



## A retrospective study on the effect of Vitamin C in the management of dengue fever in three different states of India

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### ABSTRACT

The objective of the study was to analyze the effect of Vitamin C in the management of dengue fever in the tertiary care hospitals of selected three states of India (Tamil Nadu, Kerala, and Madhya Pradesh). This retrospective study was carried out for a period of 6 months from November 2017 to April 2018, in which 200 patients were selected by considering the inclusion and exclusion criteria. It included 100 patients who were administered with Vitamin C and another 100 patients who were not given Vitamin C. All data were entered into the prepared PROFORMA. Mainly the increase in platelet counts and the duration of the hospital stay for both categories of patients were studied. Majority of dengue cases were in Tamil Nadu, followed by Kerala and then Madhya Pradesh depending upon the seasonal variations. Occurrence in male patients (58.5%) were more than female patients (41.5%). The most commonly affected age group ranges from 0-15 years (35.5%). Among the various types of dengue fever, a large number of patients had common dengue fever (87.5%). The 100 patients who were treated with vitamin C were mostly administered by oral routes. It was seen that the patients who were administered with Vitamin C had a greater percentage increase in their platelet count and a shorter duration of hospital stay. Study indicates that there exists an association between Vitamin C intake and length of hospital stay.

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### INTRODUCTION

Dengue is an endemic vector-borne disease predominantly seen in the tropics. Over the past few years, DENV infection has rapidly emerged as a global threat to human health, with its occurrence,

geographic distribution, and clinical severity (Murray *et al.*, 2013). There has been a significant rise in the number of epidemics and reported cases of dengue fever in the last 50 years. This represents an increase in detection rates with improved reporting, plus a true increase in incidence due to changes in environmental, climatic factors, and man-vector interaction. From 1955–1959, the average annual number of dengue infections reported to the World Health Organization was just 908 from less than 10 countries. From 2000–2007, the reported number was as high as 925,896 from more than 60 countries. Thus, the incidence of infection has been rising at an alarming rate (Ebi and Nealon, 2016).

DENV infection has been reported from over 100 countries; the current estimate of annual dengue cases is 100 million for dengue fever (DF) and 250,000 for dengue hemorrhagic fever (DHF) with a total of 25,000 deaths per year (Ahmed *et al.*, 2014).

According to the World Health Organization, there are about 390 million cases of dengue fever worldwide, 22,000 deaths occur yearly, mostly among children, and 96 million require medical treatment (WHO, 2009). Five hundred thousand cases of dengue hemorrhagic fever, the most severe form of dengue, require hospitalization each year. Clinical trials have assessed various therapeutic options with minimal success over the last 50 years, but there is no specific treatment for dengue other than supportive measures and judicious fluid therapy (Rajapakse *et al.*, 2012). Furthermore, no licensed vaccine against dengue infection is available, and the most advanced dengue vaccine candidate did not meet expectations in a recent large trial.

Symptoms can be treated with rest, fluids, and paracetamol (acetaminophen), (Sabishruthi *et al.*, 2018) while aspirin and other nonsteroidal anti-inflammatory drugs should be used only when dengue has been ruled out to reduce the risk of bleeding. For many years, it has been widely known that ascorbic acid (vitamin C) has a variety of physiological functions with clinical efficacy (Shilja *et al.*, 2013). Vitamin C is an antioxidant that has been used to prevent many diseases and infections like the common cold and other viral infections (Pok *et al.*, 2015). Ascorbic acid scavenges reactive oxygen species (ROS), increases vascular and connective tissue integrity, improves immune function (increases interferon) and assists in leukocyte phagocytic functions (Walingo, 2005). Vitamin C is easily dissolved in water and absorbed by the body, helps immediately to restore the platelet count. So, most of the practitioners are prescribing vitamin C as supportive therapy. Even the practitioners of other systems of medicine are also advising taking vitamin C and antioxidant-heavy foods such as acai berries, oranges, blueberries and tomatoes (Rahmani and Aldebasi, 2016).

Based on the above details, the present study was planned to find out the effect of Vitamin-C in the management of Dengue patients of selected states of India.

