Research Application Summary

Risk factors associated with spread of *Peste des petits ruminants* in Turkana district, Kenya

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Abstract

This research established the risk factors associated with PPR spread in Turkana district. A total of 54 variables describing key sheep and goat husbandry and production process in the pastoral set up in Turkana community being the activities that facilitate exposure of sheep and goats to possible PPR infective herds or animals were laid out in a questionnaire. The risk assessment questionnaire was developed as a Likert scale based on summated rating scale format. Factor analysis resulted into 11 factors, a reduction from the 54 variables. These reduced factors were thus taken as risk factors associated with spread of PPR in Turkana.

Key words: Factor analysis, goat, *Peste des petit ruminants* virus, PRP, sheep

Résumé

Cette recherche a établi les facteurs de risque associés à la propagation de PPR dans le district de Turkana. Un total de 54 variables décrivant la gestion clé des moutons et des chèvres et le processus de production dans la pastorale mise en place dans la communauté de Turkana, étant les activités qui facilitent l'exposition des moutons et des chèvres à d'éventuels troupeaux ou des animaux infectés de PPR, ont été énoncées dans un questionnaire. Le questionnaire d'évaluation des risques a été développé comme une échelle de Likert basée sur le format d'échelle d'estimation sommée. L'analyse factorielle a abouti à 11 facteurs, une réduction à partir des 54 variables. Ces facteurs réduits ont donc été considérés comme des facteurs de risque associés à la propagation de la PPR au Turkana.

Mots clés: Analyse factorielle, chèvre, virus de la *Peste des petits ruminants*, PPR, moutons

Background

Peste des petit ruminants (PPR) is a highly contagious, infectious and often fatal disease of sheep, goats and wild small ruminants. The disease is caused by *Peste des petit ruminants* virus (PPRV) classified under genus Morbillivirus (Gibbs *et al*., 1979). The disease occurs in Turkey, Asia, China and Africa, including Eastern Africa region. In Kenya it was first suspected in 1992 (FAO, 2008) and confirmed in Turkana District in 2007 (ProMed-Mail, 2007). The disease has since spread to all the arid pastoral districts in Kenya. PPR is transmitted by contacts between infected animals in the febrile stage and susceptible animals (Gopilo, 2005). Large quantities of the virus are shed through ocula-nasal discharges as well as the watery diarrhoea (CFSPH, 2008). The PPR virus can be detected in secretions and excretions of incubating animals 24 to 48 hours before the clinical diseases. Fomites in contact with infected animals such as water, feed troughs and bedding could become additional sources of infection for a short period of time (Gopilo, 2005). However the PPR virus is very labile thus limiting its survival period outside the host to a very short time (Lefvre and Diallo, 1990). There is no carrier status for *PPRV* (Gopilo, 2005). This study looks at the risk factors that are associated with the spread of PPR in the Turkana district.

Literature Summary

In general goats are more susceptible to PRP compared to sheep. Sheep undergoes a milder form of the disease (Lefevre and Diallo, 1990). Other domestic animals such as cattle and pigs are known to undergo subclinical infection of *PPR* (Taylor, 1984). PPR has been reported as an acute and fatal disease of camel (Khalafalla *et al*, 2010). The disease has been reported in wild small ruminants in a zoo (Furley *et al.,* 1987) and those living in the wilderness (Sharawi *et al*., 2010; Ogunsanmi *et al*., 2005). There are considerable differences in the epidemiologic pattern of the disease in different ecological systems and geographical areas (Gopilo, 2005). In the Sahel region, a sero-prevalence of 75% is observed in pastoralist small ruminants and in most cases the disease is muted or subclinical (Grenfell and Dobson, 1995). Clinical PPR is more prevalent in the humid and sub humid regions of West Africa with morbidity of 80% to 90% resulting into mortalities of about 50% to 80% (Lefevre and Diallo, 1990). Epidemics in West Africa are associated with seasonal animal husbandry patterns and livelihood activities among the settled and pastoralist communities (William *et al.,* 2001). In the Arabian country of Oman, the disease maintains itself in susceptible yearling population with an increase in incidence being a reflection of increased number

of susceptible young goats/sheep recruited rather than seasonal upsurge in the viral activity (Taylor *et al*., 1990).

The epidemiology of *PPR* in Eastern Africa is less clearly understood (William and Barker, 2001). The link between the disease pattern and factors that could influence the disease dynamics including socio cultural and economic factors such as nomadism, transhumance, livestock trade or livestock rustling has yet to be fully established. In Tanzania, risk factors for sero-positivity in small ruminants have been reported as small ruminant species, livestock production system and sex in sheep (Swai *et al*., 2009). In a study carried out in Ethiopia, analysis of national serological data concluded that further studies were needed to be carried out to investigate the association of the presence of disease with managem ent practices in place (Waret-Szkuta *et al.*, 2008). According to Gopilo (2005), some of the reported general factors responsible for introducing PPR in a flock) relate to (i) history of recent movement or gathering together of sheep and/or goats, (ii) change season that lead to nomadic animals movements resulting to shared grazing, (iii) introduction of recently purchased or rustled animals, (iv) (v) intensified change in husbandry and trading practices; (vi) cultural ceremonies that result in exchange of small stock as gifts and presents; and (vii) contacts with infected wildlife.

