four closely related but serologically distinct dengue virus called DEN-1, DEN-2, DEN-3, and DEN-4 (Anderson *et al.*, 2008).² The viruses are transmitted to man by the bite of infected mosquito, mainly *Aedes aegypti*. Liver dysfunction in Dengue is due to direct effects of the virus on liver cells and an adverse effect of host immune reaction against the virus (Burke *et al.*, 1998).³ Virus has been identified in liver tissue and dengue antigen identified within liver cells of affected individuals leading to Kupffer cell hyperplasia. Dengue viral antigens are mostly found in the liver cells surrounding necrotic areas of the liver. Apoptotic hepatocytes are found to be colocalized with dengue virus infected hepatocytes, suggesting that hepatocytes are the major site of dengue virus replication in the liver (Claro *et al.*, 2004; Cook G.C; 1997).^{4,5} Many dengue fever cases are self limiting but its complications like Dengue Hemorrhagic Fever and shock are life threatening. If untreated, mortality rate is as high as 20%, whereas if recognized on right time and managed properly, mortality is less than 1% (WHO, 2009).⁶ Dengue fever is most common in urban areas in which outbreaks occur frequently during rainy season when mosquito breed heavily in standing water. Most healthy people who get dengue fever can recover by taking necessary precautions and medications. This will reduce the mortality rate. No specific antiviral therapies are currently available for the disease caused by arthropod-borne viral diseases. Thus efforts have been focused on the prevention of disease through either vaccination or vector control (Coller *et al.*, 2010).⁷

Therefore, the aim of the present study is to study seropositive cases of Dengue fever to correlate hematological and biochemical findings of disease.

Materials and Methods

This study of 25 patients with serologically confirmed Dengue infection was carried out in General Hospital Fatehabad, District Fatehabad, Haryana from the period September 2015 to

December 2015. Twenty-five febrile patients seronegative for Dengue were selected as controls for study.

Sample and Sampling Technique

Through convenient sampling blood samples from twenty-five individuals suffering from fever belonging to both groups, i.e. seronegative Dengue patients (Group A) and seropositive Dengue subjects (Group B) were taken up for the study. Hematological and biochemical analysis were done.

Blood was collected by venipuncture method and dengue virus was determined by ELISA technique using standard kits, as per the manufactures instructions. Plasma or Whole blood samples may be used for this test. Hemoglobin, total leukocyte count (TLC) and platelets were determined by 3 part cell counter (KX-22C ERBA) using EDTA anticoagulated blood as sample.

Serum glutamic-oxaloacetic transaminase (SGOT) and Serum glutamic pyruvic transaminase (SGPT) were determined by semi-autoanalyzer (Chem 5X ERBA-Transasia) by UV enzymatic kinetic method using standard kits, as per the manufactures instructions.

Analysis of the data

The analysis of the data was done in accordance with objectives of the study using descriptive statistics.

Results and Discussion

Dengue is the most common arthropod-borne viral infection in the world. There are four distinct serotypes of dengue virus (DENV) and each of these serotypes can cause disease symptoms ranging from self-limiting febrile illness called dengue fever (DF) to dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Infection with one serotype confers protective immunity against that serotype but not against other serotypes.⁵ It is estimated that every year, 2 crore cases of dengue fever occur in the world. The risk of opportunistic infections in dengue fever infected persons continues to increase as dengue disease progresses and platelet count decreases.

This study of 25 patients with serologically confirmed dengue infection was carried out in General Hospital Fatehabad, District Fatehabad, Haryana from the period September 2015 to December 2015. Twenty-five febrile individuals

seronegative for dengue were selected as controls for study.

The analysis of serum was done in laboratory and results are discussed.

Group A: Indicates febrile individuals seronegative for dengue.

Group B: Indicates seropositive dengue patients

Values are presented as mean ± standard deviation. The results of dengue screening shows decreased values of Hb, TLC and platelets and

increased values of SGOT and SGPT in seropositive dengue patients than febrile individuals seronegative for dengue.

The Hb level in the febrile individuals seronegative for dengue is 10.2–15.6 gm/dl and the mean value is 11.45 and S.D value is ±1.76. In dengue patients Hb was in range 5.8–11.2 gm/dl and mean value is 7.42 and S.D value is ±1.98. The Hb levels are low due to disseminated intravascular coagulation (DIC), where factors responsible for clotting are used up and lead to risk of severe bleeding (Table 1).

Table 1: Hematological and Biochemical Parameters in Group A and Group B

S. No	Parameters	Group A	Group B
1	Hemoglobin	11.45 ± 1.76 gm/dl	7.42 ± 1.98 gm/dl
2	TLC	7180 ± 1172.76/cumm	3420 ± 1124.62/cumm
3	Platelets	2.25 ± 1.79 lakh/cumm	0.38 ± 0.22 lakh/cumm
4	SGOT	28.25 ± 7.05 IU/L	220.75 ± 88.20 IU/L
5	SGPT	23.66 ± 6.60 IU/L	170.35 ± 65.25 IU/L

The Hb level in the healthy controls is 10.6–15.0 gm/dl and the mean value is 12.49 gm/dl and S.D. value is ±1.13. In seropositive dengue patients

common range is 5.4–12.7 gm/dl and mean value is 8.79 gm/dl [Claro *et al.*, 2004]⁴ (Fig. 1).

