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The Prevalence of Major Cattle Diseases and the Risk Factors Associated With them in Dhas District, Borana Zone, Southern Ethiopia

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ABSTRACT

Cattle production is critical to pastoralists' livelihoods; however, various diseases have hampered its productivity. The current study was conducted in the pastoral area of Dhas District, Borena Zone, Southern Ethiopia, in order to identify the most common cattle health problem and associated risks. A total of 384 cattle were examined, with 122 (31.77%) being males and 262 (68.23%) being females. The infestation of Ixodid ticks was discovered to be the most prevalent disease in cattle in the Dhas district, with an overall prevalence rate of 93.75% (360/384). From the total number of cattle examined, 110 (28.65%) males and 250 (65.10%) females were found to be positive for tick infestation, harboring at least one tick. This result shows that there was a statistically significant difference between tick infestation and cattle body condition that p=0.001 (p=0.05), with poor body condition cattle being more affected by a tick than medium and good body condition cattle. The current study found a significant difference between tick infestation and cattle age (P=0.05), with the older age group being more affected by a tick than the younger age group. The findings revealed that there was a significant difference between gender and tick prevalence, with p=0.048 (p=0.05).

Keywords: Dhas district; Husbandry practices; Feed resources; Constraints; Ixodid tick

INTRODUCTION

Livestock is an important component of agriculture, accounting for approximately 16.5% of the national GDP and 35.6 percent of the agricultural GDP [1]. In Ethiopia, livestock, primarily cattle, are a pillar of the country's economy, generating income for the pastoralist and farmer communities, ensuring food security, contributing to the asset and social, cultural and environmental values [2]. The current livestock population is estimated to be 65.35 million cattle, 39.89 million sheep, 50.5 million goats, 7.7 million camels, 56.53 million chickens, 2.11 million horses, 0.41 million miles and 8.98 million donkeys, according to CSA. Cattle husbandry includes cattle management such as hygiene, feeding, watering, product handling and disease control and it

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serves as the foundation for improving pastoralist populations' livelihoods [3].

According to Genet, ample livestock potential in Ethiopia is underutilized due to a variety of factors such as traditional management systems, limited genetic potential, a lack of acceptable disease management policies and veterinary services. Diseases are regarded as a serious health issue that causes significant economic loss in countries where livestock production is a significant component of agriculture [4]. External parasites are common and a major impediment to the development and utilization of animal resources in tropical countries due to favorable climatic conditions and poor husbandry practices [5,6]. Ticks were ranked first among external parasites that cause significant economic loss to smallholder farmers, the tanning industry and the country as a whole due to animal mortality, decreased production, downgrading and general rejection of skins and hides [7,8]. According to Bersissa, ticks are common and widely distributed in all agro-ecological zones in Ethiopia and they are also major hindrances to cattle productivity in the country. They reduce milk yield, skin and hide quality, cause the most health issues such as udder damage and predispose to mastitis, suppress immunity and increase susceptibility to other diseases and are the most common cause of udder damage.

Though cattle husbandry practices and the interaction with the environment required improving productivity and profitability were not adequately studied in various parts of the country [9]. There is little information available in pastoral areas, particularly the Dhas district, about the current state of cattle production practices, such as management, feed resources, feeding practices, marketing systems and health-related issues. In general, health related problems and marketing systems have not been studied in the study area. Furthermore, no previous research or published information on cattle management and marketing practices in the study area was known. In such cases, it has been difficult to plan additional interventions and improve the benefit gained from a live animal, meat, milk, skin and other indigenous cattle products. However, current livestock management and market availability are not well documented and thus, providing up to date information to stakeholders in order to plan livestock production development strategies is critical for the pastoral community's benefit. In light of the aforementioned gaps, the current study assessed the major health problems of cattle production and identified the most prevalent cattle disease in the study district.

