

# Role of Dietary Supplements: Post Dengue Complications

Hrithika Panday, Abhimanyu Kumar Jha, Niraj Kumar Jha and Saurabh Kumar Jha\*  
Department of Biotechnology, School of Engineering & Technology, Sharda University,  
Greater Noida, Uttar Pradesh, India

\*Corresponding Author: [saurabh.jha@sharda.ac.in](mailto:saurabh.jha@sharda.ac.in)

**Abstract: Dengue fever is a mosquito-borne viral disease that has expanded over the world, affecting millions of people. In current age of numerous circulating viruses, we must be aware of the challenges to fight against infections. Since viruses are constantly mutating, combating them is a challenging undertaking. A balanced diet and a healthy lifestyle may become a topic of contention in the battle against viral infections and have a role in reducing the risk of infection. The relationship connecting diet with various infections is quite extensively recognized, therefore modifying dietary intake frequently gives a straightforward low-cost approach to halting dissemination, lowering predisposition, and amplifying disease impact on viruses that produce an array of chronic infectious diseases and other severe infections. Various diseases have been cured by modifying the patient's diet and adding the necessary nutrients to give the patient immunity such as yogurt, vegetable juices, fruits, etc. Since ancient times, phytochemicals such as alkaloids, flavonoids, and other secondary metabolites derived from plant extracts have been utilized to treat a variety of medical problems. These plants may aid in antibacterial, antiviral, anticancer, and other significant metabolic activities. Aside from vaccine development, finding effective antiviral drugs is crucial for preventing viral infections.**

**Keywords: Arthropod-borne virus, Dengue, Diet food, Dietary supplements, Nutritional values, Phytochemicals.**

## I. INTRODUCTION

Among the Flaviviridae family, Dengue fever is a sensitive issue owing to its annual increment in the number of cases and expansion globally [1] [2]. Dengue is an arthropod-borne viral disease that transmits by the bite of the Aedes mosquito to the human hosts. Two major species are responsible for this Aedes aegyptii, and Aedes albopictus. Dengue is causing a global impact and is common in tropical as well as sub-tropical regions [3]. This arthropod-borne viral disease has been clinically manifested symptoms are fever, headache, muscular

discomfort, skin rashes, and platelet decrease which may lead to severe dengue hemorrhagic fever [4]. The virus of dengue is a single-stranded RNA having a positive sense strand. Dengue infection can alter the bloodstream and its immune system. A food plan for dengue, in contrast to numerous therapies and preventative measures, provides a significant function in the restoration of Dengue patient populations. To recover from dengue fever, individuals must consume enough nourishment and follow a nutritious diet plan.

## II. RECOMMENDED FOODS FOR DENGUE INFECTED PATIENTS

It is important to have a good diet plan because it helps in combating various diseases at the very beginning of the infection. Various food products such as fruits, vegetables, and some spices.

- *Kiwi*

Vitamin C (ascorbic acid) is abundant in kiwifruit, and it is required for cell growth and regeneration. Vitamin E is abundant in kiwi fruit, which aids in the prevention of oxidative stress. Folate aids in amino acid synthesis, immunological function, cell development, and other physiological processes, while potassium aids in blood pressure control, neuron and muscle function, and dietary fibres aid in fluid retention. Because a diverse variety of active components, such as antioxidants, micronutrients, and metabolites, give functional but rather metabolic benefits, kiwi fruit may aid in numerous areas to boost immunological, gastro-intestinal, and metabolic functioning and help in treating the virus [2] [5].

- *Dragon Fruit*

In addition to being a good source of minerals like calcium, phosphorus, iron, vitamin C and vitamin A. Furthermore, this fruit contains a variety of flavonoids, including kaempferol, quercetin, and isorhamnetin, but also polyphenols and betacyanins, that have anti-oxidant properties, strengthen the immune system, and minimize platelet aggregation [5].

