

Epidemic situation of rift valley fever in Egypt and Saudi Arabia

Abstract

Rift valley Fever (RVF) caused by RVF virus (RVFV) an acute febrile arbovirus in the Phlebovirus genus and Bunyaviridae family, is an OIE-listed, and is a viral zoonosis that primarily affects animals but also has the capacity to infect humans. The disease remained a veterinary concern in East Africa until a major outbreak occurred in Egypt in 1977. A second outbreak occurred in the Middle East was recorded in 2000 when RVF moved into Saudi Arabia and Yemen. In order to highlight the urgent need of establishing a health system for controlling RVF and to document the principal lessons collected from the recent outbreak as tools to inform veterinary preparedness and response plans for future RVF outbreaks in Egypt and Saudi Arabia, this review article aims to providing the basic information on ecological and epidemiological aspects associated RVF outbreaks in Egypt and Saudi Arabia.

Keywords: rift valley fever, epidemic map, ecology, epidemiology, control, Egypt, Saudi Arabia

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Mohamed Sayed-Ahmed,^{1,2} Youstra Nomier³

¹Department of Internal Medicine and Infectious Diseases, Mansoura University, Egypt

²Department of Clinical Pharmacy, Jazan University, Saudi Arabia

³Department of Pharmacology, Jazan University, Saudi Arabia

Correspondence: Mohamed Zakaria Sayed-Ahmed, Department of Internal Medicine and Infectious Diseases, College of Veterinary Medicine, Mansoura University, Mansoura 35516, Egypt, Tel 0096 659 488 6878, Fax 00966 17 321 6837, Email drzakaria-infect@hotmail.com

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Abbreviations: RVF, rift valley fever; RVFV, rift valley fever virus; OIE, office international des epizooties; GOVS, general organization for veterinary services; MOH, ministry of health of Saudi Arabia

Introduction

RVF is an Office International des Epizooties (OIE)-listed. RVFV is caused by an arbovirus, a single stranded RNA virus that belonged to Phlebovirus of in the Bunyaviridae family that contained a wide variety of arthropod borne viruses that infect mammals and insects. The disease was discovered by Daubney et al.¹ during his work at the Veterinary Research Laboratory at Kabete in Kenya. The virus was reported in Kenya in 1931 by Stordy² during an outbreak occurred in wool exotic sheep in the Rift Valley area. Since then, the diseases have been reported in North Africa until a major outbreak occurred in Egypt in 1977. In September 2000, RVF cases were firstly reported in Saudi Arabia and Yemen, making the first report of the disease outside Africa.³ This considers the first report of the disease occurrence outside the African continent—where it had been confined so far—becoming a threat to the Middle East. In 2007, there were outbreaks in Kenya, Somalia, and Tanzania,^{4,5} while in 2008 and 2010, recent outbreaks of RVF occurred in Sudan.^{6,7} In the year 2000, Saudi Arabia and Yemen were exposed to a huge RVF outbreak.^{8,9} It was considered the first outbreak occurred in the Middle East. The improper quarantine measures leads to the spreads of the RVFV in Saudi Arabia and Yemen during importation of infected animals from Eastern Africa¹⁰ as well as the extension of RVFV from Sudan to Egypt in 1977.¹¹ The virus strain which causing the Saudi Arabia outbreak belonged to the same strain that caused East Africa outbreaks in 1997-1998.¹² Limited information and data is available on the Epidemiology and transmission of RVF in Egypt and Saudi Arabia.

Endemicity of RVFV in Egypt

RVFV are maintained in the environment by replication and transmission between insects and susceptible hosts.¹³ There are many

factors helps RVFV to persist in environment in Egypt depends upon certain factors.¹⁴ Firstly, the appropriate climatic conditions for multiplication of insects with absence of effective insects control programs. Secondly, camels and wild animals play an important role in establishment the endemic RVFV cycle.^{15,16} Thirdly, vaccination of livestock with RVF vaccines plays an important role in the endemicity of the disease in Egypt.¹⁷ Fourthly, partial herd vaccination of susceptible hosts by inactivated vaccines. Fifthly, the massive losses of human during the first RVFV outbreak, as result of the absence of public health instruction, social and medical situations. Lastly, the field trials in Egypt are not under control which leads to environmental contaminations with RVFV live vaccine strains.

Epidemicity of RVFV in Egypt

RVFV infected a wide range of hosts including cattle, sheep, goats, buffaloes, camels, and others. Sheep is the most susceptible host with high rates of abortions during gestation period and high mortality rates among newborns.^{18,19} The first record for RVF outbreak in Egypt was recorded at Belbies city in Sharqiya Province in 1977. It appeared as acute febrile dengue-like disease in human.²⁰ In 1977, some investigations revealed that RVFV was isolated from different animal hosts, rats and man during RVF outbreak in Egypt and some areas of North Africa. In 1993, the second outbreak was mainly due to infection or using of vaccine strains. Some investigation was suggesting the virus continued endemic this two outbreaks until reinstated in 1993 from Sudan.²¹ In 1994, RVFV was isolated from 139(31.65%) cattle and 84(57.1%) sheep in Kafr El Sheikh and Behira Provinces. However, the locally produced RVF vaccine showed failure of its application.²² In 1997, the high incidence of abortion and mortalities among sheep and cattle was observed in Upper Egypt.²³ In spite of RVFV outbreak occurred 3 years only after the last epidemic in 1994, the failure of vaccination programme was occurred. In 2003, other outbreak was encountered in various localities of Egypt.²⁴ The Egyptian Ministry of Agriculture did not announce this epidemic until now. However, WHO received reports of 45 cases of RVF including 17 deaths in Kafr El Sheikh Province about 150 km north of Cairo.²⁵

