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Prevalence of major Ovine 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 study designs were carried out from May 2008 to April 2012 in model sheep breeding villages of Farta and Lay-Gaint districts with the objective of identifying and determining the prevalence of major sheep diseases, to assess the magnitude of sheep mortality and recommend disease and mortality control options. Questionnaire survey and retrospective case study were undertaken to identify major sheep production constraints, prevailing sheep diseases and assess the magnitude of mortality. Retrospective study was employed for 184 (89 from Farta and 95 from Lay Gaint) diagnosed sheep from case registration book of respective districts and peasant associations (PA) veterinary clinics to collect information about the prevailing sheep diseases. Among diagnosed sheep diseases, Generalized septicemic condition (GSC) (13.0%), Fasciolosis (19.6%), Respiratory Disease Complex (RDC) (38.6%), Enteritis (22.6%), Sheep pox (12.0%), Orf (1.1%) and foot rot (2.2%) were the most widely diagnosed ovine diseases. On the other hand, the major identified internal parasites of sheep were *Strongyle* spp (43.0%), *Tricuris* spp (8.3%), *Fasciola* spp (20.2%), *Schistosoma* spp (1.7%), *Paramphistmum* spp (21.5%), *Monezia* spp (8.3%) and *Coccidia* spp (5.0%). Only significant differences ($P<0.05$) was observed in Fasciolosis across study districts which showed higher prevalence of *Fasciola* spp (23.5%) from Farta and relatively lower (15.1%) from Lay-Gaint district. EPG count shown that, 86.3% 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. Both *Mannheimia haemolytica* serotypes A1 (33.1%), A2 (31.8%) and A7 (28.5) and *P. multocida* A (6.6%) were found in the study areas. Comparison of sheep mortality over years and breed indicated higher mortality from all sheep breeds (Washera, Farta and their crosses) in the year 2009 and lower (6.3%) in 2012. 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, Lay-Gaint, Mortality rate, Sheep Diseases

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 and Aynalem, 2009; 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 Awigchew, 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.,* 2006; 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 stated by Alemtsehay and Girma (2006) cited by Shigdaf Mekuriaw (2011) the district's major socio-economic problem is food insecurity. However, the livelihoods of most farmers in the area mostly depend on sheep production. Having the above facts, 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), MengistieTaye *et al.,* (2009a) cited by Shigdaf Mekuriaw (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 planned and conducted through the course of the project period. The health monitoring study was undertaken at Farta and Lay Gaint districts. 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.

Materials and Methods

Study area

The study was conducted at Farta and Lay Gaint districts of South Gonder Zone from May 2008 to April 2012. 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 within 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^{o}C. The rainy season ranges from May to September. Alemtsehay and Girma (2006); Abebaw and Solomon (2009) as cited by Shigdaf Mekuriaw (2011) the district's major socio- economic problem is food insecurity.

Lay-Gaint district is located 175km from Bahir Dar and lies between altitude ranges 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^{o}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)

Study animals

The study animals were Farta, Washera and their crosses (Farta X Washera) of both sex and all age in Farta and Lay Gaint model sheep villages. For this purpose 184 (89 from Farta and 95 from Lay-Gaint) diagnosed sheep were taken in case registration book of respective districts and PA veterinary clinics.

Questionnaire survey

In addition to retrospective study, questionnaire survey was also conducted to understand farmers' perception on major constraints of sheep production in the study areas. 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. On the other hand, a total of 242 fecal samples were collected for the analysis sheep internal parasites.

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 *Nematod*e 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).

To investigate the prevailing serotypes of Ovine pasteurollosis, about 10 ml of blood was collected from the jugular vein of each sheep by using plain vacutainer tubes and needles. The blood was allowed to clot for 1-2 hours at room temperature, stored horizontally overnight at 4 degree centigrade and then the serum was separated from the clot by centrifugation at 3000rpm for 15 minutes. Then the separated serum was labeled and kept under refrigeration (-20 ^{o}c) until tested. And serum samples were sent and analyzed at National Veterinary Institute (NVI).The type of laboratory test employed was indirect haem-agglutination (IHA) test. IHA test was conducted according to the procedures of OIE (2004). The source of Pasteurella haemolytica and multocida serotypes of biotype A was CIRAD-EMVT, France.

