Strategies Used to Contain Ebola Virus Disease (EVD) in Nigeria: A Lesson to Other Developing Countries

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Abstract
The 2014 Ebola Virus Disease outbreak has been declared an international public health emergency by the WHO. It affected six West African countries among which Nigeria is one. Cases were also transmitted to UK, USA and Spain. The disease generally claim more than 11000 lives in the West African region, out of which 8 were from Nigeria. This paper aims to review the management approaches of the outbreak in Nigeria and develop specific recommendations. It was identified that immediately after the outbreak of the disease, the Nigerian government in partnership with international agencies set an Ebola Emergency Operation Centre and an Incident Management System, which were instrumental in containing the disease. A number of health protection strategies including surveillance, incident prevention/control, education and communication were put in place leading to successful management of the outbreak, hence the WHO declare the country free of Ebola in October, 2014. It is thus concluded that such approaches in conjunction with the suggested recommendations serve as a means of managing similar future outbreaks in Nigeria and other developing nations within and outside Africa.
Keywords: Ebola, Impact, Management, Nigeria

1. Introduction

Six West African countries experienced an outbreak of Ebola which drew the attention of international community by the year 2014, with over 28,000 total cases, 15,000 confirmed cases and 11,000 total deaths, which is the largest of its kind in world history (Mohammed et al, 2015; WHO Ebola Response Team, 2014; Fasina et al, 2014; CDC, 2016). Frieden and Damon (2015) further reported that, since the outbreak of the disease in March 2014, the CDC in collaboration with its partner agencies takes the most intensive response in its history, in order to convert the disease. The term Ebola was coined after a river that was first discovered in 1976 in Zaire, now called Democratic Republic of Congo (WHO, 2015). It is a deadly disease caused by RNA virus of filovaridae family, and characterised by high fever and bleeding (Matua, Van der Wal and Loosin, 2015). The species of the ebola virus include Bundibugyo, Reston, Sudan, Tai forest and Zaire. The Zaire specie is associated with the most recent outbreak in Africa (Matua, Van der Wal and Loosin 2015; WHO, 2015). The disease has an incubation period of 2 to 21days, after which the initial symptoms of the disease manifest (Chowell and Nishiura, 2014). However, Eichner, Dowell and Firese (2011) investigated into the incubation period of the Zaire specie and discovered that up to 4.1% of patients may have an incubation period above 21days, thus recommend 25days as the maximum for effective control of the disease.

The CDC (2014) categorises Ebola as a Notifiable disease, and state that early recognition is very critical in the management of the disease. However, there is no standard treatment of any specie of the Ebola virus to date, but rather treatment to minimise the symptoms (King 2015; Matua, Van der Wal and Loosin 2015). This makes the case fertility rate of the disease very high in all the epidemics in Africa (WHO, 2014a). EVD can be mainly transmitted through mere contact with body fluids of an infected person (Chowell and Nishiura, 2014). Understanding transmission process of the disease is therefore important in preventing the disease from spreading (Tambo, Ugwa and Ngogang, 2014).

In Nigeria, the Ebola outbreak was first identified when an infected traveller from Liberia landed in the most populous Nigerian city of Lagos on the 20th of July, 2014 (WHO, 2014b). The victim who was admitted in a private Hospital in Lagos, presented the signs and symptoms of Ebola with a deteriorating health condition, thereafter the Federal Ministry of Health was notified of a suspected Ebola on the 22nd July, and a confirmed diagnosis of EVD was made on the 23rd July (Musa et al. 2015). The Nigerian Public Health System which include the Nigerian Centre for Disease Control (NCDC), the Emergency Operations Centre (EOD) and the Incident Management System (IMS) were established when the country declared public health emergency on polio in 2012 (Shuaib et al., 2014). Due to success recorded in the management of the polio, similar system was maintained after the Ebola outbreak. The Nigerian government in collaboration with its international partners, established the National Ebola Emergency Operation Centre and the Incident Management System, which were instrumental in containing the disease (Musa et al., 2015; Shuaib et al., 2014).

This paper therefore aims to review the management approaches of the outbreak in Nigeria and develop specific recommendations. A literature review method targeted at identify relevant evidences in line with the management system was adopted. Studies that met the inclusion criteria include; studies conducted on Ebola outbreak in Nigeria, studies that evaluate the West African Ebola outbreak but clearly explain the outcome in Nigeria, studies in English language and studies from the time of the outbreak to 2016. It covers the outbreak

impact, management approaches, specific recommendations and conclusion.

