

Prevalence of major sheep diseases and analysis of mortality in selected model sheep villages of south Gondar administrative zone, Ethiopia

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Abstract

A cross sectional and retrospective case study design were carried out from May 2008 to April 2012 in model sheep villages of Farta and Lay Gaint districts with the objective of identifying major sheep diseases, to assess the magnitude of sheep mortality and recommend disease and mortality control options in the study areas. Retrospective study was employed for 184 (89 from Farta and 95 from Lay Gaint) diagnosed sheep from case registration book of respective woreda and kebele veterinary clinics to collect information about the prevailing sheep diseases in the study areas. Among major sheep diseases, Respiratory Disease Complex (RDC) (38.6%), Enteritis (22.6%), Fasciolosis (19.6%), Generalized septicemic condition (GSC) (13.0%), Sheep pox (12.0%), Foot rot (2.2%) and Orf (1.1%) were commonly diagnosed ovine diseases in the study areas. Ninety four (94) questionnaires were administered to sheep producers to understand sheep management practices, identifying major sheep production constraints and to assess the magnitude of sheep mortality. A total of 242 fecal samples were collected for the analysis sheep internal parasites. The major identified internal parasites of sheep were *Strongyle* spp (43.0%), *Paramphistmum* (21.5%), *Fasciola* (20.2%), *Tricuris* (8.3%), *Monezia* (8.3%), *Coccidia* (5.0%) and *Schistosoma* (1.7%). A significant differences ($P < 0.05$) was observed in Fasciolosis across study districts which showed higher prevalence of *Fasciola* (14.5%) from Farta and relatively lower (5.8%) from Lay Gaint district. EPG count shown that, 83.6% of sheep positive with nematode was categorized in the range of light infection (50-800 EPG) which depicts the level of nematode infection in the population was lower. Comparison of sheep mortality over years and breed shown that, higher (26.4%) and lower (6.3%) mortality was recorded from all sheep breeds (Washera, Farta and Cross) in the year 2009 and 2012 respectively. In conclusion, the present high mortality rate and prevalence of sheep diseases were high to cause momentous economic losses in the study area. Therefore, strengthening the control effort was suggested.

Key words; Farta sheep, Model sheep villages, Ovine disease, Washera sheep, Mortality

Introduction

Sheep have multipurpose roles as source of income, meat, skin, manure, coarse wool and serve as a means of risk avoidance during crop failure especially where land productivity is low (Judith, 2006; Berhanu Belay and Aynalem haile, 2009a; Tesfaye Getachew *et al.*, 2010; Mengistie Taye *et al.*, 2011). However, their productivity is low compared to temperate breeds under on station and on farm management condition (Kassahun Awgichew, 2000; Solomon Gizaw *et al.*, 2011). This is because of sheep production is constrained by the compound effect of diseases, poor feeding, poor management and low genetic endowment (Ademosoum, 1994; LMA, 1995; Markos Tibbo *et al.*, 2006b; Tesfaye Getachew *et al.*, 2010). Despite lower productivity, locally available sheep breeds in Ethiopia are the result of many generations of human and natural selection predominantly for survival under the prevailing fluctuating feed scarcity, disease challenges, and harsh environment and highly adapted to low input systems (Markos Tibbo *et al.*, 2006b).

As described by Alemtsehay Aberra and Girma Haile Michael (2006) cited by Shigdaf Mekuriaw (2011) the Farta and Lay Gaint district's major socio-economic problem is food insecurity and the livelihoods of most farmers in the area mostly depend on sheep production. Due to the fact that, in the year 2008, Andassa Livestock Research Center in collaboration with Food Security project has been introduced Washera sheep to Farta and Lay Gaint districts aimed at improving the livelihood of local farmers through crossing of Farta sheep with Washera. As stated by Sisay Lemma, (2009), Solomon Gizaw *et al.*, (2008a), Mengistie Taye *et al.*, (2009a; 2011) Washera sheep are much better in their growth and reproductive performances and has an important genetic potential for adaptation to a wide range of agro-climatic conditions than other indigenous highland sheep breeds in Ethiopia so far evaluated, such as the Menz and Horro sheep.