MATERIALS AND METHODS

The Study Area's Description

This research was carried out in the Dhas district, one of thirteen districts in the Borana Zone of Oromia regional state, Southern Ethiopia. Guchi district in the southeast, Wachile district in the north, Somalian regional state in the east, Miyo district in the west, Dire district in the northwest and Dubluki district in the northwest border the district. Borbor town is the district's capital, located approximately 730 kilometers south of Addis Ababa and 171 kilometers from Yabello town [10]. Administratively, the district is divided into seven Pastoralist Associations kebeles (PAs), six of which are rural and one of which is urban, namely, Borbor, Teso-Kalo, Gayo, Gorile, Dhas, Raro and Mat-arba, with an estimated population of 69,856 people, of which (33,042 and 36,814) are males and females (47.3% male and 52.7% female) [11]. The land is covered in scattered short bush, red soil dominates the majority of the eastern part of Borana rangeland and the district has a significant number of permanent water points known as "Tula." The Dhas pastoral communities' main sources of income are livestock and livestock products, gum, incense and temporary wage labor [12].

Collection of Samples and Laboratory Analysis

Samples were taken from the selected cattle to investigate the prevalence of ticks in the area. The owner of the animal, age, gender, parity, origin (pastoralist association) and body condition scores (poor, medium and good) were all recorded. The sample used for laboratory examination was collected using the sample collection material, tagged with the sample ID, date of sampling collection, pastoralist association, gender and age and then preserved using preservative chemicals before being transported to the Yaballo regional veterinary Laboratory for further examination.

Tick Gathering, Identi ication and Counting

The entire body surface of the animal was thoroughly examined for the presence of any ticks and all visible adult ticks were collected manually after casting the animals with thumb forceps. Ticks were collected carefully and gently in a horizontal pull to the body surface without harming the ticks. Ticks were collected from the animals' half body region at various predilection sites such as the ear, neck dewlap, abdomen, anus, hip udder, fore/hind legs, perineum, scrotum and tail base, as Walker suggested. The ticks were preserved in universal bottles containing 70% ethyl alcohol and labeled with the animal identification and body condition score, as well as the age, gender and date of collection. Ticks was examined in detail and classified into different genera. Ticks were classified into species based on their morphology and identification structures, such as the color of the scutum and conscutum, leg color, body, coxae one and four and ventral plates. During tick identification in the laboratory, the sample was placed on petridish and the species was identified using a stereomicroscope. Ticks were counted and identified to the genus and species level using Walter alstandard's identification keys.

Analysing Statistical Data

The data gathered from individual households was encoded into a Microsoft Excel spreadsheet and codes were assigned to the collected data. The data was then entered into the Microsoft Excel computer software program and analyzed using the Statistical Package for Social Science (SPSS)

Version 21. Descriptive statistics such as mean, standard error (mean error), percentages of both dependent and independent variables and ranking index values of various parameters were used to summarize survey results. Indices were computed as follows: (Index=sum of (4 number of HHs ranked first +3 number of HHs ranked second +2 number of HHs ranked third+1 number of HHs ranked fourth) for specific objectives divided by sum of (4 number of HHs ranked first+3 number of HHs ranked second +2 number of HHs ranked third+1 number of HHs ranked fourth) for all objectives). Furthermore, the prevalence was calculated as the percentage of infected animals in comparison to the total number of animals examined. The Chi-square test was used to examine the relationship between the prevalence of major cattle diseases and independent variables (risk factors). A confidence level of 95% and a P-value of less than 5% were deemed statistically significant.

RESULTS AND DISCUSSION

Determination of Tick Infestation Prevalence in the Study Area

Tick infestation was ranked first by study participants/ respondents in the current study. The investigation was carried out based on the responses of the respondents to determine the prevalence of tick infestations. As a result, 384 cattle were examined in order to determine the prevalence of tick infestation in the study area. The current findings revealed that ixodid tick infestation of cattle was extremely common in the Dhas district, with 360 animals out of 384 examined having an overall prevalence of 93.75%. There were 122 males (31.77%) and 262 females (68.23%) among the 384 cattle examined. From the 360 infested cattle, 110 (28.65%) males and 250 (65.10%) females were found to be infected with at least one tick (**Table 1**). When at least one tick was found on the examined animal, it was considered positive for a given tick infestation.

