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Overview of Outbreak of a Disease in India – Hand, Foot and Mouth Disease



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ABSTRACT

There is an uprising of a public health crises threatening India with the emergence and spread of Hand, Foot and Mouth Disease 2022. This disease is caused by a virus which is transmitted to humans mainly through contact with an infected person's nose or throat discharges, saliva, fluid from vesicles or stool, or after touching contaminated objects. This disease is majorly seen in children below the age of 12. There have been around 800 plus cases reported from the month May 2022 with no deaths till date [12/10/2022]. The incubation period ranges from 3-7 days. The symptoms of Hand, Foot and Mouth Disease usually include fever, mouth sores, and skin rash. The rash is commonly found on the hands and feet. The disease is mild in most people but leaves the scars of lesions and rash for over a period of time. Diagnosis is by demonstration of the virus in the sample fluid swabbed from the rash by special molecular test. Treatment is essentially supportive and symptom suppressive. Prevention is to avoid close contact with people who have a rash that look like Hand, Foot and Mouth Disease and droplet precaution.

INTRODUCTION:

Hand, Foot and Mouth Disease is a mild contagious viral infection common in young children but can also affect adults too. Hand, Foot and Mouth Disease is a common infection caused by a group *Enteroviruses* [1]. The infection generally observed on the Hand, Foot and Mouth and sometimes even on the genitals and buttocks [2]. The major causative agent for the Hand, Foot and Mouth Disease is Coxsackie virus A type 16 but the disease could be caused by many other strains of Coxsackie virus [3]. The Coxsackie virus is linked to the *Picornaviridae* family includes non-enveloped single stranded RNA virus [1].

