Essay

Social and Contextual Issues Involving Outbreak Control of Ebola Haemorrhagic Fever

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Abstract

Ebola haemorrhagic fever, a zoonotic disease, represents a major global public health threat. Although endemic to parts of sub-Saharan Africa, it poses a global threat due to globalization activities as well as its potential use as a biological terrorist agent. Since the first recorded outbreak in the Democratic Republic of Congo (1976), outbreaks of the Ebola virus have resulted it high fatality rates. Over the years, significant research advances have been made in understanding the morphology and the biology of the virus. However, challenges in identifying the natural host and the absence of a known cure make the virus a major public health challenge. The first and subsequent outbreaks of the virus have largely been characterized by features such as large scale hospital infections and spread through contact with cadavers. Due to general improvements in outbreak management of the virus, some of these characteristic features have been addressed through the concerted efforts of stakeholders. However, if outbreaks are to be completely eradicated, certain factors still have to be addressed. This paper reviews the evidence of the July and November 2012 Ebola outbreaks and its management emphasising what was done right, and what needs to be improved upon.

Keywords: Ebola haemorrhagic fever, outbreaks, crisis management.

Introduction

Ebola haemorrhagic fever, which is caused by Ebola virus, is a severe zoonotic disease and is one of the most deadly infectious diseases known to man (CDC, 2010; WHO, 2013). The high case fatality rate of Ebola haemorrhagic fever and the lack of any vaccination or treatment make it a significant global health threat (Feldmann and Geisbert, 2011; Geduld et al., 2012; WHO, 2013). Although all of the Ebola haemorrhagic fever outbreaks have occurred in African countries, Ebola constitutes a major worldwide threat, largely due to its potential of being used as a biological terrorist agent and also through threat posed via infection spread across countries (Feldmann and Geisbert, 2011; MacNeil and Rollin, 2012). With no precise natural reservoir of the Ebola virus, the first case in an outbreak is said to have occurred through contact with animal fluids or carcasses (CDC, 2010; Muyembe-Tamfum et al., 2012).

However, human to human infections are spread through contact with body fluids, secretions or blood from an infected person (Geduld et al., 2012; WHO, 2013). Contact with cadavers while burying the dead or washing the dead due to cultural practices in countries affected have also been reported as a common way of infection outbreak (Feldmann and Geisbert, 2011; WHO, 2013). Nosocomial spread of Ebola virus has largely occurred in hospital settings due to lack of adequate outbreak response, and also the lack of protective outfits for health care workers in settings where outbreaks have usually occurred (Feldmann and Geisbert, 2011).

The lack of any known location or identity of the natural reservoir for the Ebola virus has put a restraint on the type of preventive measures that can be provided. Furthermore, the various social conditions in countries where Ebola virus outbreak is usually predominant have also made it possible for outbreaks to thrive, especially across health care settings (CDC, 2010; Muyembe-Tamfum et al., 2012). Recently, an outbreak of Ebola occurred in two different cities in Uganda resulting in a high number of fatalities including that of a health worker (WHO, 2012). This incident reemphasises the need for proper infection control measures.

Although the Ebola virus is very virulent, basic infection control methods of breaking the chain of transmission can help control infection spread. These basic control measures have been previously lacking in most of the settings in which outbreaks of the Ebola virus have usually occurred (MacNeil and Rollin, 2012). This essay aims to appraise the evidence on the recent outbreak control process,

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examining the social and other contextual issues which have largely aided the spread of Ebola outbreaks as a means to improve future outbreak control measures.

Addressing the Social and Contextual Issues Involved in Ebola Outbreaks

Ebola haemorrhagic fevers in humans are caused by the four members of the filo viruses namely Zaire Ebola virus (ZEBOV), Sudan Ebola Virus (SEBOV), Bundibguyo Ebola virus (BEBOV) and the Ivory Coast Ebola virus (CEBOV) (Vanessa and Matthias, 2012; Mbonye et al., 2012; Muyembe-Tamfum et al., 2012). Outbreaks of Ebola virus, although usually small, are very severe due to the high case fatality rate of the disease which ranges from 25% to 90% (Roddy et al., 2012; WHO, 2013). Primary transmission of the Ebola virus involves animal to human interaction through contact with the reservoir, while subsequent secondary transmission occurs via contact with an infected human (Vanessa and Matthias, 2012; Feldmann and Geisbert, 2011). Since the year 2000, there have been five reported outbreaks of the Ebola virus in Uganda with two of the different filo virus strains (SEBOV and BEBOV) responsible for all five outbreaks (Mbonye et al., 2012; Vanessa and Matthias, 2012).

