Research Article

Risk Factors Associated with Pestedes Petits Ruminants (PPR) in Sheep and Goats in Makurdi, Benue State

Victor I[1]* Akuve B[1], Buba E[2], Helen AO[1]

[1]Department of Veterinary medicine, College of Veterinary Medicine, University of Agriculture, Makurdi, Nigeria

[2]Department of Animal Health and Production, College of Veterinary Medicine, University of Agriculture, Makurdi, Nigeria

***Corresponding author:** Victor I, Department of Veterinary medicine, College of Veterinary Medicine, University of Agriculture, Makurdi Nigeria. E-mail: vicshallom@yahoo.com

Abstract

Purpose. Peste des Petits Ruminants (PPR) is a highly contagious viral disease of sheep and goats. The disease is considered to be one of the main constraints to the productivity of small ruminants in the Sub-Saharan countries including Nigeria and the globe at large. This work is aimed at assessing the risk factors associated with the prevalence of PPR in Makurdi.

Methods: In this study, the location of interest (Makurdi) was divided into four blocks using Random block sampling method, with each township area representing a block. A total of 152 questionnaires were distributed in this study to assess the association of eleven risk factors (Locality, husbandry system, housing, herd size and composition, species, breed, sex, age, climate change/season, medication/vaccination, and source of the animal) with the occurrence of PPR in small ruminant's population.

Results: Ten different factors (with p-value ≤ 0.05) were found to be associated with PPR in Makurdi. The overall prevalence of PPR in Makurdi was found to be 51.3%. The incidence of PPR was found to be very high in dry season than rainy season. Demographically, animals less than 12 months of age and mostly female animals were most affected by PPR, and goats were found to be highly susceptible to PPR than sheep.

Conclusion: The results of this study showed that PPR is an important goat and sheep disease in the studied area. Thus, an appropriate control strategy has to be designed and applied, which could involve prevention of contact with infected goats and vaccination against the PPR virus.

Keywords: PPR; Risk Factors; Ruminants

Introduction

Peste des petits ruminants (PPR) is a highly contagious viral disease of sheep and goats [1]. Morbidity and mortality vary considerably and can be as high as 90 to 100% depending on the susceptibility of the small ruminants' population in an area, animal husbandry, breed and age [2]. Clinically, the disease is characterized by severe pyrexia, catarrhal ocular and mucopurulent nasal discharges, erosive stomatitis in early stages followed by severe enteritis and pneumonia.

Peste des Petits Ruminants (PPR) is considered a disease of great economic impact as reported by the World Animal Health Organization (OIE) particularly in the inter-tropical regions of Africa, in the Arabian Peninnsula, the Middle East and Asia [3,4]. PPR is currently considered to be one of the main animal transboundary diseases that constitute a significant threat to small ruminant production in developing countries

In Nigeria, the disease was first described under such names as "Kata" (catarrh) by [5]; Pseudo-rinderpest [6] and Stomatitis Pneumoenteritis Complex [7]. It was Subsequently reported by [8]. There are no known health risks to humans working with PPRV as no report of human infection with the virus exists [9]. A look into the factors that potentiate the disease among small ruminant's population is critical in understanding epidemiology and control of the disease. The aim of the study is to determine and assess the possible conditions (risk factors) that promote high incidence of the disease in a susceptible population of sheep and goats in

Makurdi. Secondly, to determine the impact of PPR and the most appropriate socio-economically sound approaches to PPR prevention and control in Makurdi.

Materials and Method

Study Area

The study was conducted in four township areas of Makurdi Local Government Area (Longitude 8.5º E and Latitude 7.74ºNorth) of Benue State designated as blocks. They include: North-Bank (in the North), Wurukum (in the Central area), Wadata (in the South) and Modern Market/Ankpa Ward (in the west). The annual rainfall is between 1200-1500mm and mean temperature of 21ºC-30 ºC [10]

Sampling and Data Collection

Using Random block sampling method, the study area (Makurdi) was divided into four blocks with each township area representing a block. A total of 152 questionnaires were distributed to farmers and herds men for risk factor assessment and a total of 11 risk factors were assessed to determine their association with the occurrence of PPR in sheep and goat in Makurdi. Fifty (50) questionnaires were administered in North-Bank, thirty (30)

in Wurukum, thirty-three (33) in Wadata and thirty-nine (39) in Modern-Market/Ankpa Ward. The eleven risk factors assessed include: Locality, husbandry system, housing, herd size and composition, species, breed, sex, age, climate change/season, medication/vaccination, and source of the animal.

