

1 Epidemiological Study of Small Ruminant Diseases in Selected
2 Districts of Kaffa and Bench-Maji Zone, Southern Nations
3 Nationalities and Peoples Regional State (SNNPRs), Ethiopia

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6 *Received: 7 December 2015 Accepted: 31 December 2015 Published: 15 January 2016*

7

8 **Abstract**

9 An epidemiological survey of small ruminant disease was conducted in Boka-Shuta,
10 Konda-Zuriya and Debre-Work kebelles of Kaffa and Bench-Maji zone, Southern Nations,
11 Nationalities and people's regional state (SNNPRs), Ethiopia from July 2012 to June 2013.
12 The objective of the study was to assess diseases of small ruminants affecting production and
13 productivity; their occurrence and distribution; and associated risk factors. For these, Semi
14 structured questioner format was prepared and survey was conducted. The result revealed
15 that, 90.6

16

17 **Index terms**— agro-ecology, diseases, epidemiology, production, small ruminant, susceptible.

18 Abstract-An epidemiological survey of small ruminant disease was conducted in Boka-Shuta, Konda-Zuriya
19 and Debre-Work kebelles of Kaffa and Bench-Maji zone, Southern Nations, Nationalities and people's regional
20 state (SNNPRs), Ethiopia from July 2012 to June 2013. The objective of the study was to assess diseases of small
21 ruminants affecting production and productivity; their occurrence and distribution; and associated risk factors.
22 For these, Semi structured questioner format was prepared and survey was conducted. The result revealed
23 that, 90.6%, 76.0% and 65.6% of interviewed farmers describe the multi-factorial causes of respiratory diseases;
24 systemic diseases; and Gastro-intestinal parasite respectively were the most prevalent diseases irrespective of agro-
25 ecology difference. The type of disease conditions documented in each agro-ecology had differences. Bloating
26 (accumulation of excess amount of fluid in their abdominal cavity and blood tinged internal organs observed when
27 slaughtered) followed by head circling in Boka-Shuta (highland); gastro intestinal parasite and head circling in
28 Debre-Work (midland); and bottle jaw and orf in Konda-Zuriya (lowland) were the most prevalent and had serious
29 problems in small ruminant production and productivity. Regarding the diseases occurrence and distribution, the
30 highest cases were recorded in summer followed by autumn. Ewes/doe and lambs/kids were the most susceptible
31 age group. Each specific disease conditions occurrence and distribution in this study had its own specific risk
32 factor. In general, however, disease management methods and practices by the farmers, susceptible age groups
33 and seasons of occurrence were important risk factors playing an important role. Thus, the production and
34 productivity of small ruminant was highly determined by diseases conditions. The result presented here suggests
35 that, ewes/doe and lambs/kids need special attention to prevent them from diseases to improve production
36 and productivity. And also, the small ruminant flock should get appropriate vaccination prior to the disease
37 occurrence. Thus, the farmers' disease management and practices method need to be improved through training
38 on small ruminant disease and their management. In addition, further studies should be conducted to identify
39 the specific diseases types and their associated risk factors.

40 **1 Introduction**

41 Indigenous small ruminants constitute greater percentage of ruminant population in Africa ??Lebbie et al., 1994).
42 These flocks of animals are commonly found in the rural areas where they are owned and managed under
43 extensive system (Otchere, 1986). Small ruminants play an important role in the lives of most people especially

5 B) SAMPLE SIZE DETERMINATION AND DATA COLLECTION

44 rural farmers who livelihood entirely depend on them. They provide source of animal protein through their meat
45 and milk ??Fajemisin, 1991). Not with standing, they fetch a source of income when sold to meet some other
46 family needs as well as play a vital social roles during ceremonies and festivals.

47 The importance of small ruminants (ie sheep and goats) to the socio-economic well being of people in developing
48 countries in the tropics in terms of nutrition, income and intangible benefits (eg savings, insurance against
49 emergencies, cultural and ceremonial purposes) cannot be overemphasized (Kosgey, 2004). Sheep and goats are
50 important livestock species in developing countries because of their ability to convert forages, and crop and
51 household residues into meat, fibre, skin and milk.

