



A Preliminary Study on Major Diseases of Cattle Circulating in North Shewa Zone, Oromia, Ethiopia

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Abstract

Introduction: Diseases have numerous negative impacts on the productivity and fertility of cattle. Reduced productivity, stunted growth of young animals, and reproductive failure are among the major impediments which wane the economic benefits of cattle producers.

Materials and Methods: A cross-sectional study was conducted from October, 2018 to June, 2019 at five selected districts of North Shewa zone; with a prime objective of assessing major diseases of cattle circulating in the area. Three peasant associations were purposively selected from the study districts based on the available cattle population and accessibility to transportation. A total of 308 households rearing cattle were proportionally obtained using systematic random sampling. The data was collected using a semi-structured questionnaire. Ranking index was used to rank major cattle diseases in the area based on socio-economic relevance.

Results: The three economically important cattle diseases occurring in the area ranked 1st, 2nd and 3rd were Blackleg, Foot and Mouth Disease, and Anthrax, respectively. Summer was identified as the season of high burden. A statistically significant ($P < 0.05$) indigenous knowledge of disease prevention strategies was observed among respondents of middle age groups (30-50 years). Sharing the meat of dead animals and thronging it out to the environment were identified as risky practices of socio-economic and public health concern.

Conclusion: The study identified major diseases of cattle circulating in the area and management practices and knowledge gaps attributed to the problem. It is crucial to confirm the occurrence of such diseases in the area using better diagnostic tools and device appropriate intervention strategies to overcome their concurrent devastating effects. Key words: Cattle, Disease occurrence, Ethiopia, North Shewa, Public health.



Introduction

Ethiopia is believed to have the largest livestock population in Africa and a proven potential for the production of livestock and livestock products. The country has an estimated population of 59.5 million cattle, 30.7 million sheep, million goats, 2.16 million horses, 8.44 million donkeys, 0.41 million mules, 1.21 million camels, 56.53 million poultry and 5.92 million beehives. About 99% of cattle population are of local Zebu breed and the remaining 1% are exotic breeds kept mainly for dairy production in urban and peri-urban areas to fulfill the local market milk consumption demands [1].

The livestock sector has been contributing a considerable portions to the economy and still promising to rally round the economic development of the country. It is eminent that livestock products and by-products in the form of meat, milk, honey, eggs, cheese, and butter provide the needed animal protein that contributes to the improvement of the nutritional status of the people. Livestock also plays an important role in providing export commodities, such as live animals and hides and skins to earn foreign exchange. Besides, draught animals provide power for the cultivation of smallholdings and for crop threshing virtually all over the country and are also essential modes of transport to take holders and their families long distances, to convey their agricultural products to the market places and bring back their domestic necessities. Livestock as well confer a certain degree of security in times of crop failure, as they are a “near-cash” capital stock. In addition, livestock provides farmyard manure that is commonly applied to improve soil fertility and used as a source of energy [2].

In Ethiopia, cattle which is believed to be the engine for the development of the nation’s economy in general, and the small holder resource-poor farmers in particular by providing draft power, are the main source of meat, milk and income generated through direct selling of animals. However, despite the substantial number of cattle in the country, productivity is low due to constraints of disease, nutrition, poor management, and poor productive and reproductive performance of endogenous cattle breeds [2].

Diseases have numerous negative impacts on the productivity and fertility of cattle, i.e., losses due to mortality and morbidity, loss of weight, depressed growth, poor fertility performance, and decreased physical power. In addition, constraints arising from epidemics and pandemics of animal diseases have been contributed to increased livestock morbidity and mortality; resulting in reduced livestock production and productivity [3]. Consequently, an organized research that can elucidate the major health problems of cattle is a central issue for further epidemiological investigation of disease in the population. In addition, knowing the type and extent of common and/or major health problems is essential to cattle owners, veterinarians, and researchers and can assist in the development of herd health strategies and the selection of possible interventions [4].

