Yellow Fever Outbreak in Darfur Region-Sudan 2012, a Response to Health Crisis

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Abstract: Yellow fever is highly infectious diseases and infect human through the bite of mosquitoes. So, yellow fever needs more efforts to control its transmission in both human and mosquitoes. Sudan is a limited resource and finds difficulties in controlling emerging diseases. This paper explains the situation during a yellow outbreak in the Darfur region, where long lasting conflict was occurring. This conflict is affected on the health system and it was become unable to detect infectious diseases at earlier stages. Also, we discussed the efforts that were made by world community towards controlling this disease.

In November 2012, Yellow fever outbreak has been reported in the Darfur region in Sudan. The Yellow fever disease outbreak affected 35 localities in four out of five states that comprise the Darfur region December 2012. According to the ministry of Health, 849 people have been infected and 171 (4.96%) died due to this outbreak. The objective is to study the response of different partners in controlling yellow fever outbreak in the Darfur region in Sudan. This is descriptive study, reviews the information regarding yellow fever, and collected data from different sources. Response to this outbreak was made by contribution from different sectors including the federal ministry of health and the international community. Health authorities provided the technical and partial financial assistances to stop disease spread, while the international community, representing in United Nation agencies and NGOs was provided the essential funding to vaccinate population in the Darfur region. Long lasting conflict in countries with limited resources weakened the health system and makes the surveillance unable to detect disease outbreak. Diseases outbreak such as yellow fever need rapid response in order to diagnose and control the disease. Yellow fever outbreak needs contribution of all sectors to control it.

Keywords: Yellow fever, outbreak, Sudan, Response.

INTRODUCTION

Yellow Fever is an infectious hemorrhagic fever disease transmitted by an infected mosquito, (*Aedes aegypti*). The yellow name refers to the jaundice that affects some patients. Yellow fever is caused by virus belongs to the flavivirus genus, and the mosquitoes transmit it from one host to another, between monkeys, from monkeys to humans, and from humans to humans.

There are three main types of the yellow fever, sylvatic or forest cycle, the Aedes aegypti-mediated urban cycle, and intermediate cycle [1]. There is a great challenge to quantify the burden of yellow fever due to a wide spectrum of clinical severity, with non-specific symptoms in the majority of infection making diagnosis difficult. Besides, there are many limitations in the surveillance and the health care system in the areas affecting with this disease.

In Africa and South America, Yellow fever is an important public health problem for people living in these areas. Although, there was no yellow fever disease outbreak took place in Europe and America, historically there was an evidence of disease outbreak. Around 200 000 cases of yellow fever were reported annually and 90% of them took place in Africa [2]. Transmission of yellow fever in Africa is related with high density of the vector population and lack of vaccination coverage.

In Africa, yellow fever is characterized by periodic occurrence of epidemics, the severity of disease represented in high attack rate (30/1000) and case fatality rate ranged between 20 – 50%. Out of 34 African countries at risk for yellow fever, outbreaks were occurred in Benin, Burkina Faso, Gabon, Ghana, Kenya, Liberia, Nigeria, and Sierra Leone between 1992 -1996 [3]. In addition, in 2011 yellow fever cases from Senegal, Sierra Leone, Uganda, and Ivory Coast have been reported to the World Health Organization [4]. Currently, the annual estimated cases of yellow fever in Africa are between 51 000 and 380 000 sever cases, resulting in an estimated 19 000 – 180 000 deaths [5].

Yellow Fever in Sudan

Sudan is described as fragile state in the list that created using the World Bank's quantitative definition [6]. Moreover, the country was facing severe development challenges like ongoing violence and long lasting conflict, poor governance and political instability [7]. Fragile state usually features poor health indicators,

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high rate of malnutrition, and lack of skilled health care workers. So, people living in such country are vulnerable to infectious disease outbreaks. Obviously, most of major disease outbreaks happen in complex emergency or a disaster setting [8]. In study conducted among 22 fragile states to study the infectious diseases outbreaks between 2000 and 2010, they found 34 diseases outbreak in the study period; 11 of them took place in Sudan (including South Sudan) [9].

Early in the 1940 yellow fever outbreak was reported in Nuba Mountain. The small Yellow fever outbreak also occurred in Blue Nile and upper Nile where these regions boarding Ethiopia in 1959 [10]. In addition, another yellow fever outbreak took place in 2004 in the Imatong Mountains of southern Sudan. The unknown cause of hemorrhagic disease was confirmed by laboratory diagnosis as yellow fever [11]. In September 2005, there was a huge yellow fever outbreak occurred in the Nuba Mountains, the South Kurdofan state in the area bordering South Sudan. But accurate data regarding yellow fever disease in Sudan is difficult to obtain because the remote, isolated area does not cover by surveillance, lack of laboratory services and occurrence of asymptomatic cases.

