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Retrospective Study on Animal Anthrax in West Gojjam Zone, Amhara Region, Ethiopia

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Abstract: Anthrax is WOAH-listed, a zoonotic bacterial disease caused by the spore-forming Bacillus anthracis. It is primarily a disease of cattle, sheep, goats, equine, pig and wild animals. This study used data from the West Gojjam Zone, disease outbreak and vaccination report (DOVAR) which is monthly reported at regional and national level. The occurrence and distribution of anthrax in domestic animals in the West Gojjam Zone and its districts were analyzed. Between 2018 and 2022, a total of 284 anthrax cases were reported to the Bahir Dar Animal Health Investigation and Diagnostic Laboratory (BAHIDL). Among these 148 cattle, 109 were equine and 27 were small ruminants. The highest numbers of registered anthrax cases were reported in Sekela followed by Bure town and Dega damot. The largest numbers of anthrax cases were recorded in 2021, followed by 2019. Anthrax is a preventable disease by vaccines and can be treated with antibiotics, however hygienic disposal of dead animals and decontamination are necessary to contain the disease and prevent its spread to animals.

Key words: Animal anthrax · Amhara region · Cases · Ethiopia · West Gojjam zone

INTRODUCTION

Anthrax is a serious, WOAH-listed, non-contagious, toxin-mediated, zoonotic bacterial disease caused by *Bacillus anthracis*, primarily of herbivores [6]. It is a disease of all warm-blooded [9].The aetiological agent, *Bacillus anthracis*, is a Gram-positive spore-forming rod-shaped bacterium [5]. The name of the bacterium is derived from "anthrakis", the Greek word for coal, because anthrax in Bovines causes black, coal-like lesions on the skin at the site of inoculation [7]. *Bacillus anthracis* exists in two distinct forms, known as the vegetative and sporulated forms. It exists in the spore form in the environment, where it can be dormant without replication over a long time. The germination of the spores into the vegetative form occurs in the host [8]. When a spore enters a mammal host, the internal environment of the host-rich in water, sugars and amino acids induces that spore to germinate into a vegetative cell that leads to disease [10]. When a dead animal's body is not disposed of appropriately, the infectious agent reaches the soil and sporulates as a means of survival for extended periods [4]. Environmental conditions like higher calcium levels, vertisol-type soils, increased humidity and temperature, slightly alkaline pH and higher levels of decaying organic matter, coupled with the organism's ability to survive in harsh environments [6].

Anthrax occurs most commonly in nature when herbivores feed on contaminated vegetation with *B. anthracis* spores from previously dead animals [8]. Humans get infected when they are exposed to infected animals or their products such as meat, animal hides, bones and other materials as well as contact with an animal that died from anthrax [6]. Diagnosis of anthrax is based on the case history, epidemiology of the disease, clinical signs and laboratory examination [9]. Sudden death, bloody discharges from natural orifices, rapid bloating of the carcass, absence or incomplete rigor mortis and the absence of clotting of the blood are the common characteristics of anthrax in susceptible animals [1]. The prevention of anthrax has been proven achievable through vaccination against the anthrax toxin components of the disease [8]. *Bacillus anthracis* is susceptible to numerous antibiotics but treatment must begin early enough in infection to be successful [1].

Animal anthrax is an endemic disease and seasonal in Ethiopia. In Amhara region, administrative zones like West Gojjam, South Gondar, Awi and East Gojam were found highly suitable for *Bacillus anthracis* spores [4]. Therefore, the current study objective is to summarize and

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update the knowledge on occurrence and distribution of anthrax in domestic animals in West Gojjam Zone based on DOVAR data registered at Bahir Dar Animal Health Investigation and Diagnostic Laboratory.

MATERIALS AND METHODS

Study Area and Population: West Gojjam Zone is located 387km from Addis Ababa and176km from Bahir Dar. It is bordered on the South by the Abay River which separates it from the Oromia region and Benishangul region, on the West by Awi zone, on the North by North Gojjam zone and on the East by East Gojjam zone. Finote Selam is the capital of the zone. It has a longitude and latitude of 10°42ˈN 37°16ˈE with elevation of 1917meters above sea level. West Gojjam zone has 9 districts and 205 kebeles. Based on the West Gojjam zone livestock office data, livestock population is predicted to be cattle 1072050, small ruminants 667833 and equines 165713.

Source of Data: This study used data on animal anthrax outbreaks encountered in the West Gojjam zone which were reported to regional laboratory; Bahir Dar Animal Health Investigation and Diagnostic Laboratory (BAHIDL) in a monthly manner.

Study Design, Data Collection and Analysis: A descriptive study was performed on secondary data on anthrax cases obtained from disease outbreak and vaccination report (DOVAR) data during 2018-2022 in the West Gojjam zone. The occurrence and distributions of anthrax cases during the period were calculated. The data was analyzed using Microsoft Office Excel 2010 and the result was presented by using graphs and tables.

