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Socio-economic Impact of Foot and Mouth Disease in Wildlife-Livestock Interface and Non-Interface of Tanzania

Daniel Mdetele[1]*, Christopher Kasanga[1], Misago Seth[2,3] and Kim Kayunze[4]
[1]*Sokoine University of Agriculture, Faculty of Veterinary Medicine, Morogoro, Tanzania*
[2]*The Nelson Mandela African Institution of Science and Technology, School of Life Sciences and Bioengineering, Arusha, Tanzania*
[3] *National Institute for Medical Research (NIMR), Tanga Medical Research Centre, Tanga, Tanzania*
[4]*Sokoine University of Agriculture, Development Studies Institute (DSI), Chuo Kikuu Morogoro, Tanzania*
*Corresponding author's Email: daniel.mdetele@sacids.org

ABSTRACT

Foot-and-Mouth Disease (FMD) is still one of the major trans-boundary animal diseases (TADs) in Tanzania. The disease is an obstacle to development of the livestock sector because it adversely affect livestock production and trade of animals and animal products. A cross-sectional study was conducted in Serengeti ecosystem (Wildlife-livestock Interface) and in the Central part of Tanzania (Non-interface) with the aim of assessing the social and economic impacts of FMD among livestock keepers in the two ecosystems. Forty households were selected, 10 from each district and to each household, a structured questionnaire was administered. The results showed that, the social impacts due to, FMD outbreaks include food insecurity (85.0%), failure to meet education costs (90.0%) and medical costs (77.5%). The observed economic impacts of FMD were losses associated with treatment costs (87.5%), milk productivity (85.0%), draught power (80.0%), livestock market loss (67.5), lower weight gain (60.0%), lower fertility (37.5%), abortion (35.0%), death of animals (25.0%) and vaccine supply cost (2.5%). Statistically, there were no significant differences in observed impacts of FMD among livestock keepers from wildlife-livestock interface and those from the non-interface. The study found no significant difference in opinion among livestock keepers from wildlife-livestock interface and non-interface areas as well as among study districts on foot-and mouth-disease impacts. Higher percentages in case responses on social impacts and economic losses indicated magnitude of the problem and feelings of livestock keepers about FMD. However, lower percentage in case response on vaccine supply cost indicated that there is no control of FMD by vaccination.

Key words: Socio-economic impact, FMD, Interface, Non-Interface, Tanzania

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INTRODUCTION

Foot-and-mouth disease (FMD) is a highly contagious, vesicular disease of cloven-hoofed animal species (Habiela et al., 2010), and is caused by *Foot-and-mouth disease virus* (FMDV) of the genus *Aphthovirus* and the family *Picornaviridae* (Carrillo et al., 2005; OIE, 2009). Domesticated animals like cattle, pigs, sheep, goats and water buffalo are susceptible to FMD. Wildlife species may also become infected especially cloven-hoofed species (OIE, 2009). The disease is characterized by high fever, loss of appetite, salivation and vesicular eruptions on feet, mouth and teats (Thomson, 1994). The severity of clinical signs varies with the strain of virus, exposure dose, age and breed of animals, host species and immunity of the animal. Mortality from a multifocal myocarditis is most commonly seen in young animals in susceptible species (OIE, 2009). The highly contagious nature of FMDV and the associated productivity losses make it a primary animal health concern worldwide. FMD results in poverty impacts either through production losses caused directly by the disease or the cost for FMD prevention and control (Perry and Rich, 2007).

FMD was first reported in Tanzania since 1927, in Arusha Region and Kahama District (Anonymous, 1927). Since then it has been reported every year, in almost every region. Outbreaks are associated with livestock movements, and it has been observed that major epidemics of FMD in Tanzania occur mostly during dry seasons and immediately after dry seasons, when livestock and wildlife congregate at water points. During draught period, animals are immuno-compromised because of insufficient water, pastures and long distance movement hence become more susceptible to FMD infection. It is also a common practice for livestock keepers to illegally graze their animals in game reserves and national parks which increases the interactions with wildlife which are considered to be carriers of FMDV.

