

## Abortions in *Peste Des Petits Ruminants* (PPR) infected flocks in Yola North of Adamawa and Askira Uba areas of Borno States, Nigeria

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### ABSTRACT

*Peste des petits ruminants* (PPR) is a highly contagious viral disease of sheep and goats with as high as 90% morbidity and 80% mortality rates. Although, its substantial economic consequences are reported in goats worldwide, there are currently little information regarding abortion cases in PPR endemic areas in Nigeria. This study investigated occurrences of abortion among PPR infected goats in Yola North and Askira Uba local government areas of Adamawa and Borno States respectively. The study involved analysis of clinical case records of two thousand Sahel goats (n = 2000) procured as part of a livestock restocking program by a government agency. The goats were purchased from local markets and held in quarantine for 2 weeks during which PPR infection was monitored. In the study, a fast spreading infection characterized by severe dehydration, respiratory difficulty, pyrexia, depression, anorexia, nasal and ocular discharges and death of many infected goats informed a suspicion of PPR infection. The number of abortions, mortality and age of the animals were recorded during the investigation. Data were organized in a 2×2 contingency table and analyzed using Chi-square. The overall mortality in both populations was 42% and the occurrence of abortion was 1% and 3% in Yola North and Askira Uba holding sites respectively. The proportion of abortions did not differ significantly ( $p > 0.05$ ) between both populations but there was a positive association indicated as  $r = 0.4264$  and  $0.4638$  between the occurrence of abortion and mortality in Yola North and Askira Uba holding sites respectively. In addition, the severity in clinical manifestation of the disease appeared higher in younger goats (< 1 years) than the adult ones. These findings suggest that PPR infection could be associated with abortions in goat flocks found in these PPR endemic areas.

**KeyWords:** Abortion, Mortality, Sahel goats, Nigeria, *Peste des petits ruminants*

### INTRODUCTION

*Peste des Petits Ruminants* (PPR) is an acute and highly contagious viral disease of goats and sheep, caused by Morbilivirus of the family *Paramyxoviridae* (Gibbs *et al.*, 1979). It is a disease of economic importance known for its rapid spread and possible destruction of entire population of susceptible animals (Dhar *et al.*, 2002; Ahaduzzaman, 2020). Although, sheep are said not to suffer clinical infection due to what appears as innate resistance to the infection in sheep (Abubakar *et al.*, 2015), its unquantifiable effects are recognized in goats, where 50 – 80% mortality and 80 – 90% morbidity has been reported (Abubakar *et al.*, 2008). PPR infections are also occasionally recorded in cattle, camels and wild ruminants (Lembo *et al.*, 2013; Li *et al.*, 2017).

Currently, there are conceivable interests in complete eradication of the disease across Africa, as such, all risk factors, manifestations and economic consequences of the disease requires comprehensive investigation.

In Nigeria, there are evidences of PPR outbreaks in West African dwarf goats (Opasina and Putt, 1985) and unvaccinated Sahel goats (El-Yuguda *et al.*, 2009). The effects of PPR on reproductive health were documented by Kumar *et al.* (2018) and their possible association with abortion was previously established (Abubakar *et al.*, 2008). Symptoms of PPR disease include fever, erosive stomatitis, pneumonia, oculo-nasal discharges and diarrhea. The incubation period varies between 4 – 7 days (Naznin *et al.*, 2014) and transmission is via aerosol and direct contact

between infected and susceptible animals (Fournie *et al.*, 2018). Death of infected animals may occur within few days post infection due to severe dehydration and respiratory failure (Diallo *et al.*, 2007). The severity of PPR disease is based on several factors which include age, species of the animal, host immune status and previous exposure of susceptible animals to the virus (Abubakar *et al.*, 2016).

Reproductive losses like abortion are among major economic consequences associated with PPR disease in susceptible animals. Although, in Africa, comprehensive investigation of this disease is now highly recommended, there are currently no reports regarding occurrences of abortion in PPR cases in most part of West Africa including Nigeria. This study therefore, was designed to investigate the occurrence of abortion cases among PPR infected goats in Yola North and Askira Uba local government areas of Adamawa and Borno States respectively.

## MATERIALS AND METHODS

### ANIMAL MANAGEMENT SYSTEM

This study involved two thousand Sahel goats procured from various livestock markets in parts of North East Nigeria, and intended for distribution in a government funded livestock restocking program. The goats were kept at different holding points for a period of 2 weeks and were intensively managed. They were fed with groundnut hay and a mixture of beans and guinea corn chaff. Clean water was provided for them *ad libitum* during the quarantine period.

### ANIMALS AND QUARANTINE SITES

Fifty percent of the studied population ( $n = 1000$ ) were held in quarantine for 2 weeks at a holding site in Yola-North Local Government Area of Adamawa State while the remaining population were also quarantined for 2 weeks in Askira Uba Local Government Area of Borno State.

### DATA COLLECTION AND CLINICO-PATHOLOGIC EXAMINATION

The animals were clinically observed and postmortem examinations of dead animals were conducted. Records of abortion and mortality occurrences with a corresponding age of the animals were investigated in this study. Specimens from sick animals were also collected and transported adequately to Laboratory Medicine Unit, Faculty of Veterinary Medicine, University of Maiduguri for processing and confirmation of PPR antibodies.