In this mega project integrated sheep research activities (Washera adoption study, reproductive performance of Washera and its crosses with Farta, and health monitoring) were conducted during the course of the project period. Health monitoring study on sheep flocks found in model sheep villages of Farta and Lay Gaint districts was undertaken since 2008. Therefore, the objectives of this study were; to identify major sheep diseases, assess the magnitude of sheep mortality and recommend disease and mortality control options in the study areas.

Materials and Methods

Study area description

This study was conducted at Farta and Lay Gaint districts of South Gonder Zone. Farta district is situated at 11°40' N latitude and 38° E longitude and located at about 100 km north-east of Bahir Dar, capital city of the Amhara Region, Ethiopia. It lies with in an altitude range of 1920-4135 m above sea level. The district receives an average annual rain fall of 900-1099 mm and a mean-range temperature of 9-25°C. The rainy season ranges from May to September. The district's major socio- economic problem is food insecurity (Abebaw Nega and Melaku Solomon (2009); Alemtsehay Aberra and Girma Haile Michael (2006) as cited by Shigdaf Mekuriaw (2011)).

Lay Gaint district is located 175km from Bahir Dar and lies with in an altitude range of 1300-3500 m above seas level. It receives an annual average rain fall of 600-1100 mm and mean minimum and mean maximum temperatures of 9 and 19°C respectively (ENMA, unpublished). It is characterized by drought, sever soil erosion, poor soil fertility, frost and shortage of arable land, crop disease and pest hail damage, landslide and feed shortage (South Gonder Zone BOA, 2008). Solomon Gizaw *et al.* (2008) reported that Farta sheep is found in sub-moist highland at altitude of 2000-2500m above sea level in South Gondar zone; Gondar zuria, Belesa and Dembia districts. Farta sheep is reared by Amhara communities and has a population of 555,600.

Study animal description

The study animals were Farta, Washera and their Crosses (Farta X Washera) of both sex and all age found in Farta and Lay Gaint model sheep villages.

Farta sheep population grouped in the central highland sheep (Sisay Lemma, 2009) and Solomon Gizaw *et al.* (2007b) classified it in short fat tailed sheep. Farta sheep is short fat tailed; medium size; woolly under coat; commonly white (37.5%), brown (27.5%) and black with brown belly (15%), white/brown with brown/white patches; males are horned (Figure 1).



Figure 1. Farta sheep ram (left) and ewe (right)

(Picture; Shigdaf Mekuriaw, 2011)

Washera sheep is also known as Agew or Dangla sheep which is mainly inhabits the wet and warmer mid-highlands (1600-2000m above sea level) (Solomon Gizaw *et al.*, 2010a). According to Solomon Gizaw *et al.* (2008) and Sisay Lemma (2009) geographically, the breed is distributed in Amhara region (West Gojjam, East Gojjam and Awi zones and Alefa Takusa district in North Gondar zone) and Benishangul-Gumz state (Dangur and Mandura districts) in Ethiopia. This sheep breed is characterized by large body size, wide fat-tail usually curved upward tip, horizontally carried or semi-pendulous long ears, both sexes hornless, slightly concave facial profile with plain, patchy and spotted patterns of coat colour (Sisay Lemma, 2009)(Figure 2).



Figure 2. Washera sheep ram (left) and ewe (right)

(Picture; Shigdaf Mekuriaw, 2011)

Study design, sampling and data recording

This study was conducted from May 2008 to April 2012 in model sheep villages of Farta and Lay Gaint districts of South Gondar Administrative Zone. Study areas and respondents for the questionnaire were sampled purposively based on sheep ownership. While simple random sampling technique was employed for fecal sample collection. Cross sectional study design was used to undertake questionnaire survey and to identify common internal parasites of sheep in the study areas. Moreover, retrospective information about disease situations were taken from 184 (89 from Farta and 95 from Lay Gaint) diagnosed sheep in case registration book of respective woreda and kebele veterinary clinics.

