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Assessment and prioritization of potential domestic diseases of ruminants in selected areas of Afar Regional State, Samara, Ethiopia

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Abstract
A cross-sectional study was carried out from January to July 2014 GC in an attempt to assess and prioritize major domestic ruminants' diseases and identify risk factors in the selected areas of the Afar region. Livestock owners' interviews and retrospective data analysis were the study methods employed. Relevant collected data was organized and further analyzed using SPSS statistical tools at $p<0.05$. Descriptive statistics were carried out to determine the frequencies of domestic ruminants' diseases. Based on descriptive statistics, the study identified and prioritized 23, 22, and 21 cattle, goat, and sheep diseases, respectively. Chi-Square analysis was computed to measure the degree of association between disease occurrence and risk factors (age, sex, study area, and season). Binomial and multinomial logistic regression analyzes were computed at $p<0.05$ to measure the significance of associated risk factors on disease occurrence. Statistically significant variations ($p<0.05$) were observed for sex, seasons, age, and study sites on the occurrence of disease, with the exception of kebeles ($p>0.05$). Though the study duly has revealed numerous diseases of domestic ruminants, the actual existence (laboratory-based confirmation) and epidemiology of each disease still demand further investigative studies. Therefore, this study recommended further and continued research activities or confirmatory investigations on the present findings to be conducted, including specific sample collection and laboratory identification of etiologies of each disease combined with careful epidemiological studies.

Keywords: Ruminants, survey, disease frequency, afar region

Introduction
Geographically situated in the northeastern part of the country, the Afar region is located between 39º34' and 42º28' East Longitude and 8º49'and 14º30'North Latitude (CSA, 2008) [9]. The region shares common international boundaries with the state of Eritrea in the north-east and Djibouti in the east, as well as regional boundaries with the Regional States of Tigray in the north-west, Amhara in the south-west, Oromia in the south and Somali in the south-east. The Afar regional state comprises 5 administrative zones, 32 districts and 331 kebeles (PFE, 2009) where the region is situated in the Great Rift Valley of East Africa. There are four distinct seasons in the region, namely, Kerma (summer), Hagay (autumn), Gilele (winter), and Sugum (spring) and climatically characterized by an arid and semi-arid climate with low and erratic rainfall. The annual temperature and rainfall in the region are 30-50 °C and 200-600 mm, respectively. The altitude in the region ranges from 100-1000 meters above sea level (Berhanu, 2008) [6]. The production system of the region is pastoralism (90%) and agro-pastoralism (10%).

The northern part of the Afar Region is a semi-desert with thorny species of shrubs and acacia; further south in the awash valley, steppe vegetation is dominant. Both ecological stages are facing bush encroachment with *Prosopis juliflora* (Woyane) (Piguet, 2001) [12]. Major crops cultivated in the region include cereals, maize, sorghum, teff, pulses, and oilseeds (CSA, 2009/2010) [8]. The total human population is estimated to be 1,493,409 (PFE, 2009) and the total estimated livestock population included 2,336,488 heads of cattle 4,267,969 head of goats, 2,463,632 head of sheep, 852,016 head of camels, and 187,287 head of equines that support the region and contribute to the national economy (ARS, 2010).

For the pastoral community, livestock is the most important economic factor influencing all other socio-political and cultural activities. However, benefits from the livestock sector remained marginal, which could be attributed to inadequate year-round feed resources, losses from widespread diseases interacting with a lack of adequate veterinary services, pastoral conflict, poor management under which they are served, the low genetic potential for milk production of the indigenous livestock breeds and poor access to input and output market services and inadequate institutions (Assegid, 2000; Garry, 2001) [4, 13].

The primary challenge for the region's community has remained to be livestock diseases including Pasteurellosis, contagious bovine pleuropneumonia (CCPP and CBPP), foot and mouse disease, anthrax, PPR, bloody diarrhea, skin and lung diseases, and internal and external parasites and others (Save the children, UK, 2008; MOA, 2004; Gelagay, 1996; Asfaw and Sintaro, 2000) [18, 16, 14, 13]. Research based reliable, organized and prioritized livestock disease information is unavailable. Experiences have shown that (Coppock, 1994) information on animal health had been the focus of research. However, knowing the type and extent of the common and/or major health problems is very important to livestock owners. Veterinarians and researchers can assist in further study of an epidemiological study on diseases of livestock the development of herd health strategies and the selection of possible interventions (Radiostatis *et al*., 1994; Damte, 2003) [7, 11]. Significant seasonal migrations within the vast lowlands are leading factors for the spread of many endemic and epidemic livestock diseases. According to some studies, livestock diseases accounted for more than 50% of the total mortality in the lowlands (Coppock, 1994) [7].

Disease, therefore, reduces household food consumption both directly and indirectly. This situation necessitates urgently identifying those livestock diseases followed by designing of appropriate control and prevention strategies. This general scenario holds true also for domestic ruminants (cattle, goats, and sheep) in the Afar region. The unavailability of organized and prioritized camel diseases in the region has instigated research activity aimed at a generation of preliminary data on camel diseases. Therefore, the objectives of this study were to assess and prioritize potential cattle and small ruminants' diseases identify risk factors associated with disease occurrence in the study areas.