Study Description

The study primarily examined the complex interrelationship between various variables of sheep and goat husbandry and production processes in the pastoral set up in Turkana community. These variables relate to livestock production activities that may facilitate exposure of sheep and goats to possible infective herds or animals. The risk assessment questionnaire was developed as a Likert scale based on summated rating scale format by Spector (1992). The questionnaire consisted of 62 variables. The variables in the survey questionnaire were rated by items that were assigned risk scores. In all the frequency structured scales, a high score indicated high risk while in the agreement structured scales, high score indicated low risk. At analysis level all the agreement structured scales were reverse coded so that high score depicted high risk (DeCoster, 2005). The sample selection method was based on simple sampling. The primary sampling unit was the *Adakar*. A total of estimated 535 *Adakars* in the six administrative divisions of Loima, Orropoi, Kakuma, Lokichogio, Kaalich, and Kibish were listed of which 200 *adakars* were selected using a random number generator. The

questionnaire was administered orally to a small focused group of about five to 15 respondents being representatives and key informants of an *Adakar*. The interviewer led a discussion on each question following which an agreed scoring was recorded for each variable. Primarily the variables were analysed through data reduction methods to a few meaningful latent factors (Berghaus *et al.*, 2005). An exploratory factor analysis (Hurnik *et al*.,1994) was performed on the 62 risk variables though 54 variables were finally analysed.

Research Application

Data from 143 questionnaires were included in the analysis with risk assessments being completed in 143 *Adakars.* Exploratory factor analysis was done using SPSS statistical software (version 17.0). The factorability of the variables was assessed by correlation matrix correlation where correlation > 0.3 were observed. Anti-image correlation matrix diagonals were examined and correlation < 0.5 were excluded from the analyses. Finally a measure of sampling adequacy Bartlett's test of sphericity was significant and Kaiser-Mayer Olkin (KMO) (Kaiser, 1970) measure of sampling adequacy was 0.763. Orthogonal factor rotation was used for the analysis.

A factor loading of = or > 0.4 was used in the interpretation of the rotated factors. A plot of the eigenvalues versus the component obtained in the initial analysis is shown in Figure 1 and informed on selection of numbers of factors to retain. Initially 15 factors were extracted with eigenvalues of >1. However only 11 factors were retained based on interpretability (Boklund *et al*., 2004) and these accounted for 62.5% of the variance in the original 54 variables

A reduced set of 11 factors were subjectively described and given a title as listed below.

Factor 1 small stock cultural husbandry practices
Factor 2 introduction of new animals in the flocks
Factor 3 grazing in foreign pastures
Factor 4 mixing of small stock
Factor 5 animal movements (nomadism and transhumance)
Factor 6 sharing water troughs
Factor 7 extent of separation of different age groups of small stock
Factor 8 watering animals together
Factor 9 herding sick and health animals together

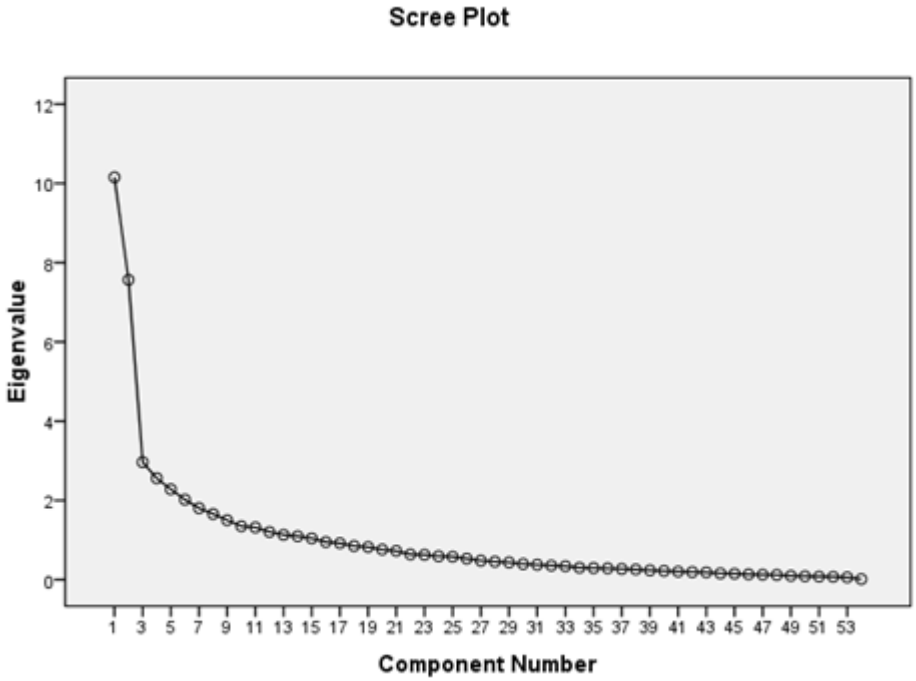

Figure 1. Eigenvalues of 54 components extracted during the factor analysis.

Factor 10 herding pre-weaned with adults together
Factor 11 straying of small stock into other herds

Through factor analysis, 54 variables describing small stock husbandry practices in Turkana were combined to produce 11 factors that were associated with PPR spread in Turkana county. The study on which this paper is based, is on-going. Field work has been concluded and laboratory serology analysis and RT-PCR is ongoing. services.

Acknowledgement

Special thanks to RUFORUM for funding this study and staff members at Veterinary Pathology, Microbiology and Parasitology of Faculty of Veterinary Medicine at University of Nairobi for support and assistance throughout this study which formed part of the PhD work of the first author. Collaborative efforts with Veterinary Department through Director of Veterinary Services Kenya, Kenya Agricultural Research Institute, NVRC, FAO-Kenya and ILRI is greatly acknowledged.

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