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Quantification of fertility impairments due to foot and mouth disease outbreaks in large scale dairy farms in Nakuru, Kenya

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Abstract

Foot and Mouth Disease (FMD) is a contagious viral disease to which dairy cattle are highly susceptible. This study quantified the association of FMD outbreak with fertility impairments in large scale dairy farms with a history of FMD outbreaks in the recent past. 507 cows were recorded for the period of six weeks before, six weeks during and six weeks after foot and mouth disease outbreaks. Data were subjected to general linear model and means comparison.

Results showed that abortion before foot and mouth disease outbreak was (0.19%), while during and after FMD was (2.77%, 0.99%). The retained placenta before FMD was significant (0.19%), but during the outbreak was (1.3%) and after the outbreak was (0.59%). The conception failure or the repeated insemination for the three periods: before, during and after foot and mouth disease outbreaks was (12.47%, 6.33%, and 4.95%).

Keywords: After, before, during, fertility impairments, foot and mouth disease

Introduction

Foot and Mouth Disease (FMD) is a contagious viral disease to which dairy cattle, cloven-hoofed ruminants are susceptible [9].

The duration of FMD outbreak is generally three weeks to one month [6]. During this period, production losses variable, depending on the genetics, management of the livestock, and the systems inputs and outputs [2]. In dairy cattle the disease has associated production losses are related to drop in milk yield, culling, calf mortality, impaired fertility or increased susceptibility to mastitis [13]. The most direct economic impact of FMD in endemic countries is the loss or reduced efficiency of production, which lowers farmers' income [4].

The outbreak of FMD attracts trade bans [7, 5]. The annual global impact of FMD previously has been estimated at US\$11 billion [10], moreover FMD outbreak has implications on the food nutrition and income security of the farming households and consumers as well with the threat of food supplies, security and safety [8, 12].

The effects of foot and mouth disease on fertility performance are categorized as an invisible loss and is difficult to measure particularly in the less intensive system [1], during the outbreak of FMD its effects can include: irregularity of oestrus in cattle (not seasonal), therefore extending calving interval, increase of abortion rate [11].

Retention of placenta is the inability of fetal membrane to be expelled from 8 to 48 hours, average 8 hours after parturition. The incidence of retained placenta varies from 4-18% of calving [14].

Materials and Methods

The study was undertaken in Nakuru County within Kenya Highlands. It has an altitude of 1,800 m above sea level with temperatures ranging between 17.5 °C and 22 °C on average but can drop during cold season. Average annual rainfall in the area is up to 895 mm (en.climate-date.org).