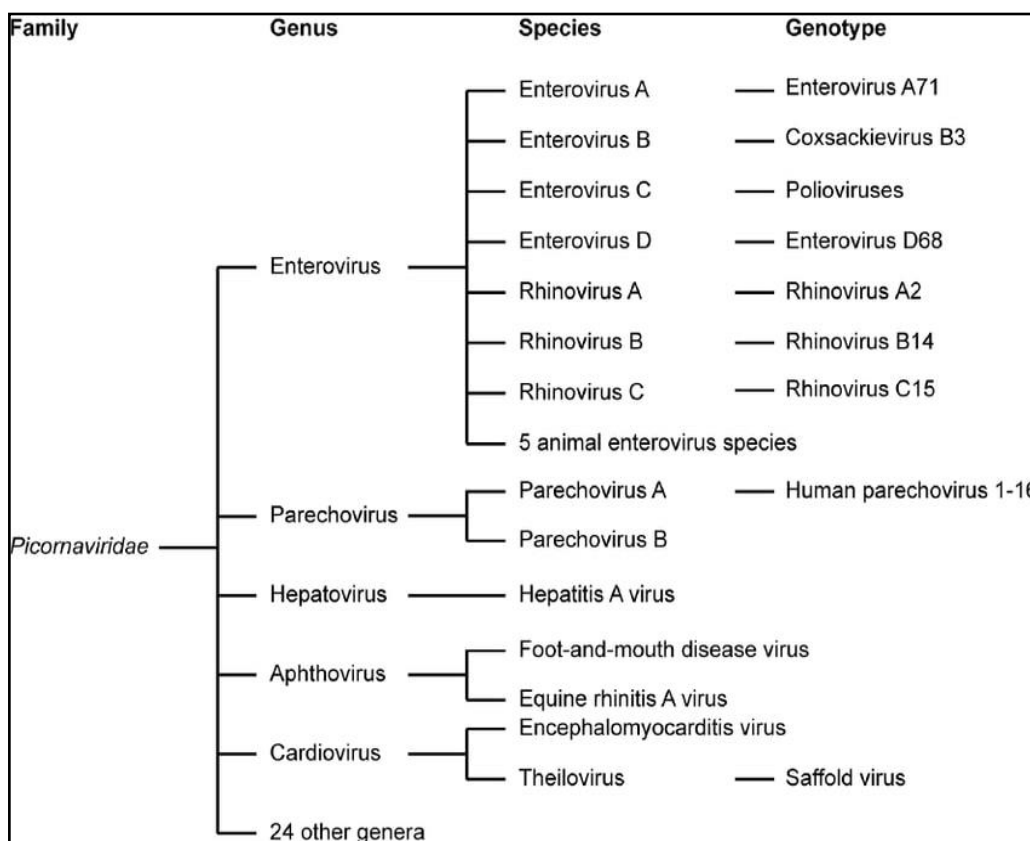


Figure 1.1 Taxonomy of Coxsackie A-16 Virus

HISTORY AND TIMELINE OF HAND, FOOT AND MOUTH DISEASE:

The cases of Hand, Foot and Mouth Disease were very firstly clinically observe and being studied in Canada and New Zealand in the year 1957[4]. In the year 1960 the name “Hand, Foot and Mouth Disease” was coined by Thomas Henry Flewett[5].

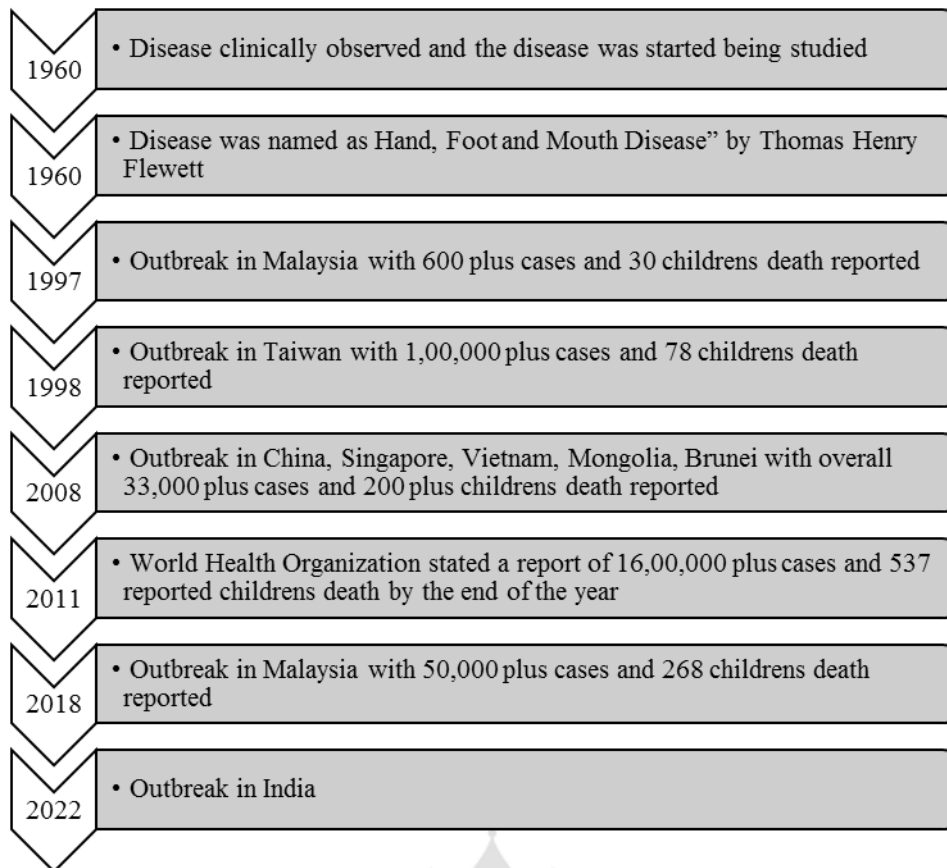


Figure 1.2 Timeline of Hand, Foot and Mouth Disease

PRESENT CONDITION AND STATISTICS OF THE DISEASE:

In India an outbreak of disease arose in Kollam district of State Kerala from the month of May 2022, it was initially referred to as tomato flu the name was given because of the red and round blisters it causes, which look like tomatoes. The disease condition mainly affects children under the age of twelve. An article in The Lancet states that the appearance of the blisters is similar to that seen in monkey pox, and the illness is not thought to be related to SARS-CoV-2. The further studies and research came to the conclusion of the new variant of Coxsackie A-16 virus which causes the Hand, Foot and Mouth disease. [1, 4, 5, 6, 7].

