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Species abundance, risk factors, predilection sites, economic impacts and control strategies of *Bovine* Ixodid ticks in Metekel zone of Benishangul-Gumuz regional state, Ethiopia

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Abstract

A cross-sectional study was conducted in three districts (Dangur, Mandura and Pawi) of Metekel zone, Benishangul-Gumuz regional state, Ethiopia from November, 2018 to May, 2019 to investigate the abundance and composition of Ixodid tick species in cattle, assessment of control strategies and financial losses followed by infestation by ticks. Adult ticks were collected from 1052 local cattle breeds reared extensively. Out of the total of 1052 cattle examined, 798 (75.9%) were found to be infested by one or more tick species. A total of 8559 adult ticks were collected from the animal body parts and tick species were morphologically identified to genera and species level. Six tick species of four genera were identified. From the total ticks collected *Amblyomma*, *Rhipicephalus*, *Rh. boophilus* and *Hyalomma* accounted for 24.3, 40.5, 31.9 and 3.2 percentages respectively. The relative prevalence of each species was *Am. lepidium* (6.8%), *Am. variegatum* (17.5%), *Rhipicephalus* (*Boophilus*) *decoloratus* (31.9%), *Rh. evertsi evertsi* (27.5%), *Rh. pulchellus* (13%) *and Hy. mar. rufipes* (3.2%). The host related risk factors such as sex, age and body conformations showed statistical significant association with the infestations rates. The prevalence of tick infestation was found to be higher in female compared to male (p = 0.02442), highest in old and adults compared to young (p=0.000). Good, medium and poor body conditions of the cattle were correlated to 31.1%, 26.4 % and 18.3% tick infestations respectively. The most favorable predilection sites for *Amblyomma spp* was under tail, udder/scrotum and brisket region while *Rhipicephalus boophilus decoloratus* preferred dewlap, brisket, belly, leg, and ear. *Rhipicephalus evertsi evertsi* and *Rhipicephalus pulchellus* species had a strong affinity for udder/scrotum, under tail and ano-genital sites. For *Hyalomma* species preferred sites were udder/scrotum and under tail, ano-genital and brisket were its hiding sites. The present information on the common tick species contributes its part in the development of effective control strategies of tick and tick borne diseases in the study area.

Keywords: Tick Species, Control practices, Economic impacts, Metekel, Ethiopia.

Introduction

Ethiopia has an extremely diverse topography, a wide range of climatic features and a multitude of agro-ecological zones that are suitable to host a very huge animal population (Mekasha *et al*., 2014). The livestock subsector has an enormous contribution to Ethiopia's national economy and livelihoods of many Ethiopians. The subsector contributes about 16.5% of the national Gross Domestic Product (GDP) and 35.6% of the agricultural GDP (Leta and Mesele, 2014).

Poor health and productivity of animals due to diseases has considerably become the major stumbling block to the potential of livestock industry (Onu and Shiferaw, 2013). Nowdays, parasitism represents a major obstacle to development and utilization of animal resource. In Ethiopia, ectoparasites in ruminants causes serious economic losses to small holder farmers, the tanning industry and the country as a whole through mortality of animals, decreased production, downgrading and rejection of skin and hide (Wall and Shearer, 2001; Regasa *et al*., 2015).
Among ectoparasites, ticks are greatly associated with health problems of man and animals and contribute to important economic losses in Ethiopia (Kumsa *et al*., 2016a). It directly affects the socio-economic development of resource limited farming community by affecting health and productivity of animals in Ethiopia (Mekonnen *et al*., 2001; Yacob *et al*., 2008; Kumsa *et al*., 2012). Ticks cause substantial losses in cattle production, in terms of diseases, reduced productivity and fertility and often lead to death and are economically the most important ecto-parasites of cattle (Eyo *et al*., 2014). According to the study conducted by Huruma et al (2015a), different ticks have different predilection sites on the host's body.

Ticks are grouped into three families as Ixodidae (hard ticks) with 702 officially recognized species, Argasidae (soft ticks) comprising 193 species and Nuttalliellidae with a single species (Guglielmone *et al*., 2010). Ixodid ticks pass via four stages in their development; eggs, 6- legged larva, 8-legged nymph and adult. They are categorized into one-host; two-host or three-host life cycles according to the number of host required to complete their lifecycle (Walker, 2014).

The main genera of ticks found in Ethiopia are *Ambylomma*, *Rhipicephalus*, *Hyalomma* and *Haemaphysalis* and a subgenus *Rhipicephalus* (*Boophilus)* (Mekonnen *et al*., 2001). Previous studies documented the presence of more than 50 species of ticks in the country including genus *Amblyomma* (8 spp.), subgenus *Boophilus*, (2 spp.), *Haemaphysalis* (4 spp.), *Hyalomma* (9 spp.), *Rhipicephalus (*15 spp.), *Ixodes* (1 spp), *Argas* (1 spp.) and *Ornithodoros* (2 spp.) which are reported to have great veterinary and medical importance in Ethiopia (Pegram *et al*., 1981).

