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Estimated prevalence and risk factors associated with clinical Lumpy skin disease in north-eastern Ethiopia

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ABSTRACT

Lumpy skin disease (LSD) is one of the major livestock disease problems in most areas of Ethiopia. A questionnaire-based cross-sectional study was conducted from October 2011 to February 2012 in four selected districts of Afar and Tigray regions to estimate the herd-level prevalence of LSD, and to assess its associated risk factors. Herd-owners were selected based on the willingness to provide information to complete the questionnaire. A total of 393 questionnaires were collected. Out of 393 herd-owners, 173 reported having LSD in their herds, giving an estimated herd- and animal-level prevalence of (44%, 95% CI: 37–50%) and (7.4%, 95% CI: 6–8%), respectively. Herd prevalence between regions and among the districts were significantly different ($\chi^2 = 8$, $P < 0.01$ and $\chi^2 = 9.9$, $P < 0.01$), respectively. The risk factors of LSD occurrence were introduction of a new animal to the herd, herd size, and utilization of communal grazing and watering points. These management characteristics cannot be readily changed in the studied area, hence, disease control should rely on a greater use of effective LSD vaccines.

1. Introduction

Lumpy skin disease (LSD) is a viral disease caused by Lumpy skin disease virus classified in the *Capripoxvirus* genus of the Poxviridae family (Kitching and Mellor, 1986). Different capripoxviruses are responsible for diseases of major economic importance in ruminants, and the Nettling virus is a prototype strain that causes LSD in cattle. Lumpy skin disease has a different geographical distribution from sheep and goat pox, suggesting that cattle strains of capripoxvirus do not infect and transmit to sheep and goats (World Organization for Animal Health, 2010). The severity of the disease depends on the virulence of the viral strain, host susceptibility, and breed type of the animals (Mathews, 1982; CFSPH, 2008). The disease has been associated with the wet season of the year, introduction of new animals to the herd, communal grazing and watering points (Gari et al., 2011; Tuppurainen and Oura, 2012).

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LSD is one of the OIE (2010) notifiable diseases, is currently endemic in most African countries, and has expanded to the Middle East region (Tuppurainen and Oura, 2012). The disease is considered an important threat to beef and dairy industries (Kumar, 2011), affects cattle of all ages and breeds, and causes financial losses as a result of reduced milk production, beef loss and draft power loss, abortion, infertility, loss of condition, and damage to the hide (CFSPH, 2008).

Eighty-five percent of the Ethiopian populations are dependent on smallholder agricultural production systems where livestock contributes a substantial role for mixed crop-livestock production activities (Tegegn, 1998). The sector is constrained by widely distributed livestock diseases of different species of animals, including LSD (Asfaw, 2003; Gari et al., 2010). However, limited research has been reported on the risk factors associated with clinical LSD occurrences (Gari et al., 2010) and its prevalence in different setting of the agricultural production systems in Ethiopia.

In north-eastern Ethiopia, the agricultural system comprises mixed, pastoral and agro-pastoral farming systems, and there is high mobilization of livestock in search of water and pasture, as well as for trade purposes. Frequent outbreaks of LSD are reported in this area and hence, the main objective of this study was to understand the epidemiology of the disease, with the specific objectives being to estimate the herd- and animal-level prevalence in the study areas, to assess the risk factors associated with the occurrence of LSD at the herd level, and to determine the seasonal pattern of the disease in the area.

2. Materials and methods

2.1. Description of study area

This study was conducted in Afar and Tigray regions in north-eastern Ethiopia. Two administrative zones (Zone-1 and Zone-4) out of five zones of Afar region were included in the study, and then one district from each zone was selected (Asiyta and Yallo, respectively). Asayita district was selected to include an agro-pastoral production system where irrigation farming is widely prevalent. Yallo district is located in the western part of Afar region bordering with Alamata and Raya Azebo districts of Tigray region. Yallo was selected for its location interfacing with the highland agro-climate in Alamata and Raya Azebo districts where the livestock are moved for grazing and watering during dry season (Philpott et al., 2005). There were two distinct agro-ecological climates prevailing in the Afar study area: lowland (<1500 m) and highland (>2300 m).

Tigray region also has five administrative zones and the study was carried out in the north-eastern zone in which the study districts Ofla and Alamata were located. These districts were selected for their seasonal shared communal grazing and watering resources, with a similar pastoral production system as in Yallo district but in a different agro-ecological setting. *Pastoral* production systems are where the society's economy relies on livestock production, and livestock move from place to place in search of grazing and water for their livestock. *Agro pastoral systems* mainly sustain their livelihood on livestock production, but also practice some crop production. They have a transhumant mode of life. *Mixed* (*sedentary*) *farming systems* are practiced mainly in the highland agro-ecology, and the societies are occupied in crop production for their livelihood and rearing animals as part of the farming system.

2.2. Farm selection and questionnaire design

A cross-sectional study was carried out between October 2011 and February 2012 to assess epidemiological factors associated with observed LSD in the previous two years (September 2009 to October 2011). Three to four Kebeles (the lowest administrative unit next to district in order of hierarchy in Ethiopia) were selected randomly from each district, and 20–30 herds were randomly selected from each Kebele. Herd-owners were selected based on willingness to complete the questionnaire. Questionnaire interviews were carried out in 15 Kebeles among 393 herds which included 3539 heads of cattle in the study. The questionnaire was designed to ascertain the presence of LSD based on the farmer's ability to recognize clinical signs associated with the disease, and to gather information on herd size, cattle age structure and management practices (Table 1) (see annexed questionnaire). A total of sixteen questions were prepared which were grouped into three main sections. The first section was about the districts' agro-ecologic conditions, herd size and herd structure. The second portion consisted of disease occurrence and questions related to season, year and month of LSD occurrence, frequency of occurrence, sex, age and breed of animals sick with LSD, and whether the animal with LSD died or not. The third section was related to herd management, which included questions about the seasonal movement of animals, farming systems, feeding and watering management, contact with sheep and goats, introduction of new animals, livestock market activity and known trade lines near the village, LSD vaccination status of the herd, and opinions of the herd owners regarding LSD prophylaxis and vaccination of the herds. The questionnaire was administered by face-to-face interviews with the herd owners using the local language.

Commonly occurring skin diseases of cattle in the study areas were recorded from the district veterinary clinic for the differential diagnoses and to cross-check whether the herd owners correctly related the disease event with the clinical signs of LSD.

2.3. Statistical analysis

A herd was considered infected when at least one animal in the herd was clinically affected. Herd-level prevalence was calculated based on the presence of the infection in the herd, while animal level prevalence was computed by dividing the number of clinically affected animals by the total number of animals which were at risk of getting the disease in the study group.

The univariate association of potential risk factors with herd prevalence of LSD and the statistical significance variation was performed using Pearson's homogeneity χ^2 test.