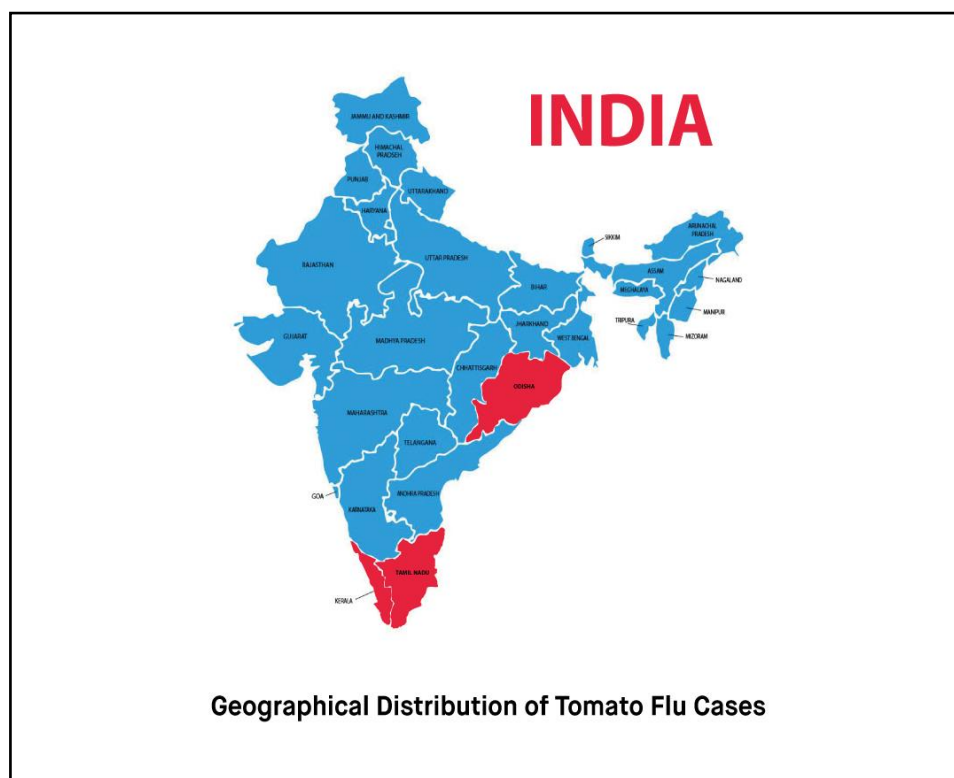


Figure 1.3 Distribution of Hand, Foot and Mouth Disease in India in the year 2022

CAUSATIVE AGENT:

Hand, Foot and Mouth Disease is more commonly seen in United States. Coxsackie virus A16 is responsible for Hand, Foot and Mouth Diseases [8]. The Coxsackie virus it belongs to a group of virus called as non-polio Enteroviruses. There are many other Enteroviruses which causes Hand, Foot and Mouth Diseases [9]. The virus that causes Hand, Foot and Mouth Disease, generally it belongs to an Enteroviruses genus [10]. There are other such common causes responsible for Hand, Foot and Mouth Disease such as:-

- 1) Coxsackie virus A6:- This virus may also cause Hand, Foot and Mouth Disease and in this the symptoms will be more severe.
- 2) Enteroviruses 71(EV-A71):-This virus has encountered many cases mostly in East and Southeast Asia. These virus causes more severe disease called as encephalitis, i.e., swelling of brain. [8]