- *Neem Leaves*

The scientific name for neem is *Azadirachta indica*, a member of Meliaceae family has a variety of medical characteristics. It is advantageous in the treatment of different viral infections as well as the prevention of certain disorders. Neem leaves are excellent traditional medicine for strengthening immunity and restricting the development of the virus. Dengue symptoms, such as skin rashes, can be efficiently treated by using neem leaves [6]. Different parts of the neem tree, on the other hand, have been used in traditional Indian treatments for thousands of years for their claimed anti-pyretic, antacid, antiparasitic, anti-viral, anti-microbial, anti-diabetic, contraceptive, anti-dermatitic, anti-inflammatory, anti-oxidant, fungicidal, anti-cancerous, dental, and other healing and protective properties. It also participates in angiogenesis to improve blood supply [7].

- *Fenugreek Seeds*

Natural foods like fenugreek seeds are one of the most effective strategies to treat dengue fever at home. They can aid in the recovery of your body from the effects of dengue shock and

hemorrhagic fever by boosting your immune system and fighting microorganisms spread by mosquitoes. Let around five grams of fenugreek seeds soak overnight in a glass of water. To gain the best health advantages, drink the water and eat the soaked seeds first thing in the morning, and repeat this routine until you are entirely clear of dengue symptoms. Adding a few teaspoons of fenugreek seeds to a cup of boiling hot water is another excellent dengue cure at home [8].

- *Turmeric*

Turmeric, scientifically known as *Curcuma longa*, possesses secondary metabolites mainly Curcumin that affect Lymphoid cells (T and B lymphocytes), natural killer cells, dendritic cells, and other immune cells. Curcumin consumed in small dosages helps to increase antibody response, an anti-bacterial, and anti-inflammatory response that facilitates a low level of inflammatory cytokines, which aids in fever reduction. Curcumin-mediated activities sustain the immune cells by simultaneously preventing cell apoptosis [9]. It also possesses anti-cancer properties, anti-depressant, and neurological properties [10].

TABLE I: DIETARY FOOD SUPPLEMENTS AND THEIR ACTIVE COMPONENTS

<i>Dietary Supplements</i>	<i>Form of Uptake</i>	<i>Source of Nutrient</i>	<i>Activities</i>	<i>References</i>
Dragon Fruit <i>Selenicereus undatus</i>	Fruit	Vit-C, Vit-A, Calcium, Phosphorus, and Iron, anti-oxidants	Anti-oxidative properties, platelet aggregation reduction, boosts immunity	[11]
Kiwi <i>Actinidia deliciosa</i>	Fruit	Vit-C, Vit- A and E, Folate, potassium, magnesium, phosphorus	Cell development, immunological functions	[2]
Pomegranate <i>Punica granatum</i>	Fruit	Vit-C, Vit-K, Ca, K, Mg, P, Fe, Punicalagnins, Punicic acid, polyphenol	Antiviral activity	[12] [13]
Chinese Ginger <i>Boesenbergia rotunda</i>	Root	4 hydroxypanduratin A (1) and panduratin A	Anti-dengue activity against DENV-2 NS3 protease	[14] [15]
Broccoli <i>Brassica oleracea</i>	Leaves	Vit-C, K, and A, Fe, P, 3,3'-Di-indolylmethane, kaempferol and quercetin	Antioxidant capacity, anti-viral and anti-bacterial	[16]
Flax Seed <i>Linum usitatissimum</i>	Seed	Omega 3 fatty acid	Ficin, Pappain, stem- bromelain	[17] [18]
Bittergourd <i>Momordica charantia</i>	Fruit	Flavonoids such as luteolin, kaempferol, and quercetin	Inhibition of DENV-1 serotype	[15] [19]
Neem <i>Azadirachta indica</i>	Leaves	Querectin, $\beta$ -sitosterol, azadirachtin, nimbolinin, etc	Antiviral, antibacterial, antiparasitic, anti-oxidant, anti-diabetic, anti-inflammatory	[20]

<i>Dietary Supplements</i>	<i>Form of Uptake</i>	<i>Source of Nutrient</i>	<i>Activities</i>	<i>References</i>
Fenugreek <i>Trigonella foenum-graecum</i>	Seed	Flavonoids apigenin, luteolin, orientin, quercetin, vitexin and isovitexin, polyphenolic substances, vitamins A, B1, C	Stabilize blood pressure, boost immune system, anti-oxidant	[21]
Turmeric <i>Curcuma longa</i>	Root	Curcumin, turmerone	Anti-cancer, anti-depressant, neurological, activity on DENV-2	[10] [15]
Amla <i>Phyllanthus emblica</i>	Fruit	Gallic acid, geraniin, syringing, and corilagin	Anti-dengue activity against DENV-2	[22]
Pumpkin <i>Cucurbita maxima</i>	Fruit	Vitamin A, C and E and glycosides, triterpenes and glycosides protein, minerals, vitamins, and omega-3 fatty acids	Anti-dengue activity, anti-parasitic effects	[23] [24]
Tulsi <i>Ocimum sanctum</i>	Leaves	Flavonoids such as orientin, vicenin, and luteolin	Inhibit DENV-1 serotype in cell lines	[25]