Case Definition: In suspected cases of animal anthrax, clinical manifestations differ from species to species, presumably reflecting differences in susceptibility. The clinical course of anthrax in animals may be per acute, acute and chronic [1]. Ruminants are most likely to manifest the per-acute and acute forms, horse the acute form and dogs, cats and pigs sub-acute to chronic or localized condition [3]. Sudden death, bloody discharges from natural orifices (rectum, mouth, nostrils, etc.) rapid bloating of the carcass, absence or incomplete rigor mortis and the absence of clotting of the blood are the common characteristics of anthrax in susceptible animals [1].

In the case of per acute anthrax the clinical signs are fever, staggering, excitation, recumbence, spasms, trembling and dyspnea and the infected animal will die within 48–72 hours. The disease progression is rapid and

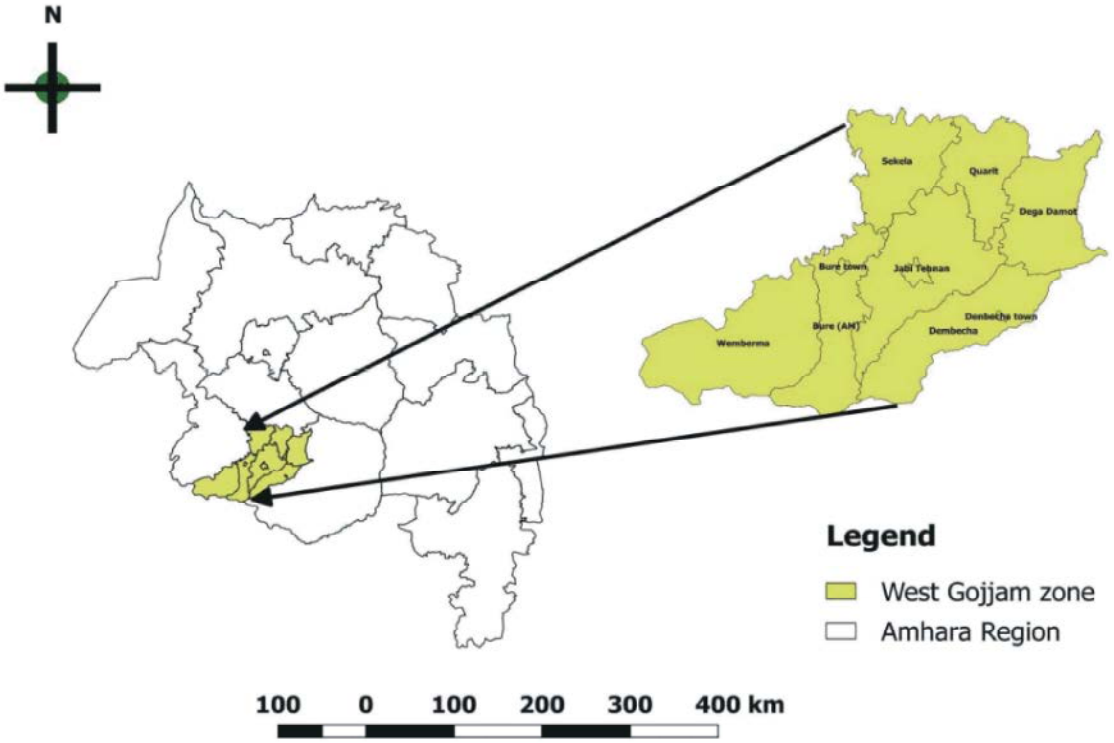

Fig. 1: Study area map of West gojjam zone, Amhara region, Ethiopia

Table 1: Reported anthrax cases in different animal species in West gojjam zone between 2018 and 2022 based on DOVAR data

	Year																	
	2018			2019			2020			2021			2022			Total		
Woreda	Cattle	Small ruminants	Equine	Cattle	Small ruminants	Equine	Cattle	Small ruminants	Equine	Cattle	Small ruminants	Equine	Cattle	Small ruminants	Equine	Cattle	Small ruminants	Equine
Sekela				23	11	42	12	5		30	10	44	25		10	90	26	96
Womberema																		
Bure zuria							5									5		
Bure town							30			2						32		
Jabithenan																		
Finote Selam town							10									10		
Quarit																		
Dembecha																		
Dega damot	5	1	13	6												11	1	13
Total	5	1	13	29	11	42	57	5		32	10	44	25		10	148	27	109
		19			82			62			86			35			284	

often animals are found dead without premonitory clinical signs. The acute form may manifest in high fever (up 42°C), excitement, congested and hemorrhagic mucosa, tachycardia, labored breathing with terminal convulsions and death. Generally, the alimentary tract involvement occurs and is characterized by dysentery and diarrhoea. In chronic anthrax, the characteristic clinical signs are swelling and oedema in the subcutaneous area, usually seen in the brisket, shoulder, thorax, perineum and flank. Localized tongue oedema and edematous lesions in the throat, sternum, perineum and flanks are also possible [5].