Data Management and Analysis

All data were entered and managed using Microsoft Excel and analysis of data was made by Statistical Package for Social Sciences software version 16 (SPSS, 16) and STATA version 11. Descriptive statistics was employed to summarize common sheep diseases and 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.

Result

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 (such as residue of local brewery). Accordingly, major supplementary feeds were potato pulp (77.4%), Nug cake (12.5%), wheat bran (7%) and vetch and hay (3.5%). As far as the management practice is concerned, 26.4% of respondents use only free grazing and 73.6% partial indoor feeding. Many of respondents (95%) indicated that feed shortage was critical during dry seasons (March-May), hence 89% of the respondents complained that they lost most of their flocks in 2009 due to draught.

Sixty three percent of the respondents provide separate sheep pen, while 37% share their own living room. In the study area, the major sheep production constraints were feed shortage (65.2%) and disease (34.8%). The major prevailing sheep diseases in the area were Respiratory Diseases Complex (RDC) vernacularly known as *anfis ,* Enteritis vernacularly known as *shint mat,* Fasciolosis vernacularly known as *Kulkult* responded by 92% of the respondents . Eighty percent of the respondents indicated that most of the sheep were died due to Respiratory Diseases Complex (RDC). Washera sheep were less resistant to diseases than Farta and their F1 crosses. Respondents believed that local Farta sheep can adapt harsh conditions (limited feed access and draught) than Washera.

Retrospective data analysis result

A total of 184 sick sheep (89 from Farta and 95 from Lay Gaint) were taken from case registration book in the respective veterinary clinics. Accordingly, major diseases such as Generalized septicemic condition (GSC) (13.0%), Fasciolosis (19.6%), Respiratory Disease Complex (RDC) (38.6%), Enteritis (22.6%), Sheep pox (12.0%), Orf (1.1%) and Foot rot (2.2%) were found the most widely diseases in the study model sheep breeding villages of Farta and Lay Gaint districts (Fig 1).

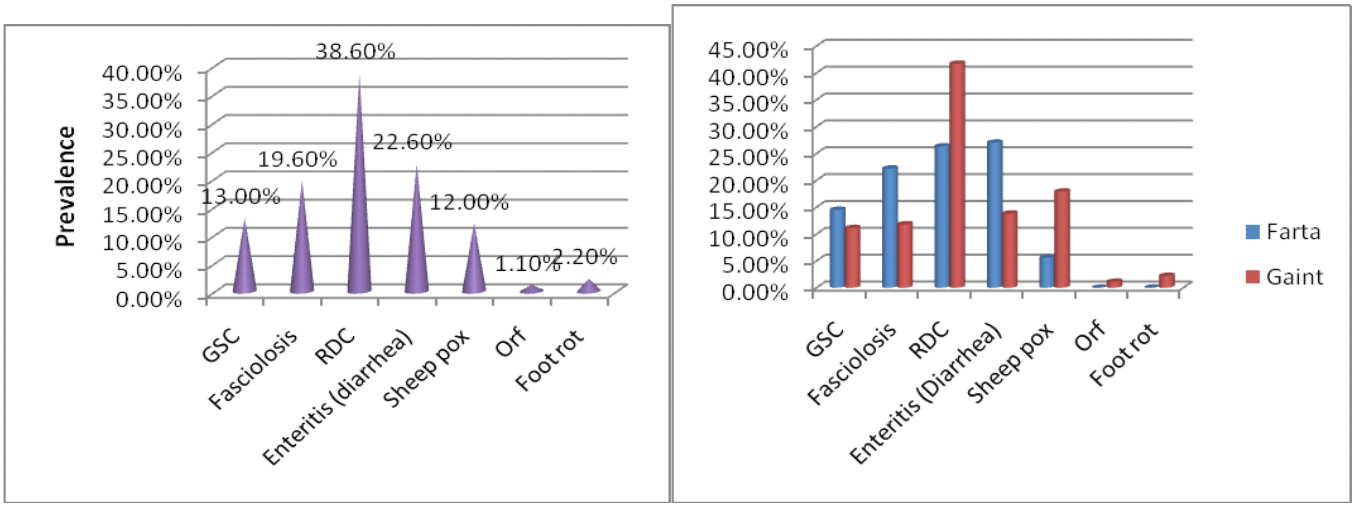


Figure 1. Prevalence comparison of major disease of sheep in two model sheep breeding villages in Farta and Lay-Gaint districts.

