



Epidemiology of Foot and Mouth Disease in the Northern Zone of Kaduna State

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ABSTRACT

Foot and mouth disease (FMD) is a viral trans-boundary animal disease (TAD) of cloven hoofed animals characterized by high morbidity and mortality of young animals. The study was aimed at estimating bovine FMD prevalence in the northern zone of Kaduna State and to determine risk factors associated with the disease. A Cross sectional study was carried out in four randomly selected local government areas (LGAs) of the zone namely; Ikara, Sabon Gari, Soba and Zaria LGAs where sera were collected from 50 cattle in each of the LGAs totaling 200 samples. The sera were subjected to NSP- blocking ELISA (Priocheck^(R)) to estimate the disease prevalence in the study area. Pre-tested questionnaire was administered to pastoralist within the study area to obtain animal disease information with emphasis on FMD. The data obtained were subjected to descriptive statistics using SPSS 16.0. The overall FMD prevalence obtained was 85.5% (171/200). The positivity was higher among males (89.7%) compared to females (84.5%), higher in white Fulani [Bunaji] (89.1%) compared to Bokolooji, in younger animals (87.5%) compared to adults (84.6%) and higher in Soba LGA (92%), followed by Sabon Gari (92%), Zaria (86%) and Ikara (74%). There was a statistically significant difference ($P < 0.05$) between young and adult cattle in term of the disease occurrence, but no statistically significant differences ($P > 0.05$) based on the sex, breed, and location of the cattle to the disease prevalence. Foot and mouth disease was rated as the most important cattle disease by 65% of the respondents followed by CBPP (27.5%) and helminthiasis (7.5%). All the respondents knew FMD and can identify signs of the disease. Local names of FMD were reported as Jode, Boru and Laee. Coping strategies adopted by herdsmen during FMD outbreaks were isolation and treatment with herbal and conventional drugs. In conclusion, findings of this study confirmed FMD is endemic in the study area, sex, breed and location of the cattle had no statistically significant difference ($P > 0.05$) in the occurrence of the disease. Pastoralist had sound knowledge of the disease. Recommendations from this work are need for national FMD control program and sensitization of cattle owners on the disease preventive measures.

Keywords: Epidemiology, Foot and mouth disease, Kaduna state, Pastoralist

INTRODUCTION

Foot and mouth disease is a highly contagious viral trans-boundary animal disease (TAD) of both domestic and wild cloven-hoofed animals that is characterized by fever, loss of appetite, salivation, formation of vesicles in the oral and gastrointestinal tract mucosa, skin, especially around the hooves, teats and udder [12]. It is caused by *Apthovirus* of the family *Picornaviridae*, affecting domestic and wild ruminants (such as deer and antelope) and pigs mainly [3], [5].

Epidemiology of FMD indicates that the serotypes are not uniformly distributed in the regions of the world where the disease occurs. The collective incidence of the disease based on serotype showed that six of the seven serotypes (O, A, C, SAT-1, SAT-2, SAT-3) have occurred in Africa, four serotypes (O, A, C, Asia-1) in Asia, and three (O, A, C) in South America [20]. According to [17], the disease was first documented in Nigeria in 1929 and sporadic outbreaks continue up to date whereby serotypes A, O, SAT1 and SAT2 were associated with the disease. Outbreak of the disease occurs every year in Nigeria causing considerable economic losses to the national herd through calf mortality, weight loss, milk loss and draught power loss [17].

Serological surveys conducted between 2009 and 2011 in six Border States and two other states that host the major cattle trek showed increasing sero-prevalence in cattle sampled from Yobe State (82%), Plateau (80%), Ogun (77.77%), Taraba (73.50%), Adamawa (68%), Borno (67%) and Sokoto (63%) states [14]. Also, 75.11% prevalence in Kwara state [17].