52 For an improved animal protein intake, there is need for improvement in the production of meat and other
53 protein sources from the livestock industry. Sheep and goats offer a great potential in this respect due to their
54 relative ease of breeding, management, ability to subsist on forages, hardiness, adaptation to a wide range of
55 ecological zones and distribution among others. In recent times, sheep and goats production is becoming popular
56 even among urban dwellers as result of the aforementioned merits (Umunna et al., 2014).

57 Small ruminant management is seriously hindered by diseases in the tropics. Diseases are very important to
58 farmers and affect the production of small ruminants in several ways. It increases cost of production, lowers
59 production level, reduces the quality and quantity of animal products and generally causes great loss to the
60 farmer (Abdullahi et al., 2013).

61 In Ethiopia, There are more than 38 millions of cattle and 30 million small ruminants (CSA, 2007). However,
62 the country is not making use of this huge potential attributed to different constraints among which disease stands
63 in the front line (Samson and Frehwot, 2010;Firew, 1999). Diseases of various origins (bacterial, viral, parasitic,
64 etc.) directly or indirectly are among the numerous factors responsible for poor production and productivity
65 (Firew, 1999;Feyesa et al., 2010) which results the major barriers for the improvement of livestock production,
66 reproduction and marketing. The annual total economic losses due to diseases, mortality and reduced productive
67 and reproductive performance were estimated by 150 million USD (Berhanu, 2002).

68 In Ethiopia, Sheep and goats contribute 25% of the meat domestically consumed with a production surplus
69 mainly being exported as live animals (Alemayehu and Fletcher, 1991;Tibbo, 2006). Both species also contribute
70 50% of the domestic needs in wool, about 40% of skins and 92% of the value of hides and skin exported ??ILCA,
71 1993). The total income share of small ruminants tends to be inversely related to size of land-holding, suggesting
72 that small ruminants are of particular importance for landless people. In some settings where, agriculture (crop
73 production) provides only seasonal employment, rearing small ruminants would provide employment and income
74 as a subsidiary occupation (Coppock et al., 2006). However in Ethiopia, Small ruminant contribution to food
75 consumption, rural income and export economy is below the expected potential, because of their husbandry is
76 constrained by compound effect of disease, poor feeding, and poor management (Chalachew, 2001). Among many
77 factors which limit the economic return from small ruminant production diseases stands in the front line (Firew,
78 1999). As a result of small ruminant diseases, 5-7 million sheep and goats die each year (Sileshi and Lidetu,
79 2007) and 35% of sheep and 56% of goat skins rejected due to skin parasites (Bayou, 1998) which leads serious
80 economic loss to small holder farmers, the tanning industry, and the country as whole ??ESGPIP, 2009) in which
81 Many of the diseases in Ethiopia are still uncontrolled and are causing devastating effects both to the producers
82 and to the national economy ??EARG, 1996).

83 Even if small ruminants play a very important socio-economic role, little is known about health problems
84 of these animals in the study area. In order to design relevant disease control strategies, assessment of the
85 existing small ruminant diseases in the area is vital to devise appropriate technological interventions as well as
86 for further study. Therefore, the aim of this study was, to assess diseases of small ruminant affecting production
87 and productivity; their occurrence and distribution; and associated risk factors in selected districts of Kaffa and
88 Bench Maji zone.

89 2 II.

90 3 Materials and Methods

91 4 a) Study Area and Study Design

92 A cross-sectional study to assess diseases of small ruminant affecting production and productivity; their occurrence
93 and distribution; and associated risk factors was conducted from July 2012 to June 2013 in Boka-Shuta and
94 Konda-Zuriya of Kaffa zone; and Debre-work of Bench-maji zone. The study areas were selected purposively
95 based on altitude variations, accessibility and availability of small ruminant. Thus, Boka-Shuta (highland),
96 Konda-Zuriya (lowland) and Debre-work (Midland). The interviewed households with in each study areas were
97 selected using systematical random sampling technique.

98 5 b) Sample Size Determination and Data Collection

99 Before conducting the formal survey, group discussion was made with experts of each respective zonal and district
100 agriculture and rural development office on small ruminant production problems and diseases in particular. Semi
101 structured questioner format was prepared. Then, it was pre-tested and modified as necessary and finally the
102 formal survey was conducted and data was collected using single-visit-multiplesubject formal survey technique

103 (ILCA, 1990). Accordingly, a total of 96 households were interviewed and data's were collected on major small
104 ruminant disease and health problems; their occurrence and distribution; and associated risk factors.