METHOD

Darfur and Vulnerability to Yellow Fever

Darfur is an area of 190 418 square miles with long open border of four countries surrounded the region. These countries include Egypt in the North, Libya and Chad in the west and Central Republic of Africa and south Sudan in South. There is a continuous population movement from these countries in the Darfur region and vice-versa. A considerable number of Darfur people are nomads and practice a continuous movement from rural to rural environment and this movement involves urban areas as well as internally displaced people in camps. Although Darfur region is a high risk area for disease outbreak due to this fragile situation, no vaccination policy was taken neither by the government nor other NGOs working in the Darfur region. This lead to decline of immunity of the population and they are becoming vulnerable to many emerging and infectious diseases such as yellow [12]. In recent years, Darfur region witnessed a huge internal migration from different parts of the country looking for gold. Gold miners live in crowed condition, where more than 3000 miners work in one place at the same time. Due to Darfur conflict about 1.8 million people still live in camps as internally displaced people. So, people in these camps are particularly vulnerable to diseases caused by lack of proper sanitation and poor hygiene.

As a result of the Security Council resolution No 1769, around 30 countries from Africa, Asia, South America and Europe are participating in the military forces in the Darfur region. These forces involved total of number of 17 515 personnel, including troops, military observer, police, international civilian, and United Nations volunteers. The situation in Darfur region made the health system weak, diagnostics tools were inadequate, surveillance for infectious diseases was poor. There was no early warning system to detecting health threats in Darfur areas where affecting by humanitarian emergencies.

Generally, the diagnosis of disease outbreak needs laboratory that has a capacity to provide rapid result using advanced laboratory techniques such as molecular biology techniques. Long lasting conflict in Darfur makes laboratory unable to detect disease outbreaks like yellow fever.

There is a long debate on the description of the conflict in the Darfur region. The international community is still put Darfur region under area with conflict, and this means that any emergency activities are provided by donors and funding bodies. So, money for development like establishing facilities or purchasing equipment is not covered by the funding organization.

RESULT

Yellow Fever in Darfur

In November 2012, Yellow fever outbreak has been reported in the Darfur region in Sudan. Due to the conflict in Darfur, which had been started since 2003, all sectors including health care system have been affected. No disease surveillance to detect infectious disease outbreak [13]. The Yellow fever disease outbreak affected 35 localities out of 64 localities. About (51 %) of the positive or suspected cases of yellow fever were reported from central Darfur locality, (9.5%) are from South Darfur, (17.4%) are from West Darfur and (21%) are from North Darfur. A total number of 849 people have been infected and 171 with a (20.1%) case fatality rate. A percentage of 1.1 of the reported cases are in the age group 0-1.9, (2%) is in the age group 2-4.9, (18.5%) are in the age group 5-14.9, (54.3%) are in the age 15-29.9 and (17.2%) are

30-44.9 years and (6.9%) are in the age group of 45 years and above. Most of yellow fever cases were from central Darfur (51.5%), followed by North Darfur (21%), West Darfur (17.4%), and (9.5%) from South Darfur. As Sudan is a resource limited country, it took long time to contain the diseases a stop spreading the diseases to other new areas [14].

Response to the Outbreak

Government Response

The first response of the Federal Ministry of Health was a provision of technical support to the different states ministry of health through scheduled field missions including senior staff from the federal ministry of health. Then technical support teams from different departments were deployed to the Darfur to make disease risk assessment and situation analysis. Some of them attached to health directorates at different states to support local staffs and increase their capacity. Support from the federal ministry of health included laboratory reagents, surveillance, tool kits and mobile blood banks. Also, the federal teams included entomologist to play a role in controlling the vector that transmits the disease. Also, the federal team raised the awareness of community leader regarding yellow fever in affected areas. Moreover, health staffs were trained on yellow fever outbreak investigation, surveillance, case management, and measurement of infection control and prevention in all affected areas. Health authorities made a great effort to provide vaccination for all gold miners. Gold miners who did not respond to vaccination campaign were vaccinated by security services.