But it can also affect older children and adults [11]. Hand, Foot and Mouth Disease is characterized by blisters and sores in mouth and rashes on hands and feet. [10]

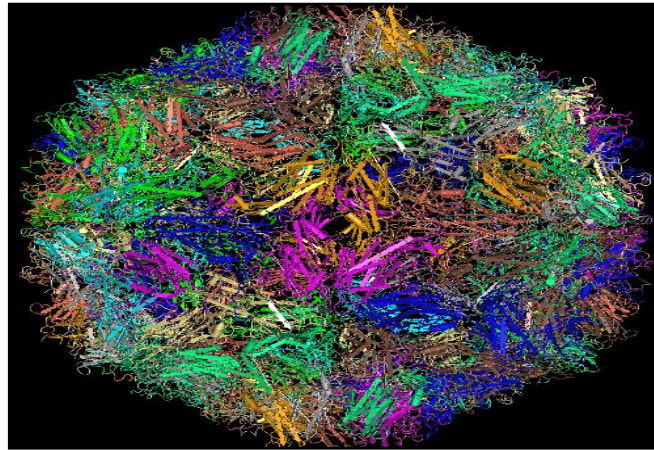


Figure 1.4 Crystal Structure of Human Coxsackie virus

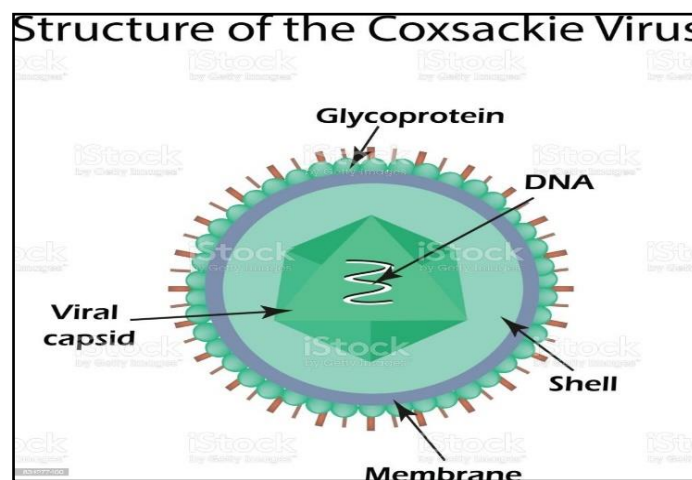


Figure 1.5 Structure of Coxsackie virus

VARIANT'S OF VIRUS:

With outbreaks in Europe, Asia and South America it has been reported a typical variant of Hand, Foot and Mouth Disease. It is transmitted through person - to - person contact, by droplet infection or by fecal-oral transmission. Typical skin findings include a popular and vesiculobullous exanthema that might be accompanied by confluent blisters, crusting and ulceration. In Hand, Foot and Mouth Disease there is one mutant whose blisters are larger than normal and it is called as tomato flu [12][13]. Recently it has been reported as Hand, Foot and Mouth Disease - a common, relatively, mild viral infection affecting children- a new virus responsible for this is dubbed as Tomato Flu [14]. In 2022, it has been reported that Tomato Flu might be a novel version of hand foot and mouth diseases [15]. Doctors have called Tomato Flu, a misleading name for Hand, Foot and Mouth Disease (as recently it is a new variant) [16].

MODE OF ACTION:

As we all know, Hand, Foot and Mouth Disease more commonly affects the children, i.e., it causes preceding fever followed by rashes on hand, feet and mouth in addition to limbs, buttocks and trunk [17]. It is generally transmitted through nasopharyngeal secretions such as saliva and nasal mucus by person-to-person contact [18]. The more common places for child care settings contracted because of toilet training, diaper changes and a fact that child put their hands into the mouth [9]. Hand, Foot and Mouth Disease is also caused by throat secretions as well as fluid in blisters [19]. Sometimes these Enteroviruses causing hand foot and mouth diseases enters into brain and causes several complications such as viral meningitis and encephalitis [20]. The Hand, Foot and Mouth Disease is asymptomatic but contagious as the infectious period starts few days to about a week before onset of illness [21]. A person recovered from infection by a particular Enteroviruses serotype generates a protective immunity against specific serotype but can still get infected by different serotypes of Enteroviruses [22].

