IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 9 Ser.14 (September. 2019), PP 40-43
www.iosrjournals.org

Rift Valley Fever-A review

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Abstract*-Rift valley fever is a vector borne disease affecting humans and livestock. The rift valley fever is a communicable disease and in an emergency outbreak; a number of challenges have to be tackled.This paper emphasizes on the mechanism of spread of the disease and various factors responsible for its outbreak. This review paper also educates about the various steps needed to prevent its spread. Controlling of a public health problem like this is a collaborative effort in which has to take all aspects into consideration.*

Date of Submission: 13-09-2019 Date of Acceptance: 01-10-2019

Rift Valley Fever is a vector borne virus disease which affects livestock and humans (Davies, 2010). The virus was initially reported in livestock by veterinary officers in the Kenya Valley (1910) and the Rift Valley Fever disease was characterized when a sheep was investigated in 1931(CDC)(WHO).The transmission of Rift Valley fever can occurs from animal to animal and also animal to human. Human infections can result from direct or indirect contact with blood or organs of infected animals and as well as bite from mosquitoes carrying the virus (WHO). Transmission of rift valley fever from human to human has not been well established (WHO). However, a few reports have suggested occurrence of transmission from infected pregnant mother to the baby (Adam &Karsany, 2008) (Arishi, Aqeel& Al Hazmi, 2006). The incubation period spans from 1- 6 days and sheep is the most susceptible animal. The initial signs and symptoms include fever, generalized weakness, back pain and dizziness (CDC). In humans, Rift Valley Fever is known to cause febrile illness, hemorrhagic diathesis, Encephalitis, inflammation of the brain, ophthalmologic complications, renal dysfunction and also death (LaBeaud, Kazura& King, 2010). This disease can cause significant economic losses due to death and abortion of fetuses among Rift Valley Fever infected livestock (WHO). The confirmation of Rift valley Fever Virus is done by laboratory tests. The Rift valley Fever virus is cytopathic in nature and it tends to infect the liver by causing focal necrosis (Shieh et al., 2010). The presence of extensive diffuse hepatocellular necrosis without inflammatory cell filtration in liver tissues is specifically pathognomic to Rift Valley Fever virus (Shieh et al., 2010). This feature is very essential in carrying out differential diagnosis of Rift Valley Fever from other fever like: Lassa fever virus, Marburg virus, Ebola and Crimean-Congo hemorrhagic fever (Shieh et al.,2010).

Rift valley fever has been known to be epidemic in the African region since 1912 (Sang et al., 2010). The outbreaks of Rift Valley Fever are known to have a distinct connection with heavy rainfall and floods (Davies, 2010). The floodwater Aedes mosquito is known to thrive in these periodic rainfalls and their breeding increases owing to suitable habitat available to them (Vilaly et al., 2013). The recurrent epidemics can also be accounted for amplification of virus in endemic areas which can persist in eggs and also by low level cycling in vertebrates (Nderitu et al., 2010). The rainfall water helps the mosquito eggs to hatch and as multiplication of mosquitoes increase, risk of exposure also increases (CDC). Another important point is that the virus in eggs can persist for years, even in dry conditions (CDC). The most important genus of mosquito for multiplication of virus is Anophelous and Culex. However, the virus has also been found in phlebotomine sand flies, Culicoides midges, and Amblyomma tick species but these do not play as important role in life cycle as these mosquitoes(CDC).

In November 2006, unusually heavy rainfall led to flooding in Kenya, Tanzania and parts of Somalia (Sang et al., 2010). Apart from the heavy rainfall, the flat topography of these areas, water retaining soil types which support flooding, dense bush areas, dense livestock population and high Aedes Mosquito population also