Analogous to many other parts of the country, North Shewa zone of Oromia regional state has also favorable livestock production potential and an enormous number of livestock population including cattle; which is able to contribute a lot to the agricultural sector of the zone, the region and the country at large. However, the productivity of cattle in the zone is limited owing to many factors among which disease is the major problem [5].

Therefore, the prime objectives of the study were to investigate cattle diseases circulating in the area, preventive and cadaver management strategies at farmers’ level, and subsequent risk of human exposure to zoonotic pathogens in selected districts of North Shewa zone, Oromia, Ethiopia.

Materials and Methods Description of the Study Areas

The study was conducted from October, 2018 to June, 2019 at five selected districts of north Shewa zone; namely, Abichu and gne’a, Wuchale, Gerar Jarso, Kuyu and Hidabu Abote.

North Shewa zone has a total population of 1,431,305, of whom 717,552 are men and 713,753 women; with an area of 10,322.48 square kilometers. The zone has a population density of 138.66; of which 10.25% of them are urban inhabitants. A total of 314,089 households were counted in this zone, which results in an average of 4.56 persons to a household and 303,609 housing units [6]. Mixed crop and livestock farming system is the mode of agriculture in the zone; and these are essential for the livelihood of the local population. There are about 1,676,748 cattle, 1,305,774 sheep, 316,403 goats, 88,383 horses, 311,996 donkeys and 6,827 mules, 1,176,886 chickens and 84,142 bee hives in the Zone [1]. **Figure 1** below illustrates map of the zone.

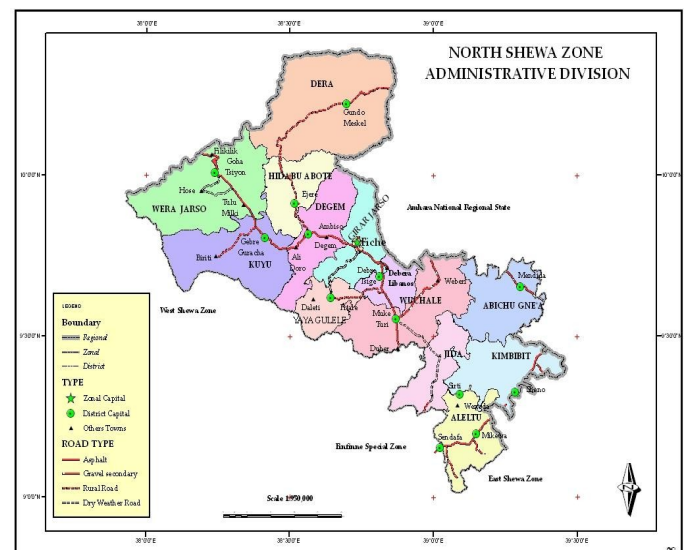


Figure 1: Map of North Shewa Zone, Oromia Regional States of Ethiopia.

Study Participants

The study participants were volunteer livestock producers who rear cattle and found in the selected districts. Moreover, the participants were varied in sex, age, location, educational background, and economic status.

Study Design

A cross-sectional study design was employed to determine the major diseases of cattle occurring in the selected study districts. Indigenous knowledge of farmers in livestock disease prevention and control and the subsequent public health implications were also assessed.

Sample Size Determination

The Sample size was determined based on the formula given by Yemane [7];

$$n = \frac{N}{1 + N * e2}$$

Where n= required sample size, N= Population size (household), and e= Marginal error (0.05)

According to CSA [6], since the population of the zone (N) is 1, 431,305, the required sample size (n) can be computed as follows;

$$n = 1,431,305 \times 0.05^2$$

$$n = 1,431,305 \times (0.05)^2$$

Thus, a total of 400 households should be participated in the study. However, due to the similarities in the response of respondents encountered during the study, the sample size was minimized to 308; and this was proportionally divided among the study districts.