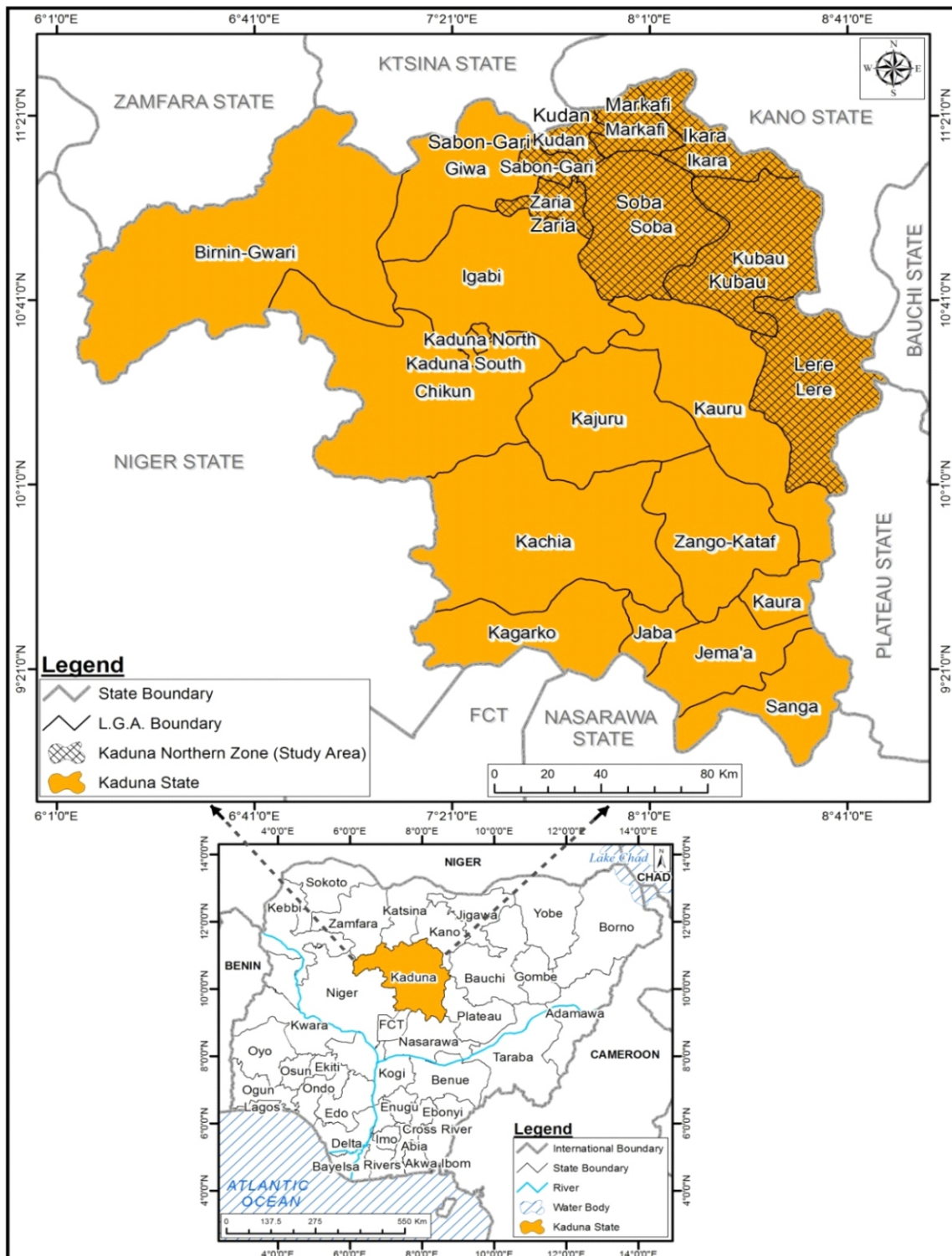
Foot and mouth disease cannot be easily distinguished from other vesicular diseases by clinical findings only, due to similarity of the clinical signs [2]. Detection of FMDV with identification of the viral serotype is the key to the diagnosis and the technique must be rapid, sensitive and specific for effective disease control [19]. Conventional laboratory diagnosis of FMD is achieved by concurrent cell culture-based virus isolation together with the enzyme-linked immunosorbent assay (ELISA) which indicates the type of viral antigen involved or by virus neutralization test [9].

Foot and mouth disease control is presently not given a required attention in Nigeria though several attempts had been made by government, which include; movement restriction of the affected herds by veterinarians, vaccine production and trials [17]. Effective quarantine procedures are very important in the disease control, however, these methods are only applicable where there is a strong institutional environment, adequate veterinary polices and man power to manage the interstate and national borders which are deficit in Nigeria [7], [17]. The disease has attained an epizootic level, but its prevalence is under or incompletely reported in Nigeria due to inefficient disease reporting system in the country [6].

The aim of the study was to estimate the serological prevalence of FMD in cattle and identify risk factors such as age, sex, breed and location associated with the occurrence of the disease in northern zone of Kaduna State.

MATERIAL AND METHODS

Study Area



The northern zone of the state comprises of the following Local Government Areas; Ikara, Kudan, Kubau, Lere, Makarfi, Soba, Sabon Gari and Zaria. The area is characterised by a mean annual temperature of 13.8-36.7°C and annual rainfall of 1092.8 mm which support production of livestock [1].

(a) Prevalence was calculated using formula [23].

$$\text{Prevalence (\%)} = \left(\frac{\text{Number of animals that tested positive to FMD}}{\text{Total number of animals sampled during the study period}} \right) * 100.$$

RESULTS

Enzyme Linked Immuno-Sorbent Assay (ELISA)

Out of the 200 samples tested for FMD NSP antibodies 171 (85.5%) were positive and 29 (14.5%) were negative. The results of NSP-blocking ELISA (Prioccheck^(R)) test showed, FMD overall prevalence of 85.5% in the study area as shown in Table 1.