Some studies have been conducted in different parts of Ethiopia on ticks infesting cattle (Yacob *et al*., 2008; Asrate *et al*., 2012; Ayana *et al*., 2013; ; Eyo *et al*., 2014; Desalegn *et al*., 2015; Kumsa *et al*., 2016b). However, there was no study conducted so far on species composition, control practices and economical impacts of tick infestations of cattle in Dangur Mandura and Pawi districts in Metekel zone of Benishangul-Gumuz regional state of Ethiopia.

Therefore, the major objectives of this study were to: determine species prevalence of ticks infesting cattle and their distribution on infected host [2] assesses control practices to reduce or eliminate infestation of ticks in the area [3] estimate financial impacts of tick infestations.

Materials and Methods

Description of study area

The study was conducted in Metekel zone of Benishangul Gumuz Regional State, Northwest Ethiopia. About 80% of the zone was characterized by having sub-humid and humid tropical climate. The topography of the zone presents undulating hills slightly sloping down to low land Plateaus having an altitude range from 600-2800 meters above sea level. According to (Engda, 2000) the surrounding of Metekel zone were a wide climatic range varied from hot to warm moist lowlands and hot to warm sub humid lowlands agro-ecological zone.

Dangur district, located 563 kms west of Addis Ababa in the Benishangul- Gumuz administrative region. Mixed agriculture was the mainstay of the livelihood of the society where crop and livestock production play integral roles. The district was situated at 11°18' N and 36°14' E with a total area of 838,700 hectares. It had an elevation that varies from 800 to 2000 meters above sea levels (masl) and has 70% plains, 8% valley and 22% mountainous topographic feature. The average annual low and high temperatures are 30°C and 38°C respectively and the mean annual rainfall ranges from 900 to 1400 ml (ARDODW, 2011).

In Dangur district the study population was constituted of indigenous zebu cattle managed under smallholder mixed crop-livestock farming system. The animals were kept under traditional extensive husbandry system with communal grazing and watering points when in my supervisions. Animal population of the district consists of 25,715 cattle, 8,453 sheep, 17,993 goats, 19 horses, 78 mules, 6305 donkeys and 43,855 poultry (DWAO, 2018).

Mandura district located in Metekel zone of Benishangul Gumuz regional sate situated at 547 Kilometres North West of Addis Ababa. The mean annual rain fall in Mandura district ranges from 900-1400 ml. The annual temperature ranges from 28-30oC. The district has altitudes ranging from 1000-1400 m. a. s.1 (Kumela, 2015).

The cattle in the Mandura district were local breeds that were kept under traditional extensive husbandry systems with communal herding. Agriculture was the main stay of the livelihood of the society with mixed farming system and livestock play an integral role for agriculture. The animal population of the district was estimated to be 24,102 cattle, 11,320 sheep, 18,212 goats, 28 mules, and 1,596 donkeys (MWAO, 2018).

The Pawe district had 20 kebeles covering an area of 64,300 hectare with human population of 42,000. It is located at latitude of 110 and 15’ 24.7’’N and, longitude of 360 and 23’10’’E. It has an altitude of 1064m above sea level. Its annual average temperature is 32^{o}C and its rainfall range is 900-1400 ml (NMSA, 2007). In Pawi district were the livelihood of the society largely depends on mixed livestock and crop production having livestock population of 59,112 Cattle, 5502 Goat, 5613 Sheep, 964 Equines, 29,445 Poultry and 3119 beehives (PWAO, 2018).

= Indicates study area districts under Metekel zone

Figure1: Map of the study districts in Metekel zone (Dangur, Mandura and Pawi) of Benishangul-Gumuz regional state Ethiopia
Source: httpswww.google.com.etsearchq=benishangul+gumuz+region+map

Study population

Among population of animals, the study was conducted on local zebu cattle populations that are present in rural and urban areas of Dangur, Mandura and Pawi districts. All the cattle sampled were local breeds kept under extensive production system.

Sample size determination

The study sites were selected by purposive sampling technique, whereas the study cattle were select by systematic random sampling technique. The sample size for the cross-sectional study was determined using the formula indicated by (Thrusfield, 2005) to determine the level of occurrence of ticks.

$$n = \frac{1.96^2 \, Pexp \, (1 - Pexp)}{d^2}$$

Where;

n= sample size
Pexp= Expected prevalence (50%)
d^2= Expected precision which is usually 5% (0.05).

$$n = \frac{(1.96)^2 \, (0.50) \, (1-0.50)}{(0.05)^2}$$

n=384 * 3 districts = 1152

From 1152 expected sample size, 1052 cattle were examined due to zone peace and security problem.

