Vom Journal of Veterinary Science Vol 8, 2011

SEROLOGICAL SURVEY OF FOOT AND MOUTH DISEASE IN CATTLE IN JOS SOUTH LOCAL GOVERNMENT AREA OF PLATEAU STATE

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SUMMARY

A cross-sectional study was conducted in Jos South Local Government Area (LGA) of Plateau State of Nigeria, to determine the seroprevalence of Foot and Mouth Disease (FMD) in cattle, and identifying the potential risk factors associated with the disease. Sera samples were collected from a total of 162 cattle from the cattle population in the study area, and were analysed. The sera were analysed using FMD-NS 3D-ELISA kit at the FMD Laboratory, National Veterinary Research Institute, Vom. Potential risk factors of age, management system and location of the animals were compared with seroprevalence of FMD. Data were analysed using Chi-square test and statistical significance was set at $P \leq 0.05$. The overall seroprevalence of FMD obtained was 56.3%. The highest prevalence recorded in Ratya (82.5%) was significantly different ($P<0.05$) from the prevalence in Du (73.1%), Kara (62.5%), Rantya (66.7%) and Vom (31.2%). Age specific seroprevalence study shows a higher prevalence in Growers, (72.9%) than in Adults (51%) and Young (31.2%). The difference in prevalence among the different age status was found to be statistically significant ($P<0.05$). A higher seroprevalence was recorded in extensive management system (71%), than in intensive management system (33.3%). The difference between the two was statistically significant ($P<0.05$). The study showed that FMD is a significant disease in Jos South LGA. Thus, an appropriate control strategy which should involve regulation of cattle movement and vaccination using the circulating virus strain is advocated.

Key Words: Foot and Mouth Disease, Cattle, Seroprevalance, Jos South

INTRODUCTION

Foot and mouth disease (FMD) is caused by a virus of the genus *Aphthovirus*, family *Picornaviridae*. There are seven serotypes of the virus namely: A, O, C, SAT-1, SAT-2, SAT-3 and Asia 1. Infection with one serotype does not confer immune protection against another. Within serotypes many subtypes can be identified by biochemical and immunological tests [4]. The disease has a high morbidity although mortality is rare in adult animals. However, myocarditis may occur in young animals resulting in death. The recovered animals remain in poor physical condition over long periods of time leading to economic losses for livestock industries [7]. The disease is characterized by high fever, loss of appetite, salivation and vesicular eruptions on the feet, mouth and teats [8].

FMD is endemic to most of sub-Saharan Africa, except in a few countries in southern Africa, where the disease is controlled by the separation of infected wildlife from susceptible livestock as well as by vaccination. Largely due to the endemicity of the disease, and the fact that FMD does not normally cause high rates of mortality in adult animals, FMD outbreaks are not perceived as important and are not reported or investigated further to determine the causative serotypes. However, a number of countries now realise that FMD is one of the transboundary diseases that should be controlled to ensure economic stability and access to lucrative international export markets for animals and animals' products [7].

FMD was first reported in Nigeria in 1924 as sporadic outbreaks attributed to Type O. Subsequently, other

serotypes (A, SAT 1 and SAT 2) were identified and each new serotype was associated with trade cattle entering Nigeria from neighbouring countries [1]. There has been very little effort to control FMD in Nigeria, probably because attention is diverted to other economically important disease like Bovine Contagious Pneumonia, Rinderpest etc and also because in the traditional, pastoral Fulani herds, the disease has become endemic and consequently runs a mild course with minimal mortality.

The reporting systems of FMD outbreaks are found to be weak [1, 2]. However, FMD will continue to gain importance as the livestock rearing system becomes more intensive and the pastoral Fulanis begin to settle in response to increased demand for animal protein. This study was designed to determine the seroprevalence of FMD in Jos South LGA of Plateau State, Nigeria because of dearth of information on FMD in this area.