The prevalence of tick infestation in the study area revealed that Gayo (97.7%) was the most affected kebele, followed by Dhas (93.4%), Borbor (92.68%) and Gorile (91.5%) (**Table 2**). The slight variation among the kebeles was due to different sample sizes collected from each kebele, as well as differences in management systems/veterinary care (treatment given). The current study found no statistically significant differences between Kebeles (2=3.6702; p>0.05).

Tick distribution within a specific habitat is influenced by a variety of environmental and climatic factors, including annual rainfall, atmospheric temperature and Relative Humidity (RH), vegetation cover, altitude and host availability. Sonenshin ticks and tick borne pathogens are major hindrances to cattle production and are known to have significant medical and veterinary importance throughout the world, including Ethiopia [13,14]. The overall prevalence of tick infestation in cattle in the district was found to be 93.75% in the current study.

This high prevalence of tick infestation demonstrated that ticks are widely distributed in the district and are the most significant external parasites of cattle. This finding was consistent with Misgana's report of 91.5% tick infestation in cattle from Ada'a and Boset districts, as well as M. Ayana's report of 90.12% tick infestation in pastoral areas of Yabello district, Borana zone, southern Ethiopia. There was no significant difference (p>0.05) in tick infestation within the district's four Kebeles in this study. This was most likely due to the study sites' similarities in agro-ecological settings and animal health practices.

The current result was higher than 16.0 percent in Benchi Maji Zone, Southern Ethiopia Tesfahewet and Simeon, 40.26% in and around Haramaya, Eastern Ethiopia Yalew, 81.25% in Dembia district, Northern Ethiopia, 82% in Borena province of southern Oromia Regassa, 89.58% tick infestation in cattle in and around Gambella Chali and colleagues [15]. This disparity could be explained by differences in the agro-climatic conditions of the study areas. In the Dillo district of Borana Zone, Southern Ethiopia, the current finding was less than 98.2% Dabasa et al., According to Pegram, the difference could be due to differences in the agro-climatic conditions of the study areas because tick activity is influenced by rainfall, altitude and atmospheric relative humidity.

The highest prevalence in the current study area may be due to environmental suitability for tick reproduction, short and sticky grasses used for adherence of adult ticks and transmission to grazing animals, large livestock population and herd size may also contribute as ticks can easily gain access to the host and complete their life cycle to reproduce quickly. Arid agro-ecology, a lack of veterinary extension services and traditional management practices all contribute to the highest tick infestation. The observation of a higher risk of tick infestation in the study district was most likely due to the abundance of grazing land in the lowland area. Ecto-parasites are common in tropical countries due to favorable climatic conditions for their development and poor husbandry standards.

Table 1: Shows the prevalence and distribution of ticks in the study areas.

Origin (PAs)	No. of cattle examined	No. of cattle positive	No. of cattle negative	Total PAs Prevalence (%) from observed cattle	X^2	P-Value
Borbor	41 /10.67%	38/9.9%	3/0.78%	92.68		

Dhas	123 /32%	115/29.95%	8/2.08%	93.4	3.6702	0.299
Gayo	90 /23.4%	88 /22.92%	2/0.32%	97.7		
Gorile	130 /38.85	119/30.99%	11/2.86%	91.5		
Total	384 /100%	360 /93.75%	24/6.25%	93.75		

Table 2: Shows the total number of tick genera found in the study area's kebeles.