Study design and methodology

The cross-sectional study type was used to assess the adult tick species present in each of the three districts under metekel zone in Benishangul-Gumuz region during the study period. The study Kebele's were purposively selected based on the agro-ecological representativeness. Study animals were selected randomly (using lottery system). All the animals randomly selected as sampling unit were checked for any tick infestation based upon the numbers of ticks found on the animal and the study record period. All selected animals were grouped into 2 age groups (adult and young) based on dentations formula by Gatenby (1991). The body condition was scored following the methodology used by Garnsworthy (2006).

Tick collection and identification

Ticks were collected from eight (8) different body sites such as head, ear, leg, dewlap, brisket, belly, udder/scrotum, ano-genital, under and the tail after proper physical restraining of the animals. During collection, ticks were removed manually from different attachment sites of the animal body by a rotating manner to retain their body parts for identification (Wall and Shearer, 2001).

Adult ticks were collected into universal bottles containing 70% ethanol from body region of each study cattle from the three study districts during study periods (Walker *et al*., 2003). Ticks were removed from the body of the cattle by using forceps. Ticks from each body regions were collected into separate, labelled sampling bottles for identification.
The ticks were then taken to the Pawi Agricultural Research Centre at Pawi town where they were examined and identified to genera and species level. Stereomicroscope was used to magnify the ticks to enable identification based on their morphological features such as mouth parts, scutum, and colour of legs, festoons, interstitial punctuations, presence or absence of adanal shields, posterior groove and marginal spots based on the taxonomic keys of (Walker *et al.*, 2003).

Questionnaire survey

Questionnaire survey aiming to assess tick control practices and estimation of economical impacts followed by tick infestation study, structured questionnaires were introduced to 100 respondents during the study period. A questionnaire survey was based on the formula recommended by Arsham (2002).

Data Analysis

First, collected data was entered in to the Microsoft Excel sheet, and then descriptive statistics like mean and percentages, and tables were used to summarize the data. Analysis of obtained data was done by Chi square (x^2) to test the association between tick infestation with different factors (sex, age and body condition score). For this analysis, R software was used.

Results

4.1Prevalence and Distribution of Ticks

In the present study, a total of 1052 cattle were examined for tick infestation. Out of the total, 798 were found infested with one or more genera or species of tick and the overall prevalence was 75.9%. A total of 8559 adult Ixodidae ticks were collected from different body regions of infested cattle. In general, four Ixodidae tick genera were identified from the study area. From identified generas; *Rhipicephalus* (40.5%) was the most abundant and widely distributed genus followed by genus *Rh. boophilus* (31.9%) and genus *Ambylomma* (24.3%). However, *Hyalomma* (3.2%) was found to be the least abundant genera (Table 1).

Table 1: Prevalence of tick genera in the study area

Prevalence of tick genera in the study area		
Genus	**Total tick count**	**Prevalence (%)**
Ambylomma	2081	24.31
Rhipicephalus	3469	40.53
Rh. Boophilus	2734	31.94
Hyalomma	275	3.21
Total	8559	100

4.2. Tick species prevalence

Out of the four genera investigated, six species of ticks were identified; the highest to the lowest percentage prevalence was determined respectively to be *Rh. boophilus decoloratus* (31.9%), *Rhipicephalus evertsi evertsi* (27.5%), *Ambylomma varigatum* (17.5%) in *Rhipicephalus pulchlus* (12.9%), *Ambylomma lepidium* (6.7%) and *Hyalomma marigatum rufipus* (3.2%). The species prevalence by districts was; in Dangur - *Rhipicephalus evertsi evertsi* (49.8%) and *Hyalomma marigatum rufipus* (1.7%); in Mandura - *Ambylomma varigatum* (47.3%) and *Rhipicephalus pulchlus* (2.7%); in Pawi - *Rh. boophilus decoloratus* (50.3%) and *Ambylomma lepidium* (2.6%) (Table 2).

Table 2: Prevalence of tick species (in three study districts)

District	*Ambylomma lepidium*	*Ambylomma varigatum*	*Rhipicephalus evertsi evertsi*	*Rhipicephalus pulchlus*	*Boophilus decoloratus*	*Hyalomma marigatum rufipes*	Total
Dangur	68 (2.3%)	102 (3.5%)	1417 (49.8%)	507 (17.8%)	699 (24.5%)	50 (1.7%)	2843
Mandura	433 (15.9%)	1289 (47.3%)	287 (10.5%)	76 (2.7%)	527 (19.3%)	111 (4%)	2723
Pawi	78 (2.6%)	111 (3.7%)	654 (21.8%)	528 (17.6%)	1508 (50.3%)	114 (3.8%)	2993
Total	579 (6.7%)	1502 (17.5%)	2358 (27.5%)	1111 (12.9%)	2734 (31.9%)	275 (3.2%)	8559 (100%)

4.3. Tick species sex composition

Out of the four genera examined six species of ticks the male ticks were more abundant than the female ticks as shown below in table 3.