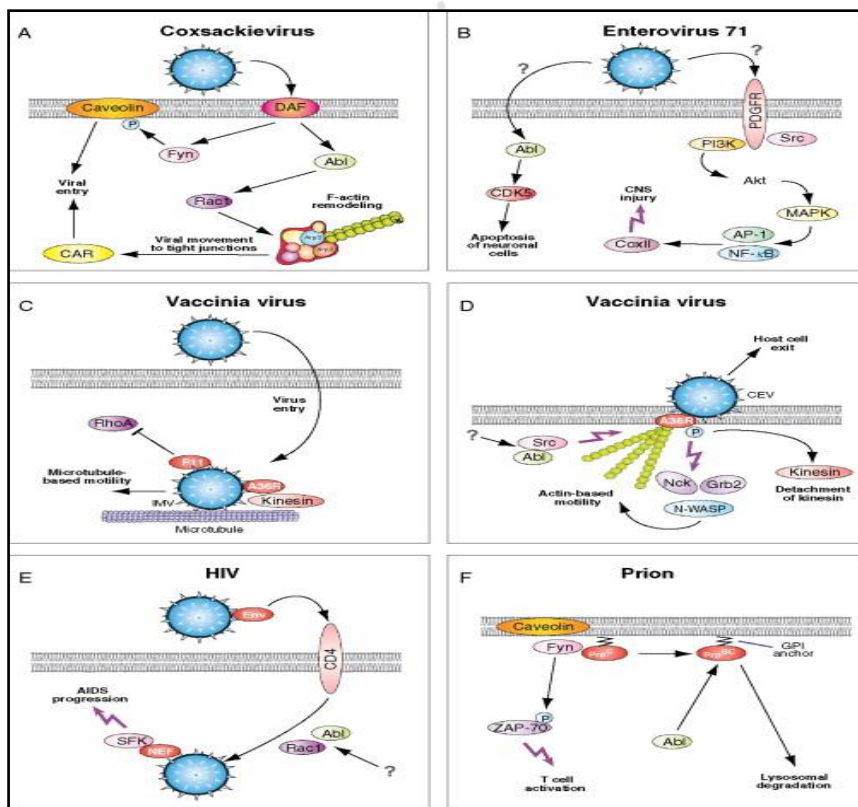


Figure 1.6 Mechanism of action of Coxsackie virus A-16

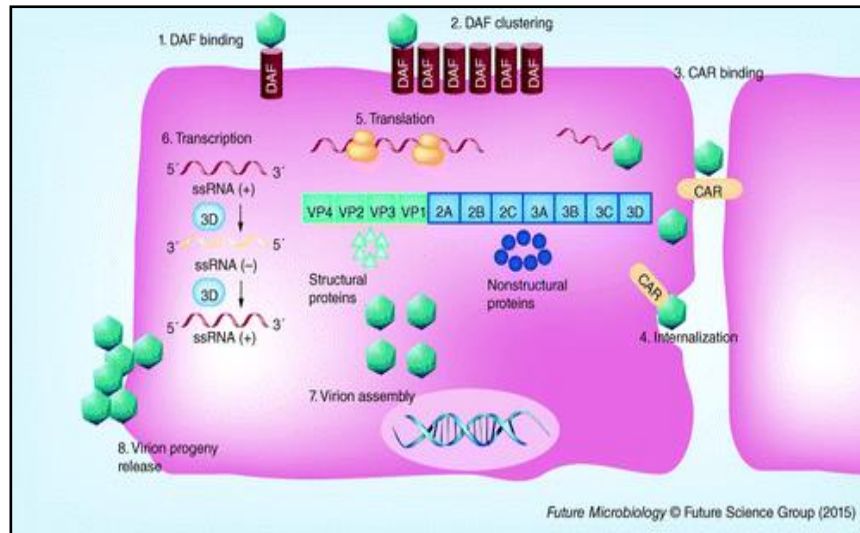


Figure 1.7 Mechanism of replication of Coxsackie virus A-16

RISK FACTOR:

It was suggested that young one less than five to ten years old having poor hygiene, High number of social contact are at high risk of hand foot and mouth diseases [22]. Male was found at a high risk of hand foot and mouth disease in most of the literature [23]. About 82% of Hand, Foot and Mouth Disease cases in Asia occurred before six year old. [9]

Other risk factors of hand foot and mouth disease are as follows:-

- 1) Overcrowding.
- 2) Close contact with infected person.
- 3) Sharing toys with other children.
- 4) Not washing hands before meal and before using toilet.
- 5) Attendance in kinder garden/child care Centre. [24]

Risk factors for a patient infected by hand foot and mouth disease developing severe manifestations are as follows:

- 1) Vomiting.
- 2) Severe fever more than three days.
- 3) Increased neutrophil count.

4) Respiratory rate greater than 24 minutes.

5) Body temperature greater than 39 degree Celsius. [25] [26]

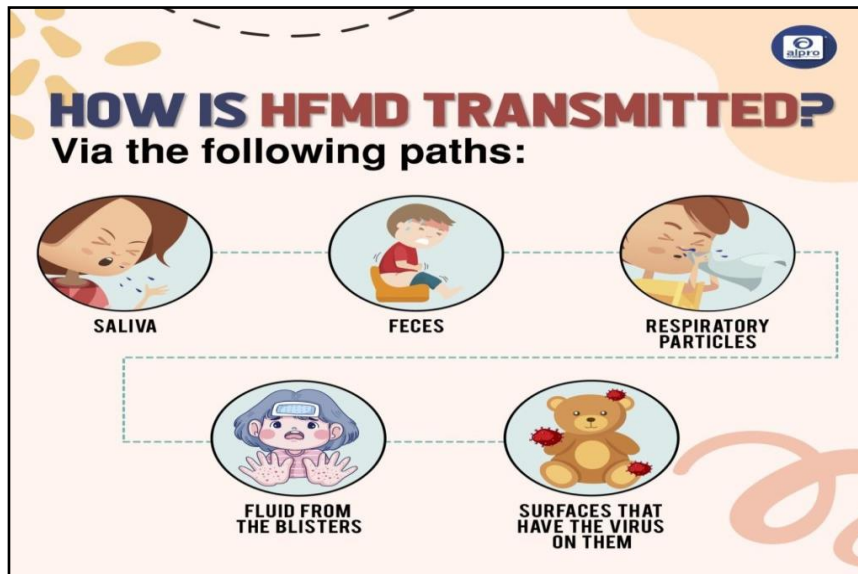


Figure 1.8 Risk factor and Mode of transmission of Coxsackie virus A-

SIGNS AND SYMPTOMS:

Gliding over the past paragraphs one comes to the light that the Hand foot and mouth disease is caused by the systemic infection with the Coxsackie virus A16 from the family of Picornaviridae^[27]. The signs and symptomatic differences displayed by the individual virus is elaborated below –

The above categorization is carried on the basis of its level of infestation and its magnitude of the affecting capability.

The onset of the HFMD starts with occurrence of small fluid filled blisters on the skin of hands, feet, and within mouth. Oral lesions are found in 90% of the patients as compared to the dermal lesions [2, 28].

The oral lesions can range from few individual lesions to marked swellings and sores also known as marked stomatitis.

The appearance of the lesions on the dermal layer are limpy or flaccid, it might be reddish or might show greyish vesicles [1, 29, 30].