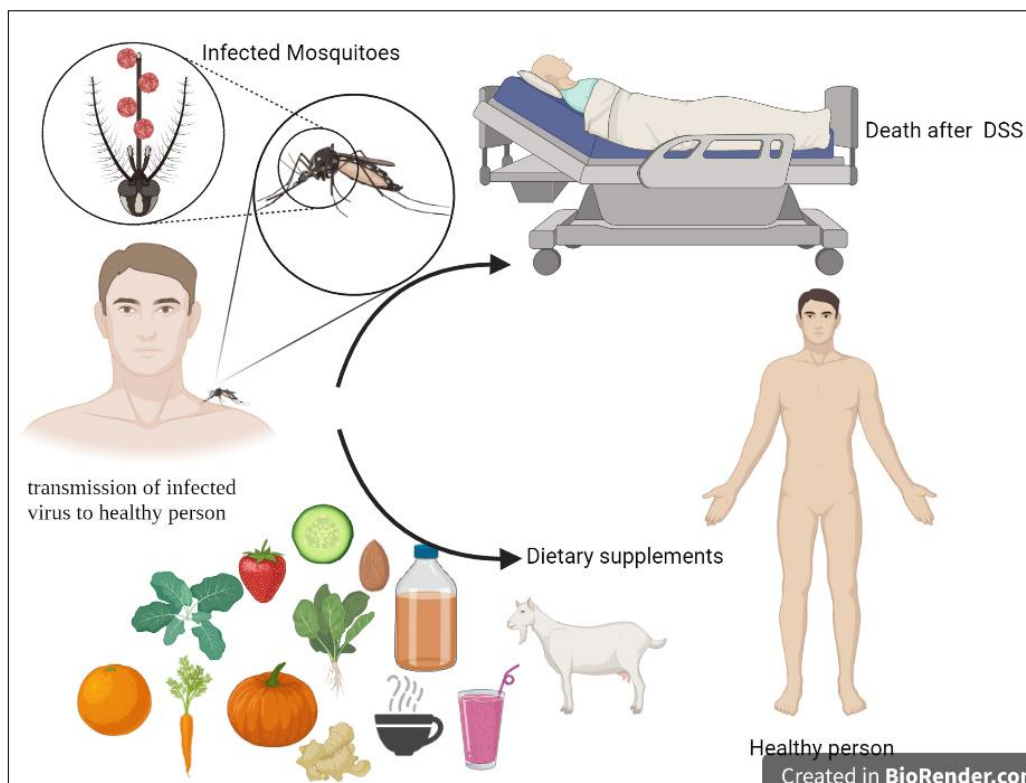


Fig. 1: Transmission and its Effects Before and After Taking Supplements

### III. ADEQUATE HYDRATION TO COMBAT DENGUE RISK

Another crucial aspect of outpatient treatment for Dengue hemorrhagic fever is to encourage patients to rehydrate early by mouth because fever frequently causes dehydration. Patients can take oral electrolyte solutions, cooled boiled water, fruit juices, or salty oatmeal as a supplement.

- *Oral Rehydration Salt (ORS)*
- *Isotonic Fluid*

The isotonic liquid is the first drink WHO recommends for dengue hemorrhagic fever (DD) or DHF sufferers. Isotonic drinks often include sodium in the range of 200 mg per 250 ml of water. Dehydrated people benefit greatly from isotonic

fluids. However, owing to its high sugar content, this isotonic drink is not healthy if eaten in excess by persons who are not dehydrated.