### DATA ANALYSES

Data obtained were organized in a 2 by 2 contingency table and analyzed using Chi-square. Correlation coefficient ( $r$ ) was determined by linear regression and  $P$ -values of less than 0.05 were considered statistically significant. Graph pad Instat<sup>®</sup> was used for the analysis.

## RESULTS

### MORTALITY AMONG SAHEL GOATS QUARANTINED IN YOLA NORTH OF ADAMAWA AND ASKIRA UBA LOCAL GOVERNMENT AREAS OF BORNO STATE, NIGERIA

In this study, PPR infection was suspected and affected animals were observed with oculo-nasal discharges, smelly exudates from the mouth (plate I), mucoid to watery diarrhea and retained placenta in some affected goats (plate II). Table I showed that; a higher proportion (504) representing 25% of the overall mortality was observed in populations quarantined in Askira Uba local government area of Borno State. Although, a proportion of 17% mortality was also recorded in Yola North areas of Adamawa State, the proportions of goat survivors (33%) in this region differed significantly ( $p < 0.05$ ) from those in Askira Uba holding site. Carcass of dead animals were dehydrated and the postmortem examination revealed congested lungs with dark red areas around the anterior lobes, congested intestine with hemorrhages, and ulcerations in dental pad, surface of the tongue, palate and inner membrane of the vagina.

**Table I: Mortality among Sahel goats quarantined in Yola North of Adamawa and Askira Uba local Government Areas of Borno State, Nigeria**

SITES	Dead	Alive	Total
Yola North	348 (17%) <sup>a</sup>	652 (33%) <sup>c</sup>	1000 (50%)
Askira Uba	504 (25%) <sup>b</sup>	496 (25%) <sup>d</sup>	1000 (50%)
<b>Total</b>	852 (42%)	1148 (58%)	2000 (100%)

Values on the same rows and column with different superscripts differed significantly at  $p < 0.05$

### ABORTION AND MORTALITY PROPORTIONS AMONG SAHEL GOATS QUARANTINED IN YOLA NORTH OF ADAMAWA AND ASKIRA UBA LOCAL GOVERNMENT AREAS OF BORNO STATE, NIGERIA

Table II showed that the proportion of abortion occurrences observed in Askira Uba quarantine site was 3%. This did not differ significantly ( $p > 0.05$ ) with the 1% proportion recorded in Yola North area of Adamawa state. A positive association indicated as  $r = 0.4264$  and  $0.4638$  between the occurrence of abortion and mortality in Yola North and Askira Uba sites respectively was recorded during the investigation (Table II).

### AGE WISE DISTRIBUTION OF MORTALITY AMONG GOATS QUARANTINED IN YOLA NORTH OF ADAMAWA AND ASKIRA UBA LOCAL GOVERNMENT AREAS OF BORNO STATES, NIGERIA

Table III showed that the highest mortality (679) which represents an overall proportion of 80% in both studied population was recorded in young goats of less than 1 year of age. Although, 20% of the mortality proportions were also recorded in the adult population, the pattern of mortality descends significantly with an increase in age; goats of less than 1 year old presented 30 % and 50 % mortalities against the 11 % and 9 % in adult populations quarantined in Yola North and Askira Uba population sites respectively (table III). Meanwhile, there was no record of vaccination before purchase of any of the animals investigated in the current study; the severity in clinical manifestation of the disease appeared higher in younger goats (< 1 years) than the adult ones.

### MORTALITY AMONG SAHEL GOATS QUARANTINED IN YOLA NORTH OF ADAMAWA AND ASKIRA UBA LOCAL GOVERNMENT AREA OF BORNO STATE, NIGERIA

In this study, the mortality was initially few but increases and peaked at approximately day 11 to 12 in both studied population (Figure I). Similarly, the mortality decreased from day 14 of quarantine in both populations. The pattern of mortality did not differ significantly ( $p > 0.05$ ) between quarantined population in Yola North and Askira Uba local areas of Adamawa and Borno states respectively.

### DISCUSSION

*Peste des petits ruminant* (PPR) still remains a major constraint that impacts on small ruminant production. Although, reports on outbreak of PPR is available in literatures from most part of West Africa including Nigeria, this study provided additional information on occurrences of abortion in PPR infected goats but in some parts of North East Nigeria. In the study, the observed retained fetal membrane and aborted fetuses, with a fast spreading infection characterized by severe dehydration, respiratory difficulty, pyrexia, depression, anorexia, nasal and ocular discharges and death of many infected goats informed a suspicion of PPR infection (Obiet *et al.*, 1988). These findings were similar to previous findings reported by El-Yuguda *et al.* (2009) in long legged Sahel and Balogun *et al.* (2017) in Africa Dwarf goats. The pattern and severity of mortality observed in the study agreed with reports of Zahur *et al.* (2014) and Kumar *et al.* (2018). Meanwhile, a greater percentage of domestic small ruminant population (62.5%) is at risk of PPR infection, efforts are currently geared to curtail the disease in livestock restocking programs for poverty