Questionnaire survey

A structured questionnaire which has been composed of various questions focused on sheep management practices (feeding and health management), production constraints and sheep mortality was administered to 94 farmers living in the study areas.

Sample collection and laboratory analysis

A total of 242 fecal samples were collected for the analysis sheep internal parasites. Fecal samples (approximately 10 gm) were collected directly from the rectum of the sheep and put into 10% formalin filled universal sampling bottle. After labeling with specific identification number, each sample was dispatched to Bahir Dar Animal Health Investigation and Diagnostic Laboratory for coprological examination. Sedimentation technique for Trematode eggs and floatation technique for Nematode and Cestode eggs counting was employed. To determine the degree of sheep Nematode infection, Egg per Gram of feces (EPG) count was carried out by using a standard parasitological procedure. Degree of sheep nematode infection (EPG) was determined according to the procedures stated by Hansen and Perry, (1994).

Data Management and Analysis

All data were first entered and managed using Microsoft Excel and analysis of data was made through STATA version 11. Descriptive statistics was employed to summarize common sheep diseases, to describe the prevalence of ovine internal parasites and degree of nematode infection in the study area. While Chi-square (X^2) test was employed to measure the effect of risk factors

(location, age, breed, sex) on gastrointestinal parasitism. A significance level ($P < 0.05$) and confidence level (95%) was set to determine the presence or absence of statistically significant difference between the given parameters.

Results

Questionnaire survey

The common feed sources of sheep in the study area were grazing pasture, hay, crop residue, concentrates, potato pulp and other non conventional feeds. According to respondents view, major supplementary feeds were potato pulp (77.4%), nugcake (12.5%), wheat bran (7%) and vetch and hay (3.5%). As far as their sheep management practices concerned, 26.4% of respondents practiced only free grazing and 73.6% practiced partial indoor feeding practices. Many of respondents (95%) indicated that feed shortage was critical during dry seasons (March-May). Many of the respondents (89%) complained that they lost most of their flocks in 2009 due to the influence of draught. Sixty three percent of respondents provide separate sheep pen, while 37% keep sheep with the main house hold house. Major sheep production constraints in the study areas were feed shortage (65.2%) and disease (34.8%). According to 92% of the interviewed respondents, the major prevailing sheep diseases in the area were Respiratory Diseases Complex (RDC) vernacularly known as *anfis*, Enteritis (*shint mat*) and Fasciolosis (*Kulkult*). Eighty percent of the respondents indicated that most sheep were died due to *Anfis*. Washera sheep were less resistant to diseases than Farta and their F1 crosses. All respondents believed that local Farta sheep can adapt in harsh conditions (limited feed access and draught) of the area than Washera.

Retrospective case study result

A total of 184 (89 from Farta and 95 from Gaint) diagnosed sheep were taken from case registration book in the respective veterinary clinics. Accordingly Respiratory Disease Complex (RDC) (38.6%), Enteritis (22.6%), Fasciolosis (19.6%), Generalized septicemic condition (GSC) (13.0%), Sheep pox (12.0%), Foot rot (2.2%) and Orf(1.1%) were the most widely diagnosed ovine disease in the study model villages (Fig 1). Unlike other diseases which are highly prevalent in Farta district, RDC and sheep pox were higher in Lay Gaint district.

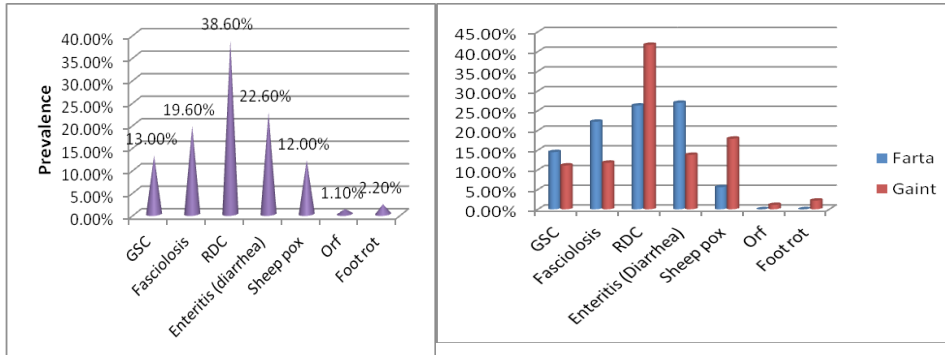


Fig 1. Prevalence comparison of major disease of sheep in two model sheep villages