Data Analysis

Data obtained were analyzed using Graph Pad Prism computer software version 5.0 in a 2-tailed Chi-square test to determine the association between the investigated 11 risk factors and PPR positive and negative cases as suggested from the information provided by the farmers and herd owners in the questionnaire (univariate analysis). A logistic regression model was then used to assess the association between the risk factors (with $p \leq 0.05$) and the PPR positive and negative cases (multivariate analysis).

Result and Discussion

Univariate analysis using Chi-square

Eleven risk factors were assessed using a structured questionnaire for every sampled herd. Ten different factors (with p-value ≤ 0.05) were found to be associated with PPR as shown in (Table 1).

Risk factor		No of tested animals	No of positive samples	Prevalence (%)	X^2	df	p-value
Locality	A	50	32	64	8.732	3	0.0331
	B	30	18	60			
	C	33	12	36.4			
	D	39	16	41			
Husbandry system	A	32	23	72	2.437	3	0.0001
	B	22	14	63.6			
	C	38	6	15.7			
	D	60	35	58.3			
Housing	A	54	38	70.4	13.68	5	0.0178
	B	43	12	27.9			
	C	5	1	20			
	D	12	7	58.3			
	E	21	11	22.4			
	F	17	9	52.9			
Herd composition	A	43	19	44.2	1.623	2	0.4442*
	B	17	8	47.1			
	C	92	51	55.4			
Species	A	37	13	35.1	5.125	1	0.0236
	B	115	65	56.5			

Factor	Category						
Vaccination status	A	15	3	20	34.86	3	0.0001
	B	23	3	13			
	C	39	17	43.6			
	D	75	55	73.3			
Source of animal	A	74	51	68.9	27.99	2	0.001
	B	53	19	45.9			
	C	25	8	32			
Breed (Goats)	A	66	46	69.7	8.010	2	0.0182
	B	40	27	67.5			
	C	9	2	22.2			
Breed (Sheep)	A	24	13	29.2	5.261	1	0.0218
	B	13	2	30.8			
Sex	A	61	33	54.1	6.969	1	0.0083
	B	91	68	74.7			
Age	A	33	9	27.3	10.15	2	0.0062
	B	39	21	53.8			
	C	80	48	60			
Season/Climate	A	63	21	33.3	13.93	1	0.0002
	B	89	57	64.1			

Table 1: Prevalence/Incidence rates of PPR in North-Bank, Wurukum, Wadata and Modern Market/Ankpa Ward areas of Makurdi and the number of animals investigated.

Multivariate analysis using Logistic regression

The risk factors, suspected to be associated with PPR from univariate analysis, were further subjected to multivariate analysis using Logistic Regression model as shown in (Table 2).

No of questionnaires for +ve PPR Incidence	32	18	12	16	78
Prevalence/Incidence (%)	64	60	36.36	41.03	
No of Sheep	14	6	8	9	37
No of Goats	36	24	25	30	115
Males	24	9	13	15	61
Females	26	21	20	24	91
Adults Kids and Lambs	29	17	18	16	80
	21	13	15	23	72

Table 2: Univariate analysis for risk factor associated with PPR prevalence using Chi-square (χ2) test.

Furthermore, Summary percentage distribution of PPR prevalence based on localities in Makurdi is presented in (Table 3).

Location	No of samples	No positive	Percentage Prevalence
North-Bank	50	32	41.0
Wurukum	30	18	23.1
Wadata	33	12	15.4
Modern Market/Ankpa Ward	39	16	20.5
Total	152	78	100

Table 3: Percentage distribution of PPR prevalence in Makurdi by location.