Materials and Methods

Description of the study areas

The study was carried out from January to August 2014 in an attempt to identify and prioritize major camel diseases in six selected Afar region districts. Three districts (Asaita, Dubti, and Chifra) and three districts (Telalak, Dewew and Dalifage) were selected from Zone 1 and 5, respectively. In Zone 1, as of the 2007 census, the total human and camel population was estimated to be 421,790; 891,330, and 2,473,290, respectively. Maize, rice, groundnut, and chickpea were major crops cultivated in Zone 1. On the other hand, in Zone 5, the census study carried out at the same time of the year indicated the total human, cattle, and shoat population to be 183,701; 201,337 and 875,130, respectively. Maize, sessame, masho, groundnut, chickpea, and rice to be major crops and green pepper, tomato, Onion, and sweet potato to be major vegetables in Zone 5. Four seasons circulate in the region each year: Kerma (summer), Hagay (autumn), Gilele (winter) and Sugum (spring).

The study population

The study was conducted on local domestic cattle, goat and sheep reared by Afar pastoral and agro-pastoral camel owners. All age groups and sex were included in the study.

The study design

The study was carried out applying a cross-sectional study design. Methodologically, questionnaires and retrospective data analysis were used to generate the required information. Two zones of the region (Zone 1 and zone 5) were selected randomly. Three districts were selected from each zone and three kebeles in turn were selected of each district. Eight camel owners were selected for each kebele for interview. As a result, 144 camel owners interviewed. Retrospective data of five years (2009-2013 GC) was collected of six selected veterinary clinics in the study districts.

Sampling methods and sample size determination

A combination of both probability and non-probability sampling methods was applied in the study. Zones (Zone 1 and 5), districts and kebeles were purposively selected based on the accessibility of selected study areas, study population density and argo-ecologic differences. From Zone 1, three districts (Asaita, Dubti and Chifra) and Zone 5, three districts (Telalak, Dawe and Dalifage) were purposively selected. Similarly, three kebeles from each selected district were in turn selected purposively. However, interviewees per each selected kebele were selected using a simple random sampling method**.** The total number of interviewees (sample size) required for this study was determined using a formula given by (Thrusfield, 1995) [21].

$$N= [1.96^2 P_{exp} (1-P_{exp})]/d^2$$

(Where, N= Sample size, P_{exp}= Expected prevalence, d= Absolute precision).

In determining the total number of samples to be taken, the absolute precision was taken to be 0.05 and the expected prevalence of 0.5. Substituting variables the formula has provided the total sample to be 384. However, due to information redundancy observed during the study period, the total number of interviewees to be taken was reduced from 384 to 144 which indirectly fixed the selection of eight livestock owners/respondents to be randomly selected for each study kebeles.

Study methodology

Two complementary study methods (questionnaire and retrospective data analysis) were parallelly carried out to generate combined possible valid information.

Questionnaire survey

Prior to the administration of questionnaires, the study questionnaires were carefully drafted and structurally organized, and pretested. Each question paper comprised nine pages and 21 targeted questions written in the English language. During the study period, 144 questionnaire papers were prepared and administered to 144 randomly selected different livestock owners (both adult men and women). Translating English to Amharic and then to Afar local language, each camel owner was asked 21 specific questions pertaining to camel disease conditions. The same study questionnaire formats were used in all study areas.

Retrospective data collection

To questionnaire outputs, retrospective data of five years (2000-2004 E.C) were also collected from six selected veterinary clinics present in the six selected districts using a separate type of paper format prepared for this purpose. This was assumed to increase the validity and truth of the respondents' responses or to correlate clinical data with community responses.

Data management and analysis

Relevant data collected from livestock owners and veterinary clinical records were organized and further analyzed us analytical software statistical packages for social sciences (SPSS, Version 15.0, 2005) ware. Descriptive statistics were conducted to determine the frequency (priority) of cattle and small ruminant diseases and associated rates of zones, districts, age groups, sex, and seasons. Chi-square test was employed to assess the existence of an association between disease occurrence and risk factors. Both binomial and multinomial logistic regression analyzes were performed to evaluate the significance of the association between disease occurrence and risk factors.

Results

The combined results of 144 livestock owners' interviews and analysis of veterinary clinical records identified 23, 22, and 21 cattle, goats, and sheep diseases, respectively, as prioritized in Table 2. The community responses on livestock diseases were also further supported by an analysis of five years' retrospective data records gathered from study districts. On the basis of etiologic agents, domestic ruminants' diseases reported in the current study were categorized into six groups: Bacterial, parasitic, fungal, viral, unknown etiology, and miscellaneous diseases as shown in the following table (Table 1).

Table 1: Etiological category of ruminant diseases

Livestock species	Frequency and disease category by etiology/causative agent					
	Bacterial (%)	Viral (%)	Fungal (%)	Parasitic (%)	Miscellaneous (%)	Unknown (%)
Cattle	9 (39.13)	4 (17.4)	1(4.34)	4(17.4)	3 (13.04)	2(8.7)
Goat	6 (27.27)	4(18.18)	1(4.55)	4(18.18)	4(18.18)	3(13.64)
Sheep	6 (28.57)	4(19.05)	1(4.76)	4(19.05)	4(19.05)	2(9.5)

Identified cattle diseases and associated findings

The study identified about 23 potential cattle diseases based on the responses of 144 livestock owners and retrospective data analysis of six selected veterinary clinical records. These findings are summarized using bar graphs, pie charts and tables below.