In the year 2012, two outbreaks of the Ebola virus occurred in Uganda. The first outbreak, which occurred in July in the western part of Uganda, recorded 24 cases including 16 deaths, while the other which began in November in the capital city (Kampala) recorded 7 cases with a total of 4 deaths (WHO, 2013). Of the reported cases during the July outbreak, a health care worker was said to have been infected taking care of a patient, while another was infected through participation in burial practices (WHO, 2012a). These practices have previously been recorded as risk factors which have aided infection spread in previous outbreaks (CDC, 2010; Kinsmann, 2012; Muyembe-Tamfum et al., 2012).

Effective outbreak control of the Ebola virus, as with other infectious diseases, is based on breaking the transmission chain. This can be achieved through isolation of cases, the use of protective outfits in health care settings and safe handling of burial practices (Muyembe-Tamfum et al., 2012; Vanessa and Matthias, 2012). However, for all these to be implemented there has to be an effective surveillance process in place that enables adequate response delivery. Public health surveillance involves a sustained, systematic collection of health data for the use of health care planning,

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monitoring and evaluation processes (WHO, n. d.). Surveillance measures are a key aspect of outbreak control and can help curb the spread of the Ebola virus. However, these measures have been lacking in settings where the disease has been known to thrive (MacNeil and Rolin, 2012; Vanessa and Matthias, 2012).

Of the total number of deaths reported in the July Ugandan outbreak, nine were said to have occurred in a single household (WHO, 2012a). While this may seem alarming, situations like these have been characteristic of Ebola outbreak and so highlight the need for heightened outbreak surveillance and adequate community awareness in settings where outbreaks have occurred. For surveillance to be effective, members of the community have to be able to identify possible cases.

One major challenge with case recognition of the Ebola virus is the similarity of its symptoms with other diseases (MacNeil and Rolin, 2012; Vanessa and Matthias, 2012). While the symptom dilemma might make it challenging for community members to identify cases, the weak public health system in the settings which it has mostly occurred has also enhanced the difficulties (MacNeil and Rolin, 2012; Vanessa and Matthias, 2012). One of the previously identified challenges to health systems across these settings is the distance of health care centres from remote communities where outbreaks have occurred. This might hinder community members from promptly seeking health care services, and inevitably result in late detection of possible cases (MacNeil and Rolin, 2012). Delays with the identification of cases, especially with the filo viruses, will ultimately result in disease exposure across communities and complicate outbreak control procedures.

Coordination of most Ebola viral outbreaks has usually been conducted by a team of international aid agencies, with the World Health Organisation overseeing activities (Muyembe-Tamfum et al., 2012). One key feature of previous outbreaks has been the over reliance on foreign agencies in order to coordinate effective response. While the input of foreign agencies like the Centres for Disease Control and Prevention (CDC), the World Health Organisation (WHO) and the Doctors Without Borders (*Médecins Sans Frontières*: MSF) who helped coordinate outbreak management in the 2012 Ugandan outbreak is highly commendable (WHO, 2013), one of the key criteria for effective outbreak management is prompt response and general preparedness (CDC, 2011).

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General preparedness should involve having a readily available team of local outbreak experts to help initiate prompt and effective response which could help minimise outbreak spread (CDC, 2011; WHO, 2012b). This was the case in the July outbreak, as health members from the local team were involved in surveillance procedures and management activities. This was one of the reasons why there were no travel restrictions placed on Uganda, as the WHO felt the response initiated by the local health team was appropriate (Wassawa, 2012; WHO, 2012a). Local health workers were reportedly involved in community mobilisation and enforcement of rules, such as banning any sort of mass gathering in markets (Disaster Relief Emergency Fund, 2013). This followed by the input of aid agencies proved to be highly effective in mitigating the spread of the outbreak in the regions which the Ebola virus outbreak has occurred. In addition, both July and November Ugandan outbreaks were successful in the coordinated response between aid agencies and local health officials.

