



## Fever in layman language

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Submitted:05-05-2022

Accepted: 15-05-2022

**ABSTRACT:** Fever is an immunological response of body against various disease conditions. It is a troublesome symptom as it weakens one's own body. Fever is caused due to many disease conditions and treatment of that particular condition can subside fever and other symptoms associated with it. However, many a times we need to treat fever with appropriate medications as it is burdensome and worrying to the individual. Moreover, it is due to the corona pandemic, many people are experiencing a lot of speculations about fever and hence are in a state of panic and fear. The main aim of this article is to provide detailed information regarding the endemic condition causing fever in a language known to the laymen. In this article we elaborated the pattern of fever in

malaria, dengue, typhoid, tuberculosis and discussed about the diagnosis and treatment measures. We also discussed our knowledge of fever in corona virus infection and outlined the treatment options as per the newly updated guidelines.

### I. INTRODUCTIONS:

Normal body temperature of human body is 98.6 degree F (37 degree C). A temporary increase in average temperature of body is considered as fever.<sup>[1]</sup> Fever is indeed a defensive mechanism of body against various diseases causing agents.<sup>[2]</sup> Thermometer is most commonly used to measure body temperature.<sup>[3]</sup>

AREA OF MEAUREMENT	THERMOMETER READING
Under armpit	Greater than or equal to 99 degree F
Rectally or in the ear	Greater than or equal to 100.4 degree F (38 degree C)
Oral	Greater than or equal to 100 degree F (37.8 degree C)

An adult is considered to have fever if the body temperature is higher than 99° F to 99.5° F (37.2 degree C to 37.5 degree F).<sup>[4]</sup>

Various conditions can increase the temperature of body beyond the normal range. These conditions vary from over stress of body to serious illness. This article is going to brief you about the most common endemic fevers in India. Most prevalent conditions that cause fever in India are malaria, dengue, typhoid, tuberculosis. Recently, COVID-19 has been added to the list which causes an increase in body temperature. However, COVID-19 is a pandemic and not an endemic disease. All of these conditions should be treated immediately as these fevers are associated with few serious complications.

In this article we will learn about the symptoms that are commonly encountered during various above mentioned conditions. A synoptic drive through various investigations and treatment measures will be covered here.<sup>[5]</sup>

Malaria:

Malaria is a disease caused by a parasite Plasmodium which is transmitted by the bite of infectious mosquitoes.<sup>[6]</sup> The onset of malaria is with a state of physical and mental weakness and lack of energy, followed by headache, nausea, chills and rigors, fever. Initially the patient feels very cold and later becomes hot, followed by rapid drop in body temperature and skin becomes moist and cool (sweating).<sup>[7]</sup> The fever pattern in malaria is paroxysmal which means that the fever is repeating every third day or fourth day.<sup>[8]</sup>

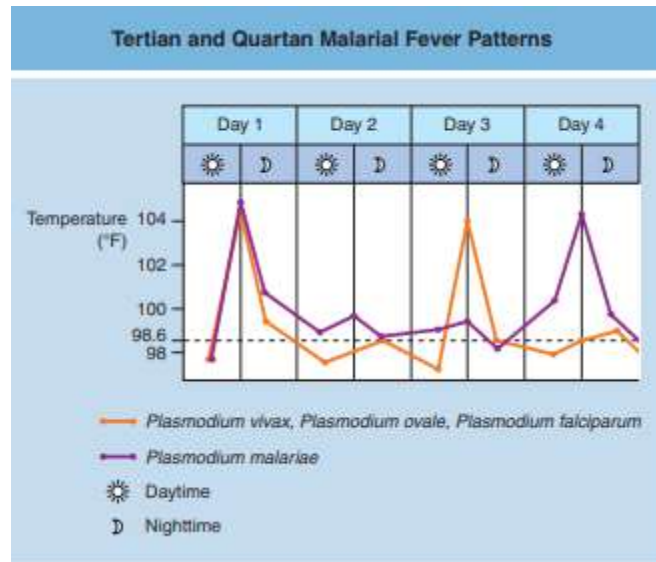


Fig.1. Typical temperature charts of malarial infections. Courtesy: Ferri FF Chapter 332. Protozoal infections. Ferri's Color Atlas and Text of Clinical Medicine. Philadelphia: Saunders Elsevier Health Sciences; 2009. Pg. 1159. [9]

#### WHAT TO DO IF YOU SUSPECT TO HAVE MALARIA? HOW TO CONFIRM DIAGNOSIS? AND IT'S TREATMENT.

Thick and thin blood films are sent for microscopy to detect the species of malaria parasite (*P. vivax*, *P. falciparum*). [7]

Once the diagnosis is confirmed the treatment should be started.

