

# The control of an epidemic outbreak of Marburg hemorrhagic fever in Angola, 2004-2005

Filomeno Fortes<sup>1</sup>, Ana Vaz da Conceição<sup>1</sup>, Sónia Centeno-Lima<sup>2</sup>, Virgílio E. do Rosário<sup>2</sup>, Luís Bernardino<sup>1</sup>, Pascoal Folo<sup>3</sup>, Filomena Wilson<sup>1</sup>, Filomena Gomes<sup>1</sup>, Eusébio Manuel<sup>1</sup>.

<sup>1</sup>Ministério da Saúde de Angola, Luanda, Angola. <sup>2</sup>Centro de Malária e Outras Doenças Tropicais, Instituto de Higiene e Medicina Tropical, Universidade Nova de Lisboa. <sup>3</sup>Serviços de Saúde das Forças Armadas de Angola; Luanda, Angola.

**Corresponding author:** Filomeno Fortes.

Ministério da Saúde de Angola, Direcção Nacional de Saúde Pública.

E-mail: philfortes@netangola.com

## Resumen

Entre Octubre del 2004 y Septiembre del 2005 Angola vivió un brote epidémico de fiebre hemorrágica debida al virus Marburg. La epidemia se dió por oficialmente por concluida el 7 de Noviembre del 2005, y se consideró la más grave de las ocurridas en todo el mundo, con 252 casos y 227 muertes, lo que suponía una tasa de mortalidad del 90%. Considerando que es un agente patógeno de gran virulencia para el cual no hay vacunas o tratamiento específico, estas epidemias precisan de una enorme cantidad de recursos humanos, financieros y técnicos tanto nacionales como internacionales

Es importante poner de manifiesto que el laboratorio del Center for Diseases Control de Atlanta fue el responsable del primer aislamiento del virus y de su identificación como causante de la epidemia. Posteriormente fue el encargado de monitorizar la epidemia y estudiar todas las muestras biológicas recogidas de los casos sospechosos. Hasta este momento ha sido imposible identificar el foco primario de la enfermedad, aunque existen sugerencias a nivel local sobre la posibilidad de que el hospital provincial de Ulge haya sido el sitio inicial y responsable de la diseminación de la epidemia a través de la infección nosocomial. En una segunda fase la ausencia de una adecuada educación para la salud, el pánico y las tradiciones culturales locales fueron los elementos cruciales para la diseminación de la enfermedad a otras provincias del país. En este contexto, la participación de sociólogos y antropólogos fue un factor clave para el control de las epidemias, en paralelo a las medidas de bioseguridad y detección activa emprendidas.

**Palabras clave:** Marburg. Epidemias. Control. Angola.

## Summary

Angola has lived an epidemic outbreak of hemorrhagic fever caused by Marburg virus between October 2004 and September 2005. The epidemic was officially terminated in November 7<sup>th</sup> 2005, and considered the most severe ever occurred in the world, with 252 cases and 227 deaths, with a lethality rate of 90%. Considering that it is a pathogenic agent of great virulence for which there are no vaccines or specific treatment, these epidemics caused a huge recruitment of national and international human, financial and technical resources despite some local constraints.

It must be outlined that CDC-Atlanta laboratory was the responsible for the first isolation of the virus as the cause of the epidemics, and later on, for monitoring the epidemics and manipulating all biological samples collected from suspected patients. Until now it was impossible to identify the primary focus of the disease, though there are suggestions from local oral comments that Uige provincial hospital may have been the initial site and responsible for the dissemination of the epidemics through nosocomial infection. In a second phase, lack of proper health education, panic and local cultural traditions were the crucial elements for disease spread to other provinces of the country. In this context, the participation of sociologist and anthropologists was a key factor for the epidemics control, in parallel with the biosafety and active survey measures undertaken.

**Key words:** Marburg. Epidemics. Control. Angola.

## Introduction

Angola is located in Southwest Africa with geomorphologic, demographic, sanitary and cultural characteristics that favor the presence of several infectious diseases such as malaria, tuberculosis (TB), HIV/AIDS, sleeping sickness, among others. It favors too the appearance and spread of emerging diseases such as hemorrhagic fevers, of which Marburg and Ebola hemorrhagic fevers represent a special group, given the following characteristics: unknown reservoir and transmission pattern, absence of specific treatment and vaccine, highly contagious and lethal<sup>1</sup>.

