Hand, foot and mouth disease (HFMD)

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Key facts

To better understand public health terms included in this Disease Tool (e.g. What is a case definition? or What is an infectious agent?), consult our page on Key concepts on epidemiology.

Importance

HFMD infects children in particular and is often caused by a group of Enteroviruses, *Coxsackie* and *Enterovirus 71* being the most common. Outbreaks associated with *Enterovirus 71* infection have been reported globally since the 1970s, predominantly in the Asia-Pacific region and largely affecting children. Clinical manifestation of cases has been mostly typical of HFMD, with fever, skin eruptions on hands and feet, and vesicles in the mouth. Rarely, HFMD can lead to serious complications including viral meningitis and other central nervous system conditions such as encephalitis and paralysis and/or fluid in the lungs (pulmonary oedema).

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Case definition

A **case definition** is a set of uniform criteria used to define a disease for public health surveillance. It enables public health officials to classify and count cases consistently.

The following are standard case definitions to allow national health authorities to interpret data in an international context. However, during an outbreak case definitions may be adapted to the local context and the Red Cross Red Crescent should use those agreed/established by national health authorities. NB: Consider that during community surveillance, ***volunteers*** *should use broad (simplified) case definitions to recognize most or all possible cases and to encourage them to seek care. Other actors such as* ***healthcare workers or investigators*** *studying the cause of a disease, on the other hand, can use more specific case definitions that may require laboratory confirmation.*

Given the endemicity of this illness, it is not necessary to report every single case of detected HFMD. Instead, the objective should be to detect events that indicate an outbreak, clusters of cases, severe cases or deaths.

The standard case definition is: febrile illness with papulovesicular rash on palms and soles, with or without vesicles/ulcers in the mouth. Rash may occasionally be without vesicular lesion, and may also involve the buttocks, knees or elbows, particularly in younger children and infants.

WHO case definition source of information: https://www.who.int

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Alert / epidemic threshold

An **alert threshold** is the pre-defined number of alerts that suggest the beginning of a possible disease outbreak and therefore warrant immediate notification.
Epidemic thresholds are the minimum number of cases indicating the beginning of a particular disease's outbreak.

The number of cases reaches two standard deviations above the normal baseline OR two or more cases occur within an institution, indicating transmission within a cohort.

Risk factors

- Taking care of infants and children who have the disease (parents, day carers, teachers).
- Poor personal hygiene.
- Close contact with infectious people in a same household or overcrowded areas where a person-to-person spread is easily possible.
- No proper sanitation and hygiene measures.
- Not properly treated recreational water, such as water in swimming pools.

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Attack rate (AR)

The **attack rate** is the risk of getting a disease during a specific time period (such as during an outbreak).

Possibly high among close contacts, but only a small proportion with the disease present symptoms. Attack rates have varied from one country to another.

Groups at increased risk of severe illness (most vulnerable)

- Infants.
- Patients with *Enterovirus 71 (EV71)* infection.
- Patients who are immunosuppressed.

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Infectious agent

Infectious agents are bacteria, viruses, fungi, prions and parasites. A disease caused by an infectious agent or its toxic products is defined as an infectious disease.

Coxsackievirus A16 and other *coxsackieviruses, Enterovirus 71 (EV71).*

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Reservoir / host

A **reservoir of infection** is a living organism or material in or on which an infectious agent lives and/or usually multiplies. Reservoirs include humans, animals and the environment.

A **susceptible host** is a person at risk of being infected. The level of susceptibility depends on age, sex, ethnicity and genetic factors, specific immunity also depends on other factors that affect an individual's ability to resist infection or to limit its ability to cause infection.

A **zoonotic disease** or **zoonosis** is an infectious disease that has jumped from a non-human animal to humans.

Humans.

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How disease is spread (modes of transmission)

Categorisation of **modes of transmission** varies from one agency to another. In addition, some infectious agents can be transmitted by more than one mode. A list of modes of transmission can be found in the key concepts to serve as guidance to better understand the diseases included in this website.

- **Contact transmission:** Contact with the nose and throat secretion fluid from blisters or scabs of an infected person by touching the person or through other types of close contact like kissing and hugging.
- **Faecal oral transmission**: Viruses in faecal particles pass from one person to the mouth of another person; for example, while changing diapers without appropriate hand hygiene.
- **Droplet spread:** Especially at the beginning of the infection, the viral load in the throat is high and can spread through coughing, sneezing or sharing eating utensils.
- **Vehicle-borne transmission:** Swallowing recreational water (e.g. in swimming pools) that is not properly treated with chlorine.