Table 3: Prevalence and sex ratio of tick species

Tick species	Total count	Male	Female	M:F ratio	Prevalence (%)
Ambylomma lepidium	579	371	208	1.78:1	6.76
Ambylomma variegatum	1502	1049	453	2.31:1	17.54
Boophilus decoloratus	2734	1899	835	2.27:1	31.94
Rhipicephalus evertsi evertsi	2358	1618	740	2.18:1	27.54
Rhipicephalus pulchellus	1111	791	320	2.47:1	12.98
Hyalomma marginatum rufipes	275	188	87	2.16:1	3.21
Total	8559	5916	2643	2.23:1	100

4.4 Distribution of tick species among predilection sites

Each tick species tended to prefer a site of attachment on the animal's body. The most and the list favorable predilection sites for each species was *Am. lepidium* (31.1%) brisket and (0.2%) head; *Am. Variegatum* (36.7%) udder/scrotum and (0.3%) head; *Rh. evertsi evertsi* (33.1%) udder/scrotum and (0.04%) ear; *Rh. pulchellus* (35.8%) under tail and (3.4%) dewlap; *B. decoloratus* (32.5%) dewlap and (1.8%) leg; *H. mar. rufipes* (36.7%) udder/scrotum and (0.4%) head preferred respectively (Table 4).

Table 4: Tick species distribution on different body region

Predilection site	*Am. Lepidium*	*Am. Variegatum*	*Rh. evertsi evertsi*	*Rh. pulchellus*	*Bo. decoloratus*	*H. mar. Rufipes*
Head	1 (0.17%)	5 (0.32%)	-	-	-	1 (0.36%)
Ear	-	-	1 (0.04%)	-	156 (5.65%)	-
Dewlap	37 (6.43%)	55 (3.59%)	32 (1.39%)	38 (3.37%)	895 (32.45%)	25 (9.09%)
Brisket	179 (31.13%)	539 (35.25%)	-	40 (3.55%)	597 (21.64%)	54 (19.63%)
Leg		-	-	-	50 (1.81%)	-
Udder / Scrotum	135 (23.47%)	565 (36.95%)	760 (33.10%)	388 (34.45%)	-	101 (36.72%)
Ano-genital	-	-	735 (32.01%)	257 (22.82%)	-	34 (12.36%)
Under tail	171 (29.73%)	305 (19.94%)	569 (24.78%)	403 (35.79%)	471 (17.07%)	60 (21.81%)
Belly	52 (9.04%)	60 (3.92%)	199 (8.66%)	-	589 (21.35%)	-
Total	575 (100%)	1529 (100%)	2296 (100%)	1126 (100%)	2758 (100%)	275 (100%)

4.5 Prevalence of ticks in relation to host risk factors (sex, age and body condition)

From both sex groups, 536 and 516 male and female cattle were examined and 391 and 407 was infested respectively. Female animals were found more affected than males (in female 38.7% and in male it was 37.7%) with statistical significance (P-value < 0.05 = 0.02442 and x^2 = 5.0645). young or less than one year it was 7.2% while in one year to three year or adult 16.3% and greater than three years or old were 52.4%. They had statistically significance (P < 0.05) x^2 36.717 and P-value 0.000 between the age groups (Table 5).

Table 5: Prevalence of ticks in relation to host risk factors

Risk factors	Category	No. of examined	No. of infested	Prevalence	X^2	P-value
Sex	Male	536	391	37.7	5.0645	0.02442
	Female	516	407	38.7		
Age	Young (<1)	130	76	7.2	36.717	0.000
	Adult (1-3)	243	171	16.3		
	Old (>3)	679	551	52.4		
Body condition	Good	378	327	31.1	71.877	0.000
	Medium	343	278	26.4		
	Poor	331	193	18.3		
Total		1052	798	75.9		

4.6 Questionnaire survey on control practices and financial impacts of infestation

Table 6: Questionnaire data representing the question items and respondents response

Question contents	Feedbacks	Respondents	Total (%)
Do you have cattle	Yes	150	150 (100)
	No	-	(0)
Is there any problem of tick infestation on cattle in your area	Yes	150	150 (100)
	No	-	(0)
In which groups of cattle is the tick problem more serious	Calves	-	(0)
	Adults	46	(30.6)
	Male	-	(0)
	Female	104	104(69.3)
In which season of the year the problem is more sever	Summer	-	(0)
	Winter	150	150 (100)
	Autumn	-	(0)
	Spring	-	(0)
The amount of money that you annually lose for the purchase of chemicals and treating animals in veterinary clinics	Average 24.4 ETB	150	150 (100)
Are the chemicals used in spraying or treatment given at veterinary clinics effective treating infested cattle	Yes(but short time)	150	150 (100)
	No	-	(0)
Do you know any medicinal plant used in the treatment of tick infestation in your area	Yes	5	5 (3.3)
	No	145	145 (96.6)
Price or value of cattle infested with ticks (marketability annually)	Yes Average (439 ETB)	95	95 (63.3)
	No loss	55	55 (36.7)
Hide lose (annually)	Yes Average (20.6 ETB)	77	77 (51.3)
	No loss	73	73 (48.7)
Decrease in production (milk production) estimated annual financial lose ETB	Yes Average (147.5 ETB)	81	81(54)
	No	69	69 (46)
Financial losses for control and prevention	Yes Average (102.3 ETB)	138	138 (92)
	No	12	12 (8)