MATERIALS AND METHOD

Study Area

Jos South is a Local Government Area in Plateau State, Nigeria. Its' headquarter is in the town of Bukuru at 9°48′00″N 8°52′00″E. It has an area of 510 km². Jos South Local Government Council is located 15 kilometres south of the state capital, Jos. The Local Government area is divided into four districts of Du, Gyel, Vwang and Kuru.

Though situated in the tropical zone, Jos South LGA has a near temperate climate with an approximate mean high temperature of 22°C and mean minimum low temperature of 18°C. The mean annual rainfall varies from 131.75 cm to 146 cm, and highest rainfall is usually recorded in the months of July and August. The weather is always cold between the months of December and February as a result of the charlatan winds. Even though, the temperatures appear highest between March and April. (Plateau state geography information).

Study Design

A cross-sectional seroprevalence survey was conducted and information from the animal owners and risk factors such as age, location, and management system were obtained. Blood samples of apparently healthy animals were collected from the jugular vein of 162 randomly selected cattle from five different unvaccinated herds using vacutainer tubes. The blood samples were transported in an icebox, to National Veterinary Research Institute, Vom. Samples were centrifuged at 1,500 revolutions per minute (rpm) for 15 minutes for serum separation and were then kept at -20°C until analysis. The sera samples were then tested using the foot and mouth disease virus 3D (FMDV 3D) ELISA kit to determine the seroprevalence of FMD in the study area.

Study Population and Sample Collection

Study animals were selected from three districts of Jos South LGA of Plateau cattle population namely: Kuru (Vom), Du (Kara, Ratya and Du) and Gyel (Rantya). The various sampled locations in the three districts areas were selected based on the proximity to livestock market and availability of cattle population. A total of one hundred and sixty two (162) sera samples were randomly collected from apparently healthy live cattle. Each animal was properly restrained and approximately 5ml of whole blood was collected from the jugular vein into 10 ml sterile vacutainer tubes bearing the names of the location, type of management system and age of each cattle / herd. The blood was transported in an icebox, to National Veterinary Research Institute, Vom, and was centrifuged at 1500 rpm for 15 minutes for serum separation.

Serological Analysis

The sera samples were screened using the FMDV 3D-ELISA test kit (FMDV3D PrioCHECKS® Netherland) which detects antibodies directed against the non structural 3D protein of FMDV) (5). Briefly, the test sera, negative, weak positive and positive reference sera were added to 96 well ELISA plates coated with 3D antigen. Following an overnight (16-

18 hours) incubation at 22 ± 3^0C , plates were washed 6 times with washing buffer after which a peroxidase conjugate anti-ruminant antibody was added to the plate and incubated for another 60 minutes at 22 ± 3^0C. After further washing, tetramethyl benzidine (TMB) substrate was added and plates were incubated at room temperature for another 15 minutes.

The reaction was terminated by adding 1M of sulphuric acid stopping solution. The optical density values of the samples were measured at 450 nm and the result was expressed as an index derived by dividing the absorbance value of the test serum by that of the cut-off control. Results are determined based on percentage inhibition. Samples: with percentage inhibition (PI) ±50% were considered positive, while sample with percentage inhibition PI<50% negative.

Data analysis

Laboratory investigation results were analysed using Medcalc statistical software Version11.5.0 for biomedical research. Variation of the seroprevalence among different locations, variation among the different age groups and management systems were analysed using chi-square. In all the analyses, confidence level was at 95% and P ≤ 0.05 was considered significant.

RESULTS

During the study period, 162 serum samples were examined for the presence of antibody against FMD virus using FMDV 3D ELISA test. From the 162 samples examined for the presence of antibody to the FMDV3D non structural protein, an overall prevalence of 56.2% (91/162) was recorded in the study area (Table 1).

Seroprevalence of FMDV based on different Locations in Jos south LGA.

The highest prevalence recorded in Ratya (82.1%) was statistically significantly different (P<0.05) from the prevalence in Du (73.1%), Kara (62.5%), Rantya (66.7%) and Vom (31.2%) as shown in Table 1.