2. Public Health Impact

Ebola virus disease hits Nigeria at a time when the country is experiencing Lassa fever in some of its regions and on the verge of eradicating polio from the country, thus makes the impact more complex on the government and the society at large (Iroezindu et al, 2015; Harmon, 2014). The disease affected a total of 20 people in the country and put the lives of 894 others in danger, due to secondary and tertiary contacts (Shuaib et al., 2014). Mean age group of affected persons was 39.5±12, with majority of the victims between 30-39 years of age (Musa et al., 2014). The first victim died shortly and an additional 7 thereafter, out of the 20 identified cases (Shuaib et al., 2014), which makes the Case Fatality Rate (CFR) to be 40% in the country. However, the outbreak has affected more health workers than the general public, with 11 out of the 20 cases as health professionals (Oladimeji et al., 2015). Furthermore, Musa et al. (2014) indicated higher rate of direct physical exposure and case fatality rate among the health workers than non-health workers.

Stigma and discrimination was also found to be high especially in the affected areas. This was more intense among people who recovered from the disease or undergone isolation as a result of contact with the victims, as well as the healthcare professionals who treated the victims (Ogoina, 2015). In like manner, other countries not affected within the region felt the impact socially, economically and politically. The social effects involved change in pattern of communication like hand shaking, visitation and ceremonial gathering that many people suspended due to fear of Ebola, the economic impact has to do with business restrictions to those countries affected by Ebola while the political effect concerns Nigerian relationships with other nations; most notable of these is subjecting people from Nigeria and other West African countries to screening on arrival to western countries (Nyarko et al, 2015; Kimball and Heymann, 2014).

Furthermore, as a result of the social stigma and fear associated with the epidemic, there was widespread circulation of misconceptions and rumours in Nigeria. One of the most prominent misconceptions/rumours that have a public health impact took place at a period when the Ebola epidemic was at its pick in the country. A media report from unidentified source was used to advocate mixing of large amount of salt in warm water to treat the disease (Chan, 2014). This led to the death of 2 persons and hospitalisation of more than 20 which was unconnected with the Ebola virus, but rather excess consumption of salt due to fear of Ebola (Chan, 2014; Adinoyi, 2014).

3. Management of the Outbreak

The early combination and use of the Ebola Emergency Operation Centre and the Incident management system (EOC/IMS) ensured success in the management of Ebola outbreak in Nigeria (Shuaib et al., 2014). The management approach was by a combine effort of the Nigerian Government, International Agencies (mainly WHO and CDC) and support from the general public. A number of public health protection strategies were used, which include; Surveillance, Disease Prevention and control, Education and Communication.

3.1 Surveillance - Due to the deadly nature and public health impact of the disease outbreak, an active surveillance method was used, although it emphasised mainly on contact tracing as demonstrated in some studies (Shuaib et al. 2014; Ogoina 2015). Immediate identification of contacts and possible spread was initiated after the first victim was confirmed to have EVD. This led to the identification of 19 additional cases, although one out of the 19 was said to be a probable case (Musa et al., 2015). The spread of the disease as investigated by Shuaib et al. (2014) follows a transmission tree, starting from the first case to third generation spreads; first generation spreads are those who contracted the disease directly from the Liberian victim mainly the hospital staff. The second generation spread are those who contracted the disease due to contact with those in the first generation, and then, the third generation are those who contracted the disease from the second generation victims. The surveillance covers a period from mid July till end of August 2014, when the third generation cases were identified. The report shows a distribution of the 19 additional cases; out of which 13 cases are through first generation transmission, 3 cases each for second and third generation transmissions (Shuaib et al, 2014; Fasina et al. 2014). Shuaib et al. (2014) further reported over 18,000 home visits in order to trace the possible contacts with any of the 20 total numbers of cases. This led to the identification of the 894 persons with possible contacts, thus were put under careful monitoring. Through the active surveillance, about 100% contact tracing was achieved in the two affected Nigerian cities of Lagos and Port Harcourt (Shuaib, 2014).

