

Retrospective Study of Foot and Mouth Disease Outbreak in West Omo Zone, Southwest Region, Ethiopia, 2017-2022



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Abstract

Foot and Mouth Disease (FMD) is a highly contagious viral disease, which affects all cloven-hoofed domestic animals. It is one of the most economically important viral diseases listed as notifiable trans-boundary animal diseases. FMD has a detrimental effect on the agricultural economies of most countries worldwide. A retrospective study was applied to shows FMD outbreaks by animals, place and time in West Omo Zone from 2017 to 2022. The data of the FMD outbreaks were collected from regional veterinary laboratory and zone agricultural department from the DOVAR II report. The data was analyzed by tables and graphs by using pivot table. During this study period within six years a total of 10 outbreaks, 11,347 cases and 43 deaths were recorded. Hence, the recorded data indicated that FMD outbreak cases are increasing. The highest case 11,240(99.05%) occur in 2022 year and the lowest case 107(0.94%) in 2019, but in 2017, 2018, 2020, 2021 within four years no FMD outbreaks. This absence of outbreak might be a weak reporting system and knowledge gaps from animal health workers. The spatial distribution of FMD is widespread throughout the west omo zone, particularly in all districts except suri. The result indicated that 40%, 30%, 20%, and 10% of outbreaks were reported from Bero, Meenit shasha, Meenit golidiya and Maji district respectively. The Vaccination coverage was very low and only 2,598 doses of prophylaxis vaccine were given within 6 years. Generally supplying adequate doses of vaccine, control risk factor and strong animal disease surveillance system is used to control and prevent the FMD disease.

Keywords: FMD; Epidemiology; Retrospective; West Omo Zone; Morbidity; Mortality

Abbreviations: FMD: Foot and Mouth Disease; SAT: Southern African Territories; DOVAR II: Disease Outbreak and Vaccination Report; SWERP: Southwest Ethiopia Regional People

Introduction

Ethiopia is one of a resource full country endowed with a large population of livestock in Africa". The entire cattle population of the country is estimated to be about 57.83 million [1]. Whereas the development of this sector is hampered by different constraints and has not been fully exploited the benefit of indigenous livestock compared to its tremendous potential. Significant losses result in each year from the death of animals as well as animal production because of lack of appropriate veterinary services, lack of attention from government, widespread endemic disease and recurrent drought [2]. Foot and mouth disease (FMD) is one of the most economically important viral diseases listed as notifiable trans-boundary animal diseases by the world organization for Animal Health [3].

Foot and Mouth Disease (FMD) is a highly contagious viral disease, which affects all cloven-hoofed domestic animals

including cattle, sheep, goats, camels and pigs [4]. The disease clinically characterized by fever and lesions in the mouth, teat and feet of cloven-hoofed animals [5].

The disease is caused by an aphthovirus (family Picornaviridae) which occurs as seven major serotypes, A, O, C, southern African Territories (SAT)1, SAT2, SAT3 and Asia1. However, distinct subtypes with different degrees of virulence within each of these strains and the virus seem to be capable of mutation, so that new, anti-genetically different subtypes are constantly appearing. Among the five FMDv serotypes that occur in Africa, the three SATs are unique to Africa [6].

The transmission in animals, including close-contact, animal-to-animal spread, long-distance aerosol spread and fomites, or inanimate objects, typically fodder and motor vehicles. The clothes and skin of animal handlers such as farmers, standing water, and

uncooked food scraps and feed supplements containing infected animal products can harbor the virus, as well. Cows can also catch FMD from the semen of infected bulls [7].

Humans can be infected with FMD through contact with infected animals, but this is extremely rare [8]. Some cases were caused by laboratory accidents, because the virus that causes FMD is sensitive to stomach acid, it cannot spread to humans via Consumption of infected meat, except in the mouth before the meat is swallowed. In the UK, the last confirmed human case occurred in 1966 [9] and only a few other cases have been recorded in countries of continent of Europe, Africa, and South America. Symptoms of FMD in humans include malaise, fever, vomiting, red ulcerative lesions (surface-eroding damaged spots) of the oral tissues, and sometimes vesicular lesions (small blisters) of the skin. According to a newspaper report, FMD killed two children in England in 1884, supposedly due to infected milk [9].