The ability of the local health officials to collaborate with aid agencies to coordinate prompt response after cases had been reported was highly laudable. The multi-sectorial collaboration with various agencies proved to be effective in managing the outbreak. Aid agencies like Doctors Without Borders helped in building isolation wards in the affected regions and also helped in logistical procedures (WHO, 2012d). The WHO and CDC also helped coordinate response with local team members. The ability to effectively collaborate with different members of the outbreak team is a key step in outbreak management (CDC, 2011).

Furthermore, in previous outbreaks due to the lack of proper diagnostic facilities, samples had usually been carried out of the country to confirm the presence of the Ebola virus strain (Roddy et al., 2012; Shoemaker et al., 2012). However, this was not the case in the Ugandan outbreaks as the government had established a viral research institute which helped in quick disease diagnosis, thus enabling effective control measures such as hospital isolation of confirmed cases and eliminating probable cases (WHO, 2012a). Proper laboratory diagnostics are an important aspect of effective outbreak surveillance (MacNeil and Rollin, 2012). The timeliness of case confirmation in both outbreaks was a key factor in aiding the delivery of appropriate response and also eliminating probable cases. This helped reduce the case load in hospital settings, thereby making hospital resources available for the confirmed cases that needed it most (Shoemaker et al., 2012).

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One key step in the control of Ebola haemorrhagic fever is the prevention of nosocomial infection spread. Since the first Ebola virus outbreak in 1976, health care associated spread has largely been a key feature of the outbreak. This has been largely due to the lack of protective gears and the use of recycled syringes across the low resource settings where the Ebola virus has occurred (WHO, 1976). In both the July and November 2012 outbreaks, there was a widespread mobilisation of protective gears as soon as the outbreak started. Aid agencies also helped in the area of protective outfits as the World health organisation supplied protective equipment to the health care centres in affected areas (WHO, 2012d). In both outbreaks, there was only one reported case of clinical infection that occurred while a clinical officer was taking care of her patient (WHO, 2012a). This is evidence of the evolution in Ebola outbreak management since the occurrence of the first outbreak in Zaire (1976), and the outbreak in Kikwit (2000) that resulted in large number of health care related deaths and the shutting down of a hospital (WHO, 1976; Kerstiëns and Matthys, 1999; Muyembe-Tamfum, 2012). While this marks a significant improvement in outbreak management for the Ebola virus, waiting until outbreaks to occur before the mobilisation of protective gears which has usually been the norm needs to be improved upon (MacNeil and Rollin, 2012; Vanessa and Matthias, 2012).

The inability to detect the exact reservoir for the Ebola virus proves that outbreaks of the Ebola virus can occur anytime and thus, there needs to be a reliable outbreak control process in place to effectively deliver the right type of response across health care settings (Borchert et al., 2011). Readily equipping hospital settings with protective gears must be improved upon. This should be done not only during the course of an outbreak but also regularly to facilitate improved outbreak control (Vanessa and Matthias, 2012).

A distinct feature of early Ebola viral outbreaks has been widespread infection through various cultural practices, such as washing the dead before burial (Muyembe-Tamfum, 2012; WHO, 2013). Infection spread through these cultural practices is due to the fact that Ebola remains in the secretions and body fluids of corpses for many days after their death (WHO, 1998; Roddy et al., 2012). Throughout the duration of both outbreaks in Uganda, there was only one reported case who contacted the virus through participation in burial rites (WHO, 2012a). The person, said to be in a stable health condition, participated in burial rites for the index case in the July Ebola virus

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outbreak (WHO, 2012a). This might be evident of how much response activities in the region have curtailed the effect of cultural practices on Ebola transmission.