Contact tracing is therefore very important since the disease was mainly spread in the country through body contact (person to person transmission) with the Liberian victim (Musa et al., 2015). This is similar with the occurrence of cases of the disease in other countries like Senegal (1 case), Mali (8 cases), UK (1 case), Italy (1 case), USA (4 cases) and Spain (1 case) (Roca et al., 2015; CDC 2016), this therefore indicates that contact tracing is an important aspect of public health surveillance which could results in containing a disease outbreak at an early stage. On this note, Greiner et al. (2015) opined that addressing challenges of contact tracing such as

identifying, locating and enrolling contacts are very essential in preventing future outbreaks of the disease. Such challenges were mostly overcome in Nigeria as the information of the contacts and cases were easily traced from a variety of sources, such as hospital records, laboratory reports, social media, airport records and the information disclosed by some of the contact persons. However, laboratory reports are not widely available as very few laboratories had the capacities to diagnosed Ebola in the country, thus bring about delay in confirmation of cases (Musa et al. 2015). Another means of surveillance of cases during the outbreak was the use of android phones. The phones with specially equipped android application were supplied to health workers by the Nigerian ehealth and Information Systems in collaboration with partner agencies (Ibukun, 2014). It was aimed to facilitate surveillance of cases. The phone application helped in reducing time of reporting suspected cases and provides opportunity to update or correct information at the control centres (Ibukun, 2014). Other surveillance strategies adopted include enhanced entry screening and monitoring at airports and other public places to detect new cases. However, the entry screening and monitoring were initiated at the beginning of the outbreak in the country rather than before the outbreak. Any information is channelled to the Nigerian Centre for Disease Control for immediate action (NCDC).

3.2 Incidence Control and Prevention- An epidemiological model of Ebola virus transmission and control was used to effectively control the Ebola outbreak in Nigeria (Fasina et al. 2014). This model was originally developed by Legrand et al. (2007) as a tool for understanding the dynamics of Ebola epidemics. The model generally describes the contribution of healthcare, community and funeral settings in the control of the Ebola infection. Bachinsky and Nizolenko (2013) added that such model also enable the estimation of human and material resources needed to control outbreak of special pathogens like the Ebola virus. It covers provision of emergency or preventive vaccinations and quarantine/isolation of suspects, cases and contacts.

In the Nigerian context, this model categorises the individuals into susceptible individuals, hospitalized individuals, exposed individuals, Infectious symptomatic individuals and isolated individuals who recover from the disease (Fasina et al., 2014). Appropriate responses were taken accordingly, which resulted in successful control of the epidemic and minimises the number of cases to only 20 and less than 10 deaths. This is the least in comparison with other West African countries of Liberia, Serra lion and Guinea (Moser, 2014). A number of preventive measures were put in place to prevent spread of the infection. High risk contacts, those identified to have high exposure rates from the first victim experienced quarantine in the Ebola observation unit. Unlike majority of the contacts who are monitored at home with guided instructions, the high risk contacts are considered to predispose large community response once they developed the disease, thus the isolation unit is prepared to prevent possible spread (Grigg et al., 2015). Protective materials such as hand sanitizers for hand washing were used in most public and work places (Odum, 2014). Since a cardinal symptom of Ebola is raise in body temperature (Matua, VanderWal and Loosin, 2015), a handheld thermometer for taking body temperature was distributed for use at bank entrances, hospitals, car parks and airports among others. Temporary closure of primary and secondary schools was ensured all over the nation, in order to prevent spread of the disease to schools, and to enable the government to put effective preventive measures in place (Chastain, 2014). Two out of the 36 Nigerian states namely Lagos and Port Harcourt, where all the cases were identified, experienced stricter control and preventive measures. This resulted in complete closure of work places, schools and all public gatherings till the outbreak was completely under control. Employers in the country were also encouraged to use Ebola assessment questionnaires while inviting people for interviews. As soon as the first victim was suspected of Ebola, immediate alert was sent to Nigerian ministry of health. This enable urgent preparation and mobilisation of resources even before the case was confirmed after 24hours. Furthermore, the Nigerian Federal Government in consultation with the WHO, shut down the health facility, where the first case was identified, mainly to prevent spread of the disease to the public, despite decontamination and proper corps handling in the hospital (Muanya, 2014). The level of disease prevention adopted in the country was basically primary and secondary. The primary prevention was seen in the area of massive awareness on preventive measures, while the secondary prevention was the early identification of cases and prompt action to prevent spread of the disease.