Comparative observation of ovine diseases over years shown that almost the occurrence of ovine diseases in the study areas were found in declining trend (Fig 2).

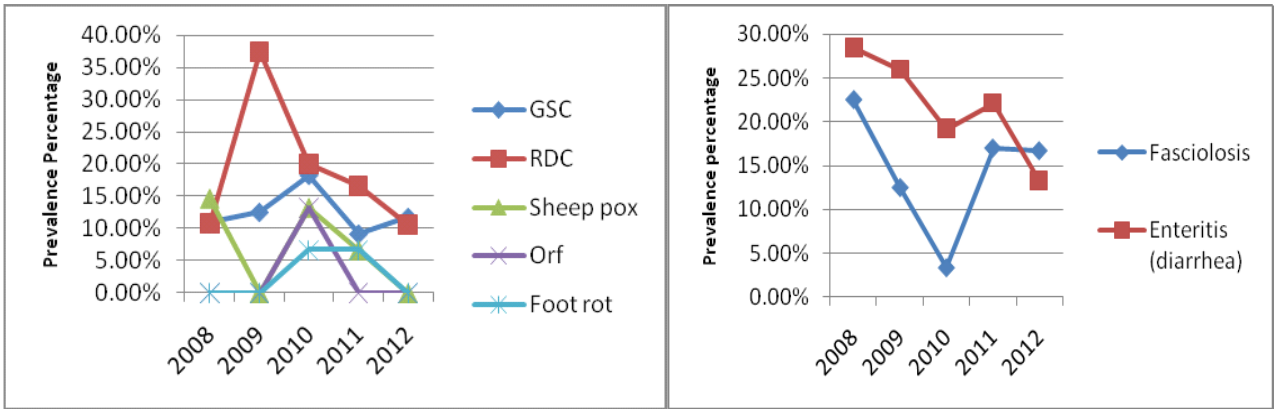


Fig 2. Prevalence of major sheep diseases according to year basis in two model sheep villages

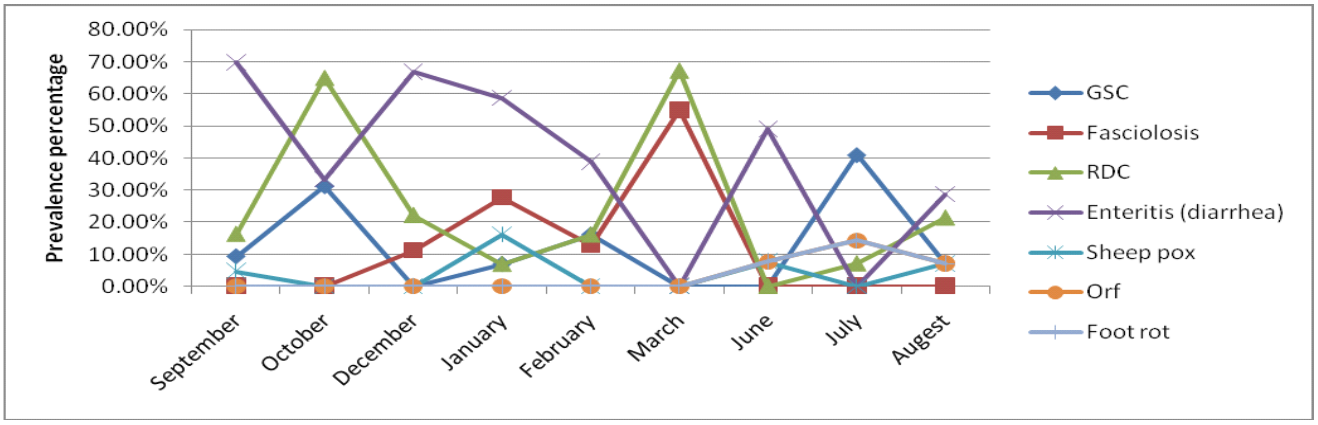


Fig 3: Epidemiological patterns of sheep diseases in monthly basis in two model sheep villages