**Table II: Abortion and mortality proportions among Sahel goats quarantined in Yola North of Adamawa and Askira Uba local Government Areas of Borno States, Nigeria**

Sites	No. of female goats affected	Abortion	Mortality	Correlation coefficient ( <i>r</i> )
Yola North	360 (40%)	12 (1%)	348 (39%)	0.4264
Askira Uba	533 (60%)	29 (3%)	504 (56%)	0.4638
Total	893 (100%)	41 (4%)	852 (96%)	



**Plate 1: Nasal and oral discharges (arrow) in a suspected Peste des Petits Ruminants PPR case**



**Plate II: Diarrhoea and retain foetal membrane (arrow) in a suspected Peste des Petits Ruminans case**

alleviation in most part of developing countries like Nigeria (FAO, 1999).

Abortions observed in the study were at any stage of gestation, similar to a previous finding by Abubakar et al. (2008) and did not differ significantly ( $p > 0.05$ ) in both investigated population (Yola North and Askira Uba holding sites). The reports of Kardjadj et al. (2016) and Kumar et al. (2018) also described PPR virus as a risk factor for abortion in goats. The virus may traverse physical barriers of the maternal defense system or affects the immature fetal immune defense systems leading to possible fetal loss at any stage of the pregnancy. Furthermore, there was no evidence of fetal malformation observed in the current study and the finding corresponds with that of Abubakar et al. (2008) who had previously related PPR virus to high rate of abortions in infected pregnant goats in Pakistan.

In the current study, the effect of the offending pathogen on subsequent reproductive cycle of infected survivors could not be established. Previous findings suggested the possibility of PPR virus pathogenesis to adversely compromise the early reproductive cycle of PPR infected goats due to increased oxidative stress (Halder et al., 2014; Kumar et al., 2018). The significantly low mortality obtained

for the adult population may be connected with satisfactory immunity probably developed from previous exposure to natural infection. This finding is in corroboration with the findings of Zahur et al. (2014) and Kumar et al. (2018). The overall mortality in both populations was high (42%) and the positive association between abortion and mortality occurrences suggests the possible association of PPR infection with abortion in the quarantined goats purchased from these PPR endemic areas. It is then concluded that abortions could occur at any stage of pregnancy in PPR infected goats and impacts negatively on production and economic outcome of poor farmers. In other words, controlling the disease in this part of North East Nigeria will help to improve small ruminant domestication and food security of interested farmers that largely depends on goat's domestication.

#### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest

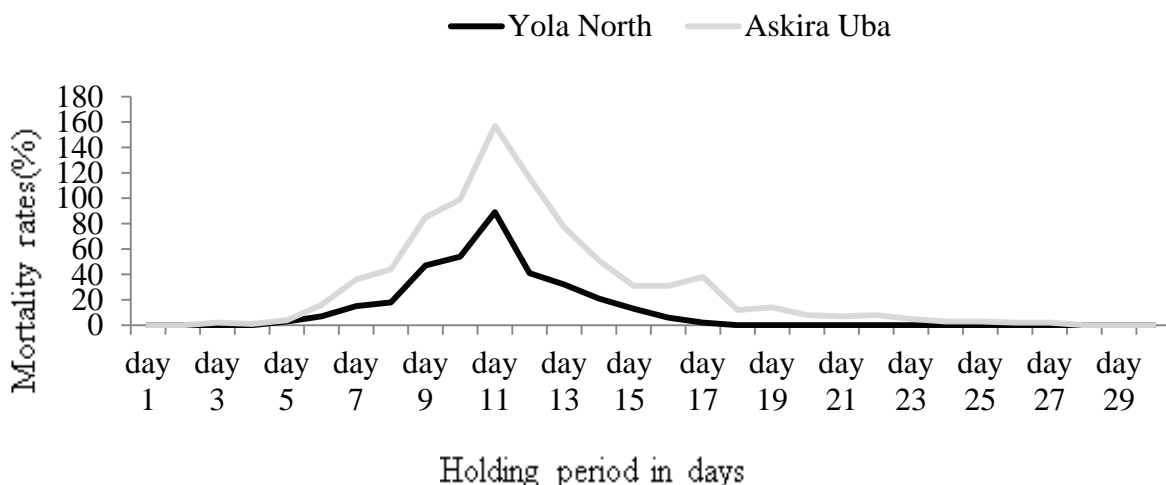
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**Table III: Age wise distribution of mortality among goats quarantined in Yola North of Adamawa and Askira Uba local government area of Borno State, Nigeria**

Mortality	Yola North	Askira Uba	Total
Young (< 1 year)	252 (30%) <sup>a</sup>	427 (50%) <sup>b</sup>	679 (80%)
Adult (> 1 year)	96 (11%) <sup>c</sup>	77 (9%) <sup>d</sup>	173 (20%)
Total	348 (41%)	504 (59%)	852 (100%)

Values on the same column or rows with different superscripts differed significantly at  $p < 0.05$



**Figure I: Pattern of mortality among Sahel goats quarantined in Yola North and Askira Uba local government areas of Adamawa and Borno States, Nigeria**

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