##### STEP1: SUSPECTED MALARIA CASE?

##### STEP2: SEND BLOOD FOR MICROSCOPIC EXAMINATION

##### STEP3: RESULT IS POSITIVE FOR:

###### 1. PLASMODIUM VIVAX:

- A) Chloroquine 3days
- B) Primaquine 0.25mg/kg

daily for 14days.

Primaquine is to be avoided in pregnant women and one with G6PD deficiency.

###### 2. PLASMODIUM FALCIPARUM:

- A) In North Eastern states treat with age specific Artemisinin-based combination therapy (Artemether-Lumefantrine)
- B) In other states: treat with Artemisinin based combination therapy (Artemisinin+ sulfadoxine-pyrimethamine)

###### 3. MIXED INFECTION:

- A) In North-Eastern states: treat with age specific Artemether-Lumefantrine for 3days+ primaquine 0.25mg/kg body weight daily for 14days

- B) In other states: Artesunate+ sulfadoxine-pyrimethamine+ primaquine 0.25mg/kg body weight daily for 14 days. [10]

##### Dengue:

Dengue is a viral infection transmitted by mosquito. The manifestation of disease is sudden with chills and high fever with intense headache, muscle pains and joint pains. This makes the patient very weak. Patient also develops retro-orbital pain and photophobia. Various other symptoms like anorexia, weakness, constipation, altered taste sensation; colicky pain and abdominal tenderness, dragging pain in inguinal region, sore throat and general depression are also seen.

Fever between 39 degree C and 40 degree C is usually present. Fever is generally followed by remission in a couple of hours to days. During remission period or 2nd febrile phase 80% patients presents with rash or skin eruptions on face, neck, chest which may spread to extremities. [11]

##### HOW CAN WE DIAGNOSE DENGUE?

Dengue is diagnosed if there is sudden (acute) fever (febrile illness) along with two or more of the following features:

1. Headache
2. Retro-orbital pain
3. Myalgia (muscle pains)
4. Arthralgia /bone pain
5. Rash
6. Haemorrhagic manifestations
7. Leucopenia (WBC < 5,000 cells/mm<sup>3</sup>)
8. Thrombocytopenia (platelet count < 1,50,000 cells/mm<sup>3</sup>)



9. Rising haematocrit (5-10%).<sup>[12]</sup>

At least one of the following:

- 1) Supportive serology on a single serum sample: titre  $\geq$  1280 with hemagglutination inhibition test, comparable IgG titre with enzyme-linked immunosorbent assay, or testing positive in IgM antibody test, and
- 2) Occurrence at the same location and time as confirmed cases of dengue fever.

The following tests are available for diagnosis of dengue:

1. Virus isolation
2. Viral nucleic acid detection
3. Immunological response
4. Viral antigen detection :
  - A) ELISA and
  - B) Nonstructural protein 1 (NS1): can be detected in primary and secondary dengue infections upto 6 days after onset of illness.
5. Rapid diagnostic test(RDT)
6. Analysis of haematological parameters:
  - A) Leucopenia(WBC $<$ 5,000 cells/mm<sup>3</sup>)
  - B) Thrombocytopenia (platelet count $<$ 1, 50,000 cells/mm<sup>3</sup>)
  - C) Rising haematocrit (5-10%)

#### MANAGEMENT OF DENGUE FEVER

- 1) Encourage intake of oral rehydration solution (ORS), fruit juices and other fluids containing electrolytes and sugars to replace losses from fever and vomiting.
- 2) Paracetamol for high fever( dose of paracetamol should be taken with a gap o minimum 6hours or more)

3) Cold sponging if patient has high fever

4) DONOT give pain killers(NSAIDs, aspirin)

5) Patient should be taken to hospital immediately if any of the following develop:

- A) no improvement
- B) severe abdominal pain
- C) vomiting persistently
- D) cold and clammy extremities
- E) restlessness
- F) bleeding(example: black stools, or coffee-ground vomiting)
- G) Not passing urine for  $>$ 4-6 hours.<sup>[13]</sup>

Typhoid Fever:

Typhoid also known as enteric fever is caused by Salmonella typhi which is found only in man. It is a systemic infection, which means that this infection tends to affect the entire body rather than a single organ. It is characterized by typical continuous fever for 3-4 weeks, bradycardia (decreased heart rate) with the involvement of lymphoid tissues.<sup>[14]</sup> Typhoid is transmitted through ingestion of contaminated water, milk or food or through flies or through direct contact through soiled hands contaminated with faeces or urine of cases or carriers.<sup>[15]</sup> Typhoid presents with chills and fever. There is malaise, cough, sore throat and headache. It is often associated with abdominal pain and distension, constipation or pea-soup diarrhea. After 7 to 10days from the onset, fever reaches a plateau and patient looks toxic.<sup>[16]</sup> Fever follows a step-ladder pattern in typhoid( i.e. fever rises one day and falls the subsequent morning). Rash may develop in 2nd week of disease generally on trunk.<sup>[14]</sup>

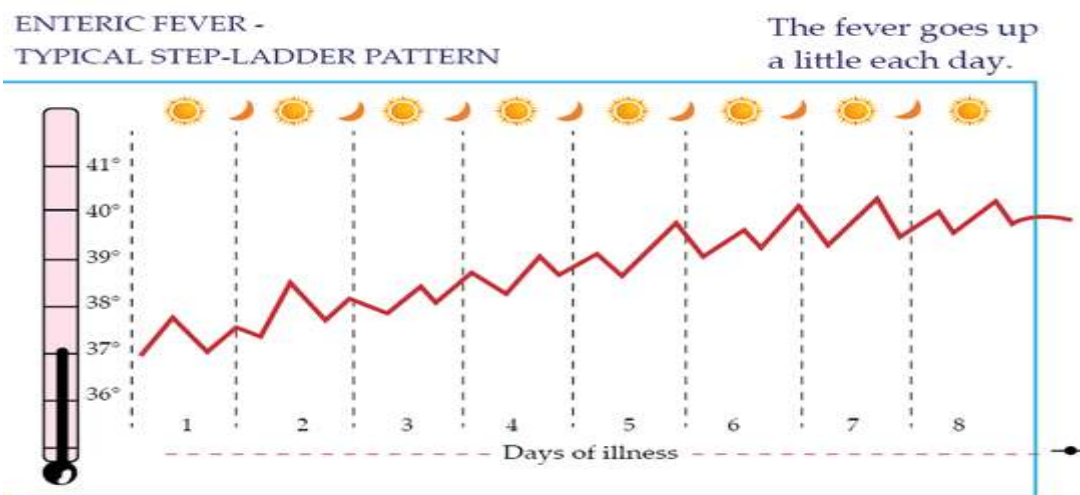


Fig.2 Continuous step ladder pattern of fever classical of typhoid fever.<sup>[17]</sup>



#### DIAGNOSIS OF TYPHOID

1. Microbiological procedure: isolation of *S. typhi* from blood, bone marrow and stools. Blood culture is the mainstay of diagnosis.
2. Serological procedure: Widal test measures the agglutinating antibody levels against O and H antigens. It can be negative in 30% cases.

#### WIDAL TEST IS POSITIVE:

1. If O antigen titre is >1:160; which means active infection
2. If H antigen titre is >1:160; indicates past infection or in immunized persons.
3. A fourfold increase in the titre (example: 1:40 to 1:160) is diagnostic.

False positives may be seen due to cross reacting infections, including malaria.

#### Other diagnostic tests:

1. Blood culture will be positive in 1st week when Widal test is negative.
2. Stool cultures are generally positive in 3rd week
3. Bone marrow culture: very sensitive
4. Typhidot

#### TREATMENT OF TYPHOID

- A) The drug of choice for treatment of typhoid is chloramphenicol. It does have side effects.
- B) Ciprofloxacin is now a drug of choice.
- C) Ampicillin, amoxicillin, 3rd degree cephalosporins, and fluoroquinolones can be used.
- D) Co-trimoxazole is better than chloramphenicol with fewer side effects
- E) Typhoid vaccine: oral and i.m are available.