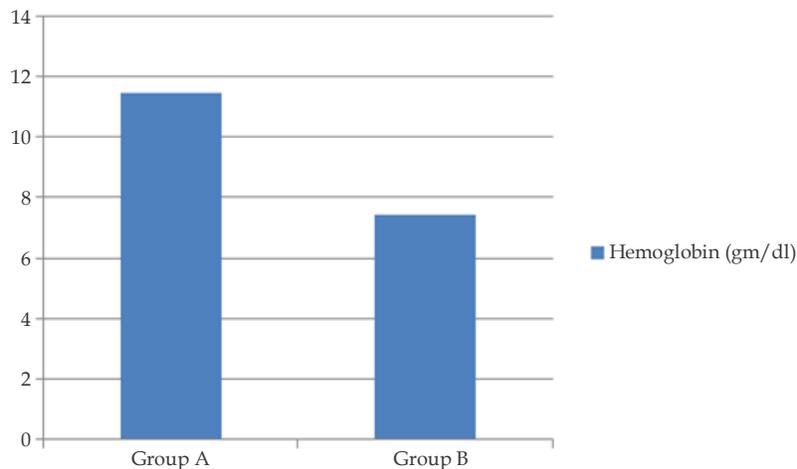


Fig. 1: Hemoglobin (gm/dl).

TLC levels decrease in seropositive dengue patients but sometimes it may also be increased due to other bacterial infections. In febrile individuals seronegative for dengue TLC range is 5800–10800/cumm. The mean value is 7180/cumm and S.D is ±1172.76. In seropositive dengue patients, the common range of TLC are 1300–4800/cumm

and mean value is 3420/cumm and S.D value is ±1214.62. This shows the new onset leucopenia with lymphocytosis and an increase in atypical lymphocytes indicate that the fever may dissipate within next 24 hours and the patient may enter into the critical phase (Fig. 2).

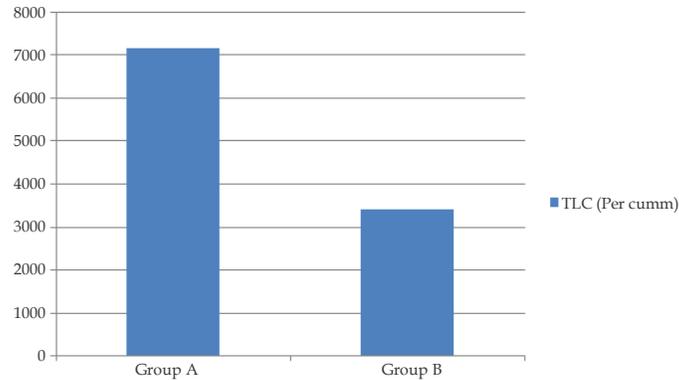


Fig. 2: TLC (Per cumm).

Platelet count in febrile individuals seronegative for dengue ranges from 1,58,000–3,32,000 cells/cu mm and the mean value is 2.55 lakh/cumm and S.D value is ± 1.79 . In seropositive dengue patients the platelet count is in range of 20,000–80,000 cells/cu mm

and mean value is 0.38 lakh/cumm and S.D value is ± 0.22 . Dengue virus has been demonstrated to have toxic effects on platelets in acute and convalescent stage of disease. Bleeding was significantly related to severe thrombocytopenia (Fig. 3).

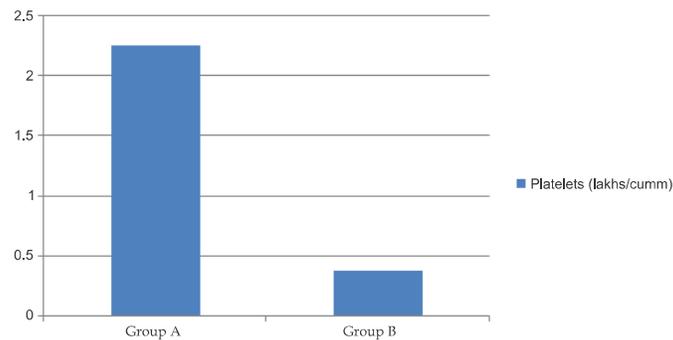


Fig. 3: Platelets (lakhs/cumm).

The results of biochemical studies show that value of SGOT in febrile individuals seronegative for dengue is 8–40 IU/L and mean value is 28.25 and S.D value is ± 7.05 while SGPT is between 12–30 IU/L, mean value is 23.67 and its S.D value is ± 6.60 . In seropositive dengue patients mean value of SGOT is 220.75 and S.D value is ± 88.20 and SGPT is 53–390 IU/L, mean value is 170.35 and S.D value

is ± 65.25 . Levels of SGOT and SGPT in patients with seropositive dengue were higher than those in patients with febrile individuals seronegative for dengue. However, these biomarkers were not independent predictors of severity among patients with dengue infection [Da Silvavoorham *et al.*, 2009]⁸ (Figs. 4, 5).