105 **6 c) Data Management and Analysis**

106 The data was analyzed using STATA version 11. Descriptive statistics was employed to determine the prevalence
107 and Chi-square (X²) test was used to measure the effect of predisposing factors on the distribution of different
108 diseases. A significance level (p<0.05) and confidence level (95%) was set to determine the presence or absence
109 of statistically significant difference between the given parameters. And also, multivariate logistic regression was
110 tested to confirm the stated factors.

111 **7 III.**

112 **8 Results and Discussions a) Importance of Livestock Species**

113 The overall importance of livestock species irrespective of agro-ecology difference indicated that, cattle had the
114 highest proportion (90.6%) followed by poultry (68.8%) (Figure 1). The different animal species are distributed
115 throughout the three agro-ecologies of the study areas; and these could suggest that, the areas have a potential
116 to favorably support live stock production and productivity. However, the proportion of livestock species had
117 differences amongst the different agro-ecologies. Thus, small ruminants had the highest level of proportion
118 than other livestock species; goat (54.5%) in Konda-Zuriya (lowland) followed by sheep (49.2%) in Boka-Shuta
119 (highland). These could indicate that, the production potential for selected species of animals in different agro-
120 ecologies (figure 2). The present finding was supported by Enwelu et al (2015) from Nigeria; the farmer's preferred
121 goat than sheep due to a number of reasons. These were; prolificacy (54.2%); profitability (36.1%); longevity
122 (long life span) (5.6%); and type of meat/animal dung (2.8%). Farmers listed different types of small ruminant
123 diseases conditions that could cause mortality and morbidity in the study areas during the questioner survey.
124 Among these, respiratory disease, systemic diseases, diarrhea, swollen head, Gastro-intestinal parasite and head
125 circling had most frequently recorded. 90.6% of the respondents mentioned, diseases of the respiratory system
126 (with signs of coughing and nasal discharge) which could be multifactorial caused followed by 76.0% for systemic
127 diseases (with signs of erected hair, depression and inappetent) were the most common. The multi symptomatic
128 gastro-intestinal parasitism (in the present case could be manifested in diarrhea, emaciation or bloating) had
129 significant occurrence (Figure ??).

130 Different research reports in Ethiopia indicated that, diseases are the main constraints limiting small The
131 study report by Abebe et al (2013) in north western Ethiopia confirmed that, Sheep diseases were one of the
132 main constraints for sheep production and Foot rot, skin disease, pasteurellosis, orf and internal parasites were
133 the main. The authors extended their findings and; sheep diseases were the major constraints (ranked first)
134 amongst several constraints limiting small ruminant production. Other authors from South Sudan revealed that;
135 internal parasite followed by pneumonia and external parasite were the most prevalent small ruminant diseases
136 (Lado et al., 2015).

137 The occurrence of small ruminant diseases conditions with respect to agro-ecologies indicated that; bloating
138 (accumulation of excess amount of fluid in their abdominal cavity and blood tinged internal organs observed
139 when slaughtered) followed by head circling were the most prevalent in Boka-Shuta. Whereas, gastro intestinal
140 parasite and head circling in Debre-Work; and bottle jaw and orf in Konda-Zuriya were the most prevalent and
141 had serious problems in the small ruminant production and productivity (Figure ??).

142 And also, statistical significant differences of diseases occurrence among the study areas were observed. Thus,
143 systemic diseases followed by gastrointestinal parasite and head circling had highest in Midland; whereas, Orf
144 followed by tick infestation in Lowland. Lowest proportion of diseases occurrence was observed in Highland
145 (Boka-Shuta) and these could be due to several intervention activities in the area by Bonga Agricultural
146 research center for controlling and preventing diseases occurrence in small ruminant (like regular vaccination
147 against ovine pasteurellosis disease, anthrax, PPR, sheep and goat pox disease; routine treatment of cases; and
148 regular deworming with broad spectrum antihelmentics), since it was one of Bonga sheep breed improvement
149 community/cooperative (Table 1).