Discussion

The present study reveals that, the overall prevalence of tick infestation in three districts of Metekel zone (Dangur, Mandura and Pawi) is 75.9%. The prevalence of tick infestation in each district was registered which were in Dangur 73.4%, in Mandura 75.4% and in Pawi 78.8%. The current result was in agreement with Meaza *et al*., (2014) who reported prevalence at 74% at Bahir Dar. Lower prevalence of 33.2% was reported by Asrate and Yalew, (2012) in and around Haramaya district eastern Ethiopia. However, higher prevalence at 93.8% was reported by Kemal *et al*., (2016) in Babille district eastern Ethiopia. This variation could be due to the differences in the agro climatic condition of the study areas. Tick activity is influenced by rainfall, temperature, altitude and atmospheric relative humidity (Pegram *et al*., 1981) and management system including the use of acaricides and other preventive measures (Fantahun and Mohamed, 2012; Eyo *et al*., 2014).

Amblyomma, Rhipicephalus, Rh. boophilus and Hyalomma were the four genera of ticks identified during the study period, with a total prevalence of 24.3%, 40.5%, 31.9% and 3.2% respectively. The genus *Rhipicephalus, Rh. boophilus* and *Hyalomma* tick was greater in prevalence in this study .5% and 31.9%) than that by Admassu *et al*., (2015) who reported prevalence of 23.1% and 25% respectively and Tamiru and Abebaw, (2010) in Asella (*Rhipicephalus* 22%, *Rh. boophilus* 15.4% and *Hyalomma* 2.5%). *Amblyomma* tick infestation was indicated higher in studies of Tamiru and Abebaw, (2010) which were 60.1%. Risk factors (sex, age and body condition scores) were also assessed in the variations of the prevalence of ticks in the study area.
The difference in prevalence was found statistically significant ($P < 0.05$) between sex of cattle. Female animals were found more affected than males (in female 38.7% and in male it was 37.7%) with statistical significance (P-value < 0.05 = 0.02442 and x^2 = 5.0645). This result was agreed with the other author in (Alemu *et al*., 2014) in female 81.8 and in male 80.84 additionally (Asrate and Yalew, 2012) in female 35.2% and in male 31.1% but not in line with reports by Tamiru and Abebaw, (2010) as well as et al (2014). This could be due to equal opportunities of oxen and cows to tick infestation in the current study area and their management system.

Age also other matters in the prevalence of ticks in cattle in the study area. In those age categories young or less than one year it was 7.2% while in one year to three year or adult 16.3% and greater than three years or old were 52.4%. They had statistically significance ($P < 0.05$) x^2 36.717 and P-value 0.000 between the age groups. Similar findings were analyzed by (Kassa and Yalew, 2012) and (Asrate and Yalew, 2012). However, (Kemal *et al*., 2017) reported that exist statistical significance difference in the age group. In general, the prevalence of ticks reported by most of the authors indicated that very young animals are affected less than adult and old animals. This could be due to the less exposure of young animals to field grazing with the other adult animals in the field which are exposed due to the communal grazing habit under extensive management.

Among the associated risk factors that were assessed in the present study, the prevalence of tick infestation varies with the body condition of the animals. The prevalence of tick infestation in the study area was significantly different in animals with good (31.1%), medium (26.4%) and poor (18.3%) body condition (x^2 71.877 (P-value 0.000). Tadesse and Sultan (2014) have reported that the proportion of tick infestation was higher in medium body conditioned (44.5%) as compared to poor body conditioned (9.8%) and good body conditioned animals (4.9%). This might be due to the fact that medium and good body scored animals are exposed to any kind of diseases when grazing on the field, and poor body conditioned animals were kept at home due to their inability to walk long distant areas, so they become less infested than good and medium sized animals but, the well fed animals were very resistant to any kind of diseases when they grazed in the field or are kept at home (Tadesse and Sultan, 2014).

With regard to predilection site for attachment, different tick species show different site preferences. *Am. variegatum* and *Am. lepidium* found in udder/scrotum, under tail and brisket whereas the *Rh. B. decoloratus* species were found on the dewlap, brisket and belly and *Rh. evertsi evertsi* and *R. pulchelus* showed high preference to the ano-genital, under tail and udder/scrotum region of the body mostly preferred sites investigated in the study area.