RESULTS

Anthrax Cases in Animals in West Gojjam Zone: Anthrax cases were registered between 2018 and 2022 in 9 districts of the West Gojjam zone (Table 1). The spatial distribution of anthrax cases in West Gojjam zone (Figure 1) during 2018–2022 shows that the highest numbers of registered anthrax cases were reported in Sekela (n = 212), followed by Bure town (n = 32) and Dega damot (n = 25). The lowest numbers of anthrax cases during this period were registered in Bure zuria (n=5), followed by Finote selam town (n=10). Most anthrax cases (n = 148) in cattle were reported from Sekela. During the study period, 90 cases were registered in Sekela, 32 in Bure town, 11 in Degadamot, 10 in Finote selam town. The smallest number of anthrax cases in cattle were reported from Bure zuria (n=5). In addition 26 cases in Sekela and 1 case in Dega damot were recorded anthrax cases in small ruminants. In the past 5 years (2018–2022), cases of anthrax were also recorded in equine species. In total, 109 cases of anthrax in equine were registered; 96 in Sekela and 13 in Dega damot.

Anthrax Cases by Animal Species: The total number of registered anthrax cases was 284, including 148 cases in cattle, 27 among small ruminants and 109 among equine species. In this study, the overall case fatality rate of anthrax was 15.49% (n = 284) with which the highest case fatality rate (25.61%) was recorded in 2019 followed by 2022 (20%) and 2020 (19.35%) as shown in Table 2.

Anthrax Cases by Time: As shown in Figure 3, the temporal distribution of anthrax cases in the last 5 years shows that the largest numbers of anthrax cases were recorded in 2021 (n = 86), followed by 2019 (n = 82), then 2020 (n = 62), 2022 (n = 35) and 2018 (n = 19).

In the 5 years of recorded animal anthrax cases, the highest cases of anthrax were recorded in Jun (n = 58) followed by September (n = 50), October (n=46), February (n=44) and July (n=41). The lowest numbers of animal anthrax cases were reported in April and December; 3 in each. In the rest months anthrax cases were January (n=6), March (n=11), May (n=5), August (n=9) and November (n=8) as shown in Figure 2.

DISCUSSION

This descriptive study shows during the last five years (2018-2022) a total of 284 animal anthrax cases and 44 deaths were reported in the West Gojjam zone. In this zone, anthrax cases were reported from five districts out of nine. These were Sekela, Bure town, Dega damot, Finote selam town and Bure zuria; others had zero case report. This might be due to proper vaccination coverage and/or missing to report cases by the local veterinarians. According to the recorded information within these 5 years at Bahir Dar Animal Health Investigation and Diagnostic Laboratory, the highest numbers of animal anthrax cases were reported from Sekela followed by

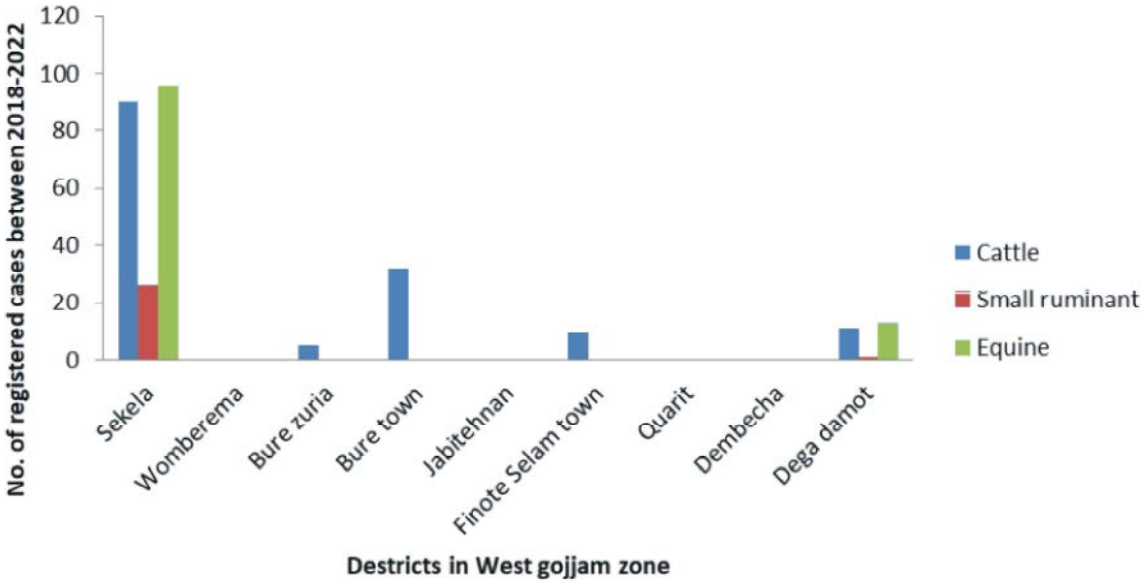

Fig. 2: Geographical distribution of anthrax in different animal species based on DOVAR data of West gojjam zone between 2018 and 2022