150 **9 c) Small Ruminant Diseases Management and Practices by 151 the Farmers**

152 In general, small ruminant disease management by modern treatment in veterinary clinics was significantly
153 different among the study areas. For example, 77.1% the interviewed household in Konda-Zuriya had better
154 trend and awareness for treating their sick animals in veterinary clinics (Table 2). But, in areas were veterinary
155 clinics are remote from farmers' residences (like in case of Boka-Shuta out of the reach of intervention areas by
156 the research center); the farmers manage their sick animals either by treating with home remedy and herbs or
157 slaughtered for skin. Few households were also mentioned that, they used drugs by buying from the market and
158 shop to treat their animals by themselves. The present finding was strongly supported by the study from South
159 Sudan that; inadequate knowledge of small ruminant management was the most common challenge facing small
160 ruminant production (Lado et al., 2015).

161 **10 d) Temporal Distribution of Small Ruminant diseases**

162 The occurrence of small ruminant diseases conditions in different seasons of the year had significantly varied.
163 Thus, the highest occurrence was documented in summer (50.0%) followed by autumn (21.9%). On the other
164 hand, seasons with high risk of disease occurrence were identified; and thus, autumn and summer with 32.3%.
165 For these, different factors were identified. Grazing on immature fresh grass (22.9%) was the main predisposing
166 factor followed by unknown reason (20.8%) (Table 3). The present finding was justified by Abebe et al (2013);
167 Sheep death occurs mainly at the end of the rainy season. This may be due to feed shortage and the suitability
168 of the environment for the disease causing organisms. These also further aggravated by the introduction of
169 animals into the area from different places and markets which might introduce different diseases. e) Occurrence
170 of Disease Outbreak in Small Ruminant flock Significant variations for the occurrence of small ruminant disease
171 outbreak in different seasons were recorded. Thus, 33.3% were during winter followed by 25% in autumn. Diseases
172 manifesting respiratory signs had 50% of probability for causing outbreak (Table 4). The present finding was
173 justified by Abebe et al (2013) report; disease mainly occurs during feed shortage periods (dry periods).

174 **11 f) Distribution of Small Ruminant Diseases Conditions in
175 Different Age Groups**

176 The occurrence and distribution of small ruminant diseases conditions in different age groups were significantly
177 vary even if, 22.9% were documented in all age groups. Thus, the highest was in ewes/doe and lambs/kids (26%)
178 as compared to other age groups (Table 5).

179 **12 g) Factors Associated with the Occurrence and Distribution
180 of Small Ruminant Diseases**

181 Based on multivariate logistic regression analysis, different determinant factors were found significantly associated
182 for the occurrence and distribution of small ruminant disease conditions (Table 6). According to the model,
183 holding the effect of other variables constant, the risk of acquiring infection with disease conditions manifested
184 by swelling of head was 6.9% higher for those not treated in veterinary clinic (didn't get Modern treatment)
185 than treated. The risk of getting head circling was 13.6% higher for Ewes/doe and lambs/kids than Lambs/kids
186 alone; and season of occurrence was 39.6% higher in summer than winter. For GIT parasite infestation, the
187 risk was 0.9% lower in Boka-Shuta than Konda-Zuriya which is justified by the regular deworming intervention
188 by the research center in the study area. Traditional treatment practice by the farmers in the study areas for
189 GIT parasite infestation indicated that, the risk was 21.2% higher for those not treated by herbal remedy than
190 treated. For the occurrence and distribution of disease conditions like emaciations and eye diseases, market was
191 significantly associated as a source of infection where diseased animals could disseminate the disease causing
192 organism to the areas.

193 **13 IV. Conclusions and Recommendations**

194 The distribution and production of small ruminant was highly determined by diseases conditions. Of which,
195 multi-factorial cause of respiratory diseases and Gastro-intestinal parasite are most prevalently occurred. The
196 occurrence and distribution of those disease conditions had differences in seasons where the highest was in summer
197 followed by autumn; and ewes/doe and lambs/kids were most frequently affected. Each specific disease conditions
198 occurrence and distribution in this study had its own specific risk factor. In general, however, disease management
199 methods and practices by the farmers, susceptible age groups and seasons of occurrence were important risk factors
200 playing an important role. Thus, the production and productivity of small ruminant was highly determined by
201 diseases conditions. The result presented here suggests that, ewes/doe and lambs/kids need special attention to
202 prevent them from diseases to improve production and productivity. And also, the small ruminant flock should
203 get appropriate vaccination prior to the disease occurrence. In addition, the farmers' disease management and
204 practices method need to be improved through training to create awareness on small ruminant disease and their
205 management. In addition, further studies should be conducted to identify the specific diseases types and their
206 associated risk factors.