Kebele name	Amblyomma	Hylomma	Rhipicephalus	Boophilus	Total
	Total count	Total count	Total count	Total count	Total count
Borbor	422 (10.5)	165 (5.8)	366 (11.2)	116 (6.3)	1069 (8.9)
Dhas	1133 (28.3)	1098 (38.5)	896 (27.4)	448 (24.3)	3575 (29.8)
Gayo	1077 (26.9)	431 (15.1)	663 (20.3)	505 (27.4)	2676 (22.4)
Gorile	1374 (34.3)	1160 (40.6)	1343 (41.2)	775 (42.1)	4652 (38.9)
Total	4006 (100)	2854 (100)	3268 (100)	1844 (100)	11972 (100)

Tick Genera and Species Relative Abundance

A total of 11,972 adult Ixodid ticks were collected from various body regions of 360 cattle that were found to be tick infested and thus sampled. From the study area, four Ixodidae tick genera and eight species were identified. In this study area, the genera *Ambylomma* (33.46%), *Hyalomma* (23.83%), *Rhipicephalus* (27.29%) and *Boophilus* (15.4%) were abundant. *Amblyomma gemma* (20.06%) and *Rhipicephalus pulchellus* (19.9%) were the most abundant tick species of the total tick count in the Dhas district, followed by *Boophilus decoloratus* (15.46%), *Hyalomma marginatum* (13.61%) and *Hyalomma truncatum* (9.9%). In contrast, the least abundant Ixodid species in the study district were *Rhipicephalus pravus* (7.4%), *Amblyomma varigutum* (7.12%) and *Amblyomma lepidum* (6.41%) (**Table 2**). *Ambyloma gemma* (94.27% of the total identified tick species) was discovered to be the first prevalent species in the study area. The current finding was higher than 65.8 percent from the Dilo district of Borana Zone, southern Ethiopia Dabasa 2.42% from Jimma high land and 8.3% from Mizan Teferi [16,17]. This finding is consistent with the previous report of Pegram who stated that *Ambyloma gemma* is the most widely distributed and abundant cattle tick in areas with woodland and thorn bush vegetation habitats in Ethiopia's rift valley. The higher prevalence of *Ambyloma gemma* in the Dhas district could be attributed to the arid climate, which, *according* to many scholars, is ideal for *Ambyloma gemma*.

Rhipicephalus pulchelus, on the other hand, was the second most prevalent tick species in the current study area (80.5%), which is slightly consistent with previous studies from Borena province and West Hararghe Zone, East Ethiopia [18]. This is most likely due to the Dhas district's lowland altitude and agroecology being the most conducive to the survival, development and reproduction of this tick species. This was in contrast to the previous report of the lowest abundance of this tick species in Western Amhara and Haramaya, Eastern Ethiopia [19,20]. This distinction is due to the nature of this tick species, which prefers semi arid and low lying areas in Ethiopia [21-23].

With a prevalence of 76.5%, *Hylomma marginatum* was the third most abundant tick species in the current study area. The current finding was higher than Tessema and Gashaw's finding in Asela (2.5%), Belew and Mekonnen's finding in Holeta (1.86%) and Tegegn finding in Bishoftu (4.7%) [24-27].

Boophilus decoloratus was the fourth most common tick species in the study area, with a prevalence of 70.05%. This finding is greater than that of Mathewos and Morka, Kassa and Yalew, Wasihun and Doda, Gedilu, Bedaso and Sileshi who described *B. decolaratus* as the most common and widespread tick in a different region of Ethiopia. The current discovery was the high prevalence of *Hylomma marginatum* and *Boophilus decoloratus* in the country. This is most likely due to Rh. (Bo.) decoloratus' preference for climatic conditions conducive to extensive management and the study area's lack of veterinary services [28].

