

# Dengue Fever: State-of-the-Art Symptoms and Diagnosis

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**Abstract**—Fever is the most normal disease in any age group, but it becomes a deadly disease if it has dengue symptoms. Identifying dengue symptoms at an early stage is very difficult because this kind of symptoms is very common in all types of fevers. When fever continues after 3-4 days the symptoms of dengue shown in patients. So far there is no vaccine (According to WHO (World Health Organization) Report in April 2015 First Dengue fever vaccine introduced. We have mention about in this paper) or particular medicine available in market to prevent from the dengue. In today era around 40% population of the world is at risk of dengue fever. Since 1950s, this disease cause several death on globe and unfortunately there is no proper preventive method developed yet. From the long period of time some senior doctors working on categorized dengue fever because symptoms of dengue fever are different for different patients. In this paper we have to provide all cause, symptoms & diagnosis methods.

**Keywords**— Dengue Fever, Symptoms , Deadly disease, Dignosis System

## I. INTRODUCTION

An aedes mosquito is responsible for most complex human disease Dengue Fever. This mosquito inject Dengue virus into human blood and will leave a liquid in patient skins and this liquid cause the dengue fever. The biggest problem with dengue fever is, it is identify only when patient is on very critically stage and unfortunately there is no special tool developed for identifying dengue within 1-2 days continues fever. There lots of type fever causes death but dengue fever has highest numbers of death [1].

The impact of dengue fever is covering all age groups, but it will cause more on poor community. According to the latest report of WHO, around 390 million people & 40% population of the world is affected with this deadly disease. One more heartbreaking report given by WHO in 2015 are nearly 22,000 deaths occurred per year and most of them are children's [2].

Dengue virus is not spread directly from person to person. If we want to save life from dengue fever, then people can follow only preventive approach [3]. According to WHO reports before 1970s only 9 countries on the world is affected by dengue virus, but now in 2016, 110 countries affected by dengue fever. In India, Delhi is the capital of dengue fever [2]. Dengue virus is more harmful for those people who have a less immune system as well as those with second time affected by dengue virus [4].

The rest of the paper is organized as follows. Section II deals with symptoms and signs of dengue. Information about first dengue vaccination is shown in section III. Section IV reveals diagnosis criteria. Noteworthy contribution in this field is discussed in section V and finally, section VI concludes the paper.

## II. SYMPTOMS AND SIGNS

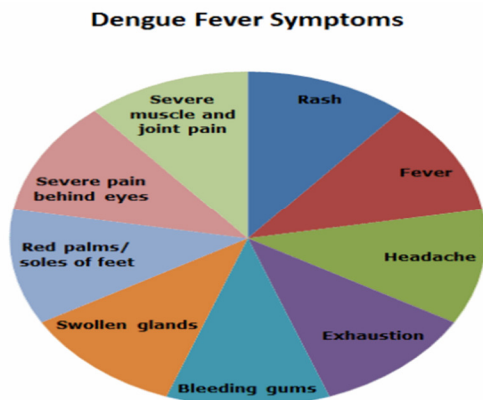
The sign of sickness and signs for dengue begin about three to 15 days after a mosquito bite inject a virus (dengue virus stereotypes 1-4) to a person (before that/before now) unexposed to the viruses. Fever and painful muscle, bone, and combined hurts can happen during the first few hours of signs of sickness when headache, chills (shaking (from fear or cold) and/or sweating), rash (may be itchy) and/or red spots or flushing, and swollen (small areas in the body that fight disease) first appear. Pain behind or in back of the eyes is also a common sign of sickness. Some people may develop a sore throat, vomiting, nausea, (related to the centre part of the body) and/or back pain, and loss of (desire to eat/desire for something) [5, 6].

These signs of sickness usually last about two to four days and then reduce, only to reappear again with a rash that covers the body and spares the face. The rash also may happen on the palms of the hands and the bottom of the feet, areas often spared in many viral and bacterial infections. The signs of sickness may last about one to two weeks with complete recovery, in most cases, in a few weeks. However, some people can develop worse signs of sickness and difficulties, such as (related to quick, sudden loss of blood or

other valuable thing) areas in the skin (easy injuring (without bleeding)), gums, and the (stomach- and intestine-related) area (of land). This condition is termed dengue (related to quick, sudden loss of blood or other valuable thing) fever (DHF). Most DHF is seen in children less than 15 years of age, but it can happen in adults. Another medicine-based difference/different version of dengue fever are termed dengue shock disease (DSS); DHF usually happens before DSS. The patients eventually develop extreme (related to the centre part of the body) pain, heavy bleeding, and blood pressure drops; this disease, if not treated quickly, may cause death [6, 7].