207 **14 V. Acknowledgments**

208 The author gratefully acknowledges Southern Agricultural Research Institute (SARI), Bonga Center, Ethiopia
209 for financial and logistic support. I would like to appreciate the research center livestock department researchers
210 and technical assistance for their contribution for the success of the study. Also, I like to express my deepest
211 gratitude to the informants for unreservedly sharing their valuable indigenous knowledge genuinely. ^{1 2}

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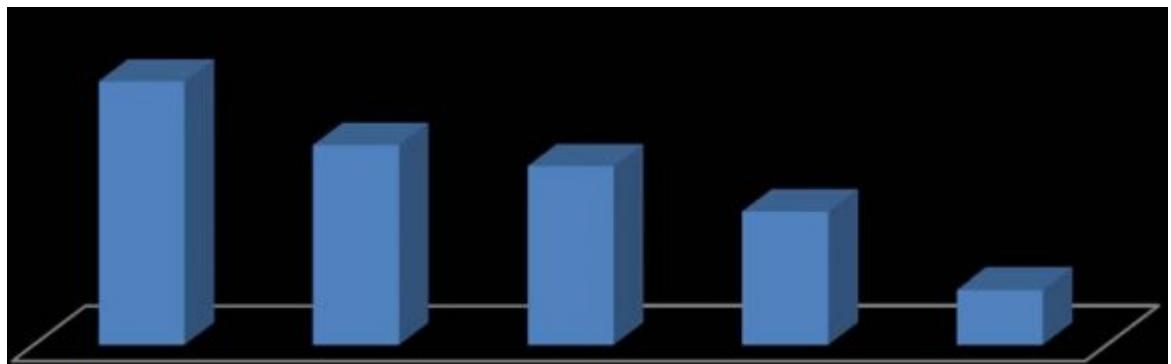


Figure 1:

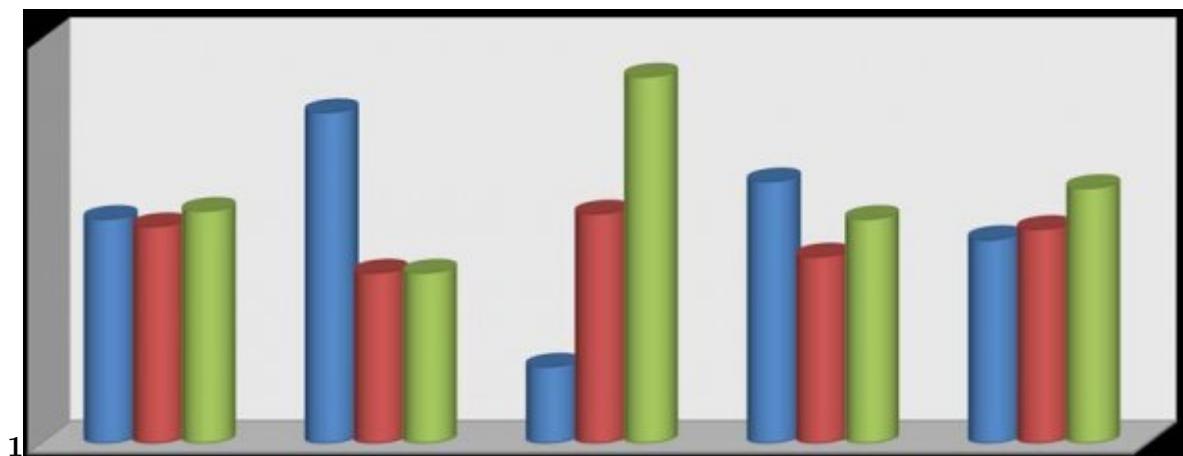


Figure 2: Figure 1 :