Demographic Distribution of Foot and Mouth Disease Antibodies in Northern Zone of Kaduna State

Sex distribution

Out of the 200 cattle sampled females were 161 (80.5%) while males were 39 (19.5%). One hundred and thirty six 136 (84.5%) female (cows) and 35 (89.7%) of the males were positive for NS antibodies FMD was found to affect bulls more than cows but not statistically significant ($p > 0.05$) (Table 2)

Breed distribution

Cattle breed distribution showed that out of the 110 White Fulani (Bunaji) sampled, 98(89.1%) were positive and 12 (10.9%) negative, while the Bokolooji (Sokoto gudali) had 73 (81.1)

positive samples and 17 (18.9%) negative. Only the two breeds were seen during the studies. There is no significant statistical association between breed and occurrence of FMD NSP antibodies ($p > 0.05$) (Table 2)

Age distribution

Young animals in this study refers to cattle within the age group of less than 3years, while adults are those above 3 years. Out of the 200 cattle sampled 64 (32%) were young, while 136 (68%) were adults. Foot and mouth disease positivity was 56 (87.5%) and 115 (84.6%) in young and adult cattle respectively. FMD was found to affect younger cattle than older ones and is statistically significant ($p < 0.05$) (Table 2)

Location

The distribution of sero-positive cattle by sampling locations indicated that Soba LGA had the highest number 46 (92%) of positive animals followed by Sabon Gari LGA 45 (90%), Zaria LGA 43 (86%) while Ikara LGA recorded the least 37 (74%) positive. Some LGAs had animals with higher prevalence of FMD than others, though not statistically significant ($p > 0.05$) (Table 2).

Table 1: Prevalence of FMDV antibodies among pastoralist cattle in the northern zone of Kaduna State

Serum Samples tested	Frequency	Percentage (%)
Positive	171	85.5
Negative	29	14.5
Total	200	100

Table 2 Risk factors associated with FMD NSP antibody positivity

S/N	Risk factor	Total	Positive (%)	Negative (%)	X ²	P value	OR
1.	Location:				0.49	0.195	
	Ikara	50	37 (74)	13 (26)			
	Soba	50	46 (92)	4 (8)			
	S/gari	50	45 (90)	5 (10)			
	Zaria	50	43 (86)	7 (14)			
	Total	200	171 (85.5)	29 (14.5)			
2	Sex:						
	Female	161 (80.5)	136 (84.5)	25 (15.5)	0.402	0.059	1.06 (0.53 -4.92)
	Male	39 (19.5)	35 (89.7)	4 (10.3)			
	Total	200 (100)	171 (85.5)	29 (14.5)			
3	Breeds:						
	White Fulani	110 (55)	98 (89.1)	12 (10.9)	0	0.112	1.902 (0.86 -4.23)
	Bokolo	90 (45)	73 (81.1)	17 (18.9)	111		
	Total	200	171 (85.5)	29 (14.5)			
4	Age:						
	Young	64 (32)	56 (87.5)	8 (12.5)	0.582	0.039	1.278 (0.53 – 3.07)
	Adult	136 (68)	115 (84.6)	21 (15.4)			
	Total	200	171 (14.5)	29 (85.5)			

Questionnaire sought to rate important cattle diseases, from which 65% of the respondents reported FMD as the most important cattle disease in their area, followed by CBPP 27.5% and helminthiasis 7.5% (Table 3). Unanimously the respondents knew FMD as a disease entity and reported that cattle were the most affected specie in their area. They also agreed that new born were the most affected age group, weaners were moderately affected while adults were the least affected group among cattle population (Table 3).

Half of the respondents reported having had more than two episodes of FMD outbreaks

every year, 26.2% reported having had it twice, but 23.8% remembered recording one outbreak every year (Table 3). Salivation was reported as the major sign of the disease in mouth by 56.8% of the respondents, ulcers by 38.2% and reddening of the mucous membrane by only 5%. Important signs on legs included: limping (61.3%), swelling of the legs (30%) and reluctance to move (9.7%). Other clinical signs associated with the disease identified were fever (40%), anorexia (36.2%) and abortion (23.8%) (Table 3). Local names of the FMD among herdsmen were *boru* (47.5%), *Jode* (47.5%) and *laee* (5%). Source of FMD knowledge and management among herdsmen

were said to be from fellow herdsmen (56.2%) and traditional (43.8%). Coping strategies adopted by herdsmen during the disease outbreak were investigated. None of them

vaccinated during outbreaks, 28.7% practiced isolation of the sick ones, 12.5% used herbal preparations and 58.8% used conventional drugs like tetracycline in outbreaks (Table 3)