Specific prevalence of sheep diseases by monthly and yearly basis

Comparative observation of ovine diseases over years shown that the magnitude of ovine diseases were higher in the year 2008 and 2009 and then after the occurrences these diseases were found in declining trend (Fig 2). Respiratory disease complex (RDC) reached peak during October and March; Fasciolosis in March and Enteritis extended in most seasons (Fig 3).

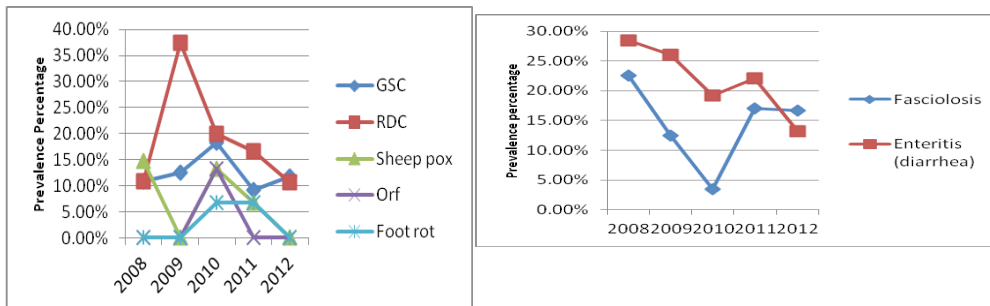


Fig 2. Epidemiological patterns of sheep diseases according to yearly basis in the study areas

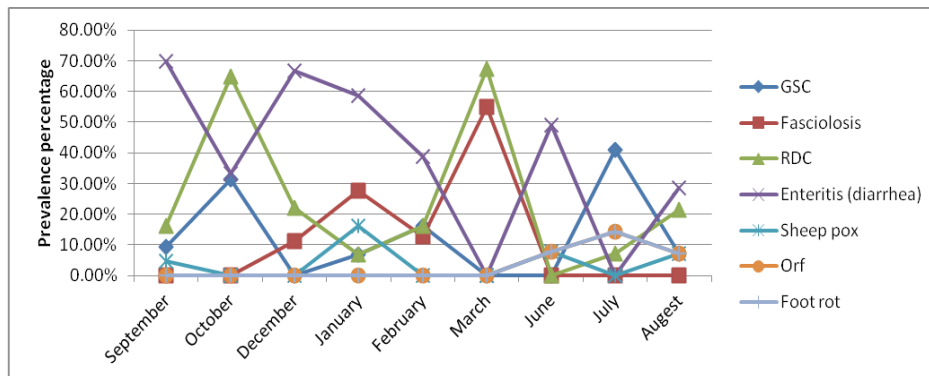


Fig 3. Epidemiological patterns of sheep diseases according to monthly basis in the study areas

Prevalence of sheep Gastro-Intestinal Parasitism

Nematode (*Strongyle* spp and *Trichuris*), Trematode (*Fasciola*, *Schistosoma* and *Paramphistum*), Cestode (*Monezia*) and Protozoa (*Coccidia*) were the major Gastro Intestinal Parasites identified (Table 1). Of total positive cases, 43.0%, 21.5%, 20.2%, 8.3%, 5.0% and 1.7% were found to be infected with *Strongyle* spp, *Paramphistomum*, *Fasciola*, *Monezia*, *Coccidia* and *Schistosoma* respectively. Higher prevalence percentage was recorded for *Strongyle* spp followed by *Paramphistomum* and *Fasciola* and the least prevalence was recorded for *Schistosoma*, *coccidia*, *Trichuris* and *Monezia*. As presented in table 1, the prevalence of all ovine internal parasites was higher in Farta than Lay Gaint district.