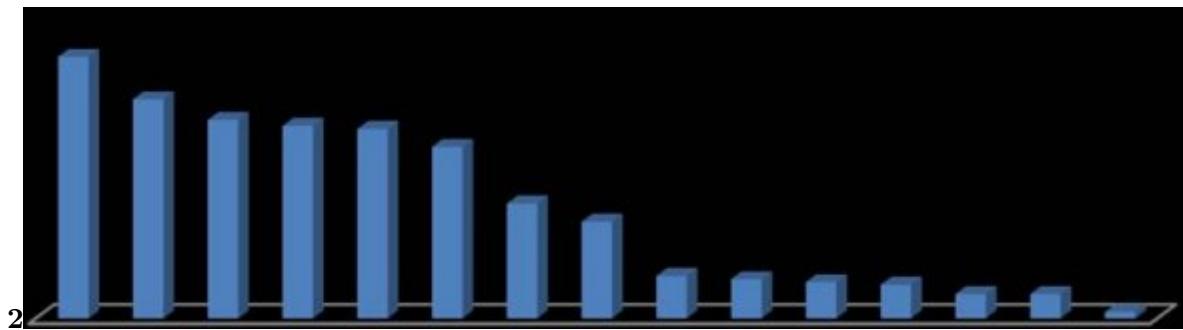


Figure 3: Figure 2 :

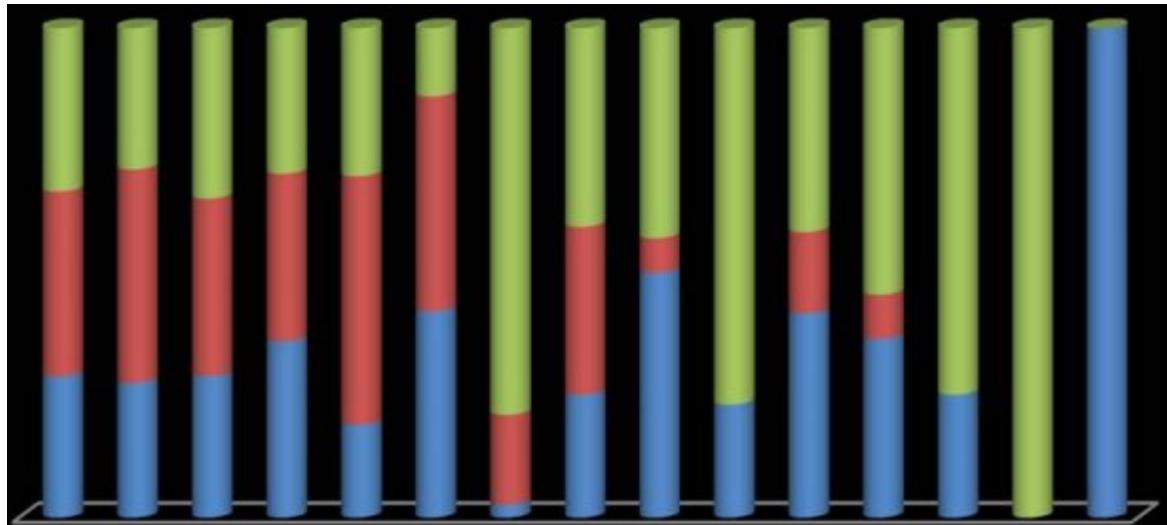


Figure 4:

3

Year 2016

90.6%

76.0%

68.8% 65.6%

66.7% 39.6%

59.4%

33.3%

14.6%

13.5%

12.5%

11.5%

8.3%

2.1%

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[Note: 30 Volume XVI Issue III Version I © 2 016 Global Journals Inc. (US) G Figure 4: Prevalence of small ruminant disease conditions with respect to agro-ecologies, southern Ethiopia]

Figure 5: Figure 3 :

1

Health related problems	N	Boka-shuta (Highland)	Study areas			Sig. ge (%)
			Debre-Work (Midland)	Konda-Zuriya (Lowland)	Percenta ge (%)	
Respiratory disease	87	25(28.7)	33(37.9)	29(33.3)	90.6	0.074
Systemic disease	73	20(27.4)	32(43.8)	21(28.8)	76.0	0.002
Diarrhea	66	19(28.8)	24(36.4)	23(34.8)	68.8	0.817
Head swelling	64	23(35.9)	22(34.4)	19(29.7)	66.7	0.145
Internal parasite	63	12(19.0)	32(50.8)	19(30.2)	65.6	0.000
Head circling	57	24(42.1)	25(43.9)	8(14.0)	59.4	0.000
Bottle jaw	38	1(2.6)	7(18.4)	30(78.9)	39.6	0.000
Emaciation	32	8(25.0)	11(34.4)	13(40.6)	33.3	0.671
Bloating	14	7(50.0)	1(7.1)	6(42.9)	14.6	0.052
Orf	13	3(23.1)	0(0.0)	10(76.9)	13.5	0.002