Angola lived an epidemic outbreak of Marburg virus between October 2004 and August 2005, which revealed a complex number of factors related to cultural and anthropologic aspects, besides the sanitary ones.

The Marburg virus was first isolated in the city of Marburg, Germany in 1967, due to the manipulation of non human primates originated from Uganda, which provoked an outbreak resulting in 30 cases<sup>2</sup>.

Other reports originated from Yugoslavia, in 1967 (2 cases), Zimbabwe, in 1975 (3 cases), Kenya, in 1980 and 1987 (2 and 1 case) and the Democratic Republic of Congo in 1994 (30 cases) and, later on, in 1998-2000 with 148 cases<sup>3</sup>.

The etiologic agent is a virus from the genus *Filovirus*, *Filoviridae* family. It is a single stranded RNA virus, with a helicoidal filament with 7 structural genes, outlayered by a membrane. Its reservoir is unknown<sup>3</sup>.

Marburg virus disease presents as an acute febrile illness and can progress within 6-8 days to severe hemorrhagic manifestations. After an incubation period of 5-10 days, onset of the disease is sudden and marked by fever, chills, headache and myalgia. Signs and symptoms become increasingly severe and can include jaundice, inflammation of the pancreas, severe weight loss, delirium, shock, liver failure, massive hemorrhaging and multi-organ dysfunction. Fatality rates for outbreaks of Marburg virus have ranged from near 25%-80%<sup>4</sup>.

The virus is transmitted directly through contact with the patient's fluids (vomit, blood, urine and faeces), skin and liquids of the corpses of patients dead due to the disease, as well as from contact with infected laboratory and hospital material.

In this paper, data relative to the Angolan Marburg outbreak is presented.

## Materials and Methods

The intervention included a National Multisectorial Emergency Commission organized by technical groups on biosafety procedures, infection control, epidemiological surveillance, IEC (information, education and communication for health) and logistics. Identical teams were established at the provincial level, reinforced by the local traditional authorities and healers.

The strategy was based on the following:

- Development of guidelines, technical mobilization and training on biosafety of patients and body management.
- Development of IEC materials and community mobilization.
- Organization and implementation of a surveillance system consisting of:
  - An active detection of new patients or corpses, as detected by and in the community.
  - Active tracing of suspected cases.
  - Control of relatives or co-habitants, at home.
  - Prevention of manipulation of corpses at home using local traditions.
  - Transport of suspected cases to main hospital.
  - Notification.
- Logistics arrangements and coordination (medicines, safety material, transports etc.).

- Infection control strategies in hospitals and homes; as disinfection and residues destruction, laboratory support and patients flow diagram.

Concerning human technical resources, a range of experts which included doctors, epidemiologists, laboratory technicians, psychologists and anthropologists were enrolled.

Laboratory support was reinforced at the molecular level in the capital city and a field small laboratory was established at the Uige province (CDC Atlanta USA support). This was crucial for patient management and monitorization.

The media, through the Press, Radio and TV, contributed strongly to the social mobilization. A twice a day meeting, for all technical groups, was organized for briefing and implementation of strategies and logistics.

## Results and discussion

The first cases reported in Angola, occurred in October 2004 at the Northern region in the country, in the Uige province. However, these were not adequately and properly evaluated, being underestimated by local health authorities. This is due to the fact that Uige province is endemic for several diseases such as malaria, sleeping sickness, schistosomiasis, whose clinical signs may be misleading, as reported by Mahanty & Bray<sup>3</sup>.

In fact, the results of thick film observation for a malaria screening, in the first cases observed, revealed that most patients were *Plasmodium* positive.

Despite this epidemiological profile, and given the geographical proximity with The Democratic Republic of Congo, which has had epidemic outbreaks of Ebola hemorrhagic fever<sup>5,6</sup>, local authorities send some samples of suspected patients to be tested for Ebola at CDC-Atlanta lab, which returned negative.