Table 2: Total frequency of cattle diseases

Disease		Frequency (%)
Local name	Another name	
Kirbi	Fasciolosis	46 (10.38)
Klim	Tick	41 (9.26)
Sole/Tuffo/waydolele	Pasteurellosis	45 (10.16)
Kahu/Gosom	Respiratory problems	6 (1.35)
Degehawe	RP	9 (2.03)
Abib	FMD	23 (5.19)
Fentidele	Brucellosis	4 (0.9)
Waybo/Gudufe	Lumpy skin disease/LSD	24 (5.42)
Gublo	CBPP	44 (9.93)
Hunkof	Footrot	7 (1.58)
Begudaria	Internal parasites	21 (4.74)
Agara	Menage	34 (7.68)
Uruguta	Diarrhea	5 (1.13)
Armeco	Jaws disease/mouth bent	2 (0.45)
Haleb	Ephemeral fever	2 (0.45)
Angubiack/Duduba	Mastitis	11 (2.48)
Begikefna	Constipation	3 (0.68)
Sangite	BTB	20 (4.52)
Andedo	Jaundice	18 (4.06)
Nooke	Tetanus	3 (0.68)
Geno/Ladore	Anthrax	39 (8.80)
Haramude/harabiti	Black leg	31 (7)
Dahoable	Babesiosis	5 (1.13)

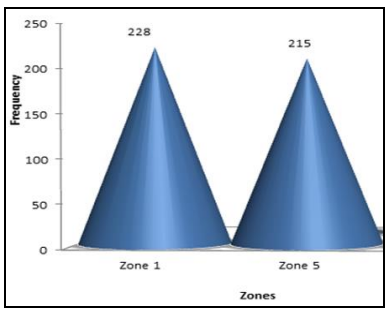

Fig 1: A column graph indicating the frequency of cattle diseases by zone Binomial logistic regression analysis indicated that there was a statistically significant association between the two zones (Zones 1 and 5) (P = 0.000).

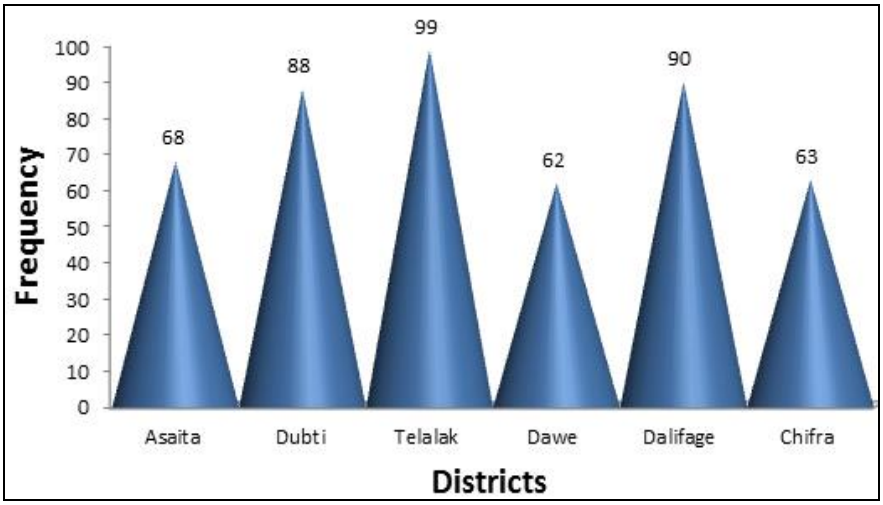

Fig 2: A column graph illustrating total frequency of cattle diseases by district The occurrence of cattle diseases between districts studied indicated a significant difference statistically (P=0.000).

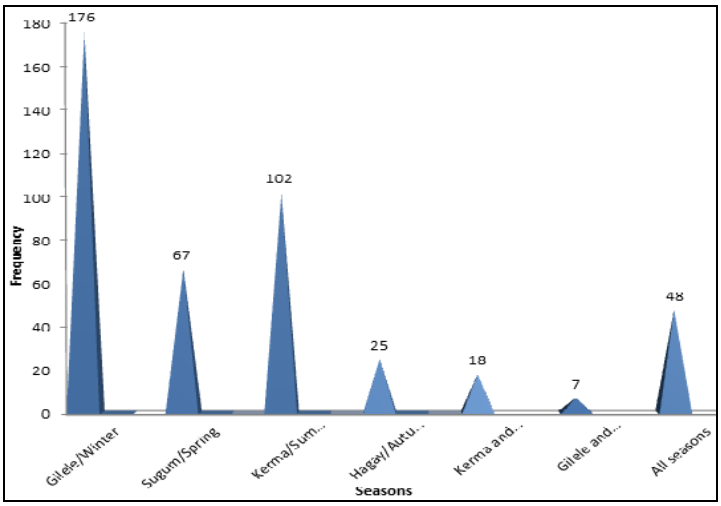

Fig 3: A column graph indicating the seasons in which diseases occur most. A statistically significant difference ($p<0.05$) was also observed among seasons

