

Chapter 4

Outbreaks of viral haemorrhagic fever, including yellow fever

Purpose of assessment

The purpose of this rapid assessment is to:

- confirm that an epidemic or potential epidemic of viral haemorrhagic fever (VHF) exists and estimate its geographical distribution;
- estimate its health impact; and
- assess local response capacity and identify the most effective control measures.

Background

General characteristics

Viral haemorrhagic fevers (VHF) are caused by a number of viruses, some associated with insects or rodents, which may infect humans. These diseases cause special problems for public health services because of their epidemic potential, high case-fatality rates and the unusual difficulties arising in their treatment and prevention.

While the specific clinical profile of each viral illness may vary, there are two prominent symptoms that may appear in all types of VHF during the most critical stage of the illness:

- bleeding, with the risk of severe haemorrhage from both cutaneous and internal sites; and
- the development of shock, which may be irreversible.

The existence of a specific virus in a community tends to reflect the geographical distribution of its natural host. Nevertheless, human and natural environments are changing rapidly so research should be considered an integral part of emergency preparedness against these epidemics.

Several viral infections also have the potential for extensive nosocomial spread (spread within a health care facility), especially when safe barrier nursing procedures are not observed. Under these conditions, case-fatality rates can often exceed 50% and may reach 80% for several days.

Table 3 lists the major VHFs that cause epidemics and shows their distribution.

Table 3. Viral haemorrhagic fevers causing epidemics

<i>VHF</i>	<i>Distribution</i>	<i>Natural host/vector</i>
Lassa fever	Central/West Africa	rodents
Junin/Machupo/Guanarito/Sabia	South America	rodents
Ebola/Marburg	Africa	unknown
Crimean-Congo haemorrhagic fever (CCHF)	Africa/Asia	ticks
Rift Valley fever	Africa	mosquitos
Dengue haemorrhagic fever	Africa/Americas/Pacific/ western Asia/ Australasia/Caribbean/ India	mosquitos
Yellow fever	Africa/South America	mosquitos
Haemorrhagic fever with renal syndrome (HFRS)	Asia/Europe	rodents

The special concerns of yellow fever

In Africa and South America, yellow fever has caused many serious epidemics, with high attack rates and mortality. However, while the clinical presentation of yellow fever may resemble other types of VHF, it is unique with respect to emergency preparedness and containment. Unlike other VHFs, timely vaccination against yellow fever, combined with vector control measures, interrupts transmission and prevents unnecessary cases and deaths.

There are many examples of yellow fever epidemics that were identified as such several months after the actual epidemic onset. The consequences of this late detection (e.g. delayed initiation of control efforts) underscore the need to consider yellow fever in a rapid assessment when an outbreak of VHF is reported or rumoured.

An epidemic alert for an outbreak of VHF with yellow fever as a possible cause should be given when one of the following occurs:

- one case is confirmed in a community with abundant vector mosquitos;
- a single case of yellow fever is diagnosed by serology or virus isolation, or suggested by histopathology;
- hospital reports show increased incidence of fatal hepatitis, suspected cases of yellow fever and of VHF.

Early warning procedures such as routine health surveillance and rapid reporting from hospitals are essential for detecting VHF outbreaks at an early stage.

The questions below should be addressed as part of these early warning procedures:

- Where are the high-risk areas for past and potential VHF and yellow fever epidemics? At-risk populations? Based on past experience, when are the high-risk seasons?
- What is the likely health impact of an epidemic of VHF or yellow fever (number of cases, hospitalizations, and deaths)?
- What early signs would signal a VHF or yellow fever “epidemic alert”? Can or could they be detected earlier through improved epidemic surveillance and reporting?
- Does routine health surveillance include rural areas, where VHF outbreaks frequently occur?

When VHF outbreaks are reported, they receive heavy media coverage, often in the context of the panic such outbreaks arouse in the local medical services and communities affected. Rapid health assessments will provide factual evidence on the existence and extent of an outbreak. This information can be provided to the media so that the potentially affected population and the medical authorities can make informed decisions.

In this way, the rapid assessment offers a valuable opportunity to allay the community’s anxiety and to provide basic information on protective measures to prevent the disease’s further spread.

Preparedness

Develop locally adapted working case definitions for VHFs and yellow fever, as well as guidelines to help health workers at all levels recognize suspicious trends and signal an epidemic alert.

