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The Epidemiology and risk factors of Bovine Viral Diarrhoea Virus (BVDV) in Tanzanian smallholder dairy cattle.

Introduction

BVD is a highly transmissible viral disease of cattle, caused by bovine viral diarrhoea virus (BVDV). Where endemic, herds report significant production inefficiencies associated with reproductive losses, such as abortion and stillbirths. BVDV has the potential to have a significant impact in African smallholder dairy herds, yet epidemiology is poorly described in African cattle populations. It has been eradicated in many high-income countries, however, it remains a threat in Tanzania due to a lack of awareness of the disease, and a lack of control efforts.
The aim of this study was to

- improve our understanding of the epidemiology,
- estimate the seroprevalence
- investigate the risk factors associated with BVDV seropositivity in Tanzanian dairy cattle.

Methods

- A cross-sectional study was conducted in the 6 highest milk-producing regions of Tanzania. A total of 2049 animals were screened for antibodies to BVDV using commercial antibody ELISA kits.
- Seroprevalence was estimated and mapped (**Fig 1**).
- Univariable associations between BVDV seropositivity and herd-level vaccination for foot-and-mouth disease (FMD) and contagious bovine pleuropneumonia (CBPP) were explored (**Fig 2**).
- A multivariable mixed effects logistic regression model was developed to explore potential risk factors for BVDV seropositivity (**Fig 3**).

Results

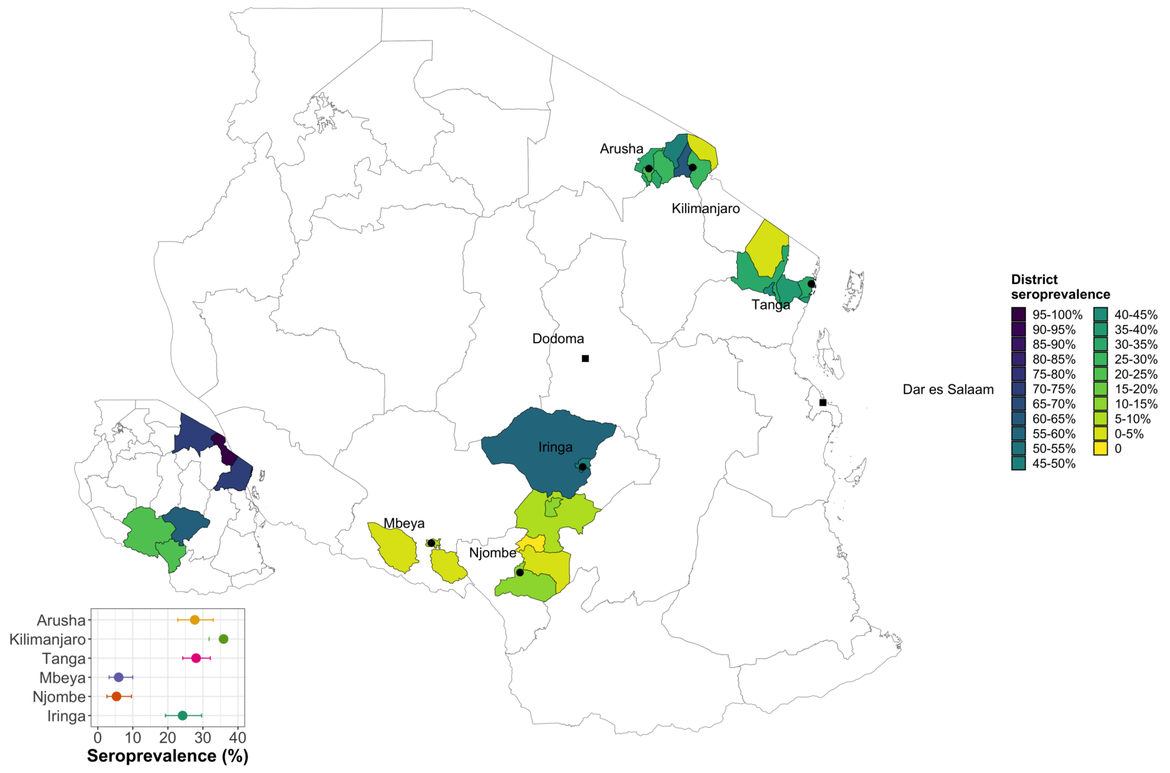


Fig 1. An inset map showing BVDV seropositivity at regional level, and an inset forest plot showing BVDV seropositivity estimate by region with 95% CI. A choropleth map showing district-level seropositivity across the 6 study sites.

Region	neg	pos	Total sampled	Prev (%)	95% CI	pops
Arusha	230	88	318	27.7	22.8 – 32.9	78,637
Kilimanjaro	334	187	521	35.9	31.8 – 40.2	161,984
Tanga	377	147	524	28.1	24.2 – 32.1	41,639
Mbeya	205	13	218	6.0	3.2 – 10.0	72,724
Njombe	177	10	187	5.3	2.6 – 9.6	7,177
Iringa	220	85	305	27.9	22.9 – 33.3	7,081

Table 1: Regional level seroprevalence estimates with 95% confidence intervals and regional cattle population size.

There are variations at district levels, and between regions.
The population adjusted seroprevalence across all 6 regions was 26.5% (95% CI: 24.3- 28.8). Kilimanjaro had the highest regional seroprevalence followed by Tanga. Mbeya and Njombe regions in the southern zones had the lowest levels of seroprevalence.