**Table: 1** Probable and warning signs of Dengue

Probable Signs of Dengue	Warning Signs of Dengue
Fever for 3 to 7 days	Abdominal pain or tenderness
Vomiting	Persistent vomiting
Rash	Clinical fluid accumulation
Aches and Pains	Inner mouth bleeding
Positive bleeding	Abdominal enlargement more than 2cm



**Figure 1 :** Dengue fever symptoms

### III. FIRST DENGUE VACCINE

According to WHO report, in end of 2015 & beginning of 2016, the first dengue vaccine, having name Dengvaxia (CYD-TDV) is invented by Sanofi Pasteur and it was registered in several countries for use in individuals between 9 to 45 years of age. The Strategic Advisory Group of Experts (SAGE) reviewed this vaccine in April 2016 and give instructions to recommended countries consider being introduction of the vaccine. About this vaccine and complete outline will be given by WHO in July 2016. There are 4 other vaccine are in development phase and out of 1

Other tetravalent live-attenuated vaccines are under development in phase II and phase III at clinical trials in laboratories and 3 other vaccine candidates are at earlier stages of clinical development. WHO provides technical advice and guidance to countries and private partners to support vaccine research and evaluation. WHO also provide technical outlines and guidance to countries and researchers who working in medicine for implements other vaccine as soon as possible [2].

### IV. DIAGNOSIS CRITERIA

Laboratory diagnosis requirements for the (identification of a disease or problem, or its cause) of dengue include one or more of the following:

- ✓ (being completely separate from others) of the dengue virus from serum, plasma, disease-fighting cells, or autopsy samples
- ✓ Demonstration of a four times or greater change in two-way immunoglobulin G (IgG) or IgM disease-fighter titers to 1 or more dengue virus (germs that the body tries to fight) in pairedserum samples
- ✓ Demonstration of dengue virus (a germ that the body tries to fight) in autopsy tissue viaimmunohistochemistry or immunofluorescence or in serum samples via enzyme immunoassay (EIA)
- ✓ Detection of viral (related to the study of tiny chemical instructions within cells) sequences in autopsy tissue, serum, or intelligent/brain-based spinal fluid (CSF)

Two types of testing are available:

#### A. Antibody Testing

These tests are generally prepared in patience to find out (identify a disease or its cause) a current or recent infection. They detect two different classes of disease-fighters produced by the body in response to a dengue fever infection, IgG and IgM. (Identification of a disease or problem, or its cause) may require a combination of above two tests because the body's disease-fighting system produces changing/different levels of disease-fighters over the critical time of the illness. IgM disease-fighters are produced first and tests for these are most effective when (did/done/completed) at least 7-10 days after exposure. Levels in the blood rise for a few weeks, then slowly decrease. After a few months, IgM disease-fighters fall below detectable levels. IgG disease-fighters are produced more slowly in response to an infection. Usually, the level rises with a sudden, serious infection, (makes steady/makes

firm and strong), and then (continues to exist/continues to do hard or annoying things) long-term. People who have been exposed to the virus before the current infection maintain a level of IgG disease-fighters in the blood that can affect the (understanding/ explanation) of disease-identifying results [8]. The below table summarizes results which may be seen with antibody testing:

**Table 2:** Results displayed in antibody testing

IgM Result	IgG Result	Possible Interpretation
Positive	Negative	Current infection
Positive	Positive	Current infection
Low or negative or not tested	Four-fold increase in samples taken 2-4 weeks apart	Recent infection
Low or negative	Positive	Past infection
Negative	Negative	Too soon after initial exposure for antibodies to develop or symptoms due to another cause

### B. Molecular Testing

This type of test detects the virus injected by mosquito in blood up to 5 days after sign of sickness beginning (fever). The following laboratory tests should also be (did/done/completed) on the patients with possible dengue [8]:

- ✓ Liver panel
- ✓ Metabolic panel
- ✓ Serum protein and albumin levels
- ✓ Complete blood count (CBC)
- ✓ DIC Panel

In any patient dengue fever sign is positive when-

- ✓ Hypoproteinemia
- ✓ Prolonged prothrombin time
- ✓ Prolonged activated partial thromboplastin time
- ✓ Decreased fibrinogen
- ✓ Increased amount of fibrin split products
- ✓ Increased hematocrit level secondary to plasma extravasations
- ✓ X-Ray shows infiltrate effusion

This report is based on the patient who is died after 15 days from the DHF [9].

