



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.3831839>Available online at: <http://www.iajps.com>

Research Article

DENGUE HEMORRHAGIC FEVER IN CHILDRENDr. Arslan Haider¹, Dr. Mansoor Ul Hassan², Dr. Sumaira Jamil³¹Post Graduate Resident Pediatric Medicine Lahore General Hospital (LGH)²Government Rural Dispensary 242 RB Dasuha, District Faisalabad (PHFMC)³Sharif Medical and Dental College, Lahore

Article Received: March 2020

Accepted: April 2020

Published: May 2020

Abstract:

Objectives of the study: The main objective of the study is to analyse the levels of antioxidants in dengue haemorrhagic fever in children. **Material and methods:** This cross sectional study was conducted in Lahore General Hospital during March 2019 to December 2019. The data was collected from 100 patients of both genders. Antioxidants levels in the blood were measured by getting blood samples of patients. 5cc blood sample was taken and then it centrifuged at 4000rpm for the separation of serum. **Results:** The data was collected from 100 patients of both male and female patients. SOD activity in the serum and liver was dramatically and significantly decreased after infection when compared to normal values. MDA levels in the serum were significantly elevated when compared to the controls ($p < 0.05$). CAT activity in the liver showed a significant decrease when compared with the controls ($p < 0.05$), whereas there was no obvious change in CAT levels in the serum. **Conclusion:** It is concluded that dengue viral infection results in a significant alteration in the oxidative status in the liver, as shown by increased ROS production, MDA levels and the GSSG/GSH ratio and decreased levels of SOD and CAT.

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Please cite this article in press Arslan Haider et al, *Dengue Hemorrhagic Fever In Children.*, Indo Am. J. P. Sci, 2020; 07(05).

INTRODUCTION:

Dengue is the most frequent arboviral infection, with > 100 million infections throughout the world annually, including 250,000–500,000 cases of dengue hemorrhagic fever (DHF) and 24,000 deaths. In most cases, dengue fever (DF) is self-limited. However, there is a risk of progressive development into DHF or dengue shock syndrome (DSS). DHF is a severe febrile disease characterized by abnormalities in hemostasis and increased vascular permeability, and severe progression may result in DSS¹. DSS is a form of hypovolemic shock that is associated clinically with hemoconcentration and that might lead to death if appropriate care is not given. Although DF is distinct from DHF/DSS by traditional classification, the various clinical manifestations after dengue virus infection show a continuum from mild to severe reactions, just as in many other viral diseases².

The pathogenesis of dengue hemorrhagic fever (DHF) is not well understood. Several epidemiologic studies demonstrate the importance of secondary infection by a different dengue serotype as the main risk factor for this severe disease. Although widely accepted, it is not clear how higher viremia levels cause the pathology and symptoms of DHF³. A high level of different cytokines produced both by dengue virus-infected monocytes and activated specific T lymphocytes could explain the main manifestation of DHF, plasma leakage⁴.

The pathogenesis of DHF/DSS with respect to liver injury remains poorly understood. The replication of DV depends on numerous host cellular factors that control various cellular processes involved in cellular metabolism and contribute to the pathogenesis of DV infection. Recently, the intracellular redox balance was proposed to be involved in viral infections and the progression of viral diseases⁵. Increased reactive oxygen species (ROS) cause a significant proportion of the damage to virus-infected cells, and ROS can be neutralized by antioxidant molecules such as glutathione (GSH), superoxide dismutase (SOD), thioredoxin (Trx), and catalase (CAT), which constitute the cellular system that counteracts oxidation and play important roles in maintaining a reductive intracellular environment. GSH is a cysteine-containing tripeptide that is the most important and ubiquitous antioxidant molecule

produced in human organs. GSH is particularly important in the liver where it serves as the principal non-protein thiol involved in the cellular antioxidant defence⁶.

Objectives of the study

The main objective of the study is to analyse the levels of antioxidants in dengue hemorrhagic fever in children.

MATERIAL AND METHODS:

This cross-sectional study was conducted in Lahore General Hospital during March 2019 to December 2019. The data was collected from 100 patients of both genders. Antioxidants levels in the blood were measured by getting blood samples of patients. 5cc blood sample was taken and then it centrifuged at 4000rpm for the separation of serum. MDA levels in the serum and tissue homogenates were measured by using the thiobarbituric acid (TBA) method, which is based on the fact that MDA reacts with TBA to form a compound with a maximum absorbance at 532 nm. Total SOD (T-SOD) in the serum and tissue homogenates was determined based on the xanthine oxidase method. CAT activity in the serum and tissue homogenates was determined by using a CAT colorimetric kit according to the manufacturer's protocol. The ratio of GSSG/GSH in the liver was also determined by using a colorimetric kit according to the manufacturer's instructions.

Statistical Analysis

Statistical analysis was performed with SPSS 16.0 software. Data from separate experiments are expressed as the arithmetic mean \pm standard deviation.

RESULTS:

The data was collected from 100 patients of both male and female patients. SOD activity in the serum and liver was dramatically and significantly decreased after infection when compared to normal values. MDA levels in the serum were significantly elevated when compared to the controls ($p < 0.05$). CAT activity in the liver showed a significant decrease when compared with the controls ($p < 0.05$), whereas there was no obvious change in CAT levels in the serum. As expected, the GSSG/GSH ratio showed a marked decrease after dengue viral infection.

Table 01: Alterations of SOD, MDA and CAT in the serum

		T-SOD (U/ml.mg)	MDA (nmol/ml.mg)	CAT (U/ml.mg)
Serum	Infectious	232.40±36.52**	5.37±1.44*	2.04±0.67
	Control	315.96±41.43	4.02±0.36	2.48±1.11

DISCUSSION:

DV infection is a rapidly growing health problem, with an estimated 2.5 billion people at risk and an estimated 50 million annual dengue infections worldwide⁷. However, the pathogenesis of human dengue infection remains unclear, and no successful vaccine is currently available. Previous studies have suggested that ROS-induced oxidative stress as part of the host cell response to viral infections might play an important role in the pathogenesis of a variety of viral infections, including DV infection⁸. Oxidative stress may result when cellular antioxidant defense mechanisms are unable to keep pace with the detoxification of reactive oxygen species (ROS). Overproduction of ROS is neutralized by various mechanisms; glutathione peroxidase (GPx) has been reported to be a more sensitive antioxidant enzyme in dengue infection⁹. Alteration in redox markers probably commences before the onset of clinical symptoms, suggesting early compromise of oxidant/ antioxidant balance¹⁰.

CONCLUSION:

It is concluded that dengue viral infection results in a significant alteration in the oxidative status in the liver, as shown by increased ROS production, MDA levels and the GSSG/GSH ratio and decreased levels of SOD and CAT.

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