Sampling Techniques

Purposive sampling method was used to select the study districts and Peasant Associations (PAs) in the districts based on the existing cattle population in the area and proximity to transportation. Five districts and three PAs from each district were selected. Households having cattle were proportionally obtained using systematic random sampling and the data was obtained through a questionnaire interview using a semi structured questionnaire.

Data Analysis and Interpretation

The data obtained was entered into an excel spreadsheet (Microsoft office® excel 2007) and analyzed using Stata version 13.0 software (Stata Corp, College Station, TX). Descriptive statistics was employed to calculate the frequency and proportion of respondents in a different response category. Ranking index was used to rank the diseases based on their socio-economic importance as per the response of respondents. A P value of < 0.05, significant level, and 95% confidence interval was used for the analysis.

Results

Challenges of Cattle Production

Among the total of 308 respondents involved in the study, 211 (68.5%) of them have indicated that the reduced productivity of cattle in the area is due to a cumulative effect of disease, feed shortage, poor husbandry and lack of improved breeds (Table 1).

Table 1: Major constraints of cattle production in north Shewa zone.

Variables	Categories	Frequency of Selection by Respondents (N)	Percentage of Selection (%)
Challenges of Cattle Production	Combination of production challenges	211	68.5
	Feed shortage	8	2.6
	Disease	41	13.3
	Poor husbandry	4	2.3
	Lack of improve breed	44	14.3
	Total		308

Furthermore, 236 (76.6%) of the respondents have shown that, disease is the major challenge of cattle production in the zone especially during the summer season (Table 2).

Table 2: Season of the year and occurrence of cattle disease in north Shewa zone.

Variable	Categories	Frequency of Selection by Respondents (N)	Percentage of Selection (%)
Season	Summer	236	76.6
	Winter	44	14.3
	Autumn	11	3.6
	Spring	17	5.5
	Total		308

The present study also revealed that, among the different groups of animals in the herd, pregnant cows followed by young animals are the most susceptible groups of cattle compared to other groups of animals in the cattle herd. Nevertheless, 269 (87.3%) of the respondents have responded that all groups of cattle are equally susceptible to the disease (Table 3).

Table 3: Susceptibility of different groups of cattle to disease.

Variable	Categories	Frequency of Selection by Respondents (N)	Percentage of Selection (%)
Disease Susceptibility	All groups are equally affected	269	87.3
	Pregnant	21	6.8
	Young	13	4.2
	Old	1	0.3
	Female	4	1.4
	Male	0	0
	Total		308

Diseases of Cattle Circulating in North Shewa Zone

The study have shown that Blackleg, Foot and Mouth Disease (FMD) and Anthrax are the most commonly circulating diseases of cattle in the zone; ranked 1st, 2nd and 3rd respectively. In addition, Bovine Pasteurellosis, Mastitis, Fasciolosis and other endoparasites, Lumpy Skin Disease (LSD), Bloat, Tick infestation, Rabies, leech infestation, Calf Pneumonia, Actinobacillosis (Wooden Tongue) and Malignant Catarrhal Fever (MCF) are also the common cattle ill health in the zone being at different ranks based on their socio-economic relevance (Table 4).

Diseases of Cattle Circulating in the Study Districts

The study also ranked diseases of cattle circulating in the selected study districts according to the socio-economic burden they impose; as per the response of respondents. See Table 5 below.

Table 4: Rank of cattle diseases circulating in north Shewa zone.

Variable	Common Diseases	Sum of Frequency of Selection by Respondents (N)	Ranking Index	Rank of the Diseases
Rank of Common Cattle Diseases in North Shoa Zone	Blackleg	196	0.271468	1
	FMD	121	0.16759	2
	Anthrax	106	0.146814	3
	Bovine Pasteurellosis	77	0.106648	4
	Mastitis	51	0.070637	5
	Fasciolosis and other endoparasites	46	0.063712	6
	LSD	42	0.058172	7
	Bloat	31	0.042936	8
	Tick infestation	24	0.033241	9
	Rabies	14	0.019391	10
	Leech Infestation	5	0.006925	11
	Calf Pneumonia	4	0.00554	12
	Actinobacillosis	4	0.00554	12
	MCF	1	0.001385	14
	Total	722	100	

Table 5: Rank of cattle diseases circulating in the selected study districts.