In March 2005, as the number of cases of febrile diseases with fatal hemorrhagic increased, especially in children, it lead the local health authorities to notify the Ministry of Health. Biological samples of these patients were collected and tested in WHO lab (Dakar) and CDC (Atlanta) revealing the presence of Marburg virus in 9 out of the 11 samples tested.

It was suspected that the Uige provincial hospital may have worked, in an initial phase, as the main site for the epidemics dissemination through nosocomial infection, in the Pediatrics Unit, which was further confirmed by the fact that initially most cases occurred mostly with children under five, an unusual pattern for hemorrhagic fevers<sup>1</sup>.

However, in the course of the epidemics, the transmission pattern changed and the disease occurred more frequently in adults, when MF spread to Uige municipalities and other provinces. This pattern of transmission could have been related with cultural obituary habits

in which death bodies are washed and manipulated by relatives, without any biosafety procedures. Cases occurred at a concentric pattern in relation to the Hospital location, simultaneously, in the entire neighborhood of Uige province.

The final epidemic numbers as official data from the Angolan government states that from a total of 252 cases, 227 were fatal (lethality rate of 90%), 159 of the cases had a confirmed laboratory diagnosis. 48 cases (19%) occurred in children under 5 and the remaining 204 cases in children over 5 and adults (81%).

The following factors had a possible major contribution in the disease outbreak:

- Factors related to the management of infected patients and corpses, induced and supported a nosocomial transmission, from a pediatric service, due to an inadequate surveillance and management of infected patients, lack of biosafety procedures, as well as inadequate manipulation of corpses all associated too to a lack in educational procedures, human and technical resources.
- Strategic factors such as initial lack of organization, absence of proper epidemiological research and surveillance and lack of adequate dissemination of information.
- Socio-anthropological factors related to traditional habits, mysticism and panic, mostly generated by the initial death of young children, which also led to the death of 16 health workers; no recommended measures of isolation of both patients and dead bodies was followed and many corpses were locally manipulated prior to information of death to local agents. Finally, fear of health agents with proper but unusually seen outfits to handle these situations, caused major divergences in the community and poor interaction with health workers.

## Conclusions

The Marburg epidemic that occurred in Angola has been considered the most damaging of epidemics in the world. The absence of a system that ensured epidemiological surveillance did not allow an

adequate notification that could have permitted a faster intervention by central health authorities. Cultural and behavioral habits of Uige province together with fear and panic were essential in disease dissemination as well as strong obstacles for the implementation of control measures. However, and in reasonably good timing, a coordinated answer from the central health authorities, with both proper laboratory support and involvement of the community, resulted in effective control of the epidemics.

A special acknowledgement is required to WHO and CDC-Atlanta, and to the commitment of the international community.

## Acknowledgments

We acknowledge the support of WHO Angola representative, to Dr. Fernando del Castillo, CDC Atlanta, for sample collection and analysis, to the Uige Provincial Health Director, and the local community.

## Bibliography

1. Peters CJ. Marburg and Ebola - Arming Ourselves against the Deadly Filoviruses. *N Eng J Med* 2005;352:2571-3.
2. Borchert M, Muyembe-Tamfum JJ, Colebunders R, Libande M, Sabue M, Van der Stuyft M. A cluster of Marburg virus disease involving an infant. *Trop Med Int Health* 2002;7(10):902-6.
3. Mahanty S, Bray M. Pathogenesis of filoviral haemorrhagic fevers. *The Lancet* 2004;4:487-97.
4. CDC. Outbreak of Marburg Virus Hemorrhagic Fever - Angola, October 1, 2004- March 29, 2005. Morbidity and Mortality Weekly Report 2005;54(12):308-9.
5. Johnson K, Webb P, Lange J, Murphy F. Isolation and partial characterization of a new virus causing acute hemorrhagic fever in Zaire. *Lancet* 1977;1:569-71.
6. Khan AS, Tshioto FK, Heymann DL, et al. The reemergence of Ebola hemorrhagic fever, Democratic Republic of Congo, 1995. Commission de Lutte contre les Epidemies a Kikwit. *J Inf Dis* 1995;179(Suppl1):S76-S86.