FMD has a detrimental effect on the agricultural economies of most countries worldwide, where cattle, sheep, goats, and pigs play a vital role in the gross domestic product [10]. The direct losses of the disease consist of loss of milk production, loss of draft power, retardation of growth, abortion and mortality especially in young animals. The indirect losses are related to the restriction of trade of animals both locally and internationally [11]. Foot and mouth disease is endemic in Ethiopia Since the first case in 1957 [12].

Materials and Methods

Study Area Description

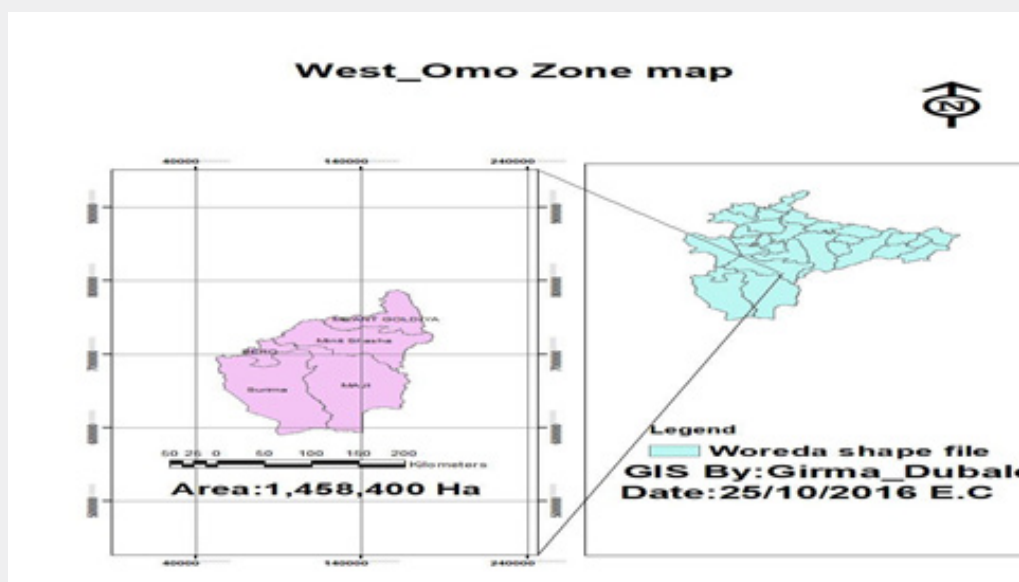


Figure 1: Map of west omo zone.

Statement of the problem

This study was undertaken in southwest Ethiopia regional people (SWERP) in west omo zone indicated that the presences of the disease in different parts of districts. The outbreak become increasing especially from 2022 and it is an economically devastating disease for west omo zone. However, Information on the spatial and temporal distribution and vaccination activities of the FMD outbreaks in the west omo zone is not properly organized. Hence, gathering of information on the disease spatial and temporal distribution and vaccination activities is an essential tool for future studies and in designing most reliable strategies for prevention and control of the disease in the study area as well as in region. Therefore, the present study planned to generate information on the geographical and temporal distribution of FMD outbreaks and the morbidity and mortality rates of the disease in west omo zone.

