

A Review on Epidemiology of Foot and Mouth Disease (FMD) in South Sudan

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Abstract: A review of Foot and Mouth Disease (FMD) was made to provide principal epidemiological data on the disease situation in South Sudan. Five serotypes of FMD virus; A, O, C, SAT₁ and SAT₂ were revealed in cattle, goats and sheep. Of which serotypes O and SAT₂ seemed to be the most prevalent in seven States of the country. The overall mean prevalence of FMD in Unity and Lakes States showed the highest and lowest rates of 56% and 25%, respectively. Young stock showed a mortality of 50% compared to 20% in adult cattle, sheep and goats. In the face of FMD outbreak a significant reduction in more than 10% milk yield and weight losses were revealed. FMD has been identified as one of the priority diseases of socio-economic importance. Further study is needed to elucidate the role of wildlife in the epidemiology of FMD. Development of control strategies for FMD is imperative for sustainable development of livestock in South Sudan.

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1. Introduction

Foot and mouth disease (FMD) is one of the enzootic diseases of socio-economic impacts on the livelihoods of pastoralists and agro-pastoralists in South Sudan (Barasa et al., 2008). The disease poses a threat to national gross domestic product (GDP) incurring from livestock sector (Kimani and Njue, 2007). The economic losses due to FMD is enormous which include a decrease in animal production, mortalities, loss of livestock trade and market, interference with agriculture and tourism besides the costs of control measures (James and Rushton, 2002).

South Sudan is endowed with an estimated population of 35.7 million cattle, sheep and goats (Anon, 2012). Indigenous Nilotic breeds of cattle, sheep and goats are predominant and kept under traditional husbandry system. FMD was discovered in the Sudan in 1903. The major outbreak of FMD in southern Sudan occurred in 1963 and 1973 in Wau and Malakal, respectively (Abu Alzein, 1983). Four serotypes: O, A, SAT₁ and SAT₂ of the seven were recorded (Vosloo et al., 2002; Rweyemamu et al., 2008; Mohammed Habiela et al., 2010).

FMD is difficult to control due to variations in the virus serotypes, but provision of vaccination policy framework for prospective control of FMD outbreaks in South Sudan is imperative. No comprehensive study has been carried out in the epidemiology of FMD in post-independent South Sudan.

The purpose of this paper was to review FMD in susceptible livestock such that control strategies

could be streamlined for sustainable development of livestock sector in South Sudan.

2. Epidemiology of FMD

2.1 Susceptible Livestock population to FMD

Livestock population of 23.9 million including cattle, sheep and goats out of the total 35.7 million is vulnerable to FMD accounting for 66.9% (Table 1).

2.2 Prevalence of FMD Virus Nonstructural protein (NSP) antibody:

Sero-prevalence of FMD among cattle, sheep and goats revealed an overall mean of 37%. The distribution of mean prevalence of FMDV NSP antibody with standard errors per state is shown in figure (1). Livestock aged less than 1 year had a mean prevalence of 17%, 12% and 20% for cattle, goats and sheep, respectively. Adult stock >3 years old showed the highest mean prevalence of 60%, 31% and 40% for cattle, goats and sheep, respectively (figure 1).

Table 1: Livestock population susceptible to Foot and mouth Disease in South Sudan

Livestock Species	No of Livestock In millions	(%)
Cattle	7.4	31.0
Goats	9.0	37.6
Sheep	7.5	31.4
Total	23.9	100

Unity State showed the highest overall mean prevalence of 56%. Lakes State showed the least overall mean FMDV NSP sero-prevalence of 25%.

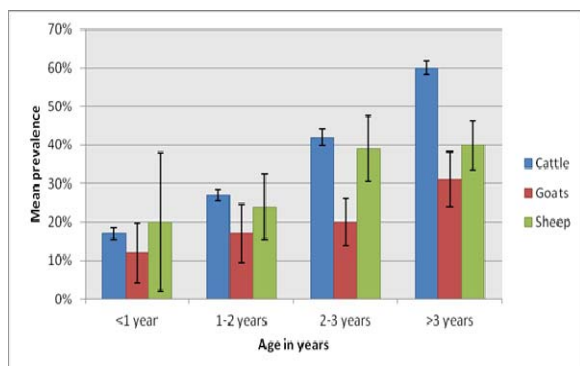


Figure 1: National Foot and mouth disease virus antibody prevalence in different age groups:
Source: VSF-Belgium Juba

2.3 Distribution of the mean Foot and mouth disease virus serotype specific antibody:

The mean FMDV serotype specific antibody was prevalent in seven states of ten for serotypes O, A, C, SAT₁ and SAT₂ (figure 2).

Antibodies to all the five serotypes (O, A, C, SAT₁ and SAT₂) were present in cattle, sheep and

goats. Serotypes O and SAT₂ antibodies were the most prevalent. The mean prevalence in cattle, goats and sheep for type O were 19%, 9% and 19% while SAT₂ were 20%, 10% and 16% respectively. The mean prevalence for the other three serotypes were below 10% in all the three species except SAT₁ in cattle at 10% (table 2).

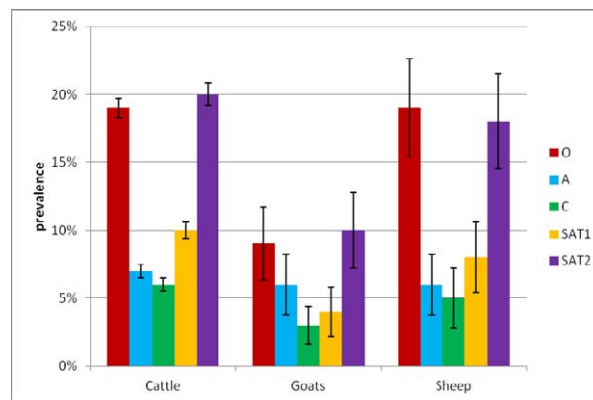


Figure 2: Mean Foot and mouth disease virus serotype specific antibody prevalence among cattle, sheep and goats
Source: VSF-Belgium Juba

Table 2 : Foot and mouth disease virus serotype antibody prevalence in seven of the ten States of South Sudan.