Table 2: Number of cases, deaths and case fatality rates in West gojjam zone based on DOVAR data of West gojjam zone between 2018 and 2022

Year	No. of cases (%)	No. of deaths (%)	Case fatality rate (%)
2018	19(6.69)	2(4.55)	10.52
2019	82(28.87)	21(47.73)	25.61
2020	62(21.83)	12(27.27)	19.35
2021	86(30.28)	2(4.55)	2.33
2022	35(12.32)	7(15.90)	20
Total	284	44	15.49

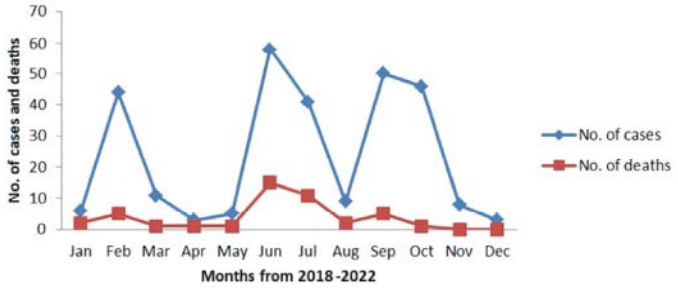

Fig. 3: Anthrax cases in animals by month between 2018 and 2022 based on DOVAR data of West gojjam zone

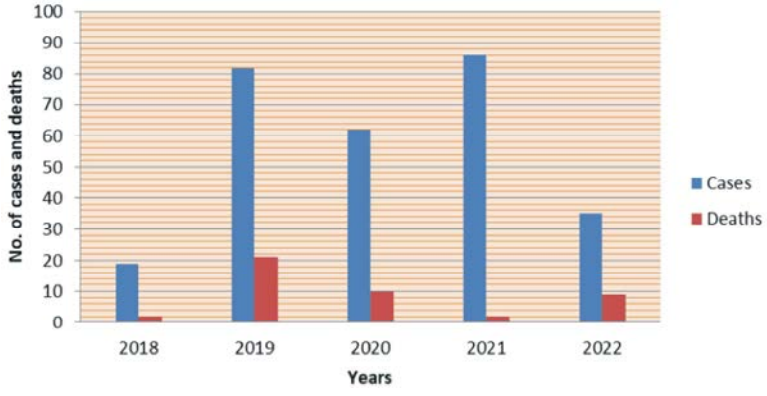

Fig. 4: Anthrax cases and deaths in animals by year between 2018 and 2022 based on DOVAR data of West gojjam zone

Bure town and Dega damot; whereas the lowest anthrax cases were registered from Bure zuria and Finote selam town. The fatality of the case between 2018 and 2022 in this zone was higher in 2019 and 2020 these were (25.61%) and (19.35%) respectively. This might be due to poor management of anthrax cases, since the highest number of cases in 2021(86), the case fatality rate was 2.33%. On the contrary, the lowest anthrax case in 2022 (35), results in a case fatality rate of 20%.

The highest number of animal anthrax cases was reported during February, Jun, July, September and October. A total of 204(71.83%) cases were reported from Jun to October. This is aligning with seasonal occurrence of anthrax cases. Anthrax spores can remain latent in the soil for long periods and a reactivated when the soil surface is disturbed, for example by flooding, heavy rain, landslides, or excavation [6]. Therefore, the disease reappears and infection occurs when spores are subsequently ingested by animals alongside grass from pastures, this finding was similar with previous study in Awi zone [2]. There were Variations of anthrax case occurrence among animal species. 52.11% and 38.38% of the total cases were recorded in cattle and equine respectively. On the other hand only 27(9.50%) cases were registered in small ruminants. These differences might be due to the grazing or browsing nature of animals [2].

CONCLUSION

This study tried to show the occurrence and distribution of animal anthrax by animal, place and time. By doing so, anthrax occurrence was recorded in the West Gojjam zone in different districts, among animal species and in all months within the five years of data. To control disease, hygienic disposal of dead animals and decontamination will help to reduce the risk of spore spread to animals. Moreover, animal anthrax outbreak reporting is better to keep its quality to properly find out the occurrence and distribution of the disease.

Limitation: This retrospective study was based on suspected anthrax cases. However, it had a few limitations of upgrading case definitions to presumptive and confirmed level. Another limitation was the study was focused specifically on livestock or animal cases, human cases were not included.

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