The major problem in controlling FMD in Tanzania and why it is considered as the most dreadful viral disease is due to its high contagiousness, wide geographical distribution, broad host range, its ability to establish carrier status, antigenic diversity leading to poor cross-immunity, and relatively short duration of immunity. Poor surveillance and diagnostic facilities as well as inadequate control programmes add to the challenges in control of the disease in Tanzania

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(Kivaria, 2003). Besides causing direct losses to livestock economy, it also causes indirect losses in terms of severe trade restrictions, impacts which may be higher than direct losses (Mlangwa, 1983).

Tanzania's economy mainly depends on agriculture, a sector that employs about 85% of its population. Livestock production, which has been increasing in the past years, is limited by disease occurrence (e.g. FMD) and large areas which are infested by tsetse flies especially in wildlife protected zones in the country (Picado et al., 2010). Tanzania is endowed with a large number of animal resources that contribute to the wellbeing of the people through provision of food, employment, transportation, animal by-products, draught power and manure. According to 2007/2008 Tanzania livestock census (NBS, 2012), the country has a total of 2,329,942 households raising livestock. Tanzania ranks third in Africa in terms of cattle population after Ethiopia and Sudan with 21,280,875 cattle 15,154,121 goats, 5,715,549 sheep and 1,584,411 pigs. Yet, livestock diseases, especially TADS, are threatening the survival of this important resource for survival of a large number of households. The contribution of livestock sub-sector to total Gross Domestic Product (GDP) has been recorded to be 4.7 percent and grew at a rate of 4.2 percent, according to 2007/2008 livestock census (NBS, 2012). Out of the livestock share of GDP of 4.7 percent, 40% comes from dairy cattle, 30% from beef cattle and the remaining 30% from shoats, pigs, poultry and game production. This sub-sector contribution is considered far below what would have been expected and most shortcomings can be attributed to presence of animal diseases that affect production and impact on local and international trade of animals and animal products (NBS, 2012). Of all TADS, FMD was ranked first (Otte et al., 2004). Therefore, the aim of this study was to determine socio-economic impact of Foot and Mouth Disease in wildlife-livestock interface and non-interface areas in Tanzania

MATERIAL AND METHODS

Study Area

The study was conducted in wildlife-livestock interface areas and non-interface areas in Tanzania. Interface area covered the Serengeti ecosystem, which included areas around Serengeti National park (Serengeti and Bunda Districts). Non-interface areas covered the Central part of Tanzania (Kongwa and Iramba Districts). The study was conducted between March and November 2013.

Study Design and Sampling

A cross-sectional study design was used, whereby District Veterinary officers (DVOs) from the study areas helped in identification of villages with prevailing and past FMD outbreaks. Villages in wildlife-livestock interface areas as well as those in non-interface areas were randomly selected. From the selected villages, Livestock field officers (LFOs) assisted in identifying the households which had more than 10 cattle and other animal species. The households in each village were randomly selected (Lottery Method), and from each household a questionnaire was administered to livestock owners on each herd (household). Therefore, 40 households were interviewed on their past FMD outbreak experiences, and the data obtained analyzed using the Statistical Package for Social Sciences (SPSS v16.0). Chi-square test was used to compare responses between interface and non-interface groups and a p value less than 0.05 was considered statistically significant.

RESULTS

In present study, majority of the respondents were male with the following proportions: in Serengeti 100%, in Bunda 90%, in Kongwa 80% and in Iramba 80%. The majority of respondents were above 50 years old with primary school level of education. Most of the respondents had an experience of 11 to 20 years of livestock keeping, and the breeds of cattle kept were local breeds managed in agro-pastoral system.

The major source of knowledge regarding FMD for majority of respondents was found to be traditional, where the disease is known as *Salata* in Iramba, *Magaga* in Kongwa, *Isinabi* in Serengeti and *Iyoho* in Bunda. All the respondents were aware of clinical signs as well as sequelae features of FMD. However, most of them were not aware of the species of animals affected by the disease. In treatment, most livestock keepers used traditional methods to treat the lesions by using Aloe vera, salt and kitchen ashes. However, they sometimes used commercial drugs mostly penicillin-dihydrostreptomycin and oxytetracycline.

