

Seroprevalence of Peste Des Petits Ruminants in Goats of Southern Parts of Tigray Region

Berihun Afera, Daniel Hussien and Kassaw Amsalu

Mekelle University, College of Veterinary Medicine, Mekelle, Ethiopia

Abstract: A cross-sectional study to investigate Peste des Petits Ruminants (PPR) seroprevalence was conducted between December 2011 and August 2012 in selected sites of southern part of Tigray region Ethiopia. A total of 240 serum samples were collected from goats. Competitive Enzyme Linked Immunosorbent Assay (c-ELISA) was used to detect the presence of antibodies in the sera of animals as indicator of exposure to the PPR virus. The results showed an overall individual animal seroprevalence of 47.5% (114/240). The seroprevalence of the disease in the different sites was 50.8% (22/48), 50% (24/48), 50% (24/48) and 45.8% (44/96) in Kukufto, Adigudem, Chercher and Maychew respectively where there is no statistical significance difference in the different sites ($P>0.05$). At the same time; the seroprevalence in the young and adult goats was 49.6% (59/119) and 45.% (55/121) respectively where there is no statistically significant ($P>0.05$). Similarly; the prevalence of the disease in male and female goats was 47.5% (28/59) in male and 47.5% (86/181) in female but there is no statistical significance between male and female goats ($P>0.05$). The high village-level seroprevalence of PPR illustrates a remarkable contagious nature of the disease. In conclusion, this study revealed a high seroprevalence and subsequent endemic establishment of PPR in goats in the selected study areas. This disease is detrimental to small ruminant welfare and causes substantial economic losses, thereby affecting the livelihood of poor farmers and pastoralists. The need for implementing feasible control measures is, therefore, eminent to minimize the losses associated with the disease.

Key words: Competitive (ELISA) • Goats • PPR • Seroprevalence • Tigray

INTRODUCTION

The small ruminant population of Ethiopia is about 25,509,004 sheep and 22,786,946 Goats [1] Owing to their high fertility, short generation interval and adaptation even in harsh environments, sheep and goats are considered as an important asset of poor framers. Small ruminants are exploited in the country for diverse purposes [2]. However, small ruminant production and productivity and producers' benefits are far below expectations due diseases and other factors. Peste des Petits Ruminants (PPR) is one of the important diseases affecting the productivity of small ruminant [3]. The disease is first described by Gargadennec and Lalanne from Ivory Coast in West Africa [4].

Peste des petits ruminants (PPR) is an acute, highly contagious, notifiable and economically important transboundary viral disease of goats and sheep, which is

listed by the World Organization for Animal Health (OIE). The disease is characterized by high fever, ocular and nasal discharge, pneumonia, necrosis and ulceration of the mucous membrane and inflammation of gastro-intestinal tract leading to severe diarrhea [5]. Morbidity and mortality rates can be as high as 100 and 90 per cent, respectively. The causative agent of this economically important disease of small ruminants is a Morbillivirus, the Peste des Petits Ruminants Virus (PPRV), under the family Paramyxoviridae of order Mononegavirales [6]. The virus is closely related to Rinderpest virus (RPV), another member of Morbillivirus genus, which causes similar disease in large ruminants [7].

Nowadays the disease is recognized as responsible for mortality and morbidity across many countries of the world. Middle East and Arabian Peninsula; Iraq, Saudi Arabia, United Arab Emirates, Kuwait, Israel, Yemen and Oman are known to have the disease [8]. In Africa, PPR

Corresponding Author: Kassaw Amsalu, Mekelle University, College of Veterinary Medicine, P.O.Box 231, Mekelle, Ethiopia.

has been reported from different countries [9]. Prevalence of 57.6% has been reported in Uganda [10]. Similarly, in Tanzania and Nigeria seroprevalence rate of 46% and 55% respectively were reported [11,12].

In Ethiopia, Clinical PPR was suspected in 1977 in afar region, East of the country [13, 14]. Clinical and serological evidence of its presence confirmed in 1991 in Addis [15]. Gelagay [16] has reported that 14.6% of sheep sampled along 4 roads from Debre Berhan to Addis Ababa were seropositive for PPR. Waret-Szkuta *et al.* [17] has also reported an overall seroprevalence of 1.7% in Oromia, 21.3% in Somalia, Amhara region of Ethiopia. Most recently, an overall seroprevalence record of 30.9% from sheep and goat in pastoral and agro-pastoral area of afar and Gambella region of Ethiopia has been reported Megersa *et al.* [18].