contributed to the outbreak in Kenya, Tanzania and Somalia (2006-2007) (Nguku et al., 2010). According to World Health Organization report (2008), 684 cases which included 155 deaths were reported (30 November 2006 - 1 March 2007). The 34% of the cases reported were laboratory confirmedbythepresenceofIgMantibodiesorbyPCRtechnique.InSomalia,114caseswerereported including 51 deaths in the period between 19 December 2006 and 20 February 2007. In Tanzania, 290 cases were reported, including 117 deaths in the period between 13 January and 8 May 2007. These figures are of critical importance which show rapid transmission of the disease as well point towards urgency to implement control and prevention programs in a strategic way. The outbreak resulted in deaths of 16,973 cattle, 20,193 goats, and 12,124 sheep (Himeidan et.al, 2014). The livestock deaths heavily affected the economy of these countries. The disease thereby showed high morbidity and called for immediate action to prevent further transmission. In addition to the rainfall number of other factors can be held responsible for the outbreak. Social conditions contribute significantly to an outbreak of disease. In social epidemiology framework, the authors point out the social factors can positively or negatively influence outcome of a disease (Berkman and Kawachi, 2000). Heymann (2005) has stated that the political, behavioral and environmental play an integral role in emergence and re-emergence of an infectious disease. The social situation at the time of outbreak, the resources available to the government and the surveillance data together contribute significantly in an outbreak situation. The geographical expansion due to the uncontrolled movement of livestock has also contributed to the outbreak of the disease (Himeidan et al, 2014). The similarity of virus samples collected from Saudi Arabia (2000) to isolate from Kenya (1997-98) outbreak also suggests movement of livestock is leading to spread of disease (Chevalier, Pépin, Plée3, and Lancelot, 2010). Non compliance with international health and safety standards by animal exporters also contribute to spreading of disease across regions (Dar, McIntyre, Hogarth &Heymann, 2013). Anyangu et al., (2010) stated that Rift Valley fever not only spreads through the consuming of products of sick animals like milk, meat or blood but as well as by touching aborted fetuses. It was reported that during the 2007 outbreak, abortion of the large number of fetuses took place. The authors also state that the quantity of Rift valley fever virus in fetuses could be very high which would thereby increase risk of infection either by touching or aerosolizing of virus after touching of the fetus (Anyangu et al., 2010). Thus, the figures showing such high numbers of cases proved that there was mishandling of animals and pointed towards little awareness regarding Rift Valley Fever.It is important to consider the changing epidemiology of Rift Valley Fever, which initially was thought to be a disease of livestock, but the recent outbreak (2007) gives proof that it is harmful to humans as well. Rift Valley Fever also proves to be an occupational hazard for individuals working as herders, butchers, veterinarians and farm workers who can easily come in contact with animals (Vilaly et al., 2013). In North East Kenya, more than 90% of the population was dependent on livestock for food andincome(Muga,Onyango-Ouma,Sang&Affognon,2015).Anestimatedeconomiclossofmorethan$60 million was reported in East Africa due to disruption in trade due to recent epizootics in the period of 2006-2007 (Himeidan et.al, 2014). The heavy burden of this disease further depletes the already limited resources present which thereby further limit progress of these countries. According to a study, when the epidemic was contained, public investment was more directed towards producers (health of humans and animals) and the impact on butcher, traders etc were not taken into consideration. Many butchers and traders could not restart their operation due to economic loss and this led to a negative impact at community level as well (Rich &Wanyoike, 2010).

After confirmation of outbreak many steps were undertaken by the government like closing of livestock markets and butcheries, imposing movement controls and quarantining the situation, warnings were issues against drinking milk, slaughtering of animals, burial or burning of carcasses, boiling of milk or eating uninspected meat (Fyumagwa et al., 2012). The people handling livestock were asked to wear protective covering like gloves, eye wear, mask and boots prevent contact of unknown infected animals (Fyumagwa et al., 2012). The ban on slaughtering of animals for religious purposes and festivals was important step which were needed to be taken. When the people were made aware about the outbreak, ban on slaughtering of animals was supported by the religious leaders which helped in containing the disease (Breiman, Minjauw, Sharif, Ithondeka&Njenga, 2010). The ban on slaughter of animals was of extreme importance as Eid-Al-Adha was approaching in which animals were slaughtered due to religious rituals and in an outbreak the situation would just getworse.

The Rift Valley Fever is a communicable disease and in an emergency outbreak; a number of challenges have to be tackled. The foremost issue is the country the outbreak takes place. The social economic conditions need to be given consideration. There are a number of challenges while management of communicable disease at such large scale. The most major challenge faced during Rift Valley Fever outbreak was the lack of awareness regarding Rift Valley Fever, weak infrastructure and irregular demographic details that lead to an uncoordinated response to Rift Valley Fever outbreak. There were no proper Rift Valley Fever epidemic control programs which had been setup from before. According to Butcher, Tan & Sheikh (2012)