Rh. B. decoloratus is one of the most important cattle ticks in Ethiopia for its parasitic effect (Morel, 1980). Accordingly, it was the most abundant (31.9%) tick species that was identified in the study area. It is also highly prevalent especially in one of the districts in the study area (Pawi district it was 50.3%). This finding slightly agrees with that of (Kemal *et al*., 2017) in Borecha district southern Ethiopia, (Alemu *et al*., 2014) in northwest Dembia district and (Bossena and Abdu, 2012) in and around Assosa town they reported 60.5%, 40.9% and 45% tick infestation prevalence respectively.

Rh. evertsi evertsi was the second abundant tick species (27.5%) in the study area. The species was highly abundant in Dangur inside the study area of the district (49.8%). The result highest with that of (Tadesse and Sultan, 2014) (20.6%) in Fitche Salale, (Alemu *et al*., 2014) (11.5%) in northwest Dembia district and (Hussein *et al*., 2018) (11.2%) in Hetosa district east Arsi zone. The higher prevalence was reported by (Bossena and Abdu, 2012) (45%) in and around Asossa. The reason for wide distribution of this species of ticks in different parts of the country could be related with the non apparent preference for particular altitude, rainfall zones or seasons (Pegram *et al*., 1981).

Rh. pulchellus species was the minimum prevalent ticks (13%) in the study area. Inside of the study districts Dangur and Pawi had higher prevalent than Mandura since Mandura district is slightly higher in altitude compared to the other two districts and *Am. variegatum* was most abundant in this district than the rest species. The Result of *Rh. pulchellus* in this districts higher than reported by (Asrate and Yalew, 2012) (6.6%) which could be due to the nature of this tick species that can have an ability to confine to semi arid and low land areas (Pegram *et al*., 1981).

An important *Amblyomma* tick species encountered in this study were *Am. variegatum*, and *Am. lepidum* with prevalence rates of 17.5% and 6.8% respectively. The two species was more abundant in Mandura district inside the study area (47.3% and 15.9%) respectively. (Bossena and Abdu, 2012) from in and around Assosa reported almost similar results for the occurrence of *Am. variegatum* (15%). But lower prevalence was reported than this study area were (Kemal *et al*., 2017) (8.2%) in *Am. variegatum.* More abundance of *Am. variegatum* also reported different study areas like (Asrate and Yalew, 2012) (38.9%), (Ayana *et al*., 2013) (35.3%) and (Hussein *et al*., 2018) (39.3).

H. marginatum rufipes was the last abundant tick species with the prevalence of 3.2%. This result is higher than that of (Tamiru and Abebaw, 2010) (2.5%) in Borena province, (Hussein *et al*., 2018) (2.6%) in east Arsi and (Huruma *et al*., 2015b) (0.8%) in Sebeta town. The result lower abundance than that of (Tadesse and Sultan, 2014), (Alemu *et al*., 2014) and (Nuna and Guder, 2018) which was 12.4%, 12.9% and 10% respectively.

The aim of tick control strategy is not to control all ticks simultaneously, but a definite species because of its particular role (FAO, 2004). The successful implementation of rational and sustainable tick control programmes in grazing animals is dependent upon a sound knowledge of the ecology or epidemiology of the tick as it interacts with the host in specific climatic, management and production environments.

Ecological control method is used for habitat and host linked treatment. Tick control in the habitat and vegetation requires modification of the plant cover by removal of vegetation that shelters ticks (Kirby, 2010). Pasture management, including spelling and seasonal changes in cattle grazing areas has been used as a tick control strategy and are believed to be responsible for a decrease its burden (Walker *et al*., 2003). In the study districts there was no exercised ecological control method and less attention on the minimization of ticks on the environment rather than given treatment on the host after the tick infestation were emerged.

The questionnaire survey revealed that acaricide treatments are commonly used and would be cheap, easily applied, with a strong knock down effect and sufficient residual effect on female ticks to prevent egg lying and to protect cattle from re-infestation by larvae. It should not select for resistance through a prolonged, gradual decay on the animal (*i.e*. it should have a sharp cut off in efficacy with time). In addition, it should be non-toxic to livestock and humans and have no detectable residues in meat and milk. Unfortunately, such an ideal acaricide has not yet been produced. Generally, although the use of acaricides for the control of ticks has limitations and tick resistance to acaricides is an increasing problem and real economic threat to the livestock worldwide, most livestock holders claimed that they depend completely on acaricides to control ticks, but do not have access to guidelines on how to make a profit from their tick control program or how to detect and resolve problems with resistance to acaricides (George *et al*., 2008).

Most livestock holders and questionnaire respondents mentioned that they are completely depended on acaricides to control ticks, but did not have access to guidelines on how to make a profit from their tick control program or how to detect and resolve problems with resistance to acaricides. As per respondents, in one local area of Mandura district of the study area the so called “Daho Gubash” they use medicinal plant the so called “endod” by grinding its leaves and attach to tick infested area of the animal’s body.