[Note: 31 Volume XVI Issue III Version I Epidemiological Study of Small Ruminant Diseases in Selected Districts of Kaffa and Bench-Maji Zone, Southern Nations Nationalities and Peoples Regional State (SNNPRs), Ethiopia]

Figure 6: Table 1 :

2

Eye disease	11	4(36.4)
Tick infestation	8	2(25.0)
Orchitis	8	0(0.0)
Mastitis	2	2(100)
Total	96	29(30.2)
Year		
2016		
32		
Medical Small	management	Variables
Re- rumi- (con-		Self treatment using home remedy and her
search nant trol-		
Vol- disease ling		
ume and		
XVI		
Issue		
III		
Ver- sion		
I (D		
D D		
D)		
G		
Global	Pasture management for disease transmission	Separate grazing/browsing house hold herd and flock
Journal		
of		
Quarantine		Free movement of animal within and
system		across the areas
		Restricted movement of animal within
		and across the areas
		Total

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Figure 7: Table 2 :

3

	Variables	Study Areas			Total	Sig.
		Boka-shuta	Debre-Work	Konda-Zuriya		
Occurred		N(%)	N(%)	N(%)		
different	All season	3(75.0)	0(0.0)	14(66.7)	1(25.0)	4(4.2)
of	sea- Autumn	5(23.8)	0(0.0)		2(9.5)	0.000
diseases	sons Spring	2(66.7)		1(100)	21(21.9)	
in						

Figure 8: Table 3 :

		Study Areas			
		Boka-shuta	Debre-Work	Konda-Zuriya	Total
		N(%)	N(%)	N(%)	N(%)
Occurrence of small ruminant disease outbreak		14(38.9)	4(11.1)	18(50.0)	36(37.5)
Seasonal distribution	Autumn	3(33.3)	3(33.3)	3(33.3)	9(25.0)
	In any of the seasons	0(0.0)	0(0.0)	8(100)	8(22.2)
	Spring Summer	3(75.0)	0(0.0)	1(25.0)	4(11.1)
		2(66.7)	0(0.0)	1(33.3)	3(8.3)
	Winter	6(50.0)	1(8.3)	5(41.7)	12(33.3)
Factors for diseases outbreak	Anthrax	1(50.0)	1(50.0)	0(0.0)	2(5.6)
	Bloating	2(100)	0(0.0)	0(0.0)	2(5.6)
	Head circling	2(100)	0(0.0)	0(0.0)	2(5.6)
	Diarrhea disease	0(0.0)	1(50.0)	1(50.0)	2(5.6)
	Respiratory disease	2(11.1)	2(11.1)	14(77.8)	18(50.0)
	Respiratory disease with diarrhea	1(100)	0(0.0)	0(0.0)	1(2.8)
	Swollen head with coughing	2(100)	0(0.0)	0(0.0)	2(5.6)
	Swollen head with coughing and diarrhea	0(0.0)	0(0.0)	2(100)	2(5.6)
	Swollen head with diarrhea	0(0.0)	0(0.0)	1(100)	1(2.8)
	Unknown disease	1(100)	0(0.0)	0(0.0)	1(2.8)
		3(100)	0(0.0)	0(0.0)	3(8.3)

Figure 9: Table 4 :

		Study area			
		Boka-Shuta	Debre-Work	Konda-Zuriya	
		N (%)	N (%)	N (%)	
Diseases distribution in different small ruminant age group	Adult	0(0.0)	1(100)	0(0.0)	
Age group	Adults and lambs/kids	8(66.7)	2(16.7)	2(16.7)	
	All age	6(27.3)	2(9.1)	5(33.3)	14(63.6)
	Ewes/doe	7(46.7)			3(20.3)
	Ewes/doe and lambs/kids	7(28.0)	5(20.0)		13(52.0)
	Lambs/kids	1(4.8)	18(85.7)		2(9.5)
	Total	29(30.2)	33(34.4)		34(35.4)

Figure 10: Table 5 :

6

Year 2016
35
Volume XVI Issue III Version I
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Figure 11: Table 6 :

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