Significant differences ($P < 0.05$) was observed in Fasciolosis across study districts with higher prevalence of *Fasciola* (14.5%) in Farta district and lower (5.8%) prevalence in Lay Gaint district as tabulated in Table 1.

Table 1. Epidemiological distribution of ovine internal parasites in model sheep villages of Farta and Lay Gaint districts

Risk Factors		Type of internal parasites identified at genus level (N=242)						
Location	N	<i>Strongyle spp</i>	<i>Trichuris</i>	<i>Fasciola</i>	<i>Schisto-soma</i>	<i>Param-phistoma</i>	<i>Monezia</i>	<i>Coccidia</i>
Farta	149	68 (45.6%)	14(9.4%)	35(23.5%)*	4(2.7%)	31(20.8%)	16(10.7%)	8(5.4%)
Lay Gaint	93	36 (38.7%)	6(6.5%)	14(15.1%)	0	21(22.6%)	4(4.3%)	4(4.3%)
Total	242	104(43.0%)	20(8.3%)	49(20.2%)	4(1.7%)	52(21.5%)	20(8.3%)	12(5.0%)
Sex								
Male	45	14(31.1%)	4(8.9%)	9(20.0%)	1(2.2%)	7(15.6%)	10(22.2%)	3(6.7%)
Female	169	80(47.3%)	13(7.7%)	35(20.7%)	3(1.8%)	42(24.9%)	10(5.9%)	9(5.4%)
Total	214	94 (43.9%)	17(7.9%)	44(20.6%)	4(1.9%)	49(22.9%)	20(9.3%)	12(5.6%)
Age								
Adult	183	85(46.4%)	12(6.6%)	40(21.9%)	4(2.2%)	48(26.2%)	14 (7.7%)	8(4.4%)
Young	31	9(29.0%)	5(16.1%)	3(9.7%)	0	2(6.5%)	6 (19.4%)	4(12.9%)
Total	214	94(43.9%)	17(7.9%)	43(20.1%)	4(1.9%)	50(23.4%)	20 (9.3%)	12(5.6%)
Breed								
Farta	107	46(43.0%)	13(12.1%)	19(17.8%)	3(2.8%)	22(20.6%)	14(13.1%)	6(5.6%)
Washera	89	39(43.8%)	2(2.2%)	21(23.6%)	1(1.1%)	25(28.1%)	5(5.6%)	3(3.4%)
Total	196	85(43.4%)	15(7.7%)	40(20.4%)	4(2.0%)	47(23.9%)	19(9.7%)	9(4.5%)
Cross(FxW)	15	7(46.7%)	2(13.3%)	2(13.3%)	0	3(20.0%)	1(6.7%)	3(20.0%)
Total	211	92(43.6%)	17(8.1%)	42(19.9%)	4(1.9%)	50(23.7%)	20(9.5%)	12(5.7%)
Month								
September	73	35(47.9%)	3(4.1%)	17(23.3%)	0	15(20.5%)	1(1.4%)	1(1.4%)
February	95	42(44.2%)	12(12.6%)	10(10.5%)	1(1.1%)	18(18.9%)	12(12.6%)	9(9.5%)
May	74	27(36.5%)	5(6.8%)	22(29.7%)	3(4.1%)	19(25.7%)	7(9.5%)	2(2.7%)
Total	242	104(43.0%)	20(8.3%)	49(20.2%)	4(1.7%)	52(21.5%)	20(8.3%)	12(5.0%)
Year								
2011	67	29(43.3%)	4(6.0%)	16(23.9%)	0	15(22.4%)	0	0
2012	175	75(42.9%)	16(9.1%)	33(18.9%)	4(2.3%)	37(21.1%)	20(11.4%)	12(6.9%)
Total	242	104(43.0%)	20(8.3%)	49(20.2%)	4(1.7%)	52(21.5%)	20(8.3%)	12(5.0%)

*=Significant (P<0.05) N=Sample size
Egg per Gram of feces (EPG) analysis of nematode infection in sheep

As presented in the table 2 below, sheep were found infected with nematode parasite with different degree of infection. Of positive cases, 86.3%, 7.8% and 5.9 % sheep were categorized in to *light*, *mild* and *heavy* nematode infection respectively.