## MATERIALS AND METHODS

### Data Collection

The Retrospective study was conducted in various hospitals in the three different states of India during the months of November 2017 – April 2018. Data included 100 Dengue patients undergoing treatment with Vitamin C for increasing the platelet count and 100 patients treated without Vitamin C. Patients given platelet transfusion were excluded from the study.

### Data Analysis

Procedures included the collection of prescriptions; recording the details from the prescription to the proforma and analyzing the prescriptions. The initial and final platelet counts and the duration of hospital stay were the crucial data are monitored to analyze the efficacy of vitamin c in patients.

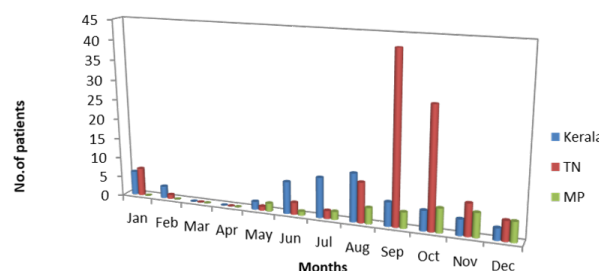
### Statistical Analysis

The data were statistically analyzed using SPSS.

## RESULTS AND DISCUSSION

A detailed study is conducted on the State of occurrence, gender, monthly distribution, and duration of hospital stay of the dengue patients and also to assess the platelet count, hemoglobin count, and temperature ranges of the patients. Majority of cases were found in the state of Tamil Nadu (n=109), followed by Kerala (n=61) and Madhya Pradesh (n=30).

Majority of Male patients (58.5%) were found to be affected with dengue fever compared to Female patients (41.5%). The maximum number of patients affected with dengue fever was among the age group of 0-15years (35.5%). Majority of the people (n=52) were affected with dengue in the month of September, followed by 41 patients in October. In Kerala, the most number of the patients were admitted in the month of August (12) followed by July (10). While in Tamil Nadu, the highest occurrence of dengue were in the months of September (42) and October (30) [Figure 1].



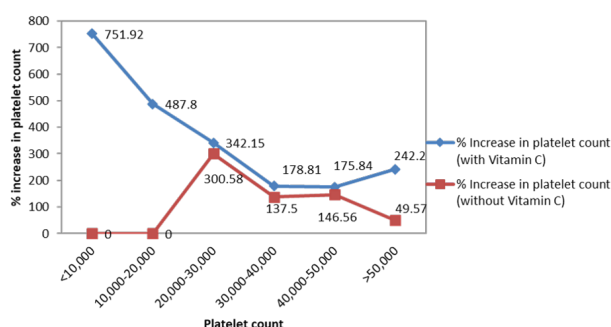
**Figure 1: Monthly Distribution of Dengue patients**

Most of the patients (96.5%) presented with fever, followed by headache (91%), and rash (82.5%) and least patients (10%) were reported with bleeding. The other symptoms taken in the account were Myalgia, Anemia, Nausea and Vomiting. Considering the hemoglobin count, 73 male patients (62.3%) and 26 female patients (31.3%), i.e., a total of 49.5% were found anemic.

It was found that the majority of the cases (87.5%) were non-severe, and only 25 cases (12.5%) were

reported as severe. A large number of patients n= 175 (87.5%) were admitted with common dengue fever, 20 patients (10%) with dengue hemorrhagic fever and only 5 patients (2.5%) were presented with dengue shock syndrome. From the 100 patients taking Vitamin C, 67 patients were administered with oral vitamin C, 28 patients were administered with intravenous vitamin C, and 5 patients were given with both oral and intravenous. Oral vitamin C was given for non-severe cases, and both oral and intravenous was given for severe cases.

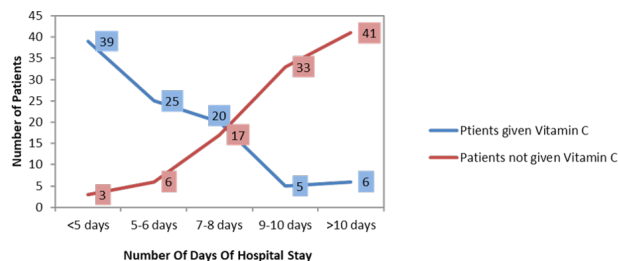
The average percentage increase in platelet count was greater (363.12%) among patients administered with vitamin C than those who were not given vitamin C (105.70%), and a \*p-value < 0.0001 indicates that the results were highly significant [Figure 2].



