



Yellow Fever outbreak in Darfur, Sudan in October 2012; the initial outbreak investigation report

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Summary

Introduction: Sudan is subject to repeated outbreaks, including Viral Hemorrhagic Fever (VHF), which is considered to be a very serious illness. Yellow Fever (YF) outbreaks in Sudan have been reported from the 1940s through 2005. In 2012, a new outbreak of YF occurred in the Darfur region.

Objective: To identify the potential for an outbreak, to diagnose the disease and to be able to recognize its cause among the initial reported cases.

Methodology: >This is a descriptive and investigative field study that applies standard communicable disease outbreak investigation steps. The study involved clinical, serological, entomological and environmental surveys.

Results: The field investigation confirmed the outbreak and identified its cause to be YF.

Conclusion: National surveillance systems should be strong enough to detect VHFs in a timely manner. Local health facilities should be prepared to promptly treat the initial cases because the case fatality ratios (CFRs) are usually very high among the index cases.

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Introduction

Yellow Fever (YF) is a mosquito-borne viral hemorrhagic fever that affects an estimated 200,000 people and causes 30,000 deaths annually [1]. YF is a member of the flavivirus genus (group B arbovirus)

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[2]. It has a high case fatality ratio (CFR), reaching 50% in some severe manifestations [3].

The disease is believed to have three identified transmission cycles in Africa: (1) sylvatic (jungle); (2) intermediate (savannah); and (3) urban [4]. The sylvatic (jungle) transmission cycle involves transmission of the virus between non-human primates and sylvatic mosquito species found in forest areas (*Aedes (Stegomyia) africanus*) [5]. Humans generally contract the infection when they are in the jungle during occupational or recreational activities [3–5]. The YF intermediate (savannah) transmission cycle is mediated both by domestic and sylvatic mosquitoes that infect humans living or working in areas bordering forest [6]. Occasionally, large human outbreaks are mediated by the mosquito species involved in the savannah cycle [7]. Urban transmission cycle involves transmission of the virus between humans and domestic mosquitoes, *Ae. (Stegomyia) aegypti* [1,4]. Urban transmission can lead to large epidemics of the disease due to the ease of communicability. The transmission cycle is very important with regard to planning and implementing appropriate control strategies, which usually involve mass vaccination, vector/surveillance control and case management [8].

Sudan is one of the African YF belt countries. YF was first documented in 1940 in the Nuba Mountains, South Kordofan State [9]. In 1959, the Sudan experienced the largest outbreak ever reported in Africa to date, with 15,000 cases and 1500 deaths reported from Blue Nile state [1]. The most recent YF outbreak occurred during 2005 in South Kordofan [10]. That outbreak included 605 reported suspect cases and 163 deaths, which resulted in a CFR of 27%. From the beginning of October 2012, the country experienced a new YF outbreak in its most vulnerable region (Darfur). The present work is the report of the initial outbreak investigation that was performed.

Methodology

Design

This was a descriptive field investigation study that applied the standard communicable disease outbreak investigation steps [11]. In this study, epidemiological description, ecological, entomological and serological surveys were conducted.

Study area

The study area consisted of the two Darfur states, Central and South Darfur, in the western part of

Sudan. The total populations for the two states are 1,022,740 and 3,485,815, respectively [12]. The area is currently suffering from the complications of civil war and longstanding conflicts.

Study population

The study population consisted of patients who were diagnosed with hemorrhagic fever and had been reported to the national directorate of epidemiology and zoonotic disease within the Federal Ministry of Health of the Republic of the Sudan through the national communicable disease surveillance system. Other people who were epidemiologically linked to these reported cases, in addition to domestic animals and insects that were present at the areas from which cases were reported, were also included in the study population.

Study timing

The study was conducted from October 2–20, 2012. During this time period, all standard operational steps of communicable disease outbreak investigation were performed, including preparation, field investigations and laboratory confirmation of the organism responsible for the outbreak.

Context background

On October 1, 2012, the national surveillance system of the Directorate of Epidemiology and Zoonotic disease with the Federal Ministry of Health of the Sudan reported 7 cases with suspected Viral Hemorrhagic Fever (VHF). These cases were from the Khour Ramla village of the Nertiti locality, which belongs to the newly formed Central Darfur state. These cases presented with sudden onset fever, body aches, vomiting and bleeding manifestations. Some cases also presented with jaundice. Five of these cases died, with a CFR of 71.4%. Some of these patients were referred from Nertiti rural hospital to Nyala hospital in the capital city of South Darfur state (the detailed case description will be provided below).

The National Directorate of Epidemiology and Zoonotic disease conducted its systematic discussions and reviews. An investigation team was immediately sent to assess the situation in the field, to explore the potential for an outbreak and to find the possible causes and sources of the event.

The team consisted of an epidemiologist, an entomologist, public health surveillance officers and a laboratory technician from FMOH. The team arrived in the field by October 10 through the

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