Variable	Districts	Common Diseases	Ranking Index	Rank of the Diseases
Diseases of Cattle Circulating in the Selected Study Districts	Abbichu & Gne'a	Blackleg	0.970588	1
		Anthrax	0.029412	2
	Wuchale	Blackleg	0.961538	1
		FMD	0.038462	2
	Gerar Jarso	FMD	0.412698	1
		Blackleg	0.206349	2
		Mastitis	0.142857	3
		Fasciolosis and other endoparasites	0.079365	4
		Tick infestation LSD	0.079365	4
		Anthrax	0.047619	5
		Bovine Pasteurellosis	0.015873	6
	Kuyu	Anthrax	0.745098	1
		Blackleg	0.156863	2
		FMD	0.039216	3
		Fasciolosis and other endoparasites	0.039216	3
Bovine Pasteurellosis		0.019608	4	
Hidabu Abote	Blackleg	0.492958	1	
	Anthrax	0.408451	2	
	Bovine Pasteurellosis	0.042254	3	
	Tick infestation	0.042254	3	
	Fasciolosis and other endoparasites	0.014085	4	

Prevention and Control

In the present study, 249 (80.8%) of the respondents have used isolation of sick animals to minimize the transmission dynamics of disease in the cattle herd. The remaining 4 (1.3%) of them had a preference of taking sick animals to the nearest veterinary clinic for immediate therapeutic remedy; whereas, 55 (17.9%) of them hadn't taken any immediate measure to minimize the risk of disease transmission. Moreover, there was a

significant ($P < 0.05$) indigenous knowledge among respondents of different age groups in minimizing the transmission dynamics of disease in the cattle herd; with better knowledge witnessed among the middle age groups of 30-50 years.

Cadaver Management Strategies

An attempt made to assess the cadaver management strategies of cattle producers in the study area has shown that 180 (58.5%) of the respondents had the trend of sharing the meat

of dead animals to financially support the owner. On the other hand, 93 (30.2%) of them prefer to throughout the dead body elsewhere in the environment (**Table 6**).

Public Health Implications

The study revealed that 208 (67.8%) of the respondents have knowledge of zoonotic disease; 264 (85.7%) of them had also known its mode of transmission as ingestion of raw meat and milk. However, 100 (32.2%) of them lack both knowledge and modes of transmission to humans (**Table 7**).

Table 6: Cadaver management strategies in north Shewa zone.

Variables	Category	Frequency of Selection by Respondents (N)	Percentage of Selection (%)
Cadaver Management Strategies	Sharing the meat of dead animals		
		180	58.5
	Throwing out	93	30.2
	Burring	18	5.8
	Burning	17	5.5
Total		308	100

Table 7: Respondents view on the modes of transmission of zoonotic diseases.

Variables	Category	Frequency of Selection by Respondents (N)	Percentage of Selection (%)
Modes of Transmission	Consumption of raw meat and milk	264	85.7
	Inhalation	9	2.9
	Direct contact	35	11.4
Total		308	100

Discussion

This study was the 1st of its kind to assess cattle ill health circulating in North Shewa zone, Oromia, Ethiopia. It revealed that the reduced productivity in cattle is fundamentally due to a cumulative effect of disease, feed shortage, poor husbandry, and lack of improved breeds. It also noticed a tremendous effect of disease on cattle production causing serious morbidity, mortality, production losses, and reduced draft power. This finding is in agreement with the findings of Ashenafi [8], who reported that animal health is recognized as a significant source of production losses such as low weight gain, poor fertility, and lactation performance. The report of Shija et al [9] also revealed that livestock production and productivity are hindered by poor nutrition (both in quantity and quality), poor husbandry practices, and animal health ailments. A baseline report of the regional Pastoral Livelihoods resilience project in Ethiopia has also shown a highly devastating effect of the disease on cattle production which was demonstrated by higher mortality rate of up to 49% in oxen, 50% in local cows, 81% in crossbred cows, 52% in local calves/heifers, and 60% in crossbred calves/heifers [10]. Thus, it is imperative to implement appropriate disease prevention and control strategy in order to boost the production and productivity of cattle for the better benefit of the farmers and the country at large.