Ticks collected from the study area included Ambyloma *lepidum* (54.9%), *Hylomma trancutum* (52.75%), *Rhipicephalus pravus* (49.7%) and *Ambyloma varigutum* (47.39%). The current study's findings were slightly consistent with those of Dabasa, who discovered *A. lepidium* (30.9%) and *R. pravus* (29.4%) in the Dilo district, Borana Zone, southern Ethiopia. The relative result was most likely due to the same climatic conditions and cattle management in the Borana area. The current finding, on the other hand, contradicts the result on *R. pravus* Wasihun and Doda (2013) reported a lower finding of 6.68 percent A. lepidum from Humbo district. According to Dessie and Getachew, *A. lepidum*

was common but not abundant in the Wolaita zone (2006). The observed difference was due to agro-ecological conditions that were unsuitable for spread and multiplication [29-31] (Tables 3 and 4).

Table 3. Displays the relative abundance of tick genera and species.

Ticks' species	Total number of cattle examined	Number of +ve cattle	Total percentage	Total number of ticks Spp counts	Total percentage of spp from the total count
Ambyloma gemma	384	362	94.27	2392	20.06
Ambyloma varigutum	384	182	47.39	849	7.12
Ambyloma lepidum	384	211	54.9	765	6.41
Hylomma marginatum	384	294	76.5	1623	13.61
Hylomma trancutum	384	201	52.75	1181	9.9
Rhipicephalus pulchelus	384	309	80.46	2380	19.9
Rhipicephalus pravus	384	191	49.7	888	7.4
Boophilus decoloratus	384	269	70.05	1844	15.46
Total ticks count				11922	

Table 4. Tick species burden in the study area.

Ticks Species	Total number of cattle examined	Number of +ve cattle	Percentage of prevalence	P-value of ticks species in relation to risk factor		
				Gender	Age	BCS
Ambyloma gemma	384	362	94.27	0.38	0.115	0.643
Ambyloma varigutum	384	182	47.39	0.637	0.332	0.969
Ambyloma lepidum	384	211	54.9	0.111	0.591	0.733
Hylomma marginatum	384	294	76.5	0.041	0.177	0.203
Hylomma trancutum	384	201	52.75	0.03	0.345	0.303
Rhipicephalus pulchelus	384	309	80.46	0.004	0.181	0.096
Rhipicephalus pravus	384	191	49.7	0	0.235	0.524
Boophilus decoloratus	384	269	70.05	0.254	0.632	0.14

Tick Risk Factor Association (Gender, Age and Body Condition Score)

During the examination, the cattle's body conditions were taken into account and the cattle were divided into three body condition scores (good, medium and poor). 87 of the 384 cattle examined were in good physical condition. Tick infestation was found in 76 (87.35%), with 218 in medium body condition. 205 (94%) were positive for tick infestation; while the remaining 79 cattle were in poor body condition

and all 79 (100%) were positive for tick infestation. This result shows that there was a statistically significant difference between tick infestation and cattle body condition that p=0.001 (p=0.05), with poor body condition cattle being more affected by a tick than medium and good body condition cattle [32].

According to the current study results, the occurrence of tick infestation in three different body conditions (poor, medium and good) of cattle shows the highest prevalence in poor body conditions (100%), followed by medium body conditions (94%) and (87.35%) in good body condition. This was due to poor and medium body condition scored cattle having lower resistance and being more susceptible to disease when grazing on the field, less cattle management and favorable environmental conditions for tick multiplication. Because cattle with a relatively good body condition were more resistant, they became less infested than medium and poor sized cattle (**Table 5**).

Table 5. Shows the prevalence of ticks in relation to a potential risk factor (Age, Gender and BCS).