Objectives of this study

General Objective

- To obtain update information on the geographical and temporal distribution of foot and mouth disease outbreak in West Omo zone

Specific Objectives

- To determine mortality and morbidity rate
- To determine vaccination coverage within study area

This study was conducted from May to July in West Omo zone; it is in the Southwest Ethiopia People's Regional state. The administrative center of West omo zone is Jemu, which is 671 km far from the capital city of Ethiopia, Addis Ababa. The area of west omo zone is 14,584 square kilometers. It is located at Ethiopian's southern margin, and where it is bordered by bench Shoko to north, northeast and northwest, by south omo zone to southeast, by Gambella region to southwest and by South Sudan to south. The area is dominantly inhabited by dizi, suri and meenit communities [13]. The topography of the west omo zone ranges from 560-2,200 meters above sea level. The average annual rainfall is 400-2000mm/m and the average temperature ranges from 15.1°C-27.5°C. The climate conforms to the Ethiopian 52% kola, 43% woynadegad and 5% dega. The latitudinal location is 808289N and 718624E. It has seven districts, 116 kebeles (112 rural and 4 urban) [13]. The West zone has population of 272,943 people, accounting for 12% of Southwest Ethiopia peoples region, and it comprises 49.5% male and 50.5% females in 55,703 households, 60% were pastoral [13]. The livestock population was 2.4 million cattle, 0.8 million sheep, 0.9 million goats, 1.2 million poultry, 0.04 million horse, 0.06 million mule and 0.04 million donkeys. (Figure 1)

The Study Population

The study population was cattle population in west omo zone. All age groups of animals were included in this study.

Study design and period

A retrospective study was conducted to obtain updated information on geographical and temporal distribution and to determine mortality, morbidity and vaccine coverage from January 2017-december 2022 in five districts.

Data collection methods

A retrospective study of the records of FMD documented in all five districts of west omo zone over the past 6 years was reviewed from 2017-2022 DOVAR-II secondary data. Veterinary Epidemiology department at the zone level, regional laboratory and from the case records at each district. Regarding the outbreaks, each year was extracted from the reports submitted by field veterinarians from around the districts and used for this study reported. The variables, which were considered in relation to the outbreaks, were factors that contributed to the current

progress of the disease outbreak. The data obtained from the monthly Disease Outbreak and Vaccination Report (DOVAR II) database maintained by the regional veterinary laboratory and zonal agricultural department.

Data Analysis Methods

The data that was extracted from the records of Veterinary Epidemiology department at the zonal level and from the case recorded at each district was processed (examined) to obtain updated information on geographical and temporal distribution, additionally to determine mortality, morbidity and vaccine coverage of foot and mouth disease. Lastly the data was coded and entered the spread sheets of a Microsoft Ex-cell and analyzed. Analysis of the data was performed by using the Pivot table on the Microsoft Ex-cell sheet.

Study Variables

The main variables conducted in this study were the number of animals at risk, the number of infected animals and mortality due to FMD, the month and year of FMD outbreak, the prophylaxis and control vaccination coverage and the morbidity rate was determined as the number of animals infected during the outbreak divided by the total number of animals at risk.

The mortality rate was determined as the number of animals that died of FMD during the outbreak divided by the total number of animals at risk.

Results

Temporal and Spatial Distribution of FMD Outbreaks:

The results of this study indicated that within six years in five districts a total of 10 outbreaks of FMD were recorded in west omo zone from January 2017 up to December 2022. During this retrospective study periods out of 10 outbreaks of FMD reports, 11,347 cases and 43 deaths were recorded. The recorded data indicated that FMD outbreak cases are increasing and can cause direct and indirect losses. The highest case 11,240(99.05%) occur in 2022 year and the least case 107(0.94%) in 2019. In addition, 43 mortality was recorded in 2022, which is the highest record comparatively with other five years. The result indicated that only 11,347 Cattle were affected from domestic animals during the outbreaks within six years from 641,119 populations at risk (Table 1-5) (Figure 2-4).