In the present study, Blackleg, FMD, and Anthrax were identified as the most commonly encountered and socio-economically important diseases of cattle in North Shewa zone; ranked 1st, 2nd and 3rd respectively. This finding is comparable with the finding of Solomon et al [11] who reported the top five diseases afflicting cattle in the highlands of Ethiopia as blackleg, anthrax, LSD, FMD, and bovine pasteurellosis respectively. The reports of NEPAD [12] has also revealed that Ethiopia is endem-

ic to numerous livestock diseases such as FMD which strongly challenges the productivity of cloven-hooved animals including cattle. The report also added that an estimated annual loss of about 1.5–2.5 billion birr was incurred from the export market due to major animal diseases [12]. Similarly, a study conducted on five cattle exporting enterprises in Ethiopia found 12.9% and 8% infection rates for FMD and CBPP, respectively, and estimated financial loss of about 241, 2341 USD due to these two diseases alone within a period of less than 2 years (between November 2013 and May 2014) [13].

The study also revealed the occurrence of Bovine Pasteurellosis, Mastitis, Fasciolosis, and other endoparasites, LSD, Bloat, Tick infestation, Rabies, leech infestation, Calf Pneumonia, Wooden Tongue and MCF having diverse occurrence and socio-economic burden in the area. A report by Ashenafi [8] also revealed that, since livestock production in Ethiopia is primarily of an extensive type, it is hindered by production losses due to animal health ailments; among which Anthrax, Blackleg, LSD, Trypanosomiasis, Fasciolosis, Tick infestation and biting flies are the most economically devastating diseases. A study conducted on major diseases of ruminants and management practices in Western Tigray province, northern Ethiopia, also reported the disease as one of the major causes of production loss; posing a serious economic burden in the area, Getachew et al [14]. So, any governmental and non-governmental organizations working on limiting the impact of diseases on the productivity of livestock, including cattle, should focus on such diseases in launching preventive and control strategies in the zone.

An assessment made to identify the indigenous knowledge of cattle producers concerning their indigenous disease prevention and control strategies has shown that 249 (80.8%) of them used isolation of the sick animals to limit the transmission cycle

of disease in the cattle herd. The report of MOA and ILRI [15] has also shown a similar scenario in which most rural population of Ethiopia have the indigenous knowledge of health management practices like disease prevention. Thus, since the number of cattle owners limiting the transmission cycle of disease through isolation of sick animal is promising, those lacking the knowledge of performing such an easiest but remarkably important disease preventive procedures should be technically intervened.

The study also connoted pregnant cows followed by young animals as the most susceptible groups of cattle to different livestock diseases compared to other groups of animals in the cattle herd. This view of respondents is also supported by the existing scientific evidences elsewhere in the literature; which dictates that genetics, immune system, management, age, and other factors influence the health of an animal [16, 17]. Thus, because pregnant cows are under a continuous physiological stress of pregnancy and lactation, and in young animals the immunity is not well developed; hence, both groups of animals are exceptionally susceptible to disease compared to others. However, 269 (87.3%) of the respondents were lacking knowledge of this fact; implying that most of the farmers did not know for which group of animals the utmost care has to be taken to minimize the risk of exposure to different disease challenges. Thus, cattle producers should be equipped with such facts through unremitting technical interventions.