- *ORS*

In addition to isotonic fluids, ORS can be used to administer electrolyte fluids to patients with DD or DHF. According to WHO and UNICEF, there are two types of ORS, each with different makeup. When compared to the new ORS, which has an osmolarity of 245 mmol/L, the old ORS has a greater osmolarity of 331 mmol/L. The new sodium ORS has a lower electrolyte concentration of 75 mEq/L than the old ORS, which has a higher electrolyte value of 90 mEq/L. The potassium concentration of the old and new ORS is the same [26].

- *Guava Juice*

In a study, in both normal and alloxan-treated diabetic mice, treatment with 1 g/kg of guava juice caused a significant hypoglycemic effect. Although the blood glucose-lowering effect of guava is more temporary and less strong than chlorpropamide and metformin, it can also be acquired orally [27] [28].

- *Coconut Water*

In order to recover rapidly from dengue fever, the patient should consume more coconut water in addition to other rehydration drinks. Because coconut water contains up to 95.5 percent water and the rest is made up of 4.0 percent carbohydrates, 2.2-3.7 mg vitamin C, 0.5 mg iron, 0.4 percent inorganic matter, 0.1 percent protein, 0.1 percent lipid, 0.02 percent calcium, 0.01 percent phosphorus, and a variety of amino acids (arginine, alanine, cysteine, and serine), as well as Vitamin B. Coconut water can aid in body cooling, detoxification, hemostasis, and diuretic in dengue patients [12].

- *Goat Milk*

- *Presence of Selenium*

One of the major deficiencies caused due to Dengue is the reduction in platelet count and deficiency in Selenium. As per the research, goat milk contains nearly 27% more Selenium than cow's milk. Selenium is essential for the body because it helps in the functioning of the immune system properly. It also works as a critical nutrient in countering the Dengue virus' development. Thereby eventually helps in the recovery of the Dengue patient [29].

- *Helps in Maintaining Higher Platelet*

Goat milk also proves to be beneficial for those patients who require to maintain higher platelet count and maintain body fluid when suffering from Dengue. Although platelet transfusion is not possible in many cases, goat milk can work wonders in such an instance [29].

- *Good Iron Content*

Goat milk also has a good percentage of iron. Hence it helps in recovery after Dengue. Often the disease causes ferropernic

nutritional anaemia, and goat milk helps with increasing the iron deposition in the organs [29].

- *Aids with Digestion and Metabolism*

The digestive system is getting weak, reducing the body's metabolic capacity, thus the system's failure to absorb minerals like calcium, iron, magnesium, and phosphorous during Dengue. Goat milk contains all these elements and helps in boosting the metabolic system naturally. Therefore, by aiding the absorption of these elements and the metabolic system, goat milk helps in faster recovery when a person is suffering from Dengue. Also, the smaller-sized casein micelles present in goat milk make it easily digestible [30].

- *Giloy*

Giloy also referred to as Guduchi is an easy-to-grow and much easier-to-eat perennial plant. It is best for curing dengue fever and is known as Amrit, which means "root of immortality". Some of the qualities of Giloy that make it a useful plant for the treatment of Dengue fever are listed below. Guduchi is one of the most powerful magical herbs ever discovered. Dengue fever is treated with its anti-inflammatory and antipyretic qualities. Giloy can treat dengue fever in its early stages without creating any negative side effects. It not only helps to raise your blood count, but it also protects your liver. The only thing you need to know about Giloy juice in Dengue is how to take it. It has a remarkable effect on raising the population of white blood cells in the bloodstream, thus increasing the overall functioning of the immune system [31] [32].

- *Green Tea*

Green tea contains catechins, also known as Green tea catechins (GTCs), which are polyphenolic chemicals derived from the *Camellia sinensis* leaves. In recent decades, GTCs have been found to give significant health advantages against a number of diseases. GTCs contain anti-oxidant properties and aid in the production of platelets. Antiviral effects of GTCs, notably epigallocatechin-3-gallate (EGCG), have been proven in trials against a number of viruses [33].

- *Papaya Leaf Juice*

Papaya juice, scientifically known as *Carica papaya*, has antiviral action against Dengue that inhibits viral activity. Papaya has two major compounds derived from leaf extract, chymopapain and papain having anti-inflammatory and anti-oxidant properties that are helpful in the treatment of digestive problems. Bactericidal activities can also be found in fruit and seed extracts. *Carica papaya* is abundant in Vitamins (Vit-A, Vit-C, Vit-E) and fibres that provide anti-oxidant, anti-cancer, and efficient scavenging activities but also assist to regulate blood sugar levels [34]. Papaya is included in the diet of dengue patients who have developed serious complications in order to limit the risk of infection by strengthening immune system function [35].