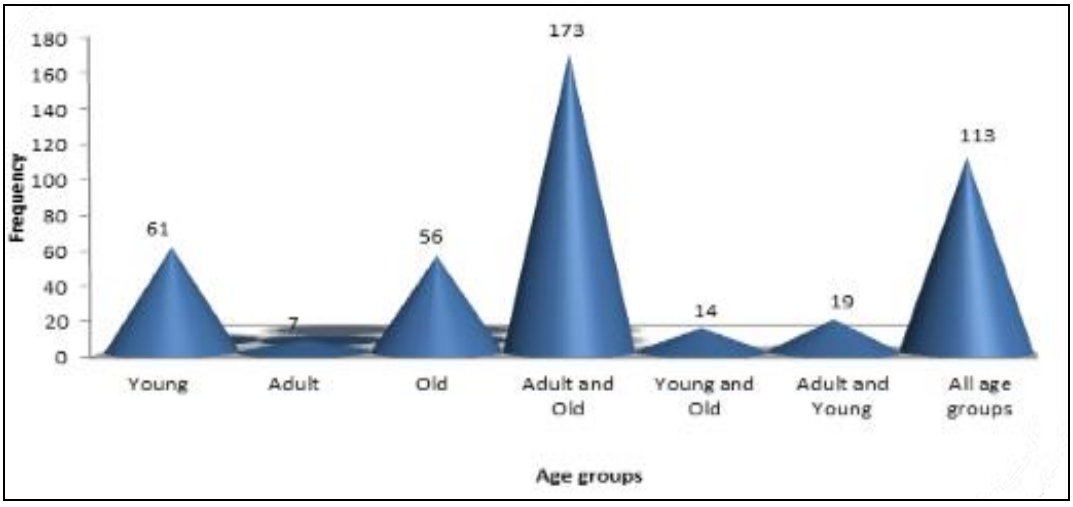

Fig 4: A column graph illustrating the total frequency of cattle diseases by age

In an attempt to assess the impact of age as a risk factor on disease occurrence, a statistically significant difference (P= 0.000) was observed using multinomial logistic regression. Analysis has also made to see sex as a factor and found as a statistically significant association (P=0.000) existed between sex and disease occurrence. On the other hand, statistical analysis indicated as kebeles or pastoral villages had no statistically significant association (P=0.783) with disease occurrence (Table 2).

Table 3: Summary of risk factors and their association of risk with cattle diseases occurrence

Variables		Frequency (%)	p-value
Zone	Zone 1	228 (51.47)	0.000
	Zone 5	215 (48.53)	
District	Telalak	86 (19.4)	0.000
	Chifra	84 (18.96)	
	Dubti	63 (14.2)	
	Asaita	81 (18.3)	
	Dawe	58 (13.08)	
	Dalifage	71 (16.03)	
Sex	Male	5 (1.13)	0.000
	Female	17 (3.84)	
	Both sex (mixed)	421 (95)	
Season	Gilele	176 (39.73)	0.000
	Sugum	67 (15.12)	
	Hagay	25 (5.64)	
	Kerma	102 (23)	
	Kerma and sugum	18 (4.06)	
	Gilele and hagay	7 (1.58)	
	All seasons	48 (10.84)	
Age groups	Young	61 (13.77)	0.000
	Adult	7 (1.58)	
	Old	56 (12.64)	
	Young and old	14 (3.16)	
	Adult and young	19 (4.29)	
	Adult and old	173 (39.05)	
	All age groups	113 (25.51)	
Kebeles	18 kebeles		0.783

Identified goat diseases and associated findings

This study identified about 22 influential goat diseases based on the responses of 144 livestock owners and retrospective data analysis of six selected veterinary clinical records. These findings are summarized using bar graphs and tables below.

Table 4: Total frequency of goat diseases

Disease		Frequency (%)
Local name	**Another name**	
Kirbi	Fasciolosis	41 (8.72)
Klim	Tick	48 (10.21)
Sole/Tuffo/waydolele	Pasteurellosis	52 (11.06)
Kahu/Gosom	Respiratory problems	22 (4.9)
Andegule/Undahe	PPR	38 (8.09)
Abib	FMD	11 (2.34)
Fentidele	Brucellosis	16 (3.4)
Ambrarisso/Korboda	Goatpox	36 (7.7)
Mesengele	CCPP	46 (9.78)
Begudaria	Endoparasites	29 (6.17)
Agara	Meange	52 (11.06)
Uruguta	Diarrhea	10 (2.13)
Surato	Nasal discharge	5 (1.06)
Angubiack/Duduba	Mastitis	13 (2.8)
Begikefna	Constipation	5 (1.06)
Sandera/Amerraro	Orf	19 (4.04)
Hunkof/eibba/Koss	Footrot	10 (2.13)
Beguharbite	Bloat	4 (0.85)
Andedo	jaundice	7 (1.5)
Nooke	Tetanus	1 (0.22)
Slaitu	Twisted neck syndrome	3 (0.63)
Hama	Ringworm	2 (0.43)

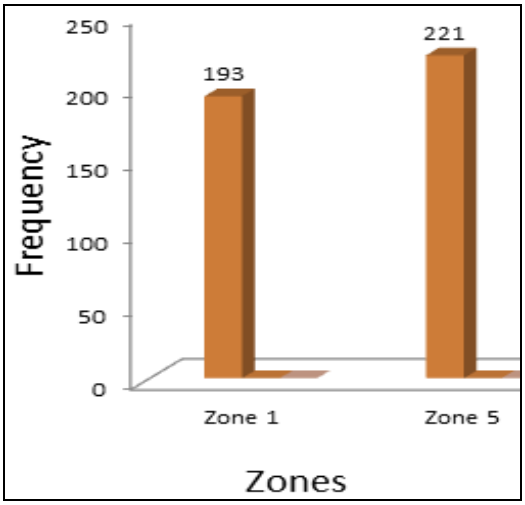

Fig 5: A column graph illustrating of total prevalence of goat diseases by zone Binomial logistic regression analysis indicated that there was a statistically significant difference between the two zones (Zones 1 and 5) (P = 0.000).