#### TREATMENT:

1. Fluoroquinolone (example: T. Ofloxacin, T. Ciprofloxacin) 15mg/kg for 5 to 7 days.
2. Multidrug resistance:  
Fluoroquinolone 15mg/kg for 15days OR  
Cefixime 15-20mg/kg for 15 to 20 days
3. Quinolone resistance:  
Azithromycin 8 to 10mg/kg for 7days  
Ceftriaxome 75mg/kg for 10 to 14days.<sup>[18]</sup>

#### Tuberculosis (TB):

TB is a serious infection caused by bacterium *Mycobacterium tuberculi*. The spread occurs when an infected person coughs or sneezes. Fever is associated with coughing for 3 or more weeks. Coughing up blood or mucus with chest pain and pain with breathing is seen in TB.<sup>[19]</sup> Other symptoms like unintentional weight loss, fatigue, night sweats, chills and loss of appetite are also seen.<sup>[20]</sup> The fever pattern in TB is typically developed in late afternoon or evening (evening rise of temperature).<sup>[21]</sup>

#### DIAGNOSIS OF TB:

##### 1. Skin test :

Requires 2 visits. In one visit the test is placed and on the 2nd visit the doctor or health care provider reads the test. A small amount of fluid called tuberculin is injected on the lower part of the arm and the patient must return within 2 to 3days after which a trained health care worker will look for a reaction on the arm. The result depends on the size of the raised, hard area or swelling.

- A positive skin test means the patient is having active TB infection.
- A negative test means that the person doesn't have TB or has a latent TB.

TB skin test is preferred test for children below 5years of age.<sup>[22]</sup>

##### 2. Blood test:

Blood test is preferred test for people who received tuberculosis vaccine, i.e., BCG. Blood is drawn by a health care worker and is sent to lab for analysis and results.<sup>[23]</sup> A positive blood test means that person is infected with TB. A negative test means that tuberculosis infection is absent or is in latent state.<sup>[24]</sup>

##### 3. Imaging:

Chest x-ray or CT scan is ordered to look for any white spots in lung which results after the immune system has immediately walled off TB bacteria or which indicate changes in lung caused by TB bacteria.

##### 4. Sputum test:

Sputum cultures are used to diagnose TB. They are also done in order to choose the likely medication as they are used to test for drug resistant strains of TB. Results generally take up to 8weeks.<sup>[25, 26]</sup>

#### TREATMENT OF TB:

Most common drugs used in the treatment of tuberculosis are:

Rifampin  
Isoniazid  
Pyrazinamide  
Ethambutol

- Medication should be taken on empty stomach 1hr before or 2hrs after a meal with full glass of water.
- If a person shows up drug resistance for TB, some antibiotic combinations called fluoroquinolones and injectable medications such as amikacin or caperomycin are generally use for 20 to 30 months.<sup>[27]</sup>

#### COVID-19:

COVID-19 is a respiratory condition caused by corona virus. People infected are mostly



symptomatic. The symptoms range from mild illness to life threatening problems. However, the incidence of severity is higher if a person is older or has another health conditions like diabetes, heart diseases, etc.

Fever is a possible symptom in COVID-19. The other symptoms also include: dry cough and shortness of breath, chills, tiredness, muscle or body pains, headaches, loss of smell or taste, sore throat, congestion or runny nose, vomiting or nausea, diarrhea.

The emergency symptoms of COVID-19 or a person should immediately consult a doctor if he/she is experiencing the following symptoms:

1. Trouble breathing
2. Constant pain or pressure in chest
3. Bluish discoloration of face or lips
4. Confusion
5. Or any other symptom that makes a person stays awake.<sup>[28]</sup>

**DIAGNOSIS OF COVID-19:**

Diagnosis of COVID-19 is possible through various tests.

1. Rapid antigen: useful to detect the presence of a specific viral antigen. Time for result can vary from seconds to minutes. A negative test with classic clinical symptoms doesn't rule out COVID-19 infection.
2. RT-PCR: highly sensitive and highly specific test used for detecting COVID-19 infection. Time for result can vary from 1 to 3 days based on the laboratory test.