**Table 3:** Dengue suffered Patient's report [9]

Diagnosis Type	Day 5	Day 6	Day 7	Day 9	Day 15
Leukocytes (x 10 <sup>3</sup> /MuL)	9.6	24.8	34.3	26.1	10.5
Neutrophils (%)	64	61	49	60	45
Lymphocytes (%)	23	29	41	30	40
Red Blood Cells (x 10 <sup>6</sup> /MuL)	4.1	4.0	3.5	3.4	3.8
Hemoglobin (g/dl)	14.0	12.7	11.0	10.7	11.2
Hematocrit (%)	42.1	38.2	32.6	31.3	33.6
Platelets (x 10 <sup>3</sup> /MuL)	16	27	55	106	208
Prothrombin Activity (%)	-	-	14	69	88
Albumin (g/dl)	-	-	2.7	2.5	3.4
AST (U/L)	-	-	7,082	2,565	101
ALT (U/L)	-	-	2,129	1,380	266
ALP(U/L)	-	-	139	176	132
gHT (U/L)	-	-	194	-	153
LDH (U/L)	-	-	5,054	2020	-
Total bilirubin (mg/dL)	-	-	1.54	1.68	0.83
Direct bilirubin (mg/dL)	-	-	0.59	0.60	0.37
Creatinine (mg/dL)	-	-	1.4	-	1.1
Glucose (mg/dL)	-	-	-	105	88

### V. LITRETURE REVIEW

In the year of 2015, Varinder Pabbi [1] designed a fuzzy expert system for medical diagnosis in which he had given complete detail of some of the disease diagnosis like diabetes heart problem. He also given fuzzy logic toolbox

for showing the result based on the inputs and rules. Sharanjit Singh et al. [3] explained about dengue fever with its symptoms. In this paper they had develop a system which help to get early notification for dengue fever. They also explain how fuzzy logic plays a vital role to detect dengue at early stage. Tajul Rosli et al. [4] presented notification system for dengue fever. In this paper they had shown all characteristics of dengue fever in detail and also describe that if any system identify dengue notification on early stage then it will save lots of life. Rao and Naresh [5] presented role of expert system in medical diagnosis like dengue fever. They shown how computer technology helps in medical field to reduce the work of doctors and if accuracy is match with database then it is one the biggest achievement in computer science fields. Rana and Sedamkar [10] introduced concept of expert system in medical diagnosis. In this paper they had given complete important part of fuzzy logic and also explained how to create input, how to create rules in matlab rule viewer by the help of fuzzy logic toolbox. S. Govinda Rao et al. [11] introduced all kind of fever. In this paper they had given symptoms of fever which is common on dengue and chikunguiya. They clearly shown in their paper if fevers continues for long time then it must be diagnosis well. They had given symptoms of all fevers and also given different rules and inputs for different types of fever.

Dayaraj Cecilia [2] describes complete detail analysis of dengue and chikangunia fever in Asia. He had given complete analysis since last 5 years. In this article he has presented all cares to save these types of fever and also provide necessary precautions. It is a good article because any researcher can use this article to select input and rules in fuzzy logic. Nivedita Gupta et al. [6] had written an article on dengue and they presented state wise figures in India. Raul Beltran Ramirez et al. [7] introduced medical diagnosis on mobile platform. In this paper they used fuzzy system for detecting dengue fever but they focus on only mobile platform so it is easier for any person to diagnosis dengue fever on their mobile. Putu Manik Prihatini and Ketut Gede Darma Putra [12] designed fuzzy logic system with notification of dengue fever. In this paper they used rule viewer to select rule in different way. They developed an algorithm for detection of chikangunia fever. After new algorithm he has implemented on matlab fuzzy logic toolbox. In the year of 2014, Oguntimilehin et al. [13] introduced DSS for medical diagnosis which is based on fuzzy logic expert system. Baig et al. [14] described detail about fuzzy expert system and how to control FES. They also had given with lots of example that in fuzzy logic most important part is input and rule selection. Priyanka Sharma et al. [15] introduced and designed a decision support system for dengue diagnosis. In this paper they had given methodology in details to develop DSS. Kamran Shaukat et al. [16] focused on data mining tool WEKA which is used

for prediction of dengue fever diagnosis. They used all the parameter and techniques for identifying dengue fever at early stage. In year of 2015 Muhammad Arif Nadeem Saqib et al. [17] presented a research article based on complete analysis of dengue fever. They compare cases and cause of death from dengue fever. In This article they present graphically analysis. Anil Pardeshi et al. [9] discussed the dengue fever, its symptoms and complete analysis based on the patient admitted in Mumbai hospital. In this paper they had given complete result analysis of patient with all age groups. Tarig Faisal et al. [18] designed adaptive neuro fuzzy system for diagnosis for dengue fever. In this paper they taken data from Malaysia and on the basis of data they design complete system for analysis and design. M. V. Jagannatha Reddy and B. Kavitha [19] introduced the concept of Neuro network and fuzzy logic for prediction of fever at early stage. They used matlab tool for graphically representation of rule based decisions. In the year of 2014, M. Palaniyandi [20] presented paper on mosquito research. In this paper they mainly focus on tow deadly fever dengue and chikungunya with complete set of result and their analysis.

## VI. CONCLUSION

In this paper, we have given most of the information about dengue fever, one of the most dangerous diseases of the world. We have also mentioned first vaccine of dengue and this paper helps new researchers to take update analysis of the dengue fever. This system will help expertise to make their work easier and can deal more knowledge of diagnose process with the critical ill patient and given a more knowledge about dengue fever.

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