Investigation of Ovine internal parasites

Nematode (*Strongyle* spp and *Tricuris*), Trematode (*Fasciola, Schistosoma and Paramphistmum*), Cestode *(Monezia*) and Protozoa (*Coccidia*) were the major Gastro Intestinal Parasites identified (Table 1). Of total positive cases, 43.0%, 8.3%, 20.2%, 1.7%, 21.5%, 8.3% and 5.0% were found to be infected with *Strongyle* spp*, Tricuris* spp*, Fasciola* spp*, Schistosoma* spp*, Paramphistmum* spp*, Monezia* spp *and Coccidia* spp respectively. Higher prevalence was recorded for *Strongyle* spp followed by *Paramphistomum* spp and *Fasciola* spp and the least was recorded for *Schistosoma* spp*, Coccidian* spp*, Tricuris* spp and *Moneziaia* spp. The prevalence of all ovine internal parasites was higher in Farta than Lay Gaint district (Table 1). A significant differences ($P<0.05$) was observed in *Fasciola* spp across study districts with higher prevalence of (23.5%) in Farta district and (15.1%) in Lay Gaint district (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						
Location	N	Strongyle spp	Tricuris	Fasciola	Schistosoma	Paramphistoma	Monezia	Coccidia
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%)
Cross(Fx W)	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 from (Table 2) 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.

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	3	5.9		
Total	51	100		

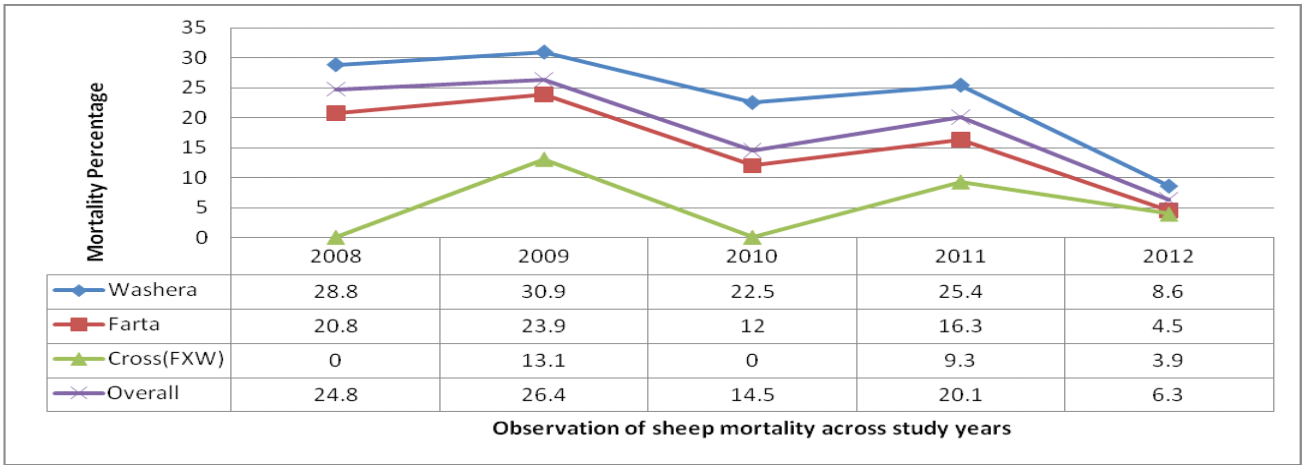
Table 2. EPG analysis of Nematode mixed infection of sheep

Prevalence of ovine pasteurollosis

In this study, both *Mannheimia haemolytica* and *P.Multocida* serotypes were investigated in the study areas. The prevalence of *Mannheimia haemolytica* A1, A2 and A7 serotypes were 33.1%, 28.5% and 31.8 % respectively and *P. multocida* A (6.6%) .

Magnitude of sheep mortality in the study districts

The overall magnitude of sheep mortality in the study areas was higher (26.4%) in 2009 and lower (6.3%) in 2012 (Fig 4). Comparison of sheep mortality over years shown that, higher mortality was recorded from all sheep breeds (Washera, Farta and cross) in the year 2009 and among breeds, relatively higher magnitude of mortality from Washera sheep was recorded across the study years (2009-2012).



	2008	2009	2010	2011	2012
Washera	28.8	30.9	22.5	25.4	8.6
Farta	20.8	23.9	12	16.3	4.5
Cross(FXW)	0	13.1	0	9.3	3.9
Overall	24.8	26.4	14.5	20.1	6.3

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

Discussion

Generalized septicemic condition (GSC) (13.0%), Fasciolosis (19.6%), Respiratory Disease Complex (RDC) (38.6%), Enteritis (22.6%), Sheep pox (12.0%), Orf (1.1%) and Foot rot (2.2%) were the most widely diagnosed ovine disease in the study areas. The present findings are almost consistent with other findings reported by (Lughano, and Dominic 1996) and major causes of mortality for Horro and

Menz were digestive and gastro-intestinal problems (14.4 vs. 11.5%), endoparasitism (8.7 vs. 13.1%), septicaemia (3.4 vs. 1.6%) and (Markos Tibbo, 2006a).