Results continued

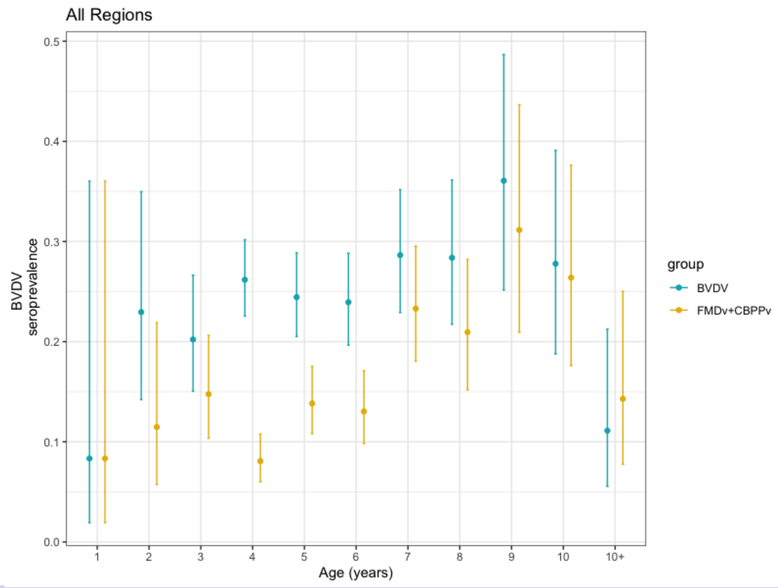
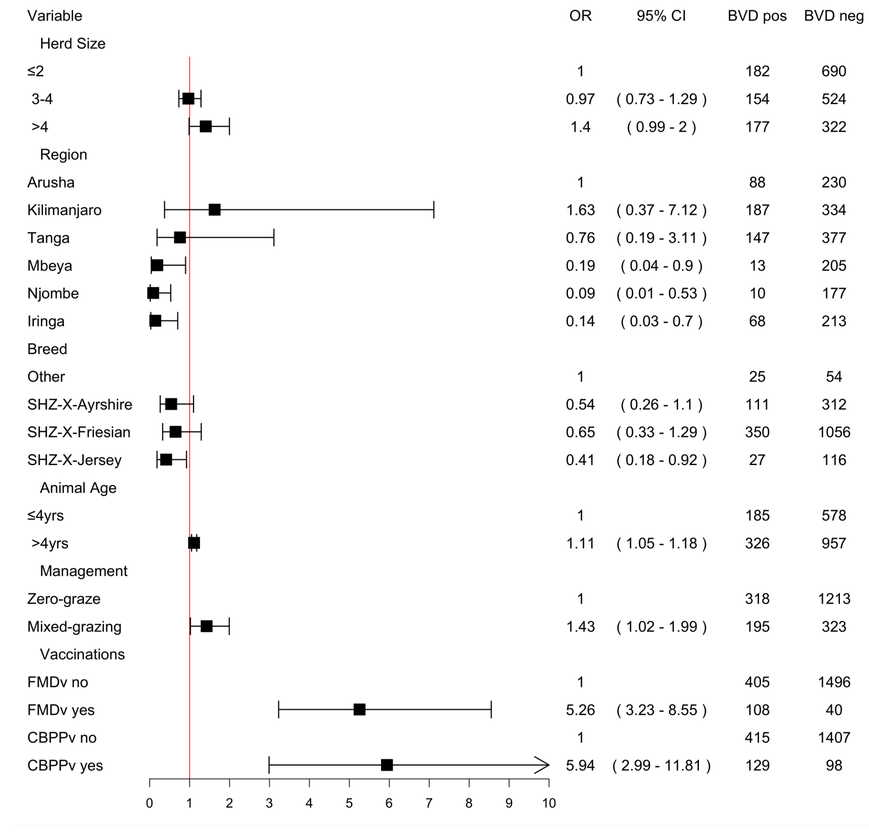


Fig 2: Plot showing BVDV seroprevalence and proportion of animals from herds vaccinating against FMD and CBPP, stratified by age, across all 6 regions.

Seroprevalence increased with age to ~ 9yo, then begins to decline.
BVDV seroprevalence was correlated with vaccine use in the herds.



*mixed grazing = extensively and semi-intensively grazed, *Zero-graze = intensively grazed.
*FMDv = Foot-and-mouth disease vaccine, CBPPv = Contagious bovine pleuropneumonia vaccine.

Fig 3: Multivariable mixed effects logistic regression forest plot showing risk factors associated with BVDV seropositivity, with district as a random effect.
Intra-cluster coefficient (ICC) = 0.21.

Older animals, larger herds and mixed-grazing systems had an increased risk of seropositivity to BVDV. Interestingly, animals from herds using FMDv and /or CBPPv were very strongly associated with being seropositive. The association between BVDV seropositivity and vaccination is being explored further.

Conclusion

- BVDV is circulating widely and seroprevalence varies between and within regions across the 6 regions in Tanzania.
- Age, herd size, and grazing management were expected risk factors but the use of vaccines was an unexpected factor.
- Further analysis of the data is currently ongoing to try and understand the seropositivity patterns observed (eg. SaTScan™), and the potential for contacts with PIs.
- We are also developing a compartmental model to explore transmission patterns, and an economic model to estimate the potential impact on productivity and whether vaccination represents an economic benefit for control.
- Further longitudinal studies are needed to understand the clinical incidence of BVDV and its impact on smallholder dairy farmers.

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