Vaccination

A yellow fever initiative was launched by WHO and UNICEF with support from the global alliance for vaccines and immunization GAVI in 2005. The aim of this initiative is to provide supply for yellow fever disease by creating vaccine stockpile to be used in disease outbreaks. In 2002, a working group was established by WHO in Africa to concern with yellow fever by making continuous update on disease outbreak.

In endemic areas like Africa, data regarding yellow fever vaccination coverage is not comprehensive available [15]. In order to stop the yellow fever outbreak two types of control measures should be applied, the first action is a mass vaccination campaign and the other one is vector control measures. In areas affected by Yellow fever vaccine should be provided to people who at risk to get infected and in areas boarding the affected area. Vector control includes killing the developed Aedes aegypti larva and spraying insecticides inside houses to kill the adult [16].

Sudan Federal Ministry of Health made a request to the WHO to provide yellow fever vaccine in order to stop disease outbreak. Coordinating Group on Yellow Fever Vaccine Provision- YF-ICG was formed and consisted of the United nation Children Fund (UNICEF), Médecins Sans Frontières (MSF), International Federation for Red Cross and Red Crescent (IFRC) and WHO as secretariat. Vaccination campaign has been divided into three phases one, two, and three. The first vaccination campaign covers two million people were supported by Non-government organizations. Phase two of the yellow fever vaccination campaign covered around one million people and supported by the Sweden government. Phase III of the vaccination campaign covered approximately two million people, and supported by the United Kingdom's Department for International Development (DFID). Donors who contribute in the yellow fever disease outbreak in Sudan included; United States Agency for International Development (USAID), Central Emergency Response Fund (CERF), European Commission's Humanitarian Aid (ECHO), Government of Sweden, United Kingdom's Department for International Development (DFID). More than 8 millions USD was provided by these donors to help in yellow fever control in the Darfur region.

Vector Control

Yellow fever is a vector born diseases, is transmitted by mosquito *Aedes aegypti,* which breeds in water like drinking water supply, tires, cans and plastic bottles. In order to reduce mosquito populations, two strategies should be followed. The first one is to kill the larvae, and the second one is reducing the adult population. During a yellow fever outbreak in the Darfur region, many efforts were made by the government and health partners in order to combat vector (*Aedes aegypti*) and stop transmission of disease. Training on safe use of spraying equipment was provided for 75 volunteers selected from affecting localities. Similar number of insecticide machine was distributed to volunteers o carry out the spraying campaigns. Besides spraying households, volunteers also mobilize the community to treat existing standing water in different

areas including markets. Furthermore, entomological survey was conducted to find *Aedes aegypti* vector.

Health Promotion

Social mobilization and accurate information are so important during disease outbreaks. During a yellow fever outbreak in the Darfur region information was provided to increase the awareness of people living in affecting areas. Mass media campaigns for yellow fever were launched. Educational materials such as leaflets, brochures were distributed to the public in the schools and markets in different areas like Jabal Moon, Habila and Azoom, etc.

CONCLUSION

To control diseases outbreaks in areas affected by long lasting conflict, such as Darfur region that need enormous efforts. Contribution from different parties involving government, NGOs, and international community is highly needed in such case. Yellow fever disease outbreak in Darfur, Sudan is a good example of coordination and collaboration of different sectors to manage and control a health crisis. Government, NGOs, and international community should contribute in strengthening the diseases surveillance system in areas affected by civil war and long conflict. Disease outbreaks such as yellow fever need rapid response in order to diagnose and confirm the diseases. This necessitate that the national laboratory in the country under conflict should be well capacitated in order to capture any diseases outbreak in early stage and to control it. The case of yellow fever in Sudan was complicated; it took a long time between the appearance of clinical remarks on the field and the confirmation of disease in the laboratory. Because the National Central laboratory was not accredited, positive samples were sent to the World health organization reference laboratory in Dakar, Senegal for confirmation. This process of sending samples to the Yellow fever reference laboratory was taking a long time because the samples were infectious substances and followed the international health regulations for the purpose of shipping. All these reasons and challenges contributed in the yellow fever outbreak in the Darfur region, Sudan. There are many laboratory and epidemiology network in the east Africa region and Sudan not part of it due to the sanctions that imposed by international communities. For instance, East Africa laboratory network project is funded by the World Bank in order to establish a network of sufficient and high quality laboratory services for diagnosis of tuberculosis and other communicable diseases.

In a country suffering from long conflict, laboratory and surveillance capacity should be developed in order to pick any disease outbreak. Also, mass vaccination has to be applied especially in areas affecting by conflict. Developed countries must contribute in providing more funds to control infectious diseases for resources limited countries a part of any political conflict.

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