Throat swabs and nasal swabs are commonly collected for detecting corona virus through rapid antigen and RT-PCR.

3. HRCT is advised when swabs come up to be negative and person has classic signs of COVID-19. This test is also used to grade the severity of infection.<sup>[29]</sup>

**TREATMENT OF COVID-19:**

COVID-19 is a highly infectious disease. Isolation and proper hygiene is very essential.

**At Home Corona virus Treatment**

If your symptoms are mild rest and take the prescribe medication from your doctor.

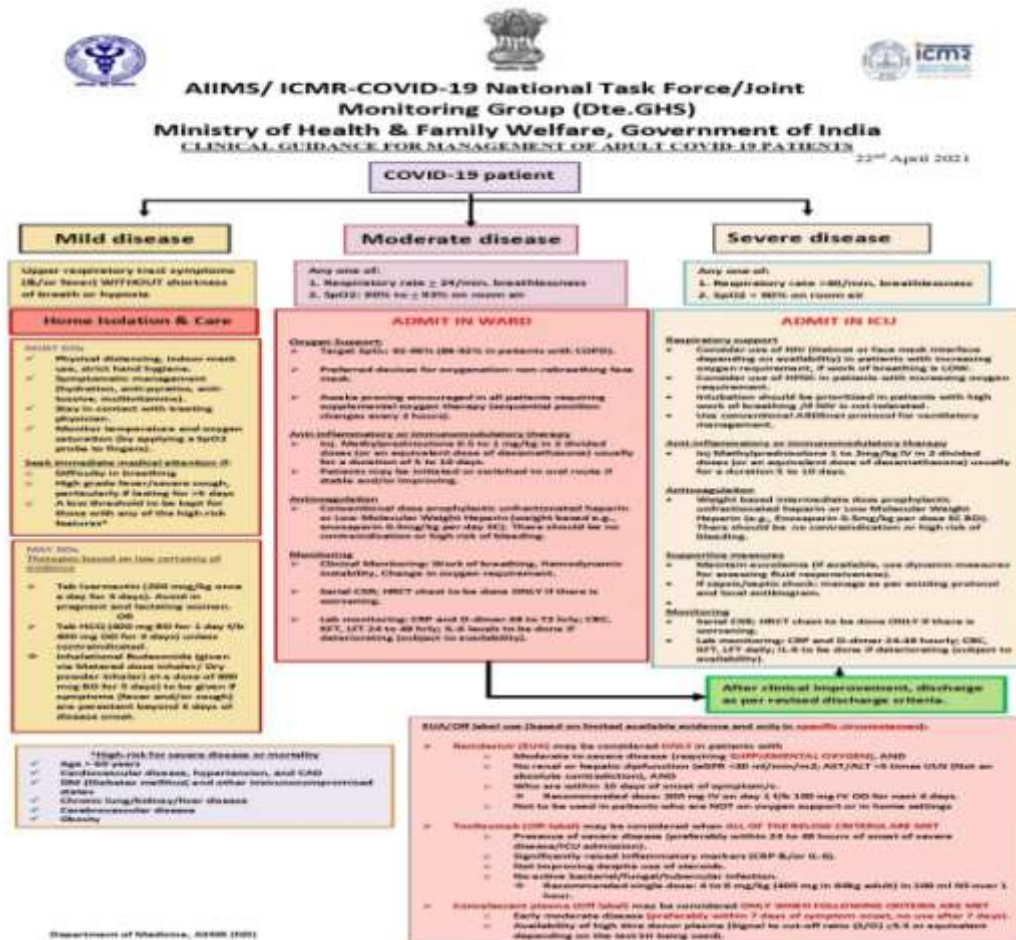


Fig.3 Clinical Guidance for management of adult Covid-19 Patients.<sup>[30]</sup>



## II. CONCLUSION

However, there are various other conditions where we see an increase in body temperature. Any severity of a condition should be treated as an emergency and you should rush to the doctor. All the conditions mentioned above do have wide range of complications and should always be treated under medical supervision.

This article aims to give you an over view of common conditions causing fever. The investigations that are done and basic treatment measures are also covered. This article is only meant to make you understand about various patterns of fever and what can you suspect accordingly. This doesn't ease off any complications caused by a disease, and is indeed an alarm for you to consult a doctor and receive the necessary treatment.

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