Table1: FMD outbreak, case, death and proportion, in west omo zone, 2017-2022

Years	Number of Out Breaks	Proportion (%)	Infected Bovine	Number of Deaths
2017	0	0	0	0
2018	0	0	0	0
2019	1	10	107	0
2020	0	0	0	0
2021	0	0	0	0
2022	9	90	11,240	43
total	10	100	11,347	43

Table 2: The seasonal distribution of FMD, in west omo zone, 2017-2022

Months	No- of outbreaks	Case number	Death number	Population at risk
January	1	148	0	78,917
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	2	18	0	74,962
June	0	0	0	0
July	2	756	12	17,271
August	1	243	3	6,860
September	0	0	0	0
October	1	1978	28	33,281
November	0	0	0	0
December	3	8204	0	439848

Table 3: Morbidity rate, CFR, mortality rate, number death and cases in west omo, 2017-2022

Years	Population at Risk	Number of Cases	Morbidity Rate (%)	Number of Deaths	Mortality Rate	CFR (%)
2017	0	0	0	0	0	0
2018	0	0	0	0	0	0
2019	5600	107	1.9	0	0	0
2020	0	0	0	0	0	0
2021	0	0	0	0	0	0
2022	635,519	11,240	2	43	0.007	0.4
total	641,119	11,347	2	43	0.007	0.4

Table 4: Number of cases with age of animals in west omo zone, 2017-2022

Years	Age of Animals			
	1-3 Year	> 3 Years	All Age	Total Number of Case
2017	0	0	0	0
2018	0	0	0	0
2019	0	107	0	107
2020	0	0	0	0
2021	0	0	0	0
2022	3	0	11,237	11,240
Total	3	107	11,237	11,347

Table 5: The vaccination activity in west omo zone, 2017-2022

Years	Control Vaccine	Prophylaxis Vaccine	Total Vaccine by Dose
2017	0	1000	1000
2018	0	1598	1598
2019	0	0	0
2020	0	0	0
2021	0	0	0
2022	0	0	0
Total	0	2598	2598

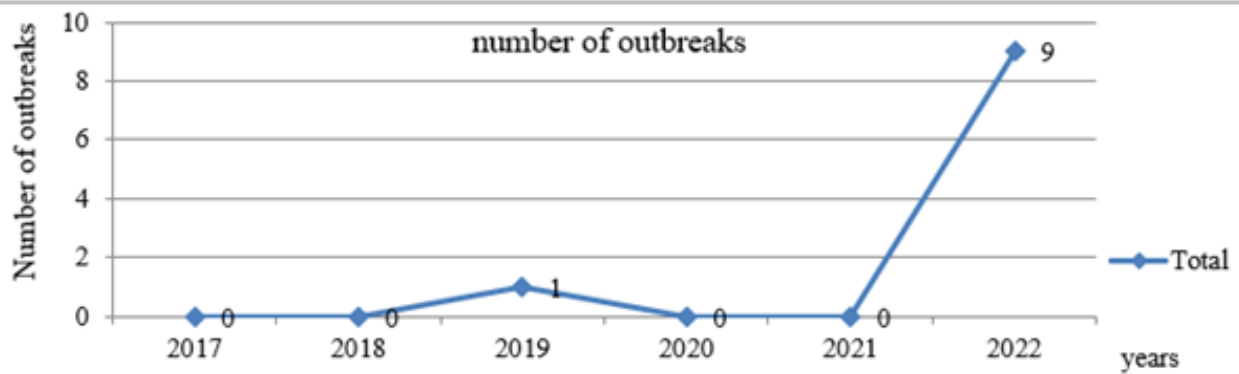


Figure 2: Number of FMD outbreaks with each year in west omo zone, 2017-2022.