The prompt diagnosis of a VHF outbreak’s cause requires a competent laboratory’s analysis of a representative sample of specimens. Epidemic preparedness should give this utmost priority, along with assessing the capacity of national laboratories, identifying reference laboratories; and ensuring methods of diagnostic specimen transport

Most of the viruses causing VHF (excluding dengue haemorrhagic fever) are classified as “Biosafety Level 4” pathogens. This biohazard requires analysis at special facilities that provide maximum containment.

Attempts to isolate the virus should be undertaken only at approved high containment laboratories. Therefore, these should be identified in advance and contacts established with the nearest specialist laboratory to obtain details of necessary precautions for packing and transport of specimens.

Serology can be carried out in standard laboratories only if it is possible to inactivate specimens and reagents.

The measures listed below should also be taken:

- identify in advance qualified local team members skilled in assessing VHF outbreaks (e.g. an epidemiologist, clinician/entomologist, virologist, and veterinarian);

- put in place advance provisions for obtaining rapid outside specialist support if qualified personnel are not locally available,
- obtain advice from a virologist on the specimens needed, precautions required for collection, the necessary equipment, and shipment procedures (consider International Air Transport Association (IATA) shipping restrictions);
- identify channels and means for rapid communication between peripheral areas and subnational/central levels — satellite telephone and facsimile may be required; and
- identify a knowledgeable individual to communicate with the press and develop a strategy to deal effectively with their inquiries

Conducting the assessment

The rapid assessment consists of confirming an outbreak of VHF and estimating its geographical distribution, assessing the impact on health, and determining the existing response capacity and immediate needs.

Confirming an outbreak of VHF and estimating its geographical distribution

Initial case definition

As for all potential epidemics, this is best determined in advance, as part of emergency preparedness. Simple, viable case definitions should be developed for suspect, probable, and confirmed cases of VHF.

Examples of case definitions for VHF are:

- *Suspected case*: acute fever with either jaundice, or cutaneous and internal bleeding, accompanied by shock, in the case of dengue the rash should also be mentioned.
- *Probable case*: a suspected case with at least two of the following signs: severe myalgia and headache, conjunctivitis, rash, shock, proteinuria, death, where the person has had contact with a possible source of transmission
- *Confirmed case*: a suspected or probable case with one of the following: virus isolation from blood or tissue; detection of viral antigen or genome in blood, tissue or other body fluid; presence of specific IgM antibody in titre high enough to indicate recent infection.

In a rapid assessment, it may be difficult to distinguish yellow fever from other haemorrhagic illnesses or diseases such as malaria. However, to maximize case detection at this early stage, it is often necessary to use a broad case definition such as “jaundice, fatal or non-fatal” to identify suspected cases.

Confirming the increase in the number of cases

(See Chapter 2, p. 20)

Case-finding and estimating geographical distribution

(See Chapter 2, p. 20.)

It is important to recognize that there could be many asymptomatic or mild cases who are hospitalized with a non-specific febrile illness. To be thorough, VHF and yellow fever case-finding efforts should not be limited to infectious wards but include other hospital departments and health facilities.

Collection of specimens

Because the definitive diagnosis of a VHF can only be made by serology or virus isolation, it is essential that appropriate specimens be collected during the rapid assessment

Key considerations in specimen collection are as follows:

- Essential information should be included with specimens (locality, name of patient, age, sex, date of sampling, date of disease onset, and summary of clinical and epidemiological findings).
- All specimens should be collected in sterile containers.
- All specimens must be considered potentially infectious and dangerous. Therefore, stringent safety precautions should be observed.
- For every patient, a specimen of whole blood should be collected without anticoagulant for virus isolation or antibody detection.
- Do not freeze whole blood or liver specimens: separate sera if specimens are to be frozen.
- All sera and cerebrospinal fluid (CSF) specimens should be frozen for preservation during transport. For virus isolation, specifically, specimens should be stored ideally on liquid nitrogen or dry ice
- Specimens are best hand-carried from peripheral areas to the central level.
- Use non-breakable containers (plastic, screw-cap) with absorbent material to contain any leakage, and double outer containers. Follow International Air Transport Association (IATA) regulations for air transport of specimens

The specimens required for laboratory analysis and confirmation are as follows:

- whole blood from patients who have been sick less than seven days (do not separate sera from blood clots unless laboratory workers can be protected against infectious aerosols);
- convalescent sera from patients at least 14 days after onset (sera should be carefully separated from blood clots);
- for suspect yellow fever cases, liver specimens should be taken at postmortem with a biopsy needle (these should be divided in two — one placed in 10% buffered formalin and the other treated in the same way as a whole blood specimen — not frozen without anticoagulant);
- skin snips preserved in formalin from fatal cases of suspect VHF.