The overall success in the control and prevention of the disease was as a result of quick response to the outbreak. This is in line with the WHO guidelines on the speed of implementing control measures, which include immediate contact follow up, isolation, management of affected persons, decontamination and proper handling of corps/safe burials (Fahnrich et al., 2015).

3.3 Education- most of the Nigerian public were sufficiently educated about the disease. Although the educational programmes were officially stopped as soon as the outbreak was declared over, but a number of the general public continued with awareness creation even after the outbreak (Odlum and Yoon 2015). A group of volunteers known as Ebola Alert used twitter and face book social media to educate the public about the disease (Ibukun, 2014). Similarly, Odlum and Yoon (2015) investigated into the use of twitter to raise Ebola awareness in Nigeria and discovered a significant impact of the social medium. The result of the analysis shows over 40

thousand tweets distributed more than 9 billion times around the time of the Nigerian outbreak. The topics covered on the tweets include prevention education, risk factors and disease trends. Furthermore, Popular Nigerian actors produce a drama show that educate the public about the disease using a local language of Hausa, the most widely spoken Nigerian language (Panse, 2012). These attracted public attention and serves as a means of awareness creation among peers. However, so many misconception and misinformation were circulated during the processes above, thus the UNICEF supports a social mobilization effort, by adopting public outreach services to create awareness and clear misconceptions. The outreach teams were deployed to households, bus stops and markets in the two affected Nigerian cities (Moser, 2014). The government and other agencies generally organised lectures and use the media, in particular TV, Radio and posters to educate people about the disease process, mode of transmission, preventive measures, in particular proper corps handling and hand washing practices. This brings about behaviour change not just to the Ebola outbreak, but other contagious diseases that prevail in the country.

3.4 Communication- this is one of the most effective health protection strategy that ensures the success of the other strategies. Katherine, Timothy and Ross (2010) opined that communication as a strategy promotes effectiveness of intervention by the health team and appropriate decision making by policy makers. A two way communication system was set by the Nigerian Centre for Disease Control and Prevention (NCDC) to successfully manage the Ebola outbreak. This ensures the function of the IMS which include coordination of responses through the different networks and consolidation of decision making (Shuaib et al., 2014). The topmost communication centre is the federal ministry of Heath, through the NCDC by the minister of health, and at the lowest level are the local health authorities and the general public. This enables the public to freely voice out any suspected case of Ebola through their local health authority. Alternatively, mobile lines/emails are widely circulated to aid communication during the outbreak.

As a result of the these substantial health protection strategies taken by the Nigerian Government, the country was able to successfully contained the disease, thus the WHO declared the country Ebola free on 20th October, 2014 (WHO, 2014c).

4. Recommendations

Although, the Nigerian government was able to overcome the outbreak within shortest period of time, however, few shortcomings were associated with the management approaches. This article thus outlined the following recommendations to meet the drawbacks, which could be effective in managing similar future outbreaks.

4.1 Early Screening - Since the virus outbreak was known to have catastrophic outcome in other West African countries, the Nigerian government should have initiated a regular screening process as part of its surveillance at the ports and land borders before the first case was discovered. Matua, Van der Wal and Loosin (2015) also reported that the management approaches to the Ebola outbreaks were largely 'reactive' (interventions to contain the disease) rather than 'pre-emptive' (preparation before the outbreak). It was thus concluded that preparedness in response to disease outbreak like Ebola is important as it results in timely management of the disease. Therefore, in the case of future Ebola outbreak, it is highly recommended that an advance emergency preparation should be put in place by countries in close proximity with the country of the outbreak. These include extensive screening at borders/ports, particularly of travellers coming from affected countries and initiating quarantine or isolation when necessary.

4.2 Health education- Awareness campaign about basic infectious control measures such as hand washing should be on continues basis, rather than during the outbreak alone. On this note, Buseh et al. (2015) opined that such awareness messages should be in consultation with community Heads, and take into consideration the communities cultural beliefs and its population characteristics to ensure continuity. The media especially radio which is an effective way of educating people particularly in African rural areas, can be used as an effective health education tool to educate people. Mobile handset health education software packages can be developed and made accessible to the public. This can serve as an effective tool to educate the public particularly youths about preventive measures for future outbreaks. Other media such as posters, billboards and periodic TV programs can also be adopted to continuously educate the public.