FMD outbreaks in the study area were associated with social and economic impacts. Social impacts (with average case response rate in study districts) included food insecurity (85%) and failure to meet medical (90%) and education (77.5%) costs (Table 1 and 2) while losses associated with treatment costs (87.5%), milk productivity (85.0%), draught power (80.0%), livestock market loss (67.5), lower weight gain (60.0%), lower fertility (37.5%), abortion (35.0%), death of animals (25.0%) and vaccine supply cost (2.5%). were the economic impacts of FMD outbreaks (Table 3).

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Table1. Social impact associated with FMD outbreak case response between interface and non-interface area in Tanzania during March - November 2013

Social Impact of FMD outbreaks	Case response %		
	Interface area	Non interface area	P-Value
Food insecurity due to FMD outbreak	89.5	81	0.451
Failure to meet medical costs due to FMD outbreak	89.5	66.7	0.085
Failure to meet education costs for school children	89.5	90.5	0.916

Table 2. Social impact associated with FMD outbreak in Tanzania: case response between study districts during March – November 2013

Social Impact of FMD outbreaks	Case response %				
	Serengeti	Bunda	Kongwa	Iramba	P-value
Food insecurity due to FMD outbreak	90	90	90	70	0.502
Failure to meet medical costs due to FMD outbreak	100	80	80	50	0.063
Failure to meet education costs for school children	90	90	90	90	1.000

Table 3. Economic impacts associated with FMD outbreak in Tanzania during March – November2013 March – November 2013

Economic Impact of FMD outbreaks	Case response %
Milk loss	85
Drought power loss	80
Lower weight gain	60
Animal death	25
Lower fertility	37.5
Treatment costs	87.5
Loss associated with abortion	35
Vaccine supply cost	2.5
Denied Livestock market	67.5
Permanent lameness	22.5

DISCUSSION

In this study, a total of 40 open-ended questionnaire copies were administered face to face to livestock keepers in 4 districts from wildlife-livestock interface and non-interface areas of Tanzania. The data collected showed that FMD was well known to farmers, and they are well acquainted with the traditional knowledge. All the 40 respondents were aware of the disease, its clinical signs, morbidity and mortality with exception of the species of animals affected. The prominent clinical signs mentioned by most of the farmers interviewed were: presence of vesicles in and around the buccal cavity, anorexia, excessive salivation and lameness; heat intolerance and long hair coat locally known in the Sukuma ethnic group of Bunda District as *luzwiga* and regarded as sequelae to FMD. The questionnaire data showed that FMD outbreaks often occur after rainy seasons (dry seasons), with less extent to rainy season and rare occurrence all the year round, despite variation in climate. It was predominantly encountered with the highest peaks just after long rains in May-June and at the end of short rains in November-December. Farmers were using salt, crushed sisals mixed with ashes, Aloe vera locally known as *magaka* in the Sukuma ethnic group of Bunda to cure mouth ulcers as a local treatment. Modern or commercial treatment was also practised by farmers by applying antibiotics (penicillin-dihydrostreptomycin and oxytetracycline) to protect infected animals from secondary bacterial infection. The study showed that the majority of the respondents were males. Normally, in most parts of Tanzania, men dominate and monopolize all means of production systems be it in pastoral or agro-pastoral system. Majority of the respondents were people aged above fifty and had owned animals for up to more than twenty years, something which indicates how experienced they were in livestock management and livestock diseases.

From this study, the average case response percentages on impacts associated with social issues were on food insecurity (85.0%), failure to meet education costs (90.0%) and medical costs (77.5%). These findings are in agreement with those of studies done by Perry *(*2003), Perry *(*1999) and Ellis (1978) who reported that FMD productivity losses were particularly hard hitting to those that depend upon their stock for traction, particularly where outbreaks in cattle occur during planting season. With that effect, FMD outbreak during farming season limits livestock keepers from using their animals for ploughing. In dry seasons the animals cannot be used for transporting farm products from farms to homesteads and nearby crop market places. In addition to that, quarantine for livestock movement becomes mandatory following an FMD outbreak according to Animal Disease Act (2003) in Tanzania. This entails closure of formal

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livestock markets, making it difficult to buy and sell animals. With such effect, livestock keepers are denied with means to raise money to buy food and meet medical, educational and other expenses and utilities.