Goats are the vital asset of rural farmers in Ethiopia including in the current study area. Hence, the control of disease like PPR is a major goal for programme aimed at poverty alleviation. In this regards, comprehensive quantification of the occurrence of the disease is the primary requisite for the control program.

There fore the objective of the study was

- To determine the sero-prevalence of Peste des petits ruminant's (PPR) in goats

MATERIALS AND METHODS

Study Design and Sampling Strategies Determination:

A cross-sectional study was undertaken in Maychew, Mekhoni, Hintalo wejerat, Kukfto district of southern zone from November 2010 to August 2011. A multi stage simple random sampling was utilized for selection of animals from individual households. First the four study districts were selected purposely. Then a list of peasant associations (PAs) within district was obtained from the districts agricultural office (Second stage) and sampling PAs were selected based on representation of the respective districts and accessibility. Villages were selected by purposive sampling on the basis of prior information on the problem, farmers' cooperation, logistics, share of communal grazing land and accessibility (Third stage). Finally, animals will be examined to test the occurrence of the disease in the selected areas. Concerning the age criteria, the goats were divided between two categories of individuals where young (Less than 6 months of age) and adult individuals were considered also belonging to the local breed.

Sample Size: The sample size was determined by taking the relative frequency goats, relative frequency of house hold to get the goats and house hold proportion. Then by using expected previous prevalence of 20% in the region due to absence of any data, a total of 245 goats was examined according to the formula given by Thrusfield [19]. The age group of sampled Goats was in the range of 1–3 years to rule out maternal antibody (>1 year) and to discover recent infection (<3 years).

$$n = \frac{1.96^2 \times P_{exp} (1 - P_{exp})}{d^2}$$

whereas

n= the total sample size;
Pexp= expected prevalence;
d= absolute precision

Sample Collection: Blood was collected from jugular-vein puncture using venoject needles and vacutainer tubes (Venoject, UK). For collection of serum samples 4ml of blood from the jugular vein of goats were collected using plain vacutainer and the blood will be put at room temperature for about 24 hours in tilted position. After 24 hours the serum was harvested using cryovials and put in the refrigerator and kept on ice for transportation to the laboratory. In the laboratory, the serum will be centrifuged for 2000 rpm for five minutes to remove the remaining red blood cells before being transferred to 2-ml cryovials and stored at -20°C.

Laboratory Examination: Serum samples were analyzed by the National veterinary Institute (NVI, Debreziet, Ethiopia) using a competitive ELISA kit according to the instructions of the manufacturer (Institute for Animal Health, Pirbright Laboratory, UK). The ELISA micro-plates were read with an immunoskan reader (Flow laboratories, UK) with an inference filter of 492 nm. The reader was connected to a computer loaded with ELISA Data Information (EDI) software (FAO/IAEA, Vienna, Austria), which was used to automate the reading and calculation of the percentage of inhibition (PI) values. The OD (Optical Density) values were converted to percentage inhibition using the following formula:

$$PI = 100 - (OD \text{ control or test serum} / OD \text{ monoclonal control}) * 100$$

The samples with PI > 50% (cut-off) were considered as positives.

Table 1: Seroprevalence of PPR in different sites of southern part of Tigray region.

Sites	Examined animals	Total positives in% (prevalence)	Chi-square	P-value
Kukfto	48	22 (45.8)	0.401	0.940
Adigudem	48	24(50)		
Chercher	48	24(50)		
Maychew	101	44(43.6)		
Total	240	114(46.53)		

Table 2: Seroprevalence of PPR in young and adult goats

Age groups	Number of animals examined	Total positives in% (prevalence)	Chi-square	P-value
Young	119	59 (49.6)	0.552	0.305
Adult	126	55 (43.65)		
Total	245	114 (46.53)		

Table 3: Seroprevalence of PPR in male and female goats

Age groups	Number of animals examined	Total positives in% (prevalence)	Chi-square	P-value
Male	64	28 (43.75)	0.994	0.557
Female	181	86(47.5)		
Total	240	114 (46.53)		

RESULTS

The prevalence of PPR in the different sites of the study area showed that it was higher in Chercher and Adigudem as compared to the other sites as shown in Table 1

The sero surveillance of PPR in different age group also showed that it was higher in adults compared to young goats as indicated in Table 2