State	% Prevalence (95% CI)				
	O	A	C	SAT ₁	SAT ₂
Central Equatoria	16 (11-23)	4 (2-9)	14 (9-21)	12 (7-18)	18(12-25)
Eastern Equatoria	18 (5-22)	13 (10-16)	2(1-4)	6 (4-8)	14 2-18)
Jonglei	13 (10-16)	3 (1-5)	4 (2-6)	8 (6-11)	13 (10-16)
Lakes	5 (3-7)	1 (0-2)	2 (1-4)	3 (2-5)	18 (15-22)
Unity	39 (35-43)	7 (5-9)	19 (15-22)	21 (18-25)	31 (27-35)
Upper Nile	6 (4-9)	14 (11-17)	1 (0-2)	4 (2-6)	20 (18-24)
Warrap	24 (20-28)	1 (0-2)	1 (0-3)	11 (8-15)	14 (11-18)

Source: VSF-Belgium Juba

2.4 Socio-economic Impacts of FMD on livestock production and productivity:

Young cattle were shown to be more impacted than adult cattle. Perception of pastoralists showed that the mortality in adult cattle was less than 20 % compared to 50% in young cattle. In sheep and goats the mortality in the young was reported to be less than 20%. Among the direct losses due to FMD were milk losses of at least 10%, reduced meat production due to weight loss of more than 10%. Besides animal care, treatment costs and feed supplementation.

Indirect losses associated with FMD included loss of milk (35%); malnutrition (30%), restricted

access to grazing areas and watering points (19%), closure of livestock markets (9%) and other social and cultural implications (7%) due to FMD affected livestock.

Risk factors associated with FMD outbreaks included the patterns of livestock movements, communal livestock watering sources, common grazing and livestock handling facilities besides the presence of susceptible wildlife species. Cattle raiding /rustling constituted an important risk factor.

3. Discussion

FMD is one of the priority diseases of economic importance not only in South Sudan but also in other Inter-Governmental Authority on Development (IGAD) Eastern Africa countries. This study has revealed that the disease is highly prevalent in Unity State (56%). This could be explained by the intensive livestock trade and marketing between Unity State and Sudan besides inadequate annual vaccination.

The presence of FMD serotypes A, C, O, SAT₁ and SAT₂ in South Sudan is in line with the reports that showed their existence in the Greater Horn of Africa region (Vosloo et al., 2002; Rweyemamu et al., 2008). Four of the seven serotype: O, A, SAT₁ and SAT₂ have been reported only from cattle in the Sudan (Abu Elzein, 1983). It seems that the pattern of animal movements, inconsistent vaccination calendar exacerbated by lack of quarantine measures on the borders and at check points may have led to the introduction of serotype C to South Sudan.

Serotypes O and SAT₂ are found to be the most prevalent in South Sudan which is in line with the study of Mohammed Habiela et al. (2010). These two serotypes could be responsible for the annual outbreaks in the country, particularly in Unity State with the highest FMD seroprevalence. The prevalence of serotypes SAT₁ and A seems to indicate sporadic occurrence of FMD.

Evidence has shown that serotypes O, A, SAT₁ and SAT₂ are still in circulation in Eastern Africa sub-region. Serotype C was last diagnosed in Kenya in 2004 (Roeder and Knowles, 2009) while SAT₃ was last isolated from African buffalo (*Syncerus caffer*) in Uganda in 1997 (Kitching and Hughes, 2002). But no study has been conducted in South Sudan to elucidate the role of *S. caffer* in the epidemiology of FMD in South Sudan. Generally, 2-5 serotypes were recorded in some countries such as India, Iran, Pakistan and Turkey (serotypes: O, A, Asia₁), South Africa, Tanzania and Uganda (serotypes: O, SAT₁, SAT₂), Argentina, Bolivia, Ecuador, Malaysia and Syria with serotypes: O, A (Youssef Chahin, 2007).

Antibodies to serotype C were detected at <10% prevalence in South Sudan. This could be explained by its circulation in the Greater Horn of Africa (Rweyemamu et al., 2008). Nilotic breeds of cattle, sheep and goats appeared less sensitive to FMD infection in the seven states which could be attributed to the state of enzootic stability.

The impact of FMD in endemic countries has received less attention compared to disease free countries. Direct losses due to deaths are easy to appreciate; however, in endemic countries the burden of FMD often manifests as widespread which hampers sustainable development of livestock sector. A report of Eisa and Rweyemamu (1977) showed that mortality rate due to FMD in calves was 50%.

Previous studies indicated that FMD causes important socio-economic impacts in South Sudan (Kimani and Njue, 2007; Barasa et al., 2008; Baumann, 2010). In Ethiopia, FMD is reported to cause substantial decrease in milk yields and deaths among adult improved dairy herds (Roeder et al., 1994).

4. Conclusion

FMD is enzootic disease in the seven states sampled with multiple serotypes in circulation at varying prevalence levels. Serotypes O and SAT₂ are the most prevalent and are likely to be responsible for annual outbreaks. Serotypes SAT₁ and A are the next in prevalence and are likely to be causing mostly sporadic outbreaks. The impact of FMD on the livelihoods of pastoralists and agro-pastoralists is most pronounced in reduced milk production. This has contributed to malnourished children and the elderly people. Development of control strategies for FMD is imperative for sustainable development of livestock in South Sudan.

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