

Seroepidemiological study of bovine viral diarrhea (BVD) in three agroecological zones in Ethiopia

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Introduction

Bovine viral diarrhea (BVD) is one of the most economically important diseases of cattle that has worldwide distribution and tend to be endemic in most populations, although national and regional variations occur (Kampa et al. 2008). The causative agent, BVD virus (BVDV) is a member of the *Pestivirus* genus within the family *Flaviviridae* (OIE 2008).

The BVD is capable of producing a broad range of clinical signs, although infection manifests itself without any obvious symptoms (subclinical). The

spread of BVDV infection through a herd is mainly by persistently infected (PI) animals; such animals harbor the virus for life and shed it in high concentration without showing any immune response. The elimination of PI animals is therefore paramount in efforts to limit the spread of the virus, but a control program also requires other components such as determination of the herd's initial BVDV status and preventing the introduction of BVDV in non-infected herds (Laureyns et al. 2009).

In Africa, few studies conducted on seroprevalence of the disease have indicated that the prevalences were varied from 70–83% (Muvavarirawa et al. 1995). Although prevalences were reported in European and some African countries, there is no research or published information available as to these authors knowledge on the investigation of BVDV infection in Ethiopia. Thus, the objectives of this study were to detect the presence of BVDV infection and to determine the prevalence and associated factors in three agroecological zones in Ethiopia.

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Materials and methods

Study area

This study was carried out in three zones, namely: Jimma, Southwest Shoa, and West Shoa.

Jimma is the largest town in Oromia region and is located at southwestern part of Ethiopia 352 km away from Addis Ababa. It is situated at an altitude of 1,740 m above sea level and at 6°50' longitude and at 07°37' latitude. The climate is tropical and humid, and the area gets rain throughout the year but with bimodal heavy annual rainfall ranging from 1,200–2,000 mm, and the mean monthly temperature ranges from a maximum of 29°C during the warmest season to 26°C during the colder months. Farmers in the area practice traditional mixed crop-livestock agriculture. Cultivated and wild coffee is the main cash crop of the area.

The main town of Southwest Shoa zone is Woliso which is located at 114 km south west of Addis Ababa. This zone covers medium altitude which has an elevation of 1,500–2,000 m above sea level and average bimodal annual rainfall ranges from 700–880 mm. A subsistence mixed crop-livestock farming system is widely practiced in the area.

West Shoa zone represents atypical cool highland part of central Ethiopia having an altitude of greater than 2,200 m above sea level, and the mean annual rainfall is 909 mm. The area also experiences a bimodal rainfall, with the main rainy season from June to September and the short rainy season from March to April. Smallholder mixed crop-live stock farm settings characterizes the agricultural activities in this area.

Source of sample sera

These study sera were collected by the National Animal Health Research Institute during 2007–2008 for national foot and mouth disease surveillance as source study samples for seroepidemiological investigation of the BVD in the three selected agroecological zones of Oromia, regional state of Ethiopia. The sera were sorted according to the area from which they were collected. For every zone, 20% of the available sera were randomly selected. From a total of 567 sera, 146, 241,

and 180 were obtained for Jimma, Southwestern Shoa, and West Shoa, respectively.

Study methodology

The study was conducted by using indirect antibody enzyme-linked-immunosorbent-assay (ELISA) technique on serum samples to detect the antibody level specifically produced as a result of BVDV antigens in the serum. BVDV antigens were obtained from SVANOVA Biotech AB, Uppsala Park, 751 83 Uppsala, Sweden, and instruction of the manufacturer were followed in performing the test.

Statistical analyses

Data were analyzed as proportion or percentage seropositivity. The X^2 -tests of significance in difference in proportions and strength of association (odds ratio) for sex and age of cattle were done using Statistical Package for the Social Sciences statistical methods.

Results

Seroprevalence of BVD

From a total of 567 serum samples tested, 65 (11.46%) were positive for the presence of antibodies against BVDV by using indirect antibody ELISA technique. Among the three different zones that were selected for the investigation of BVDV infection, Southwest Shoa has the highest prevalence of 16.6% (Table 1).

The prevalence of BVD was significantly different ($P=0.03$) among sexes, and the risk in males was 1.8 times for the females.

In the current study, it was also observed that the prevalence of seropositive animals is higher ($P=0.004$, odds ratio=10.7) in adult animals than in younger animals.

Table 1 The prevalence of bovine viral diarrhea virus in Southwest Shoa, West Shoa, and Jimma zones

Zone	Positive	Negative	Total	Prevalence	X^2	P value
Jimma	14	132	146	9.59%	11.84	0.003
Southwest Shoa	40	201	241	16.6%		
West Shoa	11	169	180	6.11%		
Total	65	502	567	11.46%		

Discussion

By using indirect antibody ELISA technique, this study revealed the overall prevalence of 11.46% from a total serum sample of 567 collected from Southwest Shoa, West Shoa, and Jimma zones of the Oromia regional state. This finding represents the first survey of the disease in Ethiopia, so discussion is made by figuring a few reports done in Africa and Europe.

The prevalence obtained in this study is the lowest compared to some data reported by other researchers in Jordan (Talafha et al. 2008). From the three zones compared, Southwest Shoa has the highest prevalence, and this might be attributed to the fact that the presence of higher number of PI animals, herd size, cattle population density, management practices, and replacement animals from outside without screening for BVDV in the area (Talafha et al. 2008; Laureyns et al. 2009). In addition, absence of vaccination for BVDV in the three zones contributes the some degree to the present prevalence.

In this study, male animals scored higher prevalence than female animals, and the odds of having BVD in males were about two times those in females. This finding strongly agrees with previous reports in beef and dairy cattle from Zimbabwe (Abayineh 2005). In addition, the seroprevalence was higher in adult cattle than young animals of less than 3 years old observed in this study, which is in agreement with previous findings (Talafha et al. 2008). The results indicated that older animals were over ten times at risk compared to younger ones. This might reflect the lower chance of transmission of the virus from pregnant uterus to the fetus and higher possibility of getting the virus from the environment, which is shed by carrier animals. Lifelong carriers (PI) animals

contribute to the perpetuation of the disease in the cattle population (Laureyns et al. 2009).

The result of this study indicates that BVDV is present in Southwest Shoa, West Shoa, and Jimma zones with varying prevalence. The seropositive animals were from both sex and age groups, although male and adults had higher prevalence. Since BVD is a disease of great economic importance, the infected animals can contribute to the persistent spread of the virus to different areas.

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