Financial impact analysis followed by tick infestation also measured by questionnaire survey by asking of respondents. The amount of money that the farmer or stock holder annually expend for the purchase of chemicals and treating animals in veterinary clinics were from 150 respondents all was affected by financial losses especially in rainy season annually loosed an average of 24.4 ETB. Price or value of cattle infested with ticks in market also mattered on normal prices or reduced acceptance by buyers; the farmer loosed annually an average of 439 ETB or 63.3% of the respondent affected by the reduction especially in rainy season.

Hide losses also another losses that occurred were owners slaughtered their animals infested with ticks and the hide could be damaged with tick were sold reduced annually an average prices of 20.6 ETB or 51.3% of the respondents affected by this losses.

Decrease in production (milk) estimated annual financial losses also surveyed and annually lost an average of 147.5 ETB or 54% of the respondents were declined their milk production since estimations done by 1 litre milk equivalent with 10 ETB in rural areas; 1 cow infested with ticks declined its milk production by half litre gap and half litre calculated with 5 ETB so days of declined milk times 5 ETB gives the result of reduction. N.B. cows with other cases of diseases were excluded.

For control and prevention of tick infestation financial losses were registered. Stock holders bought acaricide on the beginning of rainy season withstand infestation were ticks occurred and 92% of the respondents faced this lose with annually an average of 102.3 ETB.

Generally tick infestation in the study area results in significant financial loss through cost of animal treatment, prices for control and prevention, through reduced efficiency of working oxen as well as reduced production and productivity and marketability in the study districts. This high prevalence of ticks in the study area might be due to low level of awareness by breeders and farmers on impact of ticks on health and productivity of their animal and the need to regular treatment of infected animals, poor extension and veterinary service as well as absence of regular and strategic tick control program which requires due attention by professionals and policy makers.

Conclusion and Recommendations

This study showed high burden of ticks in the study area with an overall prevalence of 75.9%. The most important and abundant tick species were *Rh. B. decoloratus, A. lepidum, A. varigatum, Rh. evertsi evertsi*. The predilection sites identified for the tick species will help in designing tick control methods. The study indicated that there was high burden of ticks in the area. However, the attention given to control the infestation had not been sufficient. Acaricide application is the main method of tick control in the study area. The high prevalence of ixodid tick infestation in the study area pose huge economic and health constraint to the farmers and the animals in the study area. Tick should be managed at an economically acceptable level by a combination of techniques and this requires knowledge of the prevalent tick species and understanding of their epidemiology. Therefore, awareness creation and educating animal breeders and farmers on the effect of ticks should be given. Furthermore, effective tick strategic control program should be implemented based on the distribution pattern of ticks and factors responsible for their distribution.

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References

Admassu, B., Yeneneh, H., Shite, A., Haile, B., & Mohammed, S., 2015. Prevalence and identification of major ixodid Tick genera of Cattle in Dangila District, Awi Zone, North West Ethiopia. *Acta Parasitol.Glob*, **6**: (2) 129-135

Alemu, G., Chanie, M., Mengesha, D., Bogale, B., 2014. Prevalence of Ixodid ticks on cattle in Northwest Ethiopia. *Acta Parasitol.Glob*, **5**: (2) 139-145.

Arsham, H., 2002. Questionnaire Design and Surveys Sampling, Survey: The Online Survey Tool. Http: //home.ubalt.edu/ntsbarsh/Business-stat. Accessed on 20 September 2014.

ARDODW, 2011. Agricultural and Rural Development Office of Dangur District Annual Report pp: 25-28.

Asrate, S. and Yalew, A., 2012. Prevalence of cattle tick in and around Haramaya district, Eastern Ethiopia. *Journal of Veterinary Medicine and Animal Health*, 4: (6) 84-88.

Ayana, D., Eshetu, E. and Abunna, F.,2013. Survey of Ixodid ticks on cattle in Borana pastoral area, Ethiopia. *Acta Parasitologica Globalis*, 4: (1) 14-23.

Desalegn, T., Fikru, A., Kasaye, S., 2015. Survey of Tick Infestation in Domestic Ruminants of Haramaya District, Eastern Hararghe, Ethiopia. J Bact Parasitol **6**: 1-4.

Engda M., 2000. Agro-climatic classification of Ethiopia. Ethiopian J. Nat. Resour, 2 (2): 115-135.

Eyo, J.E., Ekeh, F.N., Ivoke, N., Atama, C.I., Onah, I.E., Ezenwaji, N.E., & Ikele, C.B., 2014. Survey of tick infestation of cattle at four selected grazing sites in the tropics. *Global Veterinaria*, **12**: (4) 479-486.

Fantahun, B. and Mohammed A., 2012. Survey on the distribution of tick species in and around Assosa town, Ethiopia. Pp (4-6).

FAO, 2004. Acaricide resistance: diagnosis, management and prevention: in Guidelines Resistance Management and Integrated Parasite Control in Ruminants. Rome: FAO Animal Production and Health Division.