Generalized septicemic condition, RDC, Sheep pox, Orf and Foot rot were highly prevalent in Lay Gaint and Fasciolosis and *Enteritis* were higher in Farta district. The variations may be attributed due to differences in disease epidemiology across study location (frequent sheep pox outbreak was observed in Lay Gaint).In this study, *Mannheimia haemolytica* serotype A1 33.1%, A7 28.5% and A2 31.8 % and *Pasteurella multocida* biotype-A 6.6%) were confirmed. This result is partially comparable with previous studies conducted in some other regions of Ethiopia which shown that the prevalence of *M. haemolytica* A2 (36%), A8 (35%), serotype A9 (2%) and *P multocida* A (10%) (Gelagay Ayelet *et al,* 2004*)* and *M haemolytica* biotype A serotypes A2 and A1 are the most prevalent in Ethiopia, (Pegram *et al* 1980).

Relatively higher prevalence of sheep internal parasites; *Strongyle* spp. *(*43.0%), followed by *Paramphistomum (*21.5%), and *Fasciola (*20.2%), and the least; *Schistosoma* spp.*(*1.7%), *Coccidian* spp. *(*5.0%*), Tricuris* spp. and *Moneziaia* spp. *(8.3*%).These finding is also comparable with previous reports 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 agro-ecological zones. Relatively higher prevalence of Fasciolosis (23.5%) from Farta and lower (15.1%) from Lay Gaint districts was statistically significant ($P<0.05$). This difference might 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 is epidemiologically favorable habitat for aquatic snail, *Lymnaea natalensis* and L*. truncatula;* the intermediate hosts of *Fasciola.* Up on EPG analysis, 86.3% of sheep were found positive with mixed nematode infection which depicts the average level of mixed nematode infection in the population of the study areas was lower (Hansen and Perry, 1994). Seasonal deworming of sheep with broad spectrum anthelminthics by farmers and Andassa Livestock Research Center during flock monitoring throughout the course of study period might be contributed in low *helminth* infection.

The higher overall magnitude of sheep mortality (26.4%) in 2009 was due to severe drought and feed scarcity; hence up on interview, 89% of the respondents explained most flocks were wiping out in 2009

due to severe draught. More over, higher mortality might be resulted due to adaptation problem of Washera sheep in Farta and Lay Gaint districts, as it was newly introduced in late 2008 from West Gojam (origin of Washera sheep) for breeding purpose. The lower sheep mortality (6.3%) recorded in the year 2012 might be associated with breed acclimatization/adaptation to the local agro-climatic conditions and management practices. The result of training focused on improved sheep husbandry practices to sheep breeders and provision of Veterinary services during the course of monitoring period by Andassa Livestock Research Center could significantly reduce sheep mortality in the study areas.

The questionnaire result revealed that RDC vernacularly *Anfis* was the major causes of sheep mortality. This finding is consistent with the report made by (Markos Tibbo, 2006a), half of the deaths in Horro (54.4) and Menz (54.2%) breed lambs were attributed to pneumonia. 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.

Conclusions and recommendations

Respiratory Disease Complex, Generalized Septicemic Condition, Fasciolosis, Enteritis, Sheep pox, Orf and Foot rot were the major surveyed Ovine diseases in the study areas. Causes of ovine Pasteurolosis, Mannheimia haemolytica serotype A1, A7 and A2 and Pasteurella Multocida biotype-A were investigated. Strongyle SPP, Paramphistomum, Fasciola, Schistosoma, coccidian, tricuris and monezia were the major sheep internal parasites investigated in the study areas. Accordingly, strategic dworming should be 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 and schistosomiasis. Multivalent vaccine which contains the most prevalent sero-types of ovine *Pasteurolosis* need to be developed and regular vaccination in accordance with the epidemiology of ovine *pasteurollosis* should be conducted in the study areas. As causes of *RDC* and *Enteritis* are multifactorial and their prevalence were higher in the study areas, detailed investigation on causes of *RDC* and *Enteritis* associated with possible risk factors should be investigated.

In general, 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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