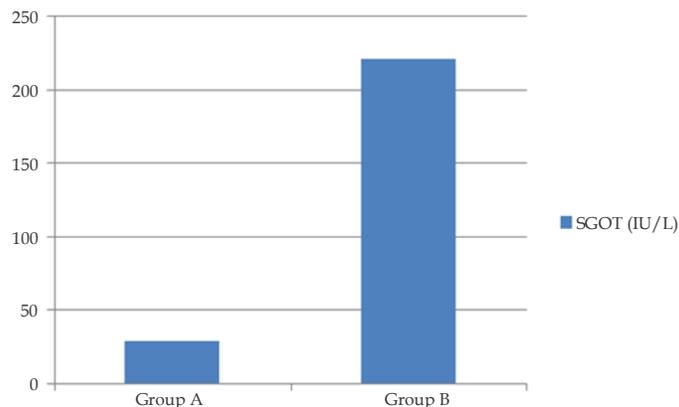


Fig. 4: SGOT (IU/L).

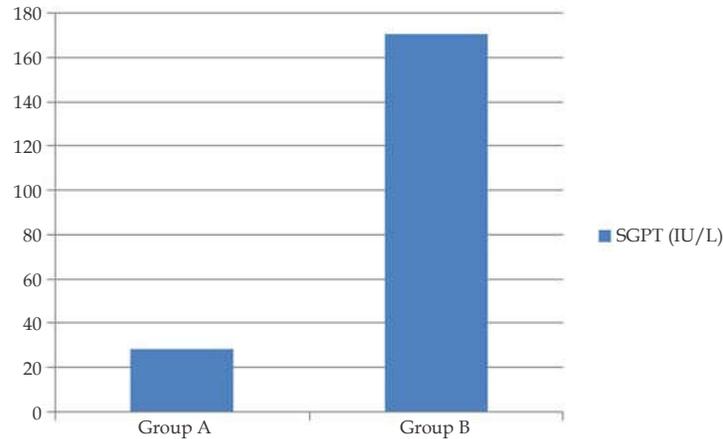


Fig. 5: SGPT (IU/L).

Conclusion

In seropositive dengue patients Hb levels are low as compared to febrile individuals seronegative for dengue whereas TLC levels show a decrease in seropositive Dengue patients but sometimes it may also be increased due to other bacterial infections [Claro *et al.*, 2004].⁴ Platelet count is significantly decreased and the decrease is according to the clinical course of the disease and its severity in seropositive dengue patients. In seropositive dengue patients biochemical markers, i.e. SGOT and SGPT, were higher than those with non dengue conditions due to tissue injury of liver. The degree of liver dysfunction in dengue infection varies from mild injury with elevation of aminotransferases alone to severe injury with jaundice and even fulminant hepatic failure [Cook G.C., 1997].⁵

It is concluded from this study that decreased hemoglobin, leucopenia, thrombocytopenia, raised SGOT and SGPT gave enough clues to test for dengue serology so as to diagnose dengue cases in their initial stage and thus facilitate early treatment and observation of dengue cases. This would minimize morbidity and mortality arising out of serious complications of dengue fever. Most healthy people who get dengue infection can recover by taking necessary precautions and medication. As no vaccine is yet available for protection against dengue. The best way to prevent dengue viral infection is to strengthen community awareness, early diagnosis, management and vector control

measures, to reduce the morbidity and mortality because of this disease.

References

1. Ananthanarayan R, Paniker CK. Arboviruses. In: Textbook of Microbiology, 9th edn. 2013.p.523.
2. Anderson R, King AD and Innis BL. Correlation of E protein binding with cell susceptibility to dengue for virus infection. Journal of General Virology. 2008;73(1):2155–59.
3. Burke DS, Nisalak A and Johnson, DE. A prospective study of Dengue infections in Bangkok. American Journal of Tropical Medicine and Hygiene. 1998;38(1):172–80.
4. Claro LB, Tomassini HC and Rosa ML. Dengue prevention and control: A review of studies on knowledge, beliefs and practices. Caderns de saude publica. 2004;20(6):1447–45.
5. Cook GC. Liver involvement in systemic infections. European Journal of Gastroenterology and Hepatology. 1997;9(12):1239–47.
6. World Health Organisation. Dengue: Guidelines for diagnosis, treatment, prevention and control. WHO, 2nd edition, 2009.
7. Coller BA, Clements DE, Martyak T, *et al.* Advances in falvi virus vaccine development. Drugs. 2010;13(12):880–4.
8. Da Silvavoorham AM, Dittus WP, Amerasinghe PH, *et al.* Serologic evidence for an epizootic dengue virus infecting toque macaques (Macacainica) at Polonnaruwa, Sri Lanka. Am J Trop Med Hyg. 2009;60(2):68–78.