Prevalence and associated risk factors of Rift Valley fever in cattle in selected endemic prone and regions of no known outbreaks in Uganda

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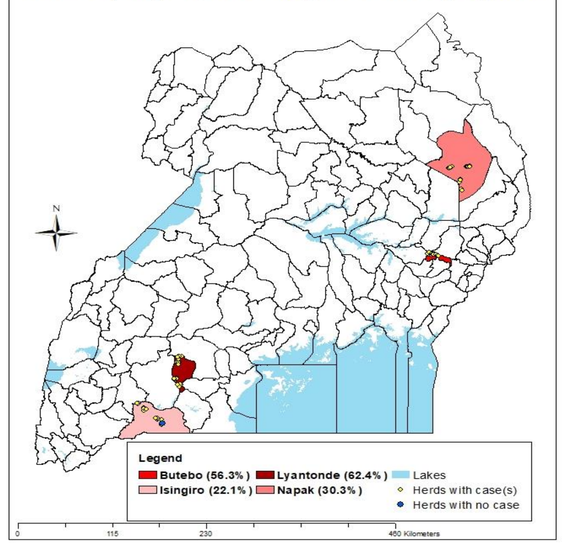
Introduction

- Rift Valley fever (RVF) is an emerging neglected zoonotic vector-borne infectious disease with a significant threat to animal and human health, and livestock production, primarily in sub–Saharan Africa. Uganda reported the first RVF outbreak in 2016 since 1968 (Shoemaker et al., 2019). Recent serosurveys indicated widespread positivity including areas that have never reported an outbreak.
- Little is known regarding the epidemiological drivers for RVF occurrence and exposure risk factors for infection in livestock at the farm level in Uganda.

Methods

- We conducted a cross-sectional study (January – February 2022) to examine the seroprevalence and associated risk factors of Rift Valley fever virus (RVFV) in cattle in selected two endemic prone districts (Lyantonde and Isingiro) and two districts of no known outbreaks (Butebo and Napak) in Uganda.
- Stratified sampling strategy was used to select 84 herds where sera were collected from 1,470 randomly selected cattle in eight sub-counties (Masha and Kashumba in Isingiro district; Lyantonde and Kasagama in Lyantonde district; Iriiri and Matany in Napak district; and Butebo and Kanginima in Butebo district).
- Sociodemographic and animal-level data collected using electronic forms designed using Open Data Kit.
- The sera were tested at the National Animal Disease Diagnostic and Epidemiology Centre (NADDEC) using the commercial ID Screen® RVFV competition Multispecies ELISA kit with a level of sensitivity and specificity of 91% – 100% and 100% (95% CI: 99.58% – 100%) (Comtet et al. 2010; Kortekaas et al. 2013).
- Positive samples and approx. 10% of the negative samples were screened for anti-RVFv IgM antibodies.
- Data were analysed using IBM SPSS Statistics for Windows, Version 20.0.

Fig 1: Cattle RVF Seroprevalence in Lyantonde, Butebo, Napak, and Isingiro dictricts, Uganda



Findings

Table 1: Potential risk factors associated with anti-RVFV IgG seroprevalence in cattle constructed on univariable logistic regression

Risk factor	Variables	No. tested	Number +ve	% Positive	95% CI	P-value
Locality: District	Lyantonde	367	229	62.4	57.0 – 67.0	<0.001*
	Butebo	375	211	56.3	51.0 – 61.0	
	Napak	353	107	30.3	25.0 – 35.0	
	Isingiro	375	83	22.1	18.0 – 26.0	
Locality: Subcounty	Kashumba	189	40	21.2	15.0 – 27.0	<0.001*
	Masha	186	43	23.1	17.0 – 29.0	
	Iriri	171	46	26.9	20.0 – 34.0	
	Matany	182	61	33.5	27.0 – 40.0	
	Kanginima	168	84	50.0	40.0 – 58.0	
	Butebo	207	127	61.4	55.0 – 68.0	
	Lyantonde	185	91	49.2	42.0 – 56.0	
	Kasagama	182	138	75.8	70.0 – 82.0	
Animal Age (years)	<2	95	31	32.6	23.0 – 42.0	<0.001*
	2-<4	1,257	511	40.7	38.0 – 43.0	
	4 to 6	118	88	74.6	67.0 – 83.0	
Animal Breed	Local	935	365	39.0	36.0 – 42.0	<0.001*
	Crossbred	535	265	49.5	45.0 – 54.0	
Sex	Male	281	114	40.6	35.0 – 46.0	0.389
	Female	1,189	516	43.4	41.0 – 44.6	
Abortion history	Yes	43	24	55.8	40.0 – 71.0	0.049*
	No	1,137	499	43.9	41.0 – 47.0	
Grazing type	Zero grazing	25	04	16.0	1.0 – 31.0	<0.001*
	Fenced	566	276	49.0	45.0 – 53.0	
	Communal	526	244	46.0	42.0 – 5.0	
	Migratory	353	106	30.0	25.0 – 35.0	
Animal species in a herd	Cattle only	236	103	43.6	37.0 – 50.0	0.016*
	Cattle + goats	503	239	47.5	43.0 – 52.0	
	Cattle + sheep	128	58	45.3	37.0 – 54.0	
	Cattle + goats + sheep	603	230	38.1	34.0 – 42.0	

Table 2: Multivariable logistic regression model for RVFV seropositivity in cattle

Risk factor	Variable	B	S.E.	Wald	df	P-value	OR	95% C. I for OR
Animal sex	Male cattle	-0.436	0.159	7.532	1	0.006*	0.646	0.473-0.883
Animal species on farm	Cattle + goats + sheep			9.973	3	0.019*	Ref	
	Cattle only	-0.319	0.21	2.311	1	0.128	0.727	0.482-1.097
	Cattle + goats	-0.531	0.204	6.764	1	0.009*	0.588	0.394-0.877
	Cattle + sheep	0.138	0.248	0.307	1	0.579	1.148	0.705-1.867
Animal age (in years)	4 – 6+			31.671	2	<0.001	Ref	
	<2	-1.793	0.319	31.641	1	<0.001	0.166	0.089-0.311
	<2 – <4	-0.892	0.263	11.499	1	0.001	0.41	0.245-0.686

OR: odds ratio; df: degree of freedom; CI: confidence interval; Ref: Modality considered as a reference while performing logistic regression

IgM Screening: Six anti-RVF IgM cases were identified (cattle)

District	No. tested	No. Positive	% Positive
Butebo	228	01	0.4
Lyantonde	243	01	0.4
Napak	166	03	1.8
Isingiro	84	01	1.2

Conclusions & limitations

This study revealed that anti-RVFV antibodies are present in cattle in both endemic-prone and districts with no known outbreaks. It suggests the likely endemic circulation of RVFV in the study districts notwithstanding the absence of clinical cases reported in animals or humans. The high seroprevalence in Butebo and Napak could be attributed to communal and migratory grazing systems respectively and sampling of more male and older animals. The low seroprevalence in Isingiro could be due to the sampling of more young and female animals than in other districts. Cattle kept with goats had higher seroprevalence. The presence of anti-RVFV IgM antibodies in sera can be construed as a possible recent infection of the animals in both contrasting regions. Ecological variables are being analyzed to further understand their role in RVF distribution in the four districts.

Contribution to Uganda's livestock development agenda

This information will help policymakers, planners, and stakeholders in designing and implementing cost-effective and sustainable RVF surveillance, prevention & control strategies.

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