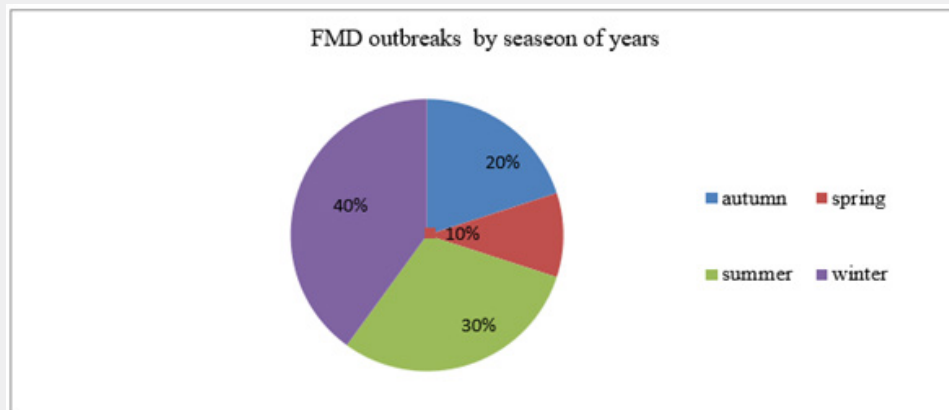


Figure 3: FMD outbreaks by season of years from 2017-2022

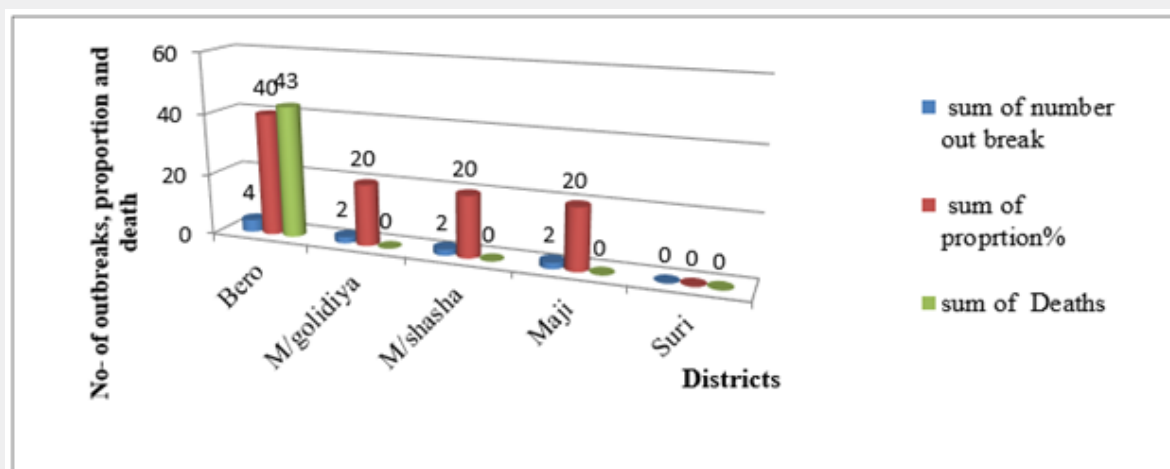


Figure 4: The spatial distribution of FMD, in west omo zone, 2017-2022

The result revealed that only 2598 dose prophylaxis vaccine was given within six years in Maji district only, which indicated the vaccination activity is weak and nearly null in west omo zone

Discussion

According to the current retrospective study, the spatial distribution of FMD is widespread throughout the west omo zone, particularly in all districts except suri. The study result indicated that 40%, 30%, 20%, and 10% of outbreaks were reported from Bero, Meenit shasha, Meenit goldiya and Maji district respectively. The study showed that Meenit shasha district had relatively higher proportion of FMD outbreaks occurrence next to Bero district. Bero district have the highest number of outbreak (n=4) is due to unrestricted movement of cattle population from Gambela region and Meenit shasha districts for watering and grazing during dry season and lack of prophylactic vaccination [14]. But suri districts had zero % of FMD outbreak occurrence; this might be due to the poor disease reporting system in pastoral communities [15]. The result stated that within six years, 10 number of outbreaks was recorded, which is closely related to Retrospective Study on the Occurrence of Reportable Priority Cattle Diseases in Southern Nations, Nationalities and Peoples' Regional State, Southern Ethiopia by [16] from which 7 number of FMD outbreak was recorded. Therefore, it would be acceptable to focus on all districts in west omo zone as well as western region for FMD disease surveillance and management in the future.