Garnsworthy, P., 2006. Body Condition Score in Dairy Cows: Targets for Production and Fertility. Recent Advances in Animal Nutrition 2006(1):61-86.

George, J.E., Pound, J.M., & Davey, R.B., 2008. Acaricides for controlling ticks on cattle and the problem of acaricide resistance. *Ticks: Biology, Disease and Control.Cambridge University Press, Cambridge, UK* 408-423.

Gatenby, R.M., 1991. Sheep: The tropical agriculturalist. London and Basingstoke, MACMILLAN education Ltd. ACCT. pp. 6-10.

Guglielmone, A.A., Robbins, R.G., Apanaskevich, D.A., Petney, T.N., Horak, I.G., Shao, R., Barker, S.C., 2010The Argasidae, Ixodidae and Nuttalliellidae (Acari: Ixodida) of the world: a list of valid species names. *Zootaxa*, 28: (6) 1-28

Huruma, G., Abdurhaman, M., Gebre, S., Deresa, B., 2015a. Identification of bovine tick species and their prevalence in and around Sebeta Town, Ethiopia. *Journal of parasitology and Vector Biology*, **7**: (1) 1-8

Huruma, G., Abdurhaman, M., Gebre, S., Deresa, B., 2015b. Identification of bovine tick species and their prevalence in and around Sebeta Town, Ethiopia. *Journal of parasitology and Vector Biology*, **7**: (1) 1-8

Hussein, M., Melaku, M., Bekele, T., 2018. Study on Prevalence and Identification of Bovine Tick Species in Hetosa District of East Arsi Zone, Eastern Ethiopia. *Int.J.Adv.Res.Biol.Sci*, **5**: (7) 105-114.

Kassa, S.A. and Yalew, A., 2012. Identification of Ixodide ticks of cattle in and around Hararamaya district, Eastern Ethiopia. *Sci.J.Crop Sci*, **1**: (1) 32-38.

Kemal, J., Israel, M., Alemu, S., 2017. Prevalence and Species of Ticks on Cattle in Borecha District, Southern Ethiopia. *East African Journal of Veterinary and Animal Sciences*, **1**: (1) 41-46.

Kemal, J., Muktar, Y., Alemu, S., 2016. Distribution and prevalence of tick infestation in cattle in Babille district, eastern Ethiopia. *Livestock Research for Rural Development*, **28**: 232

Kirby C., 2010. Tick Management Hand book Biological tick Control, 2nd Edit. The Connecticut Agricultural Experimentation Station, New Haven.

Kumela L., 2015. Prevalence of Bovine Trypanosomosis and Apparent Density of Tsetse and Other Biting Flies in Mandura District, Northwest Ethiopia. DVM thesis, Addis Ababa University, College of Veterinary Medicine and Agriculture, Bishoftu, Ethiopia.

Kumsa, B., Geloye, M., & Beyecha, K., 2012. Ectoparasites of sheep in three agro-ecological zones in central Oromia, Ethiopia. *Onderstepoort Journal of Veterinary Research*, **79**: (1) 1-7

Kumsa, B., Laroche, M., Almeras, L., Mediannikov, O., Raoult, D., Parola, P., 2016_a. Morphological, molecular and MALDI-TOF mass spectrometry identification of ixodid tick species collected in Oromia, Ethiopia. *Parasitology research*, **115**: (11) 4199-4210.

Kumsa, B., Laroche, M., Almeras, L., Mediannikov, O., Raoult, D., Parola, P., 2016_b. Morphological, molecular and MALDI-TOF mass spectrometry identification of ixodid tick species collected in Oromia, Ethiopia. *Parasitology research*, 115: (11) 4199-4210.

Leta, S. & Mesele, F., 2014. Spatial analysis of cattle and shoat population in Ethiopia: growth trend, distribution and market access. *SpringerPlus*, 3: (1) 310-315.

Meaza, G., Abdu, M., Yisehak, K., 2014. Determination of the prevalence of ixodid ticks of cattle breeds, their predilection sites of variation and tick burden between different risk factors in Bahir Dar, Ethiopia. *Global Veterinaria*, 13: (4) 520-529.

Mekasha, A., Tesfaye, K., Duncan, A.J., 2014. Trends in daily observed temperature and precipitation extremes over three Ethiopian eco-environments. *International Journal of Climatology*, 34: (6) 1990-1999

Mekonnen, S., Hussein, I., Bedane, B., 2001. The distribution of ixodid ticks (Acari: Ixodidae) in central Ethiopia.Veterinary Research, 68 (1): 243-251.

Melaku, A., 2013. Ethno veterinary practices and potential herbal materials for the treatment of ticks in North Gondar. *Global Veterinaria*, 11: (2) 186-190

Morel PC, 1989. Manual Tropical Veterinary Parasitological CAB International UK, 299- 460

NMSA, 2007. Monthly report on temperature and Rainfall Distribution for Asossa Zone, National Meteorological