Seroprevalence of FMDV based on Age groups in Jos South LGA

Age specific seroprevalence study revealed a higher prevalence in Growers (72.9%) than in Adults (51.1%) and Young (31.2%). The difference in prevalence among the different age status was found to be statistically significant ($\chi 2$=13.99, P<0.05) (Table 2)

A higher seroprevalence was recorded in extensive management system (71%), than in intensive management system (34.3%). The difference was statistically significant ($\chi 2$= 20.76, P<0.05) (Table 3).

Table1: Seroprevalence of FMDV based on different Locations in Jos South LGA

Location	Number of Sample (N)	Serological Status (+ve)	Prevalence (%)
Vom	64	20	31.3
Du	26	19	73.1
Kara	40	25	62.5
Ratya	28	23	82.1
Rantya	6	4	66.7
Total	**162**	**91**	**56.2**

(Df = 4, $\chi 2$=27.63, P<0.05)

Table: 2 Seroprevalence of FMDV based on Age group

Age	Number of Sample (N)	Serological Status (+ve)	Prevalence (%)
Young (0 – 1yr)	43	14	32.6
Growers (1- 2yr	74	54	72.9
Adults (>3yr)	45	23	51.1
Total	**162**	**91**	**56.2**

(Df=2, $\chi 2$=13.99, P<0.05)

Table 3 Seroprevalence of FMDV base on Management system in Jos south LGA

Management System	Number of Sample (N)	Serological Status (+ve)	Prevalence (%)
Intensive	70	24	34.3
Extensive	92	67	71.3
Total	**162**	**91**	**56.2**

(Df=1, $\chi 2$= 20.76, P<0.05)

DISCUSSION

This study revealed that foot and mouth disease is a significant disease in Jos south LGA of Plateau state with an overall prevalence rate of 56.2%. This prevalence rate agrees with a previous study conducted on the National surveillance of FMD in which a seroprevalence of 55.5% was reported. However, the result of the present study is higher than the 33.66% obtained for the state about 23 years ago using 146S antigen ELISA technique. The sensitivity of FMDV 3D ELISA compared to 146S antigen ELISA may have accounted for the difference in prevalence recorded in this report with that recorded previously. Furthermore, the increase in prevalence found in this study compared to the previous study, may be associated with extensive movement of livestock and high rate of contact between animals at common grazing places as well as at watering point [1].

At location levels, a higher significant difference (p<0.05) in seroprevalence was observed in Ratya than other locations Kara, Du, Rantya and Vom. This variation may be due to the fact that Ratya is near to a major cattle market in the study area and as a result prone to infection from cattle from different sources being brought to the market for sale.

There was a significant difference in seroprevalence amongst animals of different age groups. The relative low seroprevalence in young animals may be indicative of low frequency of exposure to risk factors. Therefore, adult and growers animals might have acquired the infection from multiple serotypes and could produce antibodies against all serotypes of FMD. This finding was in agreement with a previous study conducted in Southern Ethiopia, where age appeared to have a significant effect on seropositivity of FMD [3].

Furthermore, significant difference in seroprevalence was recorded in different management system. It was found to be higher in extensively managed system than in intensively managed system. This finding is consistence with a previous reported by Megarsa *et al* [3], in Southern Ethiopia, where pastoral management system was seen to be significantly associated with

seroprevalence of FMD. This variation may be due to the fact that extensively managed cattle have to travel long distances in search of good pasture and surface water leading to contact of cattle of different origin, which is the predominant factor for the transmission of the disease.

In conclusion, this study has proven that foot and mouth disease is endemic in Jos south LGA, Plateau state. Therefore, strict control of animal movement along with application of FMD vaccination using the locally circulating FMD virus serotypes is recommended.

ACKNOWLEDGEMENT

I wish to thank the management of National Veterinary Research Institute for using their facilities.

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