Epidemicity of RVFV in Saudi Arabia

Epidemics of RVF were limited to the African continent until 2000. In 2000, the first confirmed occurrence of RVF outside Africa was firstly reported in Saudi Arabia. The Ministry of Health (MOH) of Saudi Arabia received reports of unexplained severe hepatitis in 7 patients from the Jizan region at the south western border of the kingdom. During this outbreak it was estimated that around 40,000 animals including sheep, goats, cattle and camels died whereas about 10,000 of them aborted.²⁶ During the outbreak of 2007 in Sudan, The livestock trade between Saudi Arabia and Sudan were prohibited.²⁷ The main route for transmission of the disease among livestock through mosquitoes bites. In addition, disease can also be occurred vertically between animals.²⁸ The massive infections of human result from direct or indirect contact with the blood, secretions and consumption of unpasteurized milk from infected animals.²⁹⁻³¹ The virus was mostly transmitted to human through bites of infected *Aedes* mosquito.^{32,33} RVFV was transmitted vertically in the flood water of *Aedes* mosquitoes.^{34,35} Other mosquitoes in the *Culex* and *Anopheles* genus are thought to be important in amplification of virus activity during outbreaks. Up till now, the virus transmission from human to human not documented. A strategy called “One Health” was applied by cooperation between all collaborating authorities in Saudi Arabia on both animal and human hosts to prevent and control the disease.^{33,36} During the outbreak, active surveillance surveys to detect the RVF cases among animals and humans to locate infected areas for animal vaccination.^{8,9,26} Urgent control measures were implemented included disposal of infected dead animals under complete hygienic measures. Around 1million doses of the vaccine were used and more than 10million ruminants being vaccinated.³⁷ Importation of animals from RVF-epidemic countries and restricting the movement of animals will reduce the extension of the virus to outside the affected areas.¹⁶ Ministry of Health in Saudi Arabia well-prepared the laboratories for detection of RVFV antibodies in suspected cases.^{8,26} Some epidemiological and entomological studies were performed to recognize the main predisposing factors of the disease.⁹ In addition, an intensive control program for mosquitoes was applied.^{9,38} This strategy succeeded to limit the disease from spreading to other areas. Since 2000, the local authorities of Saudi Arabia was recorded a few sporadic cases of the disease.⁸

Discussion and conclusion

RVFV is an endemic disease in Africa and Arabian Peninsula.³⁹ This virus is classified as OIE, List A with a highly potential pathogen for international spread.⁴⁰ The disease considered a highly fatal zoonotic disease for human. The use of effective vaccine was helping in break the life cycle of the pathogen.⁴¹ The viremic animals as well as infected mosquitoes serve as a main source of direct infection of humans.⁴² Since 1977 outbreak, the live attenuated and killed vaccine was used in Egypt.^{43,44} In 2008, the Egyptian General Organization of Veterinary Services (GOVS) revealed that RVF live vaccine don't used in Egypt in the present time. Consequently, the vaccination of RVF performed by the killed vaccines only.⁴⁵ It is one of the most promising vaccines to date, and if effective, could be tested in the field in Egypt.⁴⁶ Whereas RVF was previously restricted to specific areas in Africa, the disease seems to be spreading into new territories beyond the traditional foci as evidenced by outbreaks in Saudi Arabia and the Arabian Peninsula.

The epidemiology of RVF is complex and transmission involves

multiple mosquito vector species. While the scientific community has started to address the possibility of large-scale epidemics and preventive measures that can be used to stop them, there are still no low-cost, broadly effective vaccines approved for use by the general public. In the nearest future, we hope to some of the vaccine in a wide scale. It is also clear that with enhanced coordination among stakeholders, Ministries of Health and epidemiologist to handle future outbreaks in Saudi Arabia. Clear strategies and action plans for handling of future outbreaks include strong surveillance systems, adequate and well trained personnel, should be done. To facilitate the control and eradication of RVF in Saudi Arabia and Arabian Peninsula, we have many things to do. First, regional or national wide eradication should be initiated and implemented. Second, the cooperation between the government and stakeholders to fight against RVF jointly. Third, proper animal vaccination program. Fourth, disruption the breeding sites by using the larvicidal agents are the most effective manner of vector control. Lastly, we need to know more about the virus: how does it replicate/infect and establish infection? How does it interact with the host? This may lead to more efficient intervention strategies for RVF.

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Conflict of interest

Author declares that there is no conflict of interest.

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