An attempt made to know cadaver management strategies in the area has shown that 180 (58.5%) of the respondents believe that sharing the meat of dead animals among the community is the best cadaver management strategy to financially support the owner. After sharing the meat of the dead animal, they refund the owner with some amount of money; so that the owner will purchase and replace the dead animal. However, this traditional strategy could end up with serious public health implications, especially if the animal is died of zoonotic diseases like Anthrax. Moreover, 93 (30.2%) of the respondents also believe that the dead bodies should be thrown out elsewhere in the environment. This results in environmental contamination which espouses the cycle of disease transmission. It also predisposes the surrounding community in general and livestock farmers in particular to soil-born zoonotic pathogens such as Anthrax which are easily acquired from the contaminated environment. This finding also agrees with the finding of Grace [18] who reported that farmers, veterinarians, and other livestock workers are directly exposed to environmental and food borne zoonosis. Therefore, such knowledge gaps should be managed through technical intervention. On the other hand, 18(5.8%) and 17 (5.5%) of the study participants have responded that the dead bodies should be managed through burning and burring, respectively; and such knowledge should be promoted in the study area to limit the cycle of disease transmission and to minimize the risk of zoonosis.

Concerning the public health implications of cattle disease, 208 (67.8%) of the respondents have shown knowledge of such risks that some of the diseases could be zoonotic. However, 100 (32.2%) of them were lacking such knowledge. Although the majority of the respondents had knowledge of the fact that some animal diseases are zoonotic, there are still many resource poor cattle owners who need technical support. Grace [19] have also reported that, in 59 low- income countries, zoonosis accounted for 13% of the infectious disease burden, while in rich countries zoonosis were responsible for less than 1% of

the infectious disease burden.

The study also assessed respondents' knowledge on the transmission modalities of zoonotic diseases. Accordingly, 264 (85.7%) of them have shown that ingestion of raw meat and milk are the major modes of transmission. Since about 60% of human diseases are originated from animals and animal products, it is a must for medical and veterinary professionals to intensively work on promoting the awareness of the community regarding the risk of infection, modes of transmission and preventive measures of zoonotic diseases. Grace [18] also stated that around 60% of all pathogens that cause disease in humans are zoonotic and it can have a direct effect on human health.

Conclusion

The current cross-sectional study on the occurrence of cattle ill health and associated risk of human exposure in North Shewa zone of Oromia, Ethiopia, has revealed that Blackleg, FMD and Anthrax are the most prevalent and socio- economically important diseases of cattle in the zone; ranked 1st, 2nd and 3rd respectively. Other diseases such as Bovine Pasteurellosis, Mastitis, Fasciolosis and other endoparasites, Lumpy Skin Disease (LSD), Bloat, Tick infestation, Rabies, leech infestation, Calf Pneumonia, Wooden Tongue and MCF are also occurring with different levels of incidence and prevalence in the zone in general and in the selected study districts in particular.

Among the control and prevention strategies, isolation of sick animals was renowned as the most commonly used disease prevention method at farmers' level; while sharing the meat of dead animals and throwing it out to the surrounding environment were evidenced as the commonly used risky cadaver management methods in the area. A notable number of the study participants were also lacking knowledge of zoonosis and its transmission modalities. This knowledge gap and traditional practices like sharing the meat of dead animals are areas of public health concern. Thus, it is imperative to pay utmost attention to intervene the existing knowledge gaps of cattle producers and confirm the occurrence of disease in the cattle population using better diagnostic tools so that the information shall boost an effective control strategies of cattle diseases and aid in curbing the economic burden and public health implications of the diseases.

Declarations

Ethics approval

The study was reviewed and approved by Salale University Ethical Review Committee with an approval certificate Ref No.SLU/ERC/025/11/2018.

Informed consent

A written informed consent was obtained from all participants of the study.

Consent for publication: Not applicable

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Authors' contributions

The study was conceived, designed, data was collected, analyzed and interpreted, and the first draft manuscript was written by T.D. Both D.B. and B.A. were also participated in enrich-

ing the research idea, study design, data collection, analysis and interpretation. All the three researchers were edited the draft manuscript, approved and agreed to its publication.

Competing interests

The authors declare that they have no competing interests.

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