Similarly, the sero-surveillance of PPR in goats showed that it was higher in female compared to male as indicated in Table 3

DISCUSSION

The current finding revealed that the overall seroprevalence rate of 46.53%. This result indicated that the disease is more important which needs particular attention in the southern part of the region as it is one of the most economically important disease affecting both productivity and production. The overall seroprevalence of 46.53% observed in the current study was lower than the report of 52.5% from Somalia region, Ethiopia (Waret-Szkuta *et al.* [17]. Moreover the result of the current study is also lower, compared to the findings of 55% in Nigeria [12], 55.2% in Uganda [10], 55.95% in Saudi Arabia [20], 61.8% in Sudan [21]. Other hand, the current finding is higher compared to the study carried out by Banik *et al.* [22] in Bangladesh with the prevalence of 25%. However, the report of 46% in India, 45.8% in Tanzania don't vary much with the 46.53% report of the current study [23, 11]. The difference in Agro climatic conditions, cultural and social practice could be the reason for the variations between the current report and the previous report.

In this study we observed statistically insignificant variation among the study districts. The higher seroprevalence of 50% was in Adigudem and Chercher and it is slightly lower in Maychew with the prevalence of 43.6%. The current finding also revealed the higher prevalence of 47.5% in female than the prevalence of 43.73% in male but there was no statistical significant variation in male and female goats. In Agreement to the current finding Waret- Szkuta *et al.* [17] also reported higher prevalence in females. The higher seroprevalence in young goats in the this study agrees the report by Hilan *et al.* [24].

In conclusions, the current finding generally showed that the disease was common in goats of the southern part of the region so that it needs great attention of the government as it was evidenced by the highest prevalence of the disease in all the study sites. In addition, most of the farmers in the study site rear goats as means of income generating and the vaccination coverage of the region is very minimal which might be the reason for contributing the high prevalence of the disease in the study sites. Therefore, further study should be carried out to investigate the possible source of the disease and its associated risk factors and Regular Vaccination of animals should be conducted.

ACKNOWLEDGEMENTS

We would like to thank NORAD III small scale project, Mekelle University for the financial support of the project. The infrastructure and other facilities were provided by College of Veterinary Medicine, Mekelle University.