The Symptomatic effects displayed by an individual while affected with the Coxsackie virus A16 include –

Fever, malaise, conjunctival injection or hyperaemia displaying enlargement of conjunctival vessels, headache, and abdominal pain, occasionally diarrhoea, sore throat, loss of appetite [5, 24].

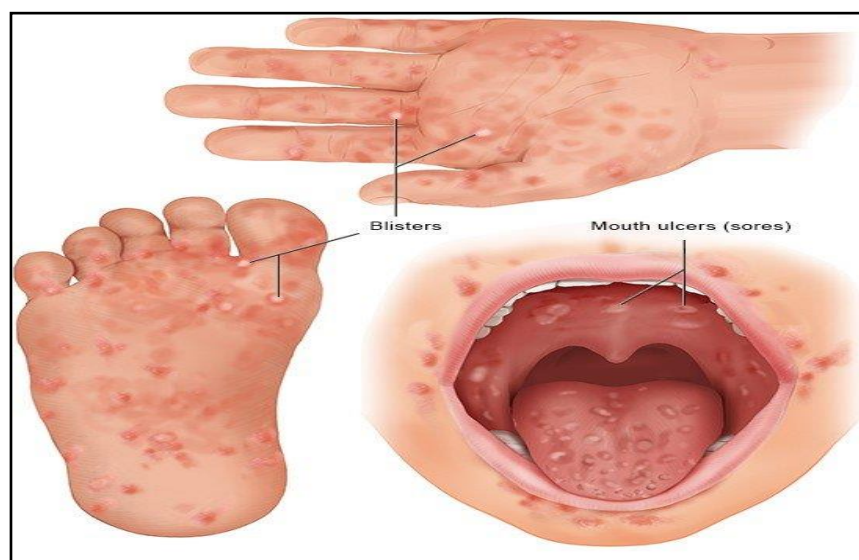


Figure 1.9 Common Symptoms of Hand, Foot and Mouth Disease

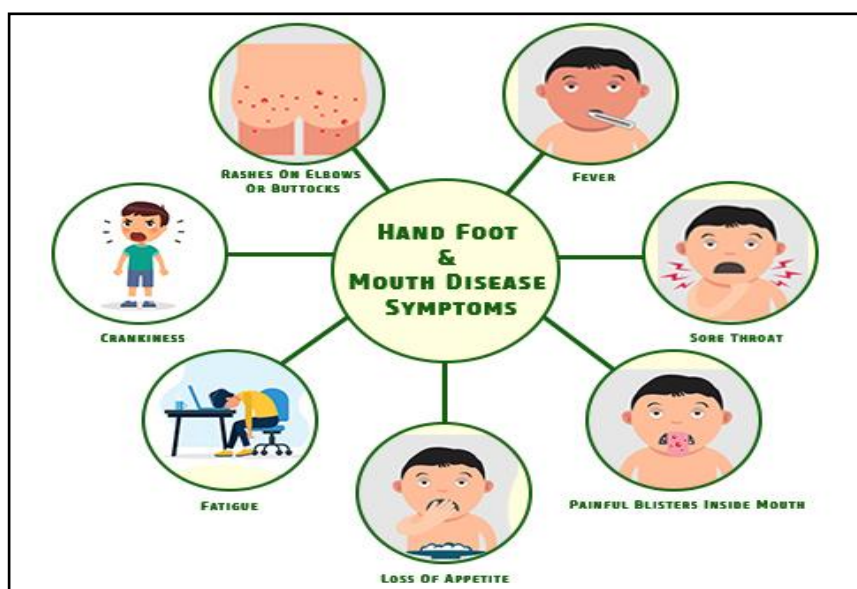


Figure 1.10 Symptoms of Hand, Foot and Mouth Disease

TREATMENT:

HFMD shows low rate of death or serious conditions in case of the Coxsackie virus A16, but shows small accounts of death with the case of the Enteroviruses which is more critical than the Coxsackie virus A16 [18].