**Figure 2: Comparison of percentage increase in platelet count of patients administered with Vitamin C and who were not given Vitamin C**

Most numbers of patients (n=73) were hospitalized for 6-8 days followed by (n=47) patients who were in the hospital for less than 5 days. The average number of days of hospitalization of the dengue-affected patients were found to be  $8.005 \pm 3.2$  days. It was found that the majority of patients taking vitamin c were hospitalized for less than 5 days (n= 39) and only (n= 6) patients had to stay in the hospital for more than 10 days. In patients not taking vitamin C, only 3 patients were hospitalized for less than 5 days, and the majority of patients (n= 41) required more than 10 days of hospital stay. \*p-value < 0.0001 indicates that there exist an association between vitamin C intake and length of hospital stay [Figure 3].

The major threat of dengue fever is thrombocytopenia, bleeding manifestations and shock. There is no satisfactory treatment for thrombocytopenia, which might be caused due to oxidative damage. Vitamin C, a well known potent anti-oxidant, has been used in common cold and idiopathic thrombocytopenic purpura. It has been recommended empirically in the treatment of viral infections. This study is designed



**Figure 3: Association between Vitamin C and Length of hospitalization**

to assess the efficacy of vitamin C in patients of dengue fever.

According to the National Vector-borne Disease Control Programme, the occurrence of dengue in various states was 22197 in Tamil Nadu, 19776 in Kerala, and 2585 in Madhya Pradesh. The findings in our study were in accordance to this national distribution, out of our 200 patients 109 cases (54.5%) were from Tamil Nadu, 61 cases (30.5%) were from Kerala, and 30 cases (15%) were from Madhya Pradesh.

Majority of male patients (58.5%) were found to be affected with dengue fever compared to female patients (41.5%). It correlates with an earlier study (Raza *et al.*, 2014) in which dengue was found in 72.9% males and 27.1% females. There does not exist much difference in gender distribution of dengue fever, but several studies have shown varying results, where mostly male patients outnumbered female patients (Singh *et al.*, 2005; Sinha *et al.*, 2008). The maximum number of patients affected with dengue fever was in the age group of 0-15years (35.5%). A similar study showed a different incidence rate among the age group 15-29 (31.6%) (Mishra *et al.*, 2017). This gender difference in dengue cases may be due to increased mobility of the male population in the society.

The incidence of dengue fever is in accordance with climatic changes in various states. It is highest during the month of August in Kerala and September in Tamil Nadu which are rainy seasons there. Analyzing the clinical manifestations, most of the patients presented with fever, headache and rashes along with other symptoms of Myalgia, anaemia, vomiting and nausea, which was also reported in a previously conducted study. The hemoglobin count of less than 13g/L and 12g/L was considered as anemic. Hence, in the study, a total of 49.5% were found to be anemic. This correlates to an earlier study, in which 49.6% were found anemic (Raza *et al.*, 2014).

In accordance with the study carried out by de Jesus in which Dengue hemorrhagic fever (DHF) and Dengue shock syndrome (DSS) were considered as severe dengue, and Dengue fever (DF) was classified

as non-severe dengue, the present study showed that majority of the cases were non-severe (de Jesus Dias Junior *et al.*, 2017). They were mostly treated with oral Vitamin C while severe dengue patients were treated by both oral and intravenous route. There was an association between vitamin C intake and duration of hospital stay. The duration of hospital stay was compared in patients who were treated with vitamin C and those who were treated without vitamin C. It was found that majority of patients taking vitamin C was hospitalized for less than 5 days. In patients without vitamin C, the majority of patients required more than 10 days of hospital stay. \*p-value < 0.0001 indicates that there exist an association between vitamin C intake and length of hospital stay.

## CONCLUSION

The study provides some rationale for the use of Vitamin C in dengue fever. The results showed that Vitamin C might accelerate the replenishment of the circulation with platelets in dengue fever, thereby reducing the risk of bleeding and the need for platelet transfusion. As Vitamin C is available at low cost and is relatively free of serious adverse effects, it may be recommended to all patients of Dengue fever.

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