TABLE II: DIETARY WATER SUPPLEMENTS AND THEIR ACTIVE COMPONENTS

<i>Dietary Supplements</i>	<i>Form of Uptake</i>	<i>Source of Nutrient</i>	<i>Activities</i>	<i>References</i>
ORS		Sodium chloride, Potassium chloride, Trisodium Citrate dihydrate, anhydrous Glucose	Diarrhoea	[26] [36]
Guava <i>Psidium guajava</i>	Fruit	Vit-C, Vit-A, Vit-K, Vit-B-complex, Ca, Mg, K, P, Mn, Fe anti-oxidant	Increase platelet	[27]
Coconut <i>Cocos nucifera</i>	Fruit	Vit-C, Iron, Protein, Calcium, Vit-B	Detoxification, hemostasis, diuretics	[37]
Goat Milk	Milk	Selenium, Iron	Immune system functioning, maintain blood platelets count, increase iron deposition in other organs, boost metabolic rate	[29]
Giloy <i>Tinospora Cordifolia</i>	Stem	Alkaloids Berberine, Palmatine, diterpenoid Furanolactone, glycosides Tinocordiside, sesquiterpenoid Tinocordifolin, phenolics, aliphatic compounds and polysaccharides	Increase WBC, help in the immune system, Immunostimulant, anti-malarial, anti-diabetic, anti-spasmodic, anti-oxidant, anti-inflammatory, anti-arthritis, anti-stress, anti-allergic, anti-leprotic, immunomodulatory and antineoplastic activities	[38] [39]
Green Tea	Leaves	Polyphenolic compounds, epigallocatechin-3-gallate	Anti-oxidant, antiviral	[33]
Papaya <i>Carica papaya</i>	Fruit	Chymopapain and papain Vit-A, Vit-C, Vit-E, B complex vitamins	Anti-oxidant, Anti-cancer, and efficient scavenging activities	[32] [35]
Achyranthes <i>Aspera chaff-flower</i>	Stem	Alkaloids, flavonoids, saponins, steroids and terpenoids, achyranthine, ecdysterone, betaine, pentatriacontane, pentatriacontane, hexatriacontane and tritriacontane	Asthma, cough and even pneumonia	[40] [41]
<i>Aloe vera</i>	Leaves	Vitamins, minerals, enzymes, sugars, anthraquinones or phenolic compounds, lignin, tannic acids, polysaccharide, glycoproteins, saponins, sterols, amino acids, and salicylic	Hypoglycemic, anti-inflammatory effects	[42] [43]

#### IV. DIETARY RESTRICTIONS FOR DENGUE PATIENTS

Patients with dengue fever should avoid certain foods to reduce the risk of infection and speed up their recovery.

- *Non-Veg Foods*

Patients suffering from dengue fever must rigorously eliminate non-vegetarian foods. Patients get weak and their process of digestion gradually decreases during dengue infection. Patients should prevent non-vegetarian foods since they are difficult to digest.

- *Alcohols and Beverages*

Alcohol, or caffeinated drinks (Coffee and Tea), can activate the digestive tract, causing nausea and diarrhoea. Furthermore,

this sort of drink might induce a rise in gastric acid secretion generation, as well as a fast heartbeat and muscular degradation. All of these adverse effects might impede dengue treatment.

- *Fatty Foods*

Oily and spicy meals include more fat, which can contribute to increased blood pressure and cholesterol. As a result, it might impede healing by weakening the immune system and can cause severe gastric disorders like acidity, piles, etc.

#### V. CONCLUSION

Considering dengue as a major concern, the patient's healthy eating plan must be clear and simple to prevent serious infection, because it may give worsen effects on the patient if the diet

is disturbed during the infection, and it will become difficult to recover from that patient even though dengue infection has many after-effects the immune function as well as other organs. However, nutrition is regarded as a critical factor in the proper functioning of metabolic and immunological functions. According to the findings of several literature surveys, there is a link between dengue infection and nutritional qualities, although additional research is needed.

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