inhibition of proper management of Rift valley fever was mainly due to political instability, food insecurity, civil war, no uniform strategy to manage and poor emergency response. The weak and unstable government and health sectors added to the chaos and led to poor management of the disease. The awareness about signs and symptoms of the disease and how to recognize early warning signs was found to be particularly low among agro-pastoral communities (Fyumagwa et al., 2012). Davies (2010) has stated that the African countries do not have enough resources or institutional capacity for proper surveillance of epidemic diseases and thus it was difficult to carry out proper prevention and management programs. It is very important to examine social and economic situation at the time of outbreak. The socio- economic factors are important as they shape the management process. The civil unrest among people leading to the displacement of populations and in turn causing overcrowding was also a major challenge faced while controlling the epidemic (Kebede, Duale, Yokouide and Alemu, 2011). Other challenges faced by Kenya, Somalia and Tanzania were inadequate maintenance of livestock production thereby increasing disease spread and inadequate marketing systems which made it further difficult to contain the situation. Jost et al. (2010) reported that even though staff and resources were deployed to north eastern Kenya to control the situation but the personnel faced various challenges. The roads were not accessible due to floods and there were lack of sufficient equipments like vehicles, less number of people and lack of fluids. However, by the time disease was detected, Rift Valley Fever had spread not only to livestock but also to humans and thus had established itself. The delayed detection and response and insufficient communication between the various sectors heavily affected the outcome of this epidemic. The weak health infrastructure further disabled proper management of the outbreak. As there is no licensed vaccine present for humans; importance of integrated disease control programs like community based education campaigns became of high importance (Vilaly et al., 2013). Even though diagnostic kits for Rift Valley fever are present at lower prices to national government; but due to financial crisis of the governments, this again is not possible in an emergency situation (Dar, McIntyre, Hogarth and Heymann, 2013). The Rift Valley Fever virusisolatesfrom2007-08outbreakwerewhencomparedtoisolatesofpreviousoutbreaksinKenya (1965,1980 and 1980) and Saudi Arabia (2000); were found to have unique substitutions in GI protein. Thus this shows that slowly but eventually evolution of the virus is taking place (Nderitu et al., 2010). Due to the outbreak, these countries with limited resources accompanied with unstable governments further deteriorate the condition as the already scarce resources have to be now used for treatment and management of humans andlivestock.

It is important to understand that in an emergency like this, communicable disease like Rift Valley Fever threatens over all livelihood of a country. The measure to just close markets, ban slaughtering are not sufficient enough. There is no disease specific treatment available and thus deployment of methods to control the outbreak and also predict the next one is important (LaBeaud, Kazura& King, 2010). There are other methods that need to be taken up like strengthening of surveillance system which can track progress of the outbreak and calculate effect of control measures being taken (Fyumagwa et al., 2012). Vector Control programs like distribution of mosquito nets, use of insecticides etc also need to be taken up. There should also be focus on implementation of at risk livestock vaccination (Amwanyi et al., 2010). As climate change and weather prediction is of vital importance to Rift Valley Fever; thus setting up of proper centers which can predict an outbreak is of utmost importance. The current risk prediction models of Rift Valley fever are limited and there is a need of more specific climate forecasting which can enable immediate action. The surveillance system needs to include surveillance among animals and also calculation of herd immunity. This is of significance as many places where there are no known human cases; the disease may go unnoticed as the livestock surveillance data is not available (Breiman, Minjauw, Sharif, Ithondeka&Njenga, 2010). Provision of localized information about environmental factors which could be associated with disease vector habitats and human transmission risks can be done by remote sensing (Beck, 2000). Satellite mentoring and mapping of climatic and geographical condition can help is better predication of an outbreak and thus must be given importance (Anyamba et al., 2009). The Intergovernmental Panel on Climate change has predicted that although rainfall would decrease, but have suggested that wet and dry years will become more extreme. This suggests continuation of production of floodwater Aeds eggs, which would be infected Rift Valley Virus (Martin et al., 2008). However continued surveillance and prediction of outbreaks requires a proper infrastructure which is again difficult where countries have limitedresources.

As I have mentioned before; to control a communicable disease outbreak in an already unstable environment and in an underdeveloped country itself presents as a huge disadvantage. The challenges faced by countries like Kenya, Somalia and Tanzania due to civil wars, less resources and weak infrastructure need to be taken into account while planning any prevention program. International organizations need to take into account the present situation of a country while trying to set aims and agendas to control an outbreak. An emergency situation in an already chaotic environment cannot be tackled with single aim and need to be multi-sectoral. It is important to involve all stakeholders and try to find a way where everyone can come in agreement. In countries

where there is civil unrest and weak government, it becomes even more difficult to implement prevention programs and in turn creates further unrest. Thus controlling of a public health problem like this is a collaborative effort in which has to take all aspects intoconsideration.

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Dr. Abdul Aleem. "Rift Valley Fever-A review." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 9, 2019, pp 40-43.