To verify the clinical diagnosis and identify the causative virus, it is advisable to transport specimens to WHO collaborating centres for urgent analysis

Assessing the impact on health

Collecting information on a representative sample of cases

When the cause of a VHF outbreak is unknown, careful interviewing and physical examination of suspect, probable, and confirmed cases is extremely important.

These early clinical findings provide clues as to the type of virus and source of infection

As a minimum, gather information on:

- name, age, sex, residence, date of onset, and of reporting;
- signs and symptoms, severity of illness, treatment given, and response to treatment, and
- presence of risk factors, e.g. history of contact.

Useful information on the mode of transmission can be gained by investigating the contacts of identified index cases. It is also important to ask about exposures to infected animal hosts (e.g. contact while slaughtering livestock)

The definition of a “primary” or “close” contact is one or more of the following.

- has shared the same place (for working or travelling), the same room or meals, had occasional face-to-face contact during the period of communicability of a severe, classical or mild form of the disease,
- has given care, handled the patient’s belongings, participated in autopsy or burial preparations without special protection; or
- has travelled from an area where VHF transmission is endemic.

The definition of a “possible” contact is:

- was a close contact of a case during a period in which she or he possibly was not yet contagious (e.g. persons hospitalized in the same ward).

Whatever the method chosen, the characterization of the contact should include a clarification on the index case: was he or she suspect, probable or confirmed?

Analysing the information

The information should be analysed in terms of time, place, and person (See Chapter 2)

Assess vectors present

One rapid assessment priority is to determine whether vectors that may transmit VHF or yellow fever are present in the affected area. It is not the purpose of a rapid assessment to carry out a detailed entomological survey, but rather to ask the following questions.

- Are vectors present in the affected area? If so, what are they?
- Are they known to bite humans?
- Are there breeding sites? If so, how extensive?

The answers to these preliminary questions are critical to deciding on the need for further entomological studies and control measures for vectors and natural hosts

Assess disease in other vertebrate hosts

- Are there unexplained deaths in monkeys in the affected area? If so, where and when did they occur?

- Are there unexplained deaths or abortions in livestock? If so, where and when did they occur? (Particularly relevant for Rift Valley fever.)

Assessing local response capacity and immediate needs

Local response capacity and immediate needs should be assessed to determine the type and quantity of external support required.

Local epidemic surveillance

- Are there sufficient trained personnel, vehicles, and communications support to maintain adequate surveillance? Is outside technical help needed?
- Is there a need for animal studies (e.g. sentinel herd surveillance) or further entomological investigations?

Response capacity of local health services

- What steps have local health officials taken to organize epidemic response? Is there a plan of action, standardized reporting procedures, and trained staff?
- Are hospitals equipped to carry out safe barrier nursing measures? (Check bed nets, gloves, disinfectants, masks, and gowns.)
- What is the local cold chain capacity? Trained vaccinators? Jet injectors? Vehicles? Stocks of syringes? Yellow fever vaccine stocks in country?
- Do medical, nursing and laboratory personnel need further training on case detection and safe patient management?
- What links have been established with key community members (e.g. for allaying panic in case of outbreaks, for general health education and improved surveillance and case detection)?
- What vector control equipment, pesticides, and larvicides are available?
- Has a strategy been developed for dealing with press inquiries?

Determine immediate needs

To determine immediate needs the following questions should be addressed.

- Is there an outbreak of VHF which has led or could lead to a large number of cases?
- If so, are external resources needed to contain it?

If the answer to both questions is “yes”, then an emergency response is needed.

Presenting results

In presenting the results of your assessment, indicate the following information:

- Is there an outbreak of some type of VHF?
- If so, how many cases and deaths so far?
- What is the geographical distribution?
- Does it appear to be spreading?
- What are the trends?
- What is the clinical presentation?
- Are signs and symptoms indicative of any specific type of VHF?
- Where should specimens be sent for rapid analysis?
- Is the etiologic agent responsible for the outbreak identified?

- Have specimens been sent to reference laboratories?
- What are the estimated geographical magnitude, size of population at risk and health impact in numbers of projected cases and deaths?

Describe the immediate needs. Are outside resources (such as drugs, equipment, other supplies, personnel, expert assistance, logistics, funding) needed?