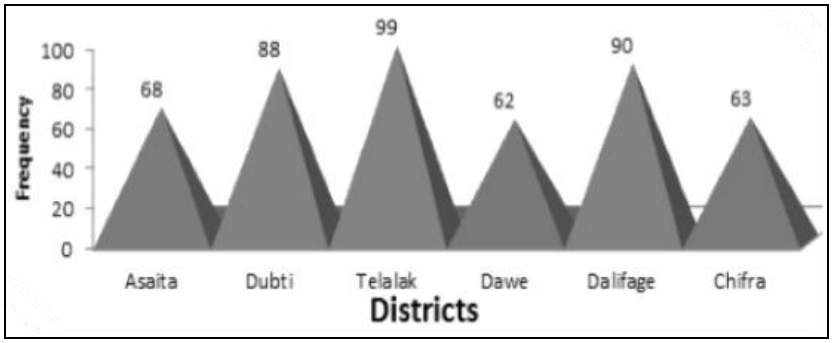

Fig 6: A column illustrating total frequency of goat diseases by district The occurrence of goat diseases between districts studied indicated a significant statistical difference (P=0.000).

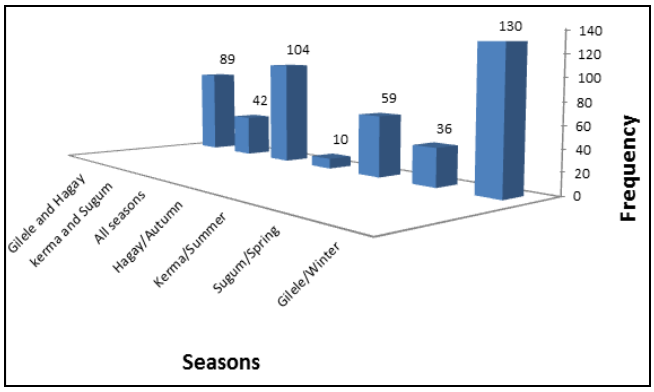

Fig 7: A column graph indicating the seasons in which diseases occur most Multinomial logistic regression analysis has revealed a statistically significant difference ($p<0.05$) was observed among seasons

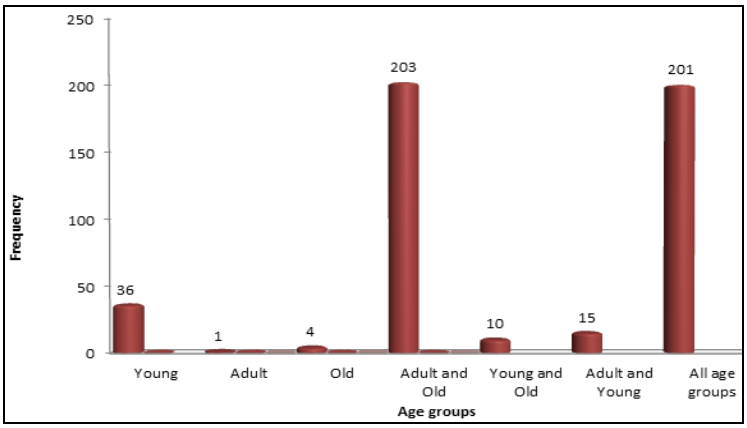

Fig 8. A bar graph illustrating total frequency of goat diseases by age In an attempt to investigate the effect of age as risk factor on disease occurrence, statistically significant difference (P= 0.000) was observed applying MNLR analysis

Analysis has also made to see sex as factor indicating a statistically significant association (P=0.000) between sex and disease occurrence. On the other hand, MNLR analysis indicated the absence of impact of kebeles on disease occurrence (P= 0.851) (Table 4).

Table 5: Summary of risk factors and their association of risk with goat diseases occurrence

Variables		Frequency	P-value
Zone	Zone 1	219 (46.6)	0.000
	Zone 5	251 (53.4)	
District	Telalak	99 (21.06)	0.000
	Chifra	63 (13.4)	
	Dubti	88 (18.72)	
	Asaita	68 (14.47)	
	Dawe	62 (13.19)	
	Dalifage	90 (14.15)	
Sex	Male	---	0.000
	Female	20 (4.25)	
	Both sex (mixed)	450 (95.75)	
Season	Gilele	130 (27. 66)	0.000
	Sugum	36 (7.67)	
	Hagay	10 (2.13)	
	Kerma	59 (12.55)	
	Kerma and sugum	42 (8.94)	
	Gilele and hagay	89 (18.94)	
	All seasons	104 (22.13)	
Age groups	Young	36 (7.7)	0.000
	Adult	1 (0.2)	
	Old	4 (0.85)	
	Young and old	10 (2.13)	
	Adult and young	15 (3.19)	
	Adult and old	203 (43.19)	
	All age groups	201 (42.77)	
Kebeles	18 kebeles		0.865

Identified sheep diseases and related findings

This study identified about 21 influential sheep diseases based on the responses of 144 livestock owners and retrospective data analysis of six selected veterinary clinical records. These findings are summarized using bar graphs and tables below.

Table 6: Total frequency of sheep diseases

Disease		Frequency (%)
Local name	**Another name**	
Kirbi	Fasciolosis	43 (10.4)
Klim	Tick	42 (10.2)
Sole/Tuffo/Undahi/	Pasteurellosis	50 (12.1)
Kahu/Gosom	Coughing	23 (5.6)
Andegule/Undahe/Harogiti	PPR	26 (6.28)
Abib	FMD	4 (0.97)
Fentidele	Brucellosis	16 (3.87)
Ambrarisso/Korboda/Amararo	Sheep pox	26 (6.28)
Mesengele	CCPP	28 (6.8)
Begudaria	Internal parasites	28(6.8)
Agara	Ectoparasites/meange	55 (12.29)
Uruguta	Diarrhea	10 (2.42)
Andedo	Jaundice	5 (1.21)
Surato	Nasal discharge	3 (0.72)
Angubiack/Duduba	Mastitis	13 (3.14)
Begikefna	Constipation	5 (1.21)
Sandera/Ambrarugu	Orf	18 (4.35)
Hunkof/eibba/Koss	Footrot	11 (2.66)
Beguharbite	Bloat	5(1.21)
Nooke	Tetanus	1 (0.24)
Hama	Ringworm	2 (0.48)

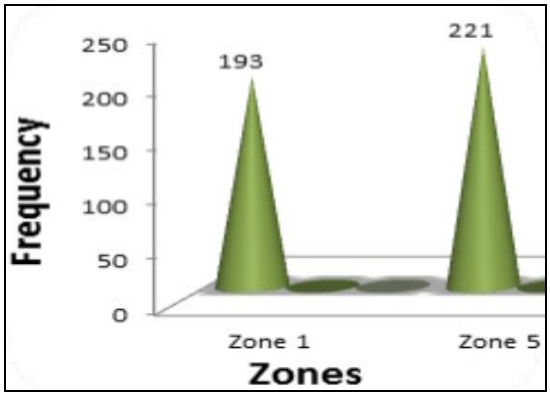

Fig 9: A column graph indicating total frequency of sheep diseases by zone. Binomial logistic regression analysis indicated that there was a statistically significant difference between the two zones (Zones 1 and 5) (P = 0.000).

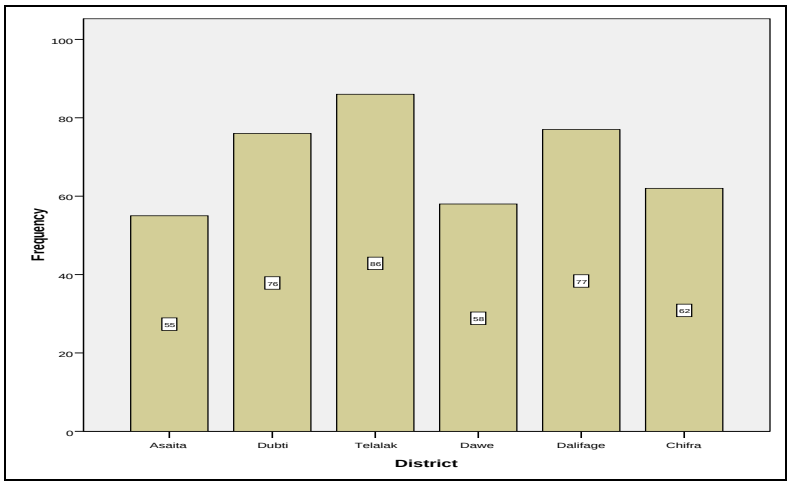

Fig 10: A bar graph illustrating total frequency of sheep diseases by district. The occurrence of sheep diseases between districts studied indicated a significant statistical difference (P=0.000).

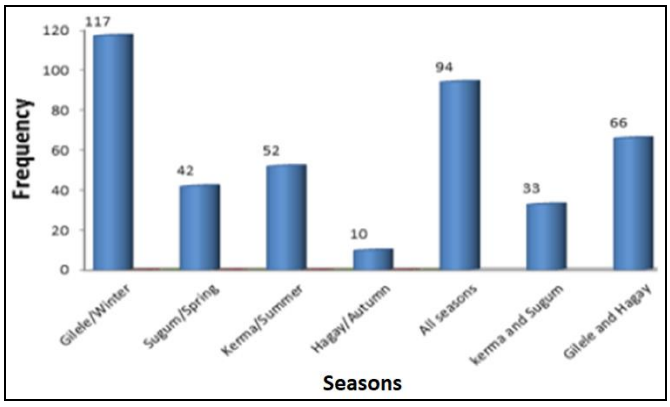

Fig 11: A column graph indicating the seasons in which diseases occur most. A statistically significant difference ($p<0.05$) was also observed among seasons.

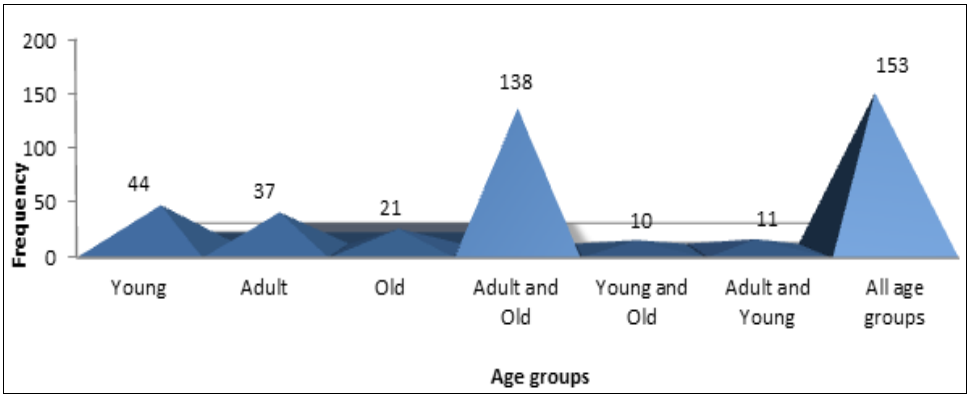

Fig 12: A bar graph illustrating total frequency of sheep diseases by age

In an attempt to assess the impact of age as a risk factor on disease occurrence, a statistically significant difference (P= 0.000) was observed. Analysis has also been made to see sex as a factor indicating a statistically significant association (P=0.000) with disease occurrence. On the other hand, a statistical analysis has made for kebeles (three kebeles from each selected district) and revealed that there was no statistically significant difference (P=0.997) with the occurrence of disease (Table 8).

Table 7: Summary of risk factors and their association of risk with sheep diseases occurrence

Variables		Frequency	P-value
Zone	Zone 1	193 (46.18)	0.000
	Zone 5	221 (53.38)	
District	Telalak	86 (20.77)	0.000
	Chifra	62 (14.97)	
	Dubti	76 (18.36)	
	Asaita	55 (13.29)	
	Dawe	58 (14)	
	Dalifage	77 (18.6)	
Sex	Male	------	0.000
	Female	21 (5)	
	Both sex (mixed)	393 (94.93)	
Season	Gilele	117 (28.26)	0.000
	Sugum	42 (10.15)	
	Hagay	10 (2.4)	
	Kerma	52 (12.56)	
	Kerma and sugum	33 (7.97)	
	Gilele and hagay	66 (15.94)	
Age groups	Young	44 (10.63)	0.000
	Adult	37 (8.93)	
	Old	21 (5.07)	
	Young and old	10 (2.4)	
	Adult and young	11 (2.66)	
	Adult and old	138 (33.33)	
	All age groups	153 (36.96)	
Kebeles	18 kebeles		0.997

Discussion

Combined analysis of retrospective data and community interviews revealed 23;22 and 21 potential cattle, goat, and sheep diseases as indicated (Tables 2, 4, and 6), respectively. Dagnachew (1997) [10] conducted a livestock disease survey in zone 2 and reported 19 cattle, 13 camels, 22 goats, and 18 sheep diseases. His report agrees with the findings of the present study. The local and scientific names of the diseases he reported in each species are also similar with few variations due to local differences in the naming of the same disease. The more numerous disease lists reported in this present study in cattle and camel species compared to his findings may be due to sampling of more study areas (six selected districts from zones 1 and 5) in contrast to a single study woreda, Aba'ala. In addition, though not all, those dominant diseases reported by Dagnachew (1997) [10] are also dominantly reported in the present study areas. This might be attributed to the fact that the study areas are ecologically identical (Zones 1, 2, and 5). Furthermore, factors like animal breeds, management, and intermingling (communal grazing) of livestock in the study areas.

Cattle diseases

This survey has revealed 23 cattle diseases, including their respective frequencies as indicated (Table 2) which were supposed (by livestock owners) to affect cattle health and expected productivity levels. Most frequent cattle diseases in decreasing order included Fasciolosis/Kirbi (10.38%), Pasteurellosis/Sole (10.16%), CBPP/Gublo (9.93%), Ticks/Kilim (9.26%), Anthrax/Geno (8.80%) and others. This study revealed as that Fasciolosis/Kirbi (10.38%) the most frequent disease in cattle. A high prevalence of Fasciolosis was reported by Ameni *et al*., (2001) [23] in northeast Ethiopia in cattle. These most frequent and other cattle diseases (listed in Table 2) are also reported by different authors including Tekle (2007) [20] in Alamata district, Tigray region, and Dagnachew (1997) [10] in zone 2 of Afar region. However, the occurrence of these diseases indicated significant variation ($p<0.05$) among study areas.

Goat diseases

The study assessed and revealed 22 potential goat diseases of all the study sites. Goat diseases identified were ranked based on occurrence or frequency as tabulated (Table 4). A few most frequent sheep diseases in decreasing order include: Undahi/Pasteurellosis (11.06%, and meange/agara/(11.06%) both are ranked first), secondly kilim/ticks (10.21%), thirdly Mesengele/CCPP (9.78%), Fasciolosis/kirbi (8.72%), and others as indicated (Table 5) were found to be the most challenging sheep diseases reported by respondents and clinical data analysis. The reports of Dagnachew (1997) [10], from zone 2 of the Afar region agree with the present findings though variations exist. He reported 22 major goat diseases which coincided with the present findings though a few diseases he reported are slightly different from the diseases found in zone 1 and 5. He found CCPP/Mesengele to be the leading goat disease in zone 2 followed by meange/Agara and thirdly Undahi/Pasterollosis. Despite existence of the diseases, the prevalence/frequencies of tick/kilim and Fasciolosis/kirbi which were placed third and fifth in this study were ranked 15th and 20th, respectively in zone 2 in contrast to their frequencies in zones 1 and 5 (present study areas). Variations might be an ecologic preference of diseases, animal management practices, the geography of the study

areas, study methods, and the like. A few goat diseases identical to the present study were also reported by Tekle (2007) [20], from Tigray region.

Sheep Diseases

This study assessed and established 21 major sheep diseases from all the study sites. Sheep diseases identified were ranked based on occurrence or frequency as tabulated (Table 6). A few most frequent sheep diseases in decreasing order include: Meange (locally termed as "Agara" is found to be the leading disease of sheep followed by Pasteurellosis/Tuffo (12.1%), thirdly Fasciolosis/Kirbi (10.4%), fourthly ticks/kilim (10.2%), and two diseases of sheep were equally frequent (CCPP/Mesengele (6.8%) and Begudaria/internal parasites (6.8%)), theses and others mentioned in table 6 were found to be the most challenging sheep diseases reported by respondents and clinical data analysis. Majority of these sheep diseases were also reported by Dagnachew (1997) [10], from zone 2 of Afar region. He reported 18 sheep diseases and ranked Pasteurellosis/Undahi/ Tuffo/first, Agara/meange second/, tick/kilim/12th, Begudaria/ internal parasite 5th and lastly Fasciolosis/kirbi. These variations can attributed to ecological difference which can enhance/hinder the occurrence diseases, season of study between study areas and better clinical data recording system. Moreover, Tekle (2007) [20] had conducted a study in one of Tigray region districts, Alamata and reported majority of these sheep diseases.

A statistically significant variation ($p<0.05$) has been indicated among different age groups of each species (cattle, goat and sheep) respectively. The questionnaire survey indicated as disease occurrence is far more frequent in young once followed by older animals. In support of other observations (Urquhart, *et al*., 1996 and Melauncon, 1993) [22, 15], young animals are more severely affected than older animals, this is perhaps because they possess a higher ratio of accessible surface to body volume, inefficient grooming behavior and other defense capabilities/immunological maturity (Melauncon, 1993) [15] as the animals get older and the development of acquired resistance due to repeated exposure. It was also observed that a much lower frequency of diseases was observed in adult cattle compared to young and old once.

There was statistically significant variations ($p<0.05$) between sex indicating that identified diseases in each species were more frequent in female animals compared to male animals (Tables 3, 5, and 7 for cattle, goat and sheep, respectively). But, most diseases were found to influence both sex in each species. This may be due to the exposure of female animals stress conditions, especially lactating and pregnant animals. Generally, identified in the three species (cattle, sheep and goat) diseases were more frequent in female animals than male animals.

The study of seasonal dynamics on the occurrence of diseases had implied that there were statistically significant variations ($p<0.05$) among the four common seasons in the region (Tables3, 5 and 7 for cattle, goat and sheep, respectively). As indicated majority of the diseases in each species occur in the season winter/gielele followed by summer/kerma season, thirdly in spring/sugum and least in the season autumn/hagay. Many riskfactors found to be significantly associated with domestic ruminants' diseases ($p<0.05$). Study sites, sex and age of the animals, and season showed significant differences with respect to disease occurrence. Zonal and district level significant variations could be attributed to the difference in ecology, nutritional impact, breed type, geography, and management practices through kebeles were found to have no impact on disease occurrence ($p>0.05$). Husbandry practices and breeds of animals kept could be probable reasons.

Statistically significant variation ($p<0.05$) was observed among different age groups. Young ruminants were frequently affected followed by older ones which could be attributed to strength of immunity in adult and followed by older animals. Urquhart, *et al*., 1996 [22] and Melauncon, 1993 [15] supported the current findings that young animals are severely affected than older animals, since they possess a higher ratio of accessible surface to body volume, inefficient grooming behavior and other defense capabilities/ immunological maturity (Melauncon, 1993) [15] as the animals get older and the development of acquired resistance due to repeated exposure. It was also observed that much lower frequency of diseases was observed in adult cattle compared to young and old once.

Sex of ruminants was found to influence occurrence of diseases statistically ($p<0.05$) where more frequency was identified in female animals compared to male animals. This may be due to the exposure of female animals to stress conditions, especially lactating and pregnant animals. Season was found to influence significantly ($p<0.05$) the occurrence of diseases in ruminants. The current studies found that majority of domestic ruminants' diseases occur in the season winter/gielele followed by summer/kerma season, thirdly in spring/sugum and least in the season autumn/hagay.

Conclusion and recommendations

Interview and retrospective data analysis methods have revealed prevalent domestic ruminants 'diseases which are impacting health and productivity along with their frequency of occurrence. Except kebeles, all factors (age and sex of animals, season, and study sites) were found to influence disease occurrence.

Based on the findings, the following recommendations were forwarded

- Confirmatory investigations should be done on those identified diseases
- Extensive and continued epidemiological investigations on ruminants' diseases should be launched besides disease identification and characterization
- Further continued studies on the remaining areas of the region must strongly and urgently be conducted

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