REFERENCES

1. Central statistical Agency (CSA), 2011/12. Federal democratic republic of Ethiopia Central statistical agency Agricultural sample survey. Volume ii Report on Livestock and livestock characteristics.
2. Rahmeto Abebe, Makelesh Tatek, Bekele Megersa and Desie Sheferaw. 2011. Prevalence of Small Ruminant Ectoparasites and Associated Risk Factors in Selected Districts of Tigray Region, Ethiopia. *Global Veterinaria*, 7(5): 433-437, 2011 ISSN 1992-6197
3. Gopilo, A., 2005. Epidemiology of Peste des Petits Ruminants virus in Ethiopia and molecular studies on virulence. In *PhD thesis* Institut National Polytechnique de Toulouse.
4. Gargadennec, L. and A. Lalanne, 1942. La peste des petits ruminants. *Bulletin des Services Zoo Technique et des Epizootie de l'Afrique Occidentale Française*, 5: 16-21.
5. Gibbs, E.P.J., W.P. Taylor, M.P.J. Lawman and J. Bryant, 1979. Classification of the pestedes petits-ruminants virus as the fourth member of the genus Morbillivirus. *Inter.virology*, 11: 268-274.
6. Murphy, F.A., E.P.J. Gibbs, M.C. Horzinek and M.J. Studdert, 1999. Classification and Nomenclature of Viruses. In: *Veterinary Virology*, 3rd Edn, Academic press, NewYork, pp: 413.
7. Couacy-Hymann, E.R.F., K. Bidjeh, A. Angba, J. Domenech and A. Diallo, 1995. Protection of goats against rinderpest by vaccination with attenuated peste des petits ruminantsvirus. *Res. Vet. Sci.*, 59: 106-109.
8. Abid Mehmood, Qurban Ali, Javaid Ali Gadahi, Salman Akbar Malik and Syed Imam Shah. 2009. Detection of *Peste des Petits Ruminants* (PPR) virus antibodies in sheep and goat populations of the North West Frontier Province (NWFP) of Pakistan by competitive ELISA (cELISA). *Veterinary World*, 2(9): 333-336.
9. Dhar, P., B.P. Sreenivasa, T. Barrett, R.P. Singh and S.K. Bandyopadhyay, 2002. Recent epidemiology of peste des petits ruminants virus (PPRV). *Vet. Microbiol.*, 8(2): 153-159.
10. Bonny Mulindwa1, Simon Petter Ruhweza, Chrisostom Ayebazibwe, Frank Norbert Mwiine, Dennis Muhanguzi and William Olaho-Mukani, 2011. Peste des Petits Ruminants serological survey in Karamoja sub region of Uganda by competitive ELISA. *Veterinary World*, 4(4): 149-152.
11. Senyael, S.E., A. Kapaga, F. Kivaria, D. Tinuga, G. Joshua and P. Sanka, 2009. Prevalence and distribution of Peste des petitis Virus in various districts in Tanzania. *Vet. Res. Comm.*, 10: 927-936.
12. El-Yuguda Abdul-Dahiru, S.S. Baba, A.G. Ambali and G.O. Egwu, 2013. Seroprevalence of peste des petits ruminants among domestic small and large ruminants in semi-arid region of north-eastern Nigeria, *Veterinary World*, 6(10): 807-811.
13. Pegram, R.G. and F. Tereke, 1981. Observation on the health of Afar livestock. *Ethiopian Vet. J.*, 5: 11-4.
14. Roeder, P.L., G. Abraham, Kenfe and T. Barrett, 1994. PPR in Ethiopian goats. *Trop Anim Hlth Prod*, 26(2): 69-73.
15. Abraham, P.L., G. Kenfe and T Barrett, 1994. PPR in Ethiopian goats. *Trop Anim Hlth Prod*, 26(2): 69-73.
16. Gelagay, A., 1996. Epidemiological and serological investigation of multi-factorial ovine respiratory disease and vaccine trial on the high land of North Shewa, Ethiopia. In *Doctor in Veterinary Medicine Thesis* Debre Zeit Faculty of Veterinary Medicine.
17. Agnès Waret-Szkuta, François Roger, David Chavernac, Laikemariam Yigezu, Geneviève Libeau, Dirk U Pfeiffer and Javier Guitián, 2008. Peste des Petits Ruminants (PPR) in Ethiopia: Analysis of a national serological survey.
18. Megersa, B., D. Biffa, T. Belina, E. Debela, A. Regassa, F. Abunna, T. Rufael, S.M. Stubbsjøn and E. Skjerve, 2011. Serological investigation of Peste des Petits Ruminants (PPR) in small ruminants managed under pastoral and agro-pastoral systems in Ethiopia. *Small Ruminant Research*, 97(1): 134-138.
19. Thrusfield, M., 2005. *Veterinary Epidemiology*, second ed. London, Black Well Science, pp: 600.
20. Elshemey, T.M. and M.A. Mahmoud, 2011. Seroprevalence of antibodies against peste des petits ruminants (PPR) virus in sheep and goat in Kingdom Saudia Arabia. *Alexandria J. Vet. Sci.*, 32(1): 175-182.
21. Abdalla, A.S., A.A. Majok, K.H. El Malik and A.S. Ali, 2012. Sero-prevalence of peste des petits ruminants virus (PPRV) in small ruminants in Blue Nile, Gadaref and North Kordofan States of Sudan. *Journal of Public Health and Epidemiology*, 4(3): 59-64.
22. Banik, S.C., S.C. Podder, M.A. Samad and M.T. Islam, 2008. Sero-surveillance and immunization in sheep and goats against peste des Petits ruminants in bangladesh. Department of Medicine, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh. *Bangl. J. Vet. Med.*, 6(2): 185-190.

23. Balamurugan, V., P. Saravanan, A. Sen, K.K. Rajak, V. Bhanuprakash, P. Krishnamoorthy and R.K. Singh, 2011. Sero-epidemiological study of peste des petits ruminants in sheep and goats in India between 2003 and 2009. *Rev. sci. tech. Off. int. Epiz.*, 30(3): 889-896.
24. Hilan, C., L. Daccache, K. Khazaal, T. Beaino, E. Massoud and F. Louis, 2006. Sero-surveillance of "peste des Petits ruminants" ppr in Lebanon, Lebanese Agricultural Research Institute, Fanar, Lebanon, Saint Esprit University, Faculty of Agricultural Sciences, Jounieh, Lebanon. *Lebanese Science Journal*, 7(1): 9-16.