Since the discovery of the first Ebola, much effort has been placed on safe burial practices through decontamination, using chemical solutions and sealing corpses in bags before burying them (WHO, 1998; Vanessa and Matthias, 2012). These burial practices are usually conducted by burial teams from health departments in the regions where outbreaks occur. This, however, has proved controversial with family members of the deceased, with claims that the interference of health officials without family involvement is an avenue to steal organs from the dead. Consequently, affected family members have been reported to revolt, thereby causing interruption to outbreak control activities (Hewlett and Amola, 2003; Raabe et al., 2010; Vanessa and Matthias, 2012). There might be a need for health officials to involve family members in burial practices to avoid protests which affect outbreak management of the Ebola virus. Proactive measures that include bio-safety precaution in burial ceremonies, and family involvement might need to be considered to strengthen population trust in outbreak management.

The cost burden of the Ebola virus in settings where outbreaks have usually occurred has also restricted the implementation of effective control measures. This was evident in the November Ebola outbreak, with the Director General of the Health services declaring that the financial burden of the Ebola virus has put a strain on the control measures that can be affected, as the outbreak was unexpected (Relief web, 2012). This was mainly because of the resources which had been expended in the July outbreak which ultimately put a strain on health care finances (Relief web, 2012).

The financial burden was also said to put a limit on the amount of health officials in hospital settings, proper coordination of burial practices and other surveillance procedures (Relief web, 2012). The lack of health officials in hospital settings and proper coordination of burial practices could cause an increase in the spread of the disease as these have been previously identified as risk factors for outbreak spread (MacNeil and Rolin, 2012; Vanessa and Matthias, 2012). Proper outbreak control involves effective surveillance and breaking the transmission chain which involves financial input to effectively implement. Financial constraints in settings where Ebola haemorrhagic fever has thriven have been suggested to be a factor in poor Ebola virus outbreak management and disease surveillance across those regions (MacNeil and Rollin, 2012).

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Of additional importance are the challenges in surveillance that lie in the detection of the natural reservoir of the Ebola virus, which is how primary transmission in most of the Ebola outbreaks occur (Vanessa and Matthias, 2012; Muyembe-Tamfum et al., 2012). There have been different postulated theories on the natural reservoir of the Ebola virus and how the index case gets infected. However, existing evidence suggests that the Ebola virus is zoonotic in nature which indicates animal interaction in infection transmission (CDC, 2010; Feldmann and Geisbert, 2011; Muyembe-Tamfum, 2012; WHO, 2013). Rodents and bats have been suggested to be natural reservoirs for the virus, while ape, chimpanzees and other primates said to be accidental hosts (Feldmann and Geisbert, 2011; Vanessa and Matthias, 2012).

Certain behavioural factors have been identified to aid primary animal to human transmission of the Ebola virus. These behavioural risk factors are associated with traditional and economic activities across settings in which outbreaks have occurred. Handling of infected dead carcasses of chimpanzees and Gorillas was identified in Gabon and Congo as the cause of human outbreak in those countries (LeRoy et al., 2005; Muyembe-Tamfum et al., 2012). These have been possible due to activities predominant across the settings where infection spread has occurred. Some of the practices include animal hunting, farming and gold digging in forests (Rouquet et al., 2005; LeRoy et al., 2009; Hartman et al., 2010; Feldmann and Geisbert, 2011).

In one case, scientific activity was associated with animal to human spread, as was the case of the etiologist who was infected in Ivory coast in 1994 (Feldmann and Geisbert, 2011; Muyembe-Tamfum et al., 2012). Additionally, there seems to be a theory that has associated changes in forest ecology due to deforestation and human activities to an increase in outbreak, and also as a possible source for animal to human transmission (Muyembe-Tamfum et al., 2012). These activities have been linked to animal to human transmission of the Ebola virus from the natural reservoir of the virus which is a key factor in outbreak occurrence. Investigations conducted to identify the animal reservoir have largely been unsuccessful because they have usually been done retrospectively (Muyembe-Tamfum et al., 2012). Large scale animal studies would need to be conducted in order to identify the precise animal reservoir. This is paramount if there is going to be improvement in disease surveillance and effective outbreak management of the Ebola virus. There also needs to be adequate measures set up by policy makers to stop these activities or to incorporate biological safety

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measures to the continuance of these activities. This would effectively break the transmission chain of infection which is associated with the spread of the Ebola virus.