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Incubation period

This time from when infection occurs to the onset of symptoms is called the **incubation period**. It is a range of days and it can be different for each disease.

Three to ten days.

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Period of infectiousness

Period of infectiousness is the time interval during which an infected person can transmit the infection to other susceptible persons.

People with HFMD are usually most contagious during the first week of illness. For *EV71*, viral shedding from the throat can occur up to two weeks after an acute *EV71* infection, and virus can be isolated from stools for up to 11 weeks.

Clinical signs and symptoms

- Fever, reduced appetite, fatigue, sore throat, and after a few days sores in the mouth.
- A skin rash with red spots, and sometimes with blisters, may also develop over one or two days on the palms of the hands and soles of the feet. It may also appear on the knees, elbows, buttocks or genital area.
- Some people, especially young children, are at increased risk of dehydration because of painful mouth sores.
- Typically symptoms of HFMD resolve on their own within 7—10 days
- Most cases of the disease are harmless. But complications may occur with neurological symptoms such as meningitis, encephalitis and polio-like paralysis.
- In rare cases it can be fatal in children, particularly those aged less than five years. These cases may experience a brief febrile illness and present with only subtle neurological signs before developing acute heart failure and pulmonary oedema.

Other diseases with similar clinical signs and symptoms

Herpetic gingivostomatitis, aphthous stomatitis, scabies infestation, chickenpox (varicella), measles and rubella.

Diagnosis

- Typically HFMD is a clinical diagnosis from signs and symptoms
- Virus isolation from cell cultures.
- Virus identification (neutralization test, reverse transcriptase polymerase chain reaction (RT-PCR), immunofluorescence assay).
- Rapid diagnostic tests for clinical purposes.

Vaccine or treatment

> **Please refer to the appropriate local or international guidelines for clinical management. All clinical management including the administration of a treatment or vaccine should be conducted by a health professional.**

- There is no specific treatment for HFMD and no vaccine.
- People who are unwell can take over-the-counter medications to relieve pain and fever and use mouthwashes or sprays that numb mouth pain.
- Sick people should drink enough liquids to stay hydrated.

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Immunity

There are two types of immunity:
- **Active immunity** results when exposure to an agent triggers the immune system to produce antibodies to that disease.
- **Passive immunity** is provided when a person is given antibodies to a disease rather than producing them through his or her own immune system.

> When someone gets HFMD, they develop immunity to the specific virus that caused their infection. However, because HFMD is caused by several different viruses, people can get the disease again.

Which interventions are most effective for prevention and control?

The following is a list of activities considered for Red Cross Red Crescent volunteers to take part in. It is not an exhaustive list of all prevention and control activities for the specific disease.

- Communicate risks about the disease or epidemic, not only to share information on prevention and mitigation measures, but also to encourage informed decision-making, positive behaviour change and maintenance of trust in the Red Cross Red Crescent response. This includes the identification of rumours and misinformation around disease—frequent during health emergencies—to manage them appropriately. Volunteers should use the most context-appropriate communication techniques (ranging from social media to face-to-face interactions).
- Community education and engagement activities to encourage the adoption of protective behaviours:
  - Handwashing with soap (caregivers and children).
  - Children who are at particular risk of contracting the disease should observe good personal hygiene practices and avoid practices such as thumb-sucking or chewing their nails.
  - Avoiding touching the face or close contact with sick people.
  - Children with the disease are quarantined and not taken to day care/schools while they are ill.
  - Monitoring drinking and recreational water to ensure it is safe.
  - Cleaning and disinfecting frequently touched surfaces (including toys and doorknobs).
- Rapid detection and encouragement of early health-seeking behaviours at healthcare centres.

- Children in schools and childcare centres should have access to appropriate and regularly cleaned sanitation facilities.

Which interventions have NO evidence and therefore are NOT recommended?

- Closure of schools, kindergartens and day care centres are not necessary, as there is no concrete evidence on the effectiveness of closures to control transmission. Health authorities may instead issue infection control guidelines to childcare centres or schools on the adoption of practices to reduce transmission.

Epidemic characteristics and RCRC indicators and targets

The first table below includes data that should be gathered from health authorities and relevant non-governmental actors to understand the progress and characteristics of the epidemic in the specific country and area of intervention. The second table includes a list of suggested indicators that can be used for monitoring and evaluating Red Cross Red Crescent activities; wording of indicators may be adapted to specific contexts. Target values for a specific indicator can vary widely from one context to another and therefore managers should define them based on the specific population, area of intervention and programmatic capacity. Exceptionally, some indicators in this website may include target values when these are globally agreed as a standard; e.g. 80 per cent of individuals who slept under an insecticide-treated net (ITN) the previous night—the normative World Health Organization benchmark for universal coverage with ITNs.