The results of the current study indicated that FMD was prevalent in a high percentage in 2022. The introduction of FMD to disease free areas is most likely the result of unrestricted animal trans boundary movements, which pose a serious risk for viruses to cross the border in both directions. This is because there are weak border regulations on animal migration and the virus can spread through the wind [17]. Cattle were the principal species that were infected by FMD in this study. This outcome is agreed with [18] finding that sero-prevalence was much greater in cattle (14%) and [19] stated that Cattle were the most affected species during the episodes of FMD. He could be explained by the fact that cattle are indicative of FMD whereas the clinical signs are unremarkable in small ruminants.

The seasonal distribution of the FMD outbreak result showed that about 40% of outbreaks occurred in the dry season (Dec-Feb). This study closely related to Seasonal distribution of cattle disease outbreaks in SNNPR (2007 – 2015) by [16] in which 31% FMD of outbreak occurred in dry season. It is also in agreement with study of [15]. The number of outbreaks increased during dry seasons, probably due to the favorable environmental conditions of dry weather, dry winds and in pastoral area massive movement of cattle population for seeks of pasture and water points. So many herds of cattle meet at such places, thereby enhancing the spread of infection from one herd to another [20]. But this study result indicated that lowest outbreak occurred in September-November,

it is disagreed with study of [21].

According to analyzed data of age groups indicated that all age groups of cattle (99%) were infected by FMD in proportion to 1-3 years and > 3 years age groups. This is because in pastoral areas all cattle population lives together in the same large. It is disagreed with study of [18] finding that FMD more occurred in cattle over 3 years of age.

This retrospective study shows morbidity rate, mortality rate and CFR are low. Other findings indicated that morbidity rate in susceptible animals is approximately 100% [22], it disagrees with current study. The total CFR is very low (0.4%) in this result and the number of mortalities in young animals is higher than in adult animals.

The current study of vaccination activity indicated that the Vaccination coverage is very low or approximately null in the study areas from starting 2019. The result of record analysis revealed that only 2,598 doses of vaccine were given within 6 years. This is because absence of vaccine supply from regional, zonal and woreda's government. In addition, the price of vaccine on market is costly comparatively to other livestock vaccine. The result of the analysis showed that the vaccine given for prophylactic in 2017 and 2018. It agrees with study of [23] who deals that vaccination activity must important and recommended for prophylactic protection in endemic areas.

Limitation

Retrospective study of DOVAR II report data was conducted in this study, to obtain organized information on the spatial and temporal distribution of FMD disease in West Omo zone. In addition to this, collecting, organizing, analyzing and disseminating data of FMD from each district of clinic case book is very important. But some districts the mortality, morbidity, CFR and vaccination activity of FMD case on recording book was not properly documented.

Conclusion

This retrospective study result shows the spatial and temporal distribution of FMD outbreaks and the morbidity and mortality rates of the diseases in west omo zone. FMD outbreaks occurred in all districts and all districts have at least one FMD outbreak in the six years study period except suri. The highest number of outbreaks and cases were observed in 2022. The diseases have low mortality and case fatality rates. The outbreaks were observed to be seasonal, and more outbreaks occurred in the dry season, especially in December. This is due to the movement of animals from place to place for searching of water and pasture (grass). The vaccination results indicated that the vaccination coverage was very low, and it needs special intervention from zone and district of concerned bodies. The identification of temporal patterns and spatial distribution FMD is important to focus when and where

attention should be primarily given to control and prevention of the disease without loss of time and resources.

Recommendation

Based on the above conclusion the following recommendations are forwarded for Maji, Bero, Meenit shasha, Meenit goldiya and suri district agriculture department and veterinarians, zone and regional agriculture office:

- Supplying adequate doses of FMD vaccine and mass vaccination in disease endemic areas
- Strategic prophylactic vaccination of animals should be needed before the dry season.
- Awareness creation of community on morbidity, transmission and seasons of occurrence.
- Controlling of movements of animal during dry seasons for searching of pasture and water.
- The surveillance and reporting system should be improved for control and prevention of the disease.
- Giving training for animal health workers to build capacity
- Strong rule and regulation
- Isolation of infected animals from healthy herd
- Giving treatment for infected animals

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