Conclusion

One area which needs to be addressed for future purposes is community awareness and social mobilisation. This will help inform community members of the action mechanism of the Ebola virus even in the absence of outbreaks to aid prompt case identification, which would aid future outbreak control procedures. Community members would need to be educated on possible transmission routes and activities such as animal hunting which are possible means of primary transmission. Burial practices which have largely aided infection spread would need to be pro-actively addressed by policy makers to effectively improve outbreak management.

There also seems to be an association between underfunded healthcare services and the spread of the Ebola virus. Inadequate protective equipment in hospitals and poorly funded healthcare systems have previously put restraints on proper disease surveillance and outbreak management. The fact that the Ebola virus has largely occurred in low resource settings should not be overlooked as effective all round outbreak control involves financial investment. Constant investment in healthcare systems needs to be adopted as it is not enough for members of community to be aware of possible symptoms. There has to be well-equipped and available health care services capable of delivering appropriate outbreak response. This is in line with Alma Ata and Ottawa charter principles of investment in health sectors and provision of adequate healthcare services that addresses the health challenges of the population (WHO, 1978; WHO, 1986).

In conclusion, while the two recent outbreaks in Uganda showed massive improvement and evolution in outbreak management of the Ebola virus, there is still more to be done if outbreaks of the Ebola haemorrhagic fever are to be effectively combated.

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References

Borchert, M., et al. (2011). Ebola Haemorrhagic Fever Outbreak in Masindi District, Uganda: Outbreak Description and Lessons Learned. *BMC Infectious Diseases*, 11(1), p. 357.

Centre for Disease Control and Prevention (CDC) (2009). *Ebola Haemorrhagic Fever Information Packet*. [Online] Available at: <http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/Fact_Sheets/Ebola_Fact_Booklet.pdf > [Accessed: 18 March, 2013].

Centre for Disease Control and Prevention (CDC) (2011). *Public Health Emergency Response Guide for State, Local, and Tribal Public Health Directors*. [Online] Available at: <http://emergency.cdc.gov/planning/pdf/cdcresponseguide.pdf> [Accessed: 1 April 2013].

Disaster Relief Emergency Fund (DREF) (2012). *DREF Operation Update Uganda: Ebola Outbreak*. [Online] Available at: <http://goo.gl/x4Xmx> [Accessed: 11 April 2013].

Feldmann, H., and Geisbert, T. (2011). Ebola Haemorrhagic Fever. *The Lancet*, 377 (9768), pp. 849-862.

Geduld, J., Spilchak, P. and Groot, E. (2012). Ebola Haemorrhagic Fever Travel- Health Fact Sheets. *Public Health Agency of Canada*. [Online] Available at: <http://www.phac-aspc.gc.ca/index-eng.php> [Accessed: 3 April 2013].

Hartman, A. L., Towner, J. S., and Nichol, S.T. (2010). Ebola and Marburg Haemorrhagic Fever. *Clinics in Laboratory Medicine: Emerging Pathogens*, 30(1), pp. 161-177.

Hewlett, B., and Amola, R. P. (2003). Cultural Contexts of Ebola in Northern Uganda. *Emerging Infectious Diseases*, 9(10), p. 1242.

Kerstiëns, B., and Matthys, F. (1999). Interventions to Control Virus Transmission during an Outbreak of Ebola Hemorrhagic Fever: Experience from Kikwit, Democratic Republic of the Congo, 1995. *Journal of Infectious Diseases*, 179 (Supplement 1), pp. S263-S267.

Kinsman, J. (2012). "A Time of Fear": Local, National, and International Responses to a Large Ebola Outbreak in Uganda. *Globalization and Health*, 8(1), pp. 1-12.

DOI: https://doi.org/10.5526/esj82

Leroy, E. M. et al. (2009). Human Ebola Outbreak Resulting From Direct Exposure to Fruit Bats in Luebo, Democratic Republic of Congo. *Vector-borne and Zoonotic Diseases*, 9(6), pp. 723-728.