Table 3. Animal disease information and management

S/N	Category	Variable	Frequency	Percentages
1	Knowledge of FMD	Yes	80	100
		No	0	0
2	Source of knowledge	Livestock officer	0	0
		Traditional	35	43.8
		Herdsmen	45	56.2
		Media	0	0
		Others	0	0
3	Rating of important livestock disease	CBPP	22	27.5
		FMD	52	65
		Trypanosomosis	6	7.5
4	Most affected livestock	Cattle	80	100
		Sheep	0	0
		Goats	0	0
		Others	0	0
5	Age group most affected	New born	80	100
		Weaners	0	0
		Adults	0	0
6	Age group moderately affected	New born	0	0
		Weaners	80	100
		Adults	0	0
7	Age group least affected	New born	0	0
		Weaners	0	0
		Adults	80	100
8	Disease occurrence per annum	Once	19	23.8
		Twice	21	26.2
		More than twice	40	50
9	Clinical signs in mouth	Salivation	45	56.8
		Ulcers	31	38.2
		Reddening	4	5
10	Clinical signs in legs	Limping	49	61.3
		Swelling	24	30
		Reluctance to move	7	9.7
11	Other clinical signs	Abortion	19	23.8
		Fever	32	40
		Anorexia	29	36.2
12	Local names	Boru	38	47.5
		Jode	38	47.5
		Lae	4	5
13	Coping strategies adopted by the herders during outbreak	Vaccination	0	0
		Isolation	23	28.7
		Herbal treatment	10	12.5
		Conv. treatment	47	58.8

DISCUSSION

Foot and mouth disease prevalence of 85.5% was estimated from this study. The prevalence obtained was similar to the findings of [24], but higher than the findings of [17] who reported a prevalence of 75.11% from cattle in Kwara State Nigeria. However, the prevalence appears to vary with area and time of studies as in the reported earlier [14]. The increase in FMD prevalence was associated with increase in the disease endemicity as evident by outbreaks occurring every year, multiple serotypes in circulation, heterogeneity amongst serotypes, high level of the viral mutation and poor control efforts in the country [8], [17].

Prevalence distribution based on sex found higher sero-positivity (89.7%) amongst males which compared to females (84.5%) but it was not statistically significant (Table 2). This is in agreement with previous report which stated that, no difference in risk association of FMD transmission between male and female animals [11]. The distribution of sero-positive FMD cattle according to breeds showed highest occurrence in white Fulani (Bunaji) (89.1%) in comparison with Bokolooji (Sokoto Gudali) cattle breeds. This finding is statistically insignificant and could be associated with predominance of white Fulani breed within the study area at the time of sampling (Table 2). Only 2 breeds were found in the nomadic herds possibly because they are the majority in Nigerian cattle population [20]. FMD sero-positivity according to age indicated low occurrence amongst adult cattle (84.6%) when compared to the young cattle (87.5%) group (Table 2). This may be associated with repeated exposure of adults making them more immune to the virus compared to the young once. The difference was statistically significant. This findings of FMD association with age is proofing early study which reported cattle

within the age of 1-2yrs were mostly affected with FMD probably due to low immunity to the disease [8]. Geographic distribution indicated highest sero prevalence in Soba LGA (92%) with least prevalence of 74% in Ikara LGA. This could be associated with more abundance of grazing areas in Ikara such as Damau grazing reserve and Damau range which probably reduces cattle concentration in one place for grazing reasons. The difference in prevalence across the study area was not statistically significant ($P > 0.05$). Foot and mouth disease was recognized as the most important livestock disease by herdsmen followed by CBPP which agrees with the previous report [6]. It also supported [18] who reported that, CBPP and FMD are associated with widespread transmission and high economic implication. The intensity of the disease was reported to be more on calves followed by weaners then adult cattle, thus in agreement with medical findings as reported by [4]. Foot and mouth disease recurrence was reported by most of the respondents, which may be related to the effect of carrier animals within the cattle population, immunologically distinct serotypes, absence of FMD control programs in the state and immunological incompetence in some animals that was caused by disease or poor nutrition. The exceptional knowledge of herdsmen to the signs of the disease in different parts of cattle, multiple local names and learning about the disease from elders (traditional and fellow herdsmen) proved the endemicity of the disease and hardship it creates to the livelihood of the respondents in the study area. Majority of the respondents used conventional drugs in managing the disease despite the low response, while others used trial and error with herbs due to lack of vaccine and effort to survive the disease challenge.

Conclusion

General findings in the work confirmed FMD prevalence of 85.5% in the study area, age is important in FMD occurrence, while sex breed and location had little or no significance in the disease occurrence. Pastoralist had sound knowledge of the disease and are managing outbreaks through isolation and treatment with herbal and conventional drugs.

Based on the findings of this research, the following recommendations are therefore suggested: There is need for national FMD control program and need for sensitization of cattle owners on the disease preventive measures.

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