The treatment of HFMD can be broadly classified under two major categories on the basis of their method of treatment –

- **Home based treatment:**

Certain home-based techniques and food articles are given to especially children to ease the pain of blisters and make them less bother [6]. Blisters make it hard to eat and swallow any food or liquid article due to throat soreness and blisters [23]. These are example of some food and liquid articles that can be introduced in the case of HFMD to the children in specific-cool and non-acidic articles like ice-creams, water, milk, and apple juice. Also, articles like tea, warm drinks might help soothe the pain and soreness. Try avoiding any acidic food and beverage as well as spicy and salty food as it might irritate the blisters and add discomfort [12, 29].

Food items that are easy to chew and easily gulp able must be consumed for better convenience. Soft foods like apple sauce, mashed potatoes, oatmeal, eggs, dairy products like curd and yogurt reduces the pain of blisters and can be gulped easily [7, 11, 20].

- **Clinical treatment:**

The medicines prescribed by doctors which are over the counter drugs helps in reducing the symptomatic effect by reducing blisters and lesions [14].

Topical oral anaesthetics and dermal creams can be used to soothe any blisters and relive pain of mouth sores [28].

Over the counter pain medications other than aspirin can be used as it associates with Reye's syndrome in kids thus needs to be avoided [14, 16].

Thus medications like acetaminophen or ibuprofen can be given to ease the pain.

Medicated syrups or lozenges helps to ease the pain of sore throats [14, 19].

DIAGNOSIS:

HFMD is diagnosed by physical exams. A medical professional check for the blisters in the mouth and on skin of the individual. Also throat swabs are taken along with stool samples to check for presence of virus and its type for further treatment. These methods are widely used to diagnose the presence of the virus [2, 9, 22].

POST HAND, FOOT AND MOUTH DISEASE EFFECT:

Certain post recovery effects might reflect due to effect of the HFMD virus during the effect period on the individual body. The post effects can be of following types –

- Dehydration – During the sore throats and blisters some individual might not have consumed adequate amount of liquid thus once the HFMD gets suppressed the individuals face a declined rate of fluids in their body.
- Loss in nails or rupture- In small amount of cases loss of finger or toe nail was displayed especially in children but yet its cause is not prominent.
- Viral meningitis – The time of effect of the virus may lead to inflation or swelling of the meningitis. This may further lead to headaches, stiff neck or back pain [3, 13, 28, 29, 30].

PREVENTION:

Raising awareness of risk factors and educating people about the measures they can take to reduce exposure to the virus is the main prevention strategy for Hand, Foot and Mouth Disease. Scientific studies are now underway to assess the feasibility and appropriateness of vaccination for the prevention and control of Hand, Foot and Mouth Disease. Some countries are developing, policies to offer vaccine to persons who may be at risk such as laboratory personnel, rapid response teams and health workers. [1, 2, 15, 22]

Some preventive steps to be taken are:

- Wash your hands often with soap and water for at least 20 seconds. If soap and water are not available, use an alcohol-based hand sanitizer.
- Clean and disinfect frequently touched surface and shared items, including toys and doorknobs

- Avoid touching your eyes, nose, and mouth. To lessen your chance of getting sick, don't touch your eyes, nose, and mouth with unwashed hands.
- Avoid close contact with sick people [1, 3, 9, 24]

CONCLUSION:

This Mini-review with scientific facts was desired to make the society aware about the emerging, threatening and dreadful ' Hand, Foot and Mouth Disease ' and the extent of the disease so far. Coxsackie virus A16 infection is an important emerging pathogen that, based on serologic studies done, may result in more infections than originally believed.

If a virulent strain of Coxsackie virus A16 were introduced in a setting where individuals have no immunity to Enteroviruses, this may provide the virus with the opportunity to exploit this naive population, which could lead to an epidemic and the growing lack of immunity in the population and it might be used as a bioweapon.

Our intent of this review article was to avoid any misconceptions about the disease and acknowledge the society about its severity through all the veritable information and facts.

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