During the study, it was observed that majority of traditional livestock keepers rely on milk and other milk products in daily meals as can be explained by high case response percentage on economic issues in case of an FMD outbreak, which was found to be 85%. This finding agrees with that of a study by Barasa (2008) who reported that, for many pastoralists, milk provides a vital source of nutrition, particularly in children, accounting for over 50% of gross energy intake. By reducing the supply of milk, FMD impacts on food security, particularly when outbreaks occur during the dry season of the year, when other food sources are in limited supply and dependency upon milk is at its maximum. Moreover, some other studies have also reported that chronic FMD typically reduces milk yields by 80% (Bayissa et al., 2011; Bulman and Terrazas, 1976).

Case response percentage of 2.5% on vaccine supply cost on economic impact have agreement with the low contribution of the livestock sector to GDP as it indicates that there are no efforts done to control FMD by vaccination. Considering a study done in other countries on FMD control by vaccination, benefit-cost analysis revealed that effective vaccination-based control of FMD in agro-pastoralist communities of South Sudan could yield $11.5 for every dollar invested. Also, it has been shown that, for every $1 that Zimbabwe disinvests from FMD control, $5 further are lost by the country (Perry et al., 2003). Through this study, literature has shown that some countries found in the same region as Tanzania have invested in FMD control through vaccination and benefitted much from the contribution of the livestock sector to those countries' GDP, unlike Tanzania irrespective of number of animals and land size suitable for livestock production.

Socio-economic impacts of FMD do not need to be over-emphasized. A number of studies have already shown its importance. For example, in one study conducted in the UK following the UK's 2001 FMD outbreak, it was estimated that the outbreak cost £ 3.1 billion. US projects about 40 billion losses in case of any FMD outbreak (Ekboir 1999, Thompson et al., 2002*)*. This can almost be corroborated by Kivaria (2003), Perry and Grace (2009) who reported that FMD as the most economically damaging trans-boundary livestock disease worldwide and its control would also benefit the poorest livestock keepers. All these observations are in agreement with the findings of this study recorded in Tables 1, 2 and 3. The findings above are also supported by those of a study conducted by FAO whereby it was found that, overall direct losses limit livestock productivity, creating food insecurity and contributing to malnutrition. Furthermore, much of the global FMD burden of production losses falls on the world's poorest communities, and those which are most dependent upon the health of their livestock (FAO-OIE, 2012). In addition to that, a study by Gall and Leboucq (2004) on questionnaire based survey of African veterinary services found, of all ruminant bacterial and viral diseases FMD have the greatest impact on poverty to livestock keepers.

CONCLUSION

This study found no significant difference in opinion among livestock keepers from wildlife-livestock interface and non-interface areas as well as among study districts on FMD impacts. However, higher percentages in case response for every aspect in both ecological zones indicated the magnitude and feelings of livestock keepers about FMD. Moreover, low percentage response on vaccine supply cost conveyed the feeling that nothing has been done so far on controlling the disease by vaccination. Considering the socioeconomic impacts of FMD from the study and the importance of the livestock sector to Tanzania, FMD control could result into significant change in poverty reduction among livestock keepers as well as contribution of the livestock sector to GDP.

Successful FMD control is possible and FMD freedom with vaccination has been achieved in large parts of South America, Southern Africa and elsewhere, e.g. recently the Philippines and Turkish Thrace (OIE 2011). Adhering to the road map developed by OIE and FAO (Courtesy of FAO-OIE, 2012) can minimize the burden of FMD or eliminate it completely and declare freedom without vaccination. Implementation of FMD control strategy, commitment and making sure quality FMD vaccines are available at reasonable and affordable costs to livestock keepers will result into successful FMD control.

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