Risk factor (variable)	Risk factor categories	Number of cattle examined	Number of cattle infected with ticks	Prevalence (%)	X^2	P-value
Age	Young	76	62	81.5	51.6	0.001
	Adult	239	229	95.8		
	Old	69	69	100		
Gender	Male	122	110	90.16	3.9244	0.048
	Female	262	250	95.4		
BCS	Poor	79	79	100	11.367	0.003
	Medium	218	205	94		
	Good	87	76	87.35		

The current study agreed with the findings of Bereket and Tekalign from Damot Woyde Woreda, Wolaita zone, Southern Ethiopia, who reported a higher prevalence of ticks in poor (92.2%) and medium body scored cattle (82.5%) than in good body conditioned animals (80.6%), Hika who reported a higher prevalence of ticks in poor (67.79%), medium (42.01%) and good body condition (34.04). The current study agreed with the findings of Bereket and Tekalign from Damot Woyde Woreda, Wolaita zone, Southern Ethiopia, who reported a high prevalence in poor (92.2%) and medium body scored individuals. This could be due to poorly conditioned cattle having low resistance to tick infestation and not having enough body capacity to build resistance. This finding indicates that poor body condition was more affected than good and medium body condition, which could be related to the management system in which animals are permitted to graze in communal fields [33].

The difference in tick prevalence among the three age groups was relatively high in old age (100%) than in adult (95.8%) and young age (95.8%), (81.5%). The current study's findings revealed statistically significant differences (P=0.05). The higher proportion may be due to grazing system management and long distance movement of older and adult cattle in search of food and water when compared to younger cattle, so the aged cattle group has a higher risk of exposure. This finding contradicted the findings of Yakhchali and Hasanzadehzarza, who found that tick infestation was higher in adults (60.8%) than in children (20%) and Tessema and Gashaw, who found a higher proportion in adults' cattle than in children.

The current finding is consistent with the findings of Dabasa, who found that adults are more susceptible to tick infestation than young cattle in Dilo district Borana zone, southern Ethiopia and also with Bossena and Abdu in and around Assosa town, Gedilu, from Bahir Dar, Ethiopia. This variation could be attributed to different age groups of cattle being managed differently. In the current study area, younger animals are kept indoors in a small separate housing called "dhokoba," which is sometimes in the family house and is easily managed by family members, so that, unlike adult animals, younger animals do not have access to harbor ticks from the field. Young animals are less affected than adults because they have less exposure to field grazing with other animals in the field, whereas adults are exposed because of the communal grazing habit.

In terms of cattle gender, the prevalence of males and females was compared. The majority of the cattle sampled (250) were females, while approximately 110 (90.16%) were males. Tick prevalence was found to be 28.65% male and 65.10% female in the current study. However, the results showed that there was a statistically significant difference between gender and tick prevalence, with p=0.048 (p=0.05). According to the current study, female cattle have a high prevalence of tick infestation (65.10%), while male cattle have a lower prevalence (28.65%).

This could be because female animals have lower immunity than males and a large number of samples were collected from female cattle. The current finding was consistent with the findings of Bereket and Tekalign from Damot Woyde Woreda, Wolaita zone, Southern Ethiopia, who found that female cattle were more infested than males. However, contrary to this current finding, the same author reports a high prevalence of tick infestation occurs in female cattle (89.9%) and a lower prevalence in male animals (89.9%) (78.9%). However, the current finding contradicts the findings of Hika, who found female cattle to be less affected than males (51.3% versus 52.6%) with no statistical significance (P-value>0.05 and x=0.063) and the current finding was greater than the findings of Mathewos and Morka, who found that the prevalence of all tick species was higher in female animals than male animals. There was no statistically significant difference (P>0.05) in the infestation rate between genders, with females having a higher infestation rate (43%) than males (28%).

CONCLUSION

The current study found a prevalence of 93.75%. In addition to climatic advantage and host animal adequacy for ticks, insufficient veterinary extension service combined with an extensive management system contributed to the highest tick burden in the current study area. Furthermore, cattle that contribute significantly to the pastoralist community's livelihoods may be affected unless necessary coordination among stakeholders on rising animal health service, supplying veterinary clinic equipment, drug and vaccine supply systems with close monitoring and supervision can minimize the problem caused by disease. More research and development should be supported in order to address the potential impact of ticks and tick-borne pathogens during dry different seasons feed scarcity.

DATA AVAILABILITY

A data that support the findings of this study are available from the corresponding author upon reasonable request.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest

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