MacNeil, A., and Rollin, P. E. (2012). Ebola and Marburg Haemorrhagic Fevers: Neglected Tropical Diseases? *PLoS Neglected Tropical Diseases*, 6(6), p. 546.

Mbonye, A., et al. (2013). Repeated Outbreaks of Viral Haemorrhagic Fevers in Uganda. *African Health Sciences*, 12(4), pp. 579-589.

Muyembe-Tamfum, J. J., et al. (2011). Ebola Virus Outbreaks in Africa: Past and Present. *The Onderstepoort Journal of Veterinary Research*, 79(2), pp. E1-8.

Raabe, V. N., et al. (2010). Infection Control during Filo Viral Haemorrhagic Fever Outbreaks: Preferences of Community Members and Health Workers in Masindi, Uganda. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 104(1), pp. 48-50.

Relief web (2012). *Fresh Ebola Outbreak Burdens Health System*. [Online] Available at: <http://reliefweb.int/report/uganda/fresh-ebola-outbreak-burdens-health-system> [Accessed: 3 April 2013].

Roddy, P., Howard, N., Van Kerkhove, M. D., et al. (2012). Clinical Manifestations and Case Management of Ebola Haemorrhagic Fever Caused by a Newly Identified Virus Strain, Bundibugyo, Uganda, 2007–2008. *PloS one*, 7(12), p. e52986.

Shoemaker, T., MacNeil, A., Balinandi, S., et al. (2012). Re-emerging Sudan Ebola Virus Disease in Uganda, 2011. *Emerging Infectious Diseases*, 18(9), p. 1480.

Vanessa, N. R. and Matthias, B. (2012). Infection Control during Filo Viral Haemorrhagic Fever Outbreaks. *Journal of Global Infectious Diseases*, 4(1), p. 69.

Wasswa, H. (2012). Uganda Gears Up to Contain Ebola Epidemic as Fears of Spread Cause Panic. *BMJ: British Medical Journal*, 345, p. e5210.

World Health Organisation (WHO) (1976). *Ebola Haemorrhagic Fever in Zaire, Report of an International Commission*. [Online] Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2395567/pdf/bullwho00439-0113.pdf> [Accessed: 1 April 2013].

DOI: https://doi.org/10.5526/esj82

World Health Organisation (WHO) (1998). *Infection Control for Viral Haemorrhagic Fevers in the African Health Care Setting*. [Online] Available at: <http://www.who.int/csr/resources/publications/ebola/whoemcesr982sec1-4.pdf> [Accessed: 1 April 2013].

World Health Organisation (WHO) (2012a). *Global Alert and Response (GAR): Ebola in Uganda*. [Online] Available at: <http://www.who.int/csr/don/2012_07_29/en/index.html> [Accessed: 18 March 2013].

World Health Organisation (WHO) (2012b). *Outbreak Surveillance and Response in Humanitarian Emergencies: WHO Guidelines for EWARN Implementation*. [Online] Available at: <http://whqlibdoc.who.int/hq/2012/WHO_HSE_GAR_DCE_2012_1_eng.pdf> [Accessed: 1 April 2013].

World Health Organisation (WHO) (2012c). *Global Alert and Response (GAR): End of Ebola Outbreak in Uganda.* [Online] Available at: <http://www.who.int/csr/don/2012_10_04/en/index.html> [Accessed: 18 March 2013].

World Health Organisation (WHO) (2012d). *Global Alert and Response (GAR): Ebola in Uganda (Update)*. [Online] Available at: <http://www.who.int/csr/don/2012_08_03/en/> [Accessed: 18 March 2013].

World Health Organisation (WHO) (2013). *Global Alert and Response: Ebola Haemorrhagic Fever*. [Online] Available at: <http://www.who.int/csr/disease/ebola/en/index.html> [Accessed: 18 March 2013].

World Health Organisation (WHO) (n. d.) *Health Topics: Public Health Surveillance*. [Online] Available at: <http://www.who.int/topics/public_health__surveillance/en/> [Accessed: 1 April 2013].