Assessment of risk factors is important for effective control and eradication of PPR in this study, the overall prevalence of PPR in Makurdi was found to be 51.3%. From all the locations, North-Bank was found to have the highest PPR prevalence in Makurdi with prevalence rate of 64%. This may be attributed to the high small ruminant population in North-Bank area as the International Cattle Market which also serves as a goat and sheep market (where the major large and small ruminant transactions in Makurdi takes place) is situated there. Wurukum, Wadata and Modern Market

areas had prevalence rates of 60%, 36.5% and 41% respectively. This study showed that the overall prevalence (51.3%) was low as compared to some other previous studies; for example, 54% by [11], 61.8% by [12], 62.8% by [13], and 70.2% by [14]. This variation might be due to the wide-coverage of vaccination against PPR in 2010 and 2011 (Mai, et al. 2004). These findings agreed with the reports of [15].

In this study, animals reared under open grazing and pastoralist systems had higher prevalence, with prevalence rates of 71.2% and 63.6% respectively. Low prevalence was found in the animals reared in intensive and semi-intensive systems (15% and 58%). This was similar to the findings of [14]. In addition, this could also be attributed to the restricted movements of the animals kept under the latter systems as well as to the vulnerability of small ruminant herds in pastoralist and open grazing systems to infected herds in pastures and water points. This finding is in agreement with the observations of [15]. PPR prevalence was found to differ significantly between housing categories. Among the animal housing types, the animals without housing had the highest PPR prevalence (70.4%) followed by animals in barbed wire/wire mesh, shrub and scrap fences with prevalence rates of 52.9%, 58.3% and 52.4%. The prevalence rate in animals kept in modern houses with fences was found to be low. Animals kept in mud and brick houses had the lowest prevalence rates of 27.9% and 20% respectively as shown in (Table 2).

Furthermore, Females were more affected with PPR, with a prevalence rate of 74.7% than males (54.1%) thereby agreeing with [12]. The present breeding system in Makurdi could be the reason for this variation as female animals were kept longer time for reproduction purpose. But, it disagreed with [16] who stated that males are most affected by PPR, and this might be due to genetic variation of the animals. Animals older than 12 months of age had the highest prevalence (60%) followed by animals from 4 to 12 months of age as shown in (Table 2). This can be attributed to waning of the maternal immunity in young animals older than 4 months of age and the absence of PPR antibodies in the serum of older animals never exposed to or vaccinated against the disease. Low prevalence was found in kids and lambs ageing 1 to 3 months. This can be attributed to the presence of maternal colustral antibodies. These results agree with the findings of [17], who reported a higher prevalence in animals older than 2 years. In this study, goats were found to have higher prevalence (56.5%) than sheep (35.1%), this finding is consistent with the report of [1].

The West African Dwarf (WAD) breed of goat was found to have higher PPR prevalence (69.7%) than the Sokoto red (67.5%) and Sahel (22.2%) breeds of goat. Similarly, the Yankasa breed of sheep was found to have a higher prevalence (30.8%) than the West African Dwarf (WAD) breed sheep (29.2%). These may be due to genetic factors. Prevalence of PPR in Makurdi is higher during the dry/harmattan season (64.1%) than in the wet/rainy season (33.3%). These findings agree with the report of while it differed from the findings of [12,14]. Seasons with high wind-speed significantly supports aerosol transmission of PPR compared to the season with slow wind-speed. Animals vaccinated and on medication history have lower rate of PPR (73.3%) compare to those with no vaccination history but have some medication history (43.6%). In this study, animals obtained from open market showed higher prevalence rate (68.9%) than those obtained from farm owners via breeding and as gifts (35.9% and 32% respectively). This may be due to; most animals sourced from the open market are sick animals that owners want to sale to minimize loss or animals that have contracted the disease via co-mingling with sick animals in the market/sales point prior to being bought as the disease is transmitted via close contact with infected animal's secretions and excretions of infected animals [3].

Conflict of Interests

The authors of this article declare that there is no conflict of interest regarding the publication of this paper.

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