4.3 Geographic Information System (GIS) - the GIS is a system use to collect and display geographic data, which enables understanding of relationships or patterns (National Geographic Society, 2015). GIS is therefore useful in public health as a fast way of tracking source of disease outbreaks and pattern of transmission. The Harvard school of public health also promotes the use of GIS to research diseases of public health concern (Melley, 2013). Furthermore, the GIS is also shown to be effective as part of surveillance and outbreak response to control the Ebola epidemics in West Africa (Fahnrich et al., 2015). However, no report indicated the use of

GIS to track transmission of the Ebola disease in Nigeria, which could be due to limited resources or narrow epidemic size in the country. Therefore, a team of GIS experts should be put in place in case of future outbreaks. This will help in providing fast and up to date information that can be used to control the disease.

4.4 Research - since there is no approved treatment or vaccine against the deadly Ebola virus (Matua, Van der Wal and Loosin 2015), there is need for extensive research in the field. The WHO in 2014 organised a convention involving over 200 international experts in order to develop therapies using recovered patients plasma or whole blood (WHO, 2014a). Similarly, Buseh et al (2015) necessitates the need to undertake research studies to develop vaccines and drugs for the management of Ebola due to its catastrophic impact in the West African countries. Furthermore, Tambo, Ugwa and Ngogang (2014) recommended not only research for vaccines and drugs, but upholding research action programmes and new interventions.

It is evident that most of the research studies that have taken place explore the disease entity or trends of outbreaks; therefore, it is highly recommended that research studies be conducted to develop treatment or control measures taking into consideration the socio-cultural values of the people concerned. Furthermore, the disease triad which include the host, agent and environment, should be taking into consideration while researching for countries' specific interventions. This is because environmental factors that play role on the course of Ebola may vary from country to country. Thus, studies targeting the major environment factors that favour the disease process will help in quick management of future outbreaks.

4.5 Health System Strengthening and Adjustment – Nigerian health system follows the three healthcare structure namely primary (local), secondary (state) and tertiary (federal). The primary health care as the most community oriented system can be effective in monitoring of diseases outbreaks like Ebola (Regmi, Gillbert and Thunhurst, 2015). However, the management of Ebola epidemic in Nigeria was directed at the state and federal levels, with little involvement of the local level. This may be connected with the report of Buseh et al. (2015), that primary healthcare structures experience many challenges in Ebola affected countries like Nigeria, even before the outbreak. Thus, have little contribution towards management of epidemics. Roca et al. (2015) added that functioning health systems are the only way of preventing future Ebola outbreak; hence it must be strengthening at basic levels to incorporate cultural values and beliefs.

In line with the above, it is therefore recommended that the health system be strengthened and adjusted to give more powers and commitment to the local healthcare system in the event of future outbreaks. This will enable urgent identification of cases with appropriate and prompt interventions.

4.6 Functional Laboratories - EVD presented with signs and symptoms very similar to other endemic diseases in Africa like malaria. It therefore requires sophisticated laboratory equipments to be in place, in order to enable quick diagnoses and confirmation of cases during outbreaks. In the case of the Nigerian epidemic, the first case presented with the common symptoms of Ebola on the first day, but diagnosis wasn't suspected or confirmed until two to three days later (Musa et al. 2015). This period is big enough to exposes more people at risk of contracting the disease, particularly nurses who provided care on continues basis to the patient. This may not be unconnected with the fact that, the second victim to be diagnosed and died of the disease in Nigeria was a Nurse, who provided care to the first victim (Mazan and Larson, 2014). Roca et al. (2015) further noted that rapid laboratory diagnosis is essential for Ebola, as other people with signs/symptoms of diseases similar to Ebola could be detained in Ebola held units, thus put their lives at greater danger. This therefore necessitates the need for advance laboratory equipments in order to quickly diagnosed and treat future Ebola cases.

5. Conclusion

Ebola virus outbreak in 2014 has been one of the most deadly outbreaks in Africa, which kills more than eleven thousand people. Nigeria as one of the West African countries affected was able to contain the disease in less than two months, and declared Ebola free by the WHO on 20th August 2014. The lesson learned from the Nigerian approach to Ebola outbreak is a good indication that, with collaboration and early intervention, even deadly diseases without standard cure can be successfully managed within short period of time. Therefore, the approaches identified in conjunction with the suggested recommendations serves as a means of managing similar future outbreaks in Nigeria and other developing nations within and outside Africa. Suggested future reviews include investigation into barriers towards the management system in order to develop appropriate policies.

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