Epidemic characteristics and progression
Reported cases in population/children under 5 years per week
Deaths in population/children under 5 years per week
Indicators for Red Cross Red Crescent activities
Number of volunteers trained on a specific topic (e.g. Epidemic Control for Volunteers (ECV); Community-based surveillance (CBS); WASH training; CBHFA training, etc.) ***Numerator*:** Number of volunteers trained Source of information: Training attendance sheets

Indicators for Red Cross Red Crescent activities
Suspect cases among children under five years detected by volunteers who were encouraged to seek healthcare and who arrived at a health facility *(NB. This indicator requires the implementation of a system in collaboration with the health facility, whereby health workers specifically asked the patient how they heard about the service)* ***Numerator:*** Children under five years who are HFMD suspect cases detected by volunteers in a determined period preceding this survey (e.g. two weeks) for whom advice or treatment was sought from a health facility ***Denominator:*** Total number of children under five years who are HFMD suspect cases in the same period preceding the survey Source of information: Survey
Percentage of people recognizing at least one transmission route and at least one measure for preventing it ***Numerator*:** Total number of people who recognized at least one transmission route and at least one measure for preventing it during the survey ***Denominator*:** Total number of people surveyed Source of information: Survey
Number of community members who received epidemic prevention and control material (e.g. soap, IEC material) ***Numerator*:** Number of community members who received materials Source of information: Distribution lists

See also:

- For Community Engagement and Accountability (CEA) indicators for activities accompanying ECV actions, please refer to the IFRC CEA toolkit (Tool 7.1: Template CEA logframe, activities and indicators) Available at: https://www.ifrc.org/document/cea-toolkit.

Impact on other sectors

Sector	Link to the disease
WASH	Smear, faecal, oral and droplet infection can be avoided by proper sanitation and hygiene measures. Food and water contaminated with human waste can transmit HFMD. Sharing cups or eating utensils is a transmission mode as well. Functional sanitation facilities like handwashing stations with water and soap are important to decrease transmission risk. Cleaning and disinfecting regularly used household items are effective interventions even more important in crowded settings or shared households. HFMD outbreaks are of particular concern in overcrowded settings.

Sector	Link to the disease
Nutrition	Malnutrition increases the risk of severe HFMD. Some studies have shown that vitamin A deficiency in children is associated with reduced immunity and more severe illness.
Psychosocial support and mental health	As in the case of a range of other diseases, HFMD can have several negative impacts on psychological, social and emotional aspects of a person's life, apart from its physical effects only. In particular, children quarantined and kept away from other people might not understand the reason for this and react with anxiety or social withdrawal.
Sex and Gender	Gender roles influence exposure to Hand, Foot and Mouth Disease (HFMD). Women and girls may be at increased risk due to caregiving responsibilities and frequent contact with young children—raising their exposure while potentially delaying their own care and treatment. Men and boys may be exposed in school, childcare, or crowded work environments. Gender norms can affect health-seeking behavior, with men often less likely to seek care at early stages. Pregnant women are not typically at risk of severe complications from HFMD, but infection close to delivery may increase the risk of transmission to the newborn, highlighting the importance of early detection and access to appropriate care.
Education	Children are the most affected by HFMD. Hygiene and health promotion sessions held in kindergartens, day care centres and schools are therefore important to prevent the spread of HFMD. Where schools or day care facilities do not have handwashing facilities with water and soap, there is an increased transmission risk. Schools and other facilities dedicated to children and youth can offer an important space for them to engage, mobilize and raise awareness around health education issues. With support, trust and appropriate capacity-building, young people can be effective advocates for the adoption of preventive measures during an epidemic and are those best placed to mobilize their peers.

Resources:

- Chen S, Yang Y, Yan X, Chen J, Yu H, Wang W. (2011) Influence of vitamin A status on the antiviral immunity of children with hand, foot and mouth disease. *Clin Nutr*. 2012 Aug;31(4):543-8. doi: 10.1016/j.clnu.2011.12.005
- CDC (2021) *Hand, Foot and Mouth Disease*. Available at: https://www.cdc.gov/hand-foot-mouth/index.html
- WHO (2011) *A Guide to clinical management and public health response for hand, foot and mouth disease (HFMD)*. Available at: https://iris.wpro.who.int/bitstream/handle/10665.1/5521/9789290615255_eng.pdf