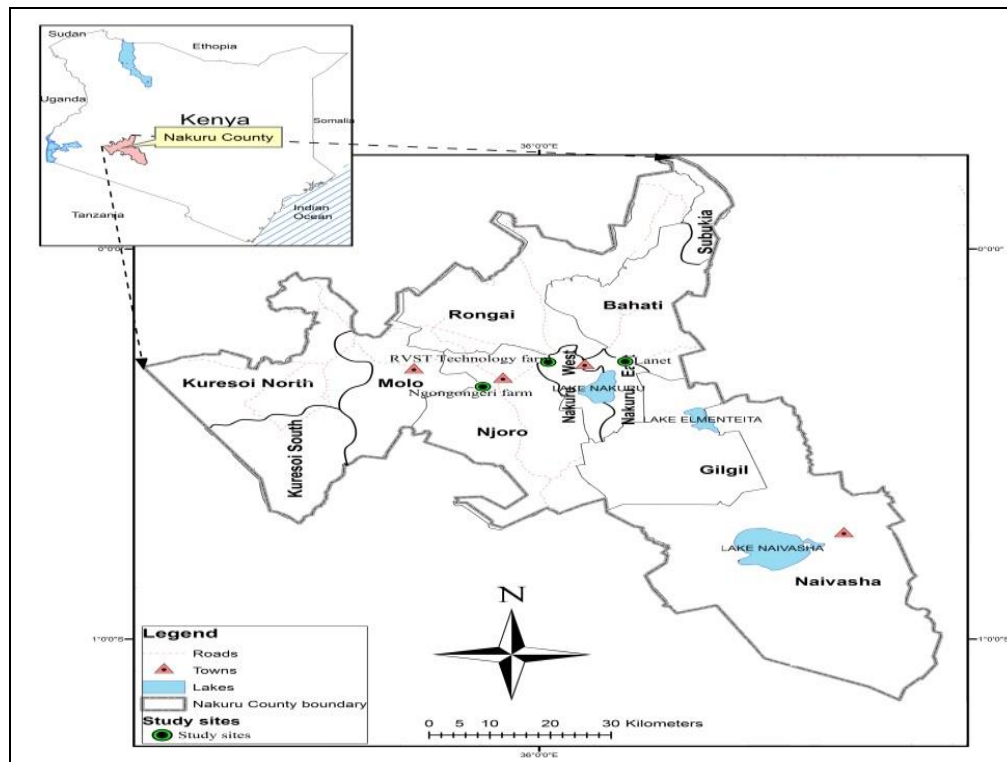


Fig 1: Show the study sites and nakuru country boundary

Three large scale dairy farms with a consistent daily record were selected for this study within Nakuru County. The data was extracted retrospectively from the farms records for the period 2008 to 2018. For each FMD outbreak event, the data on fertility impairments including abortion, retained placenta, repeated insemination. The data was partitioned into three phases: six weeks before, six weeks during and six weeks after the outbreak, to sufficient reflect the three to four weeks duration that FMD outbreak may last. The data were analyzed using SAS (2003) version 9.1.

Results

Three categories of fertility impairments (Abortion, retained

placenta, conception failure) were quantified for the period of before, during and after foot and mouth disease outbreaks whereby abortion cases during and after FMD outbreak were significant ($P < 0.05$, $P < 0.05$) comparing to the period before foot and mouth disease outbreak which was not significant ($P > 0.05$) (Table 1).

Retained placenta before and after foot and mouth disease outbreak were not significant ($P > 0.05$, $P > 0.05$), but during FMD outbreak it was significant ($P < 0.050$). Conception failure before and during foot and mouth disease outbreaks were highly significant ($P < 0.05$, $P < 0.05$) with regards to the period after FMD outbreak ($P < 0.05$).

Table 1: Fertility impairments

Period	Before n (%)	During n (%)	After n (%)	overall	Significance
Abortion	3 (16.6%)	10 (55.5%)	5 (27.27%)	18	Before ($P > 0.05$) During ($P < 0.05$) After ($P < 0.05$)
Retained Placenta	1 (9.09%)	7 (63.63%)	3 (27.23%)	11	Before ($P > 0.05$) During ($P < 0.05$) After ($P > 0.05$)
Conception failure	23 (29.48%)	22 (28.20%)	33 (42.31%)	78	Before ($P < 0.05$) During ($P < 0.05$) After ($P < 0.05$)
Total	27	39	41		

Table 2: Breed fertility impairments

Fertility impairments	Breed	Before n (%)	Period During n (%)	After	overall
Abortion	Ayshire	0 (0%)*	5 (41.66%)*	2 (50%)*	7
	Friesian	2 (0%)*	5 (41.66%)*	2 (50%)*	9
	Guernsey	0 (0%)	2 (16.66%)	0 (0%)	2
Retained Placenta	Ayshire	0 (0%)	1 (14.28%)	0 (0%)	1
	Friesian	0 (0%)*	5 (71.42%)*	2 (0%)*	7
	Guernsey	1 (0%)	1 (14.28%)	0 (0%)	2
Conception failure	Ayshire	2 (10.52%)	5 (25%)	10 (29.41%)	17
	Friesian	3 (15.78%)**	6(30%)**	11(32.35%)**	20
	Guernsey	14 (73.68%)**	9 (45%)**	13 (38.23%)**	36
	Total	21	39	40	101

*Significant **Highly significant

Discussion

Abortion, retained Placenta and insemination per conception (conception failure) were considered for fertility impairment for the three periods; before, during and after foot and mouth disease outbreaks. The reported abortion before FMD outbreak was low (0.19%), with the comparison of the period during FMD outbreaks which was higher (2.77%) and this because during foot and mouth disease the affected cows went under stress which caused the animal to loss appetite as well as the energy to move and access the feed^[15, 3]. After the recovery from foot and mouth disease outbreaks the system started to recover, therefore the recorded abortion was higher than before and lower than during FMD (0.99%). During the three periods Ayshire and Friesian were significant ($P < 0.05$), and Guernsey was not significant ($P > 0.05$).

Retained Placenta before and during foot and mouth disease was not significant ($P > 0.05$), but during foot and mouth disease outbreak was highly significant ($P < 0.05$). Among the three breeds (Ayshire, Friesian, Guernsey), it was only Friesian was significant before, during and after foot and mouth disease outbreak ($P < 0.05$).

Insemination per conception (conception failure), was high in the period after foot and mouth disease outbreak (12.47%), comparing to the two periods of before and during foot and mouth disease respectively (6.33%, 4.95). And the insemination per conception during foot and mouth disease was low because for the reason that the cows were not served during the FMD outbreak. The three breeds; Ayshire, Friesian and Guernsey were all significant ($P < 0.05$), but Friesian and Guernsey were highly significant ($P = 0.0001$).

Conclusion

To reduce the impact of foot and mouth disease the appropriate bio-security measures should be applied to reduce the production losses and to hasten recovery.

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