Table 2. EPG analysis of Nematode mixed infection of sheep

Degree of Nematode mixed infection	Frequency	Percent (%)	Mean EPG	Range
50-800 (light)	44	86.3	433.3	50-3500
801-1200 (moderate)	4	7.8		
>1200 (heavy)	3	5.9		
Total	51	100		

Magnitude of sheep mortality in the study districts

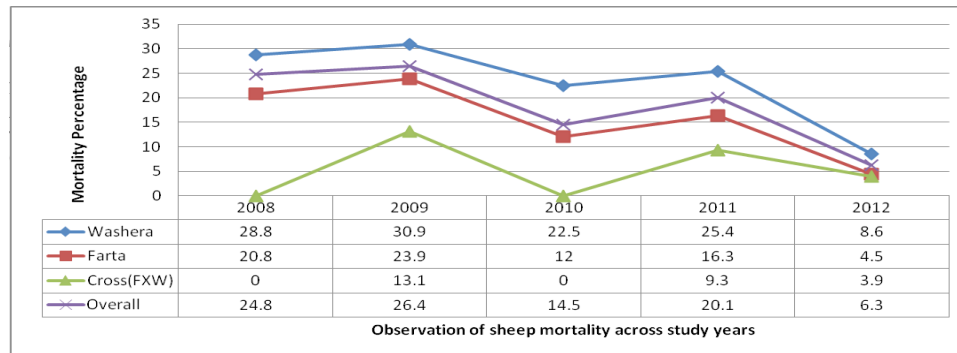


Fig 4. Comparative analysis of sheep mortality by breed category across years in Farta and Lai Gaint districts

Discussion

Respiratory Disease Complex (RDC) (38.6%), Enteritis (22.6%), Fasciolosis (19.6%), Generalized septicemic condition (GSC) (13.0%), Sheep pox (12.0%), Foot rot (2.2%) and Orf (1.1%) were the most widely diagnosed ovine diseases in the study areas. The present findings are almost consistent with other reports; Lughano and Dominic (1996) reported that the above mentioned diseases are also the major small ruminant health constraints of sub-sahran Africa and Markos Tibbo (2006a) reported major causes of mortality for Horro and Menz sheep were digestive and gastro-intestinal problems (14.4 vs. 11.5%), endoparasitism (8.7 vs. 13.1%) and septicaemia (3.4 vs. 1.6%).

The highest prevalence of RDC recorded among diagnosed sheep in the study area was consistent with the result of questionnaire survey which showed that RDC (vernacularly *Anfis*) was the first sheep health problem and cause of mortality. The term respiratory disease complex (RDC) is used for the condition conventionally known as bronchopneumonia and the causative agents could

be bacterial, mycoplasmal, viral, and parasitic lung worms and it has been reported to be high in the Ethiopian highland sheep (Njau *et al.*, 1988a; Teklye Bekele *et al.*, 1992b ; Gelagay Ayelet *et al.*, 2001).

Respiratory Disease Complex (RDC), Sheep pox, Orf and Foot rot were highly prevalent and in Lay Gaint and Fasciolosis and Enteritis were higher in Farta district. The variations may be attributed to differences in disease epidemiology across study location (frequent sheep pox outbreak was observed in Lay Gaint) and sheep management practices, the community grazing land (Gasay) in Farta district is located around irrigation ditches which enhances the multiplication of intermediate hosts (aquatic snails) of *Fasciola*.

Observation of ovine diseases over years (2008-2012) shown that the occurrences of almost all ovine diseases in the study areas had in declining trend. However, higher magnitude of these diseases was observed in 2008 and 2009. The occurrence of high magnitude of sheep mortality might be due to the influence of feed scarcity accompanied by severe drought during these periods. The present report also agreed with the survey finding which showed most respondents explained huge sheep population death in these years due to the influence of drought. The probable reason why Respiratory disease complex (RDC) reached peak during October and March, is partly because of adverse climatic conditions and feed scarcity (in lay Gaint, windy season extended from September to October and feed scarcity is a critical problem from March to May).

Higher prevalence of sheep internal parasites; *Strongyle* spp (43.0%), followed by *Paramphistomum* (21.5%), and *Fasciola* (20.2%), and the least; *Schistosoma* (1.7%), *Coccidia* (5.0%), *Trichuris* and *Moneziaia* (8.3%) recorded in this study was found in agreement with previously reported findings from other localities (Fikru Regassa *et al.*, 2006); the most frequently occurring gastrointestinal helminth species were *Strongyle* spp (especially *T. vitulorum* and *H. contortus*) in large and small ruminants, respectively. *Strongyle* species was the most prevalent and distributed in all agroecological zones (Fikru Regassa *et al.*, 2006). A statistically significant difference ($P < 0.05$) was found only in Fasciolosis prevalence from Farta and Lay Gaint districts (14.5% Vs 5.8% respectively). This difference may be due to variations in mode of grazing and its environment. Unlike Lay Gaint, the community grazing land (Gasay) in Farta district is located around a little slow moving river and irrigation ditches which are epidemiologically favorable habitat for aquatic snail, *Lymnaea natalensis* and *L. truncatula*; the intermediate hosts of *Fasciola*.

According to standards made by Hansen and Perry (1994), EPG counts recorded in this study shown that, 83.6% of sheep were positive with nematode parasite and categorized in light infection (50-800), which depicts the average level of nematode infection in the population, was lower. The lower level nematode infection in this study might be resulted due to the result of timely deworming of sheep by farmers and Andassa Livestock Research Center during flock monitoring throughout the course of study period. A relatively higher mortality recorded from Washera sheep over Farta and their crosses and the higher overall magnitude of sheep mortality (26.4%) in 2009 might be due to adaptation problem of Washera sheep in Farta and Lay Gaint, as it was newly introduced in the year late 2008 from West Gojam (origin of Washera sheep) and the occurrence of drastic environmental change (extreme feed and water scarcity accompanied by severe draught) in 2009. However, except in the year 2011, the declining trend of Washera sheep mortality over years found in this study might be because of better adaptation of Washera sheep and the result of awareness creation, training about integrated improved sheep husbandry practices has been given to sheep producers by Andassa Livestock Research center. Furthermore, provision of Veterinary service (Deworming, vaccination and immediate treatment of sick animals) by Andassa Livestock Research center during flock monitoring could also significantly reduce sheep mortality.

The questionnaire result revealed that RDC/Anfis was the major causes of sheep mortality. This finding is consistent with the report made by Markos, (2006b); in which half of the deaths in Horro and Menz lambs were attributed to pneumonia (53.4 vs. 54.2%, respectively) and also pneumonia was the most widespread cause of mortality and the causes of mortality due to respiratory diseases in the highlands of Ethiopia are multi-factorial.

Conclusion and recommendation

Generalized Septicemic Condition (GSC), Fasciolosis, Respiratory Disease Complex (RDC), Enteritis, Sheep pox, Orf and Foot rot were the major surveyed Ovine diseases in the study areas. *Strongyle*, *Paramphistomum*, *Fasciola*, *Schistosoma*, Coccidian, *Trichuris* and *Monezia spp* were also the major sheep internal parasites investigated in the study areas. Accordingly, strategic deworming is warranted according to the type of internal parasites identified and their epidemiology, keep sheep away from grazing on vegetated pasture grown around river, irrigation ditches could help to protect sheep from Fasciolosis. As causes of RDC and Enteritis are multifactorial and their prevalence

was higher in the study areas, detailed investigation on causes of *RDC* and Enteritis associated with possible risk factors should be investigated. Although analysis of sheep mortality was made across study years and breed, causes of mortality were not identified. Thus, causes of sheep mortality and the underlying risk factors associated with mortality should be clearly identified. In conclusion, provision of improved health care and strategic feed supplementation during critical feed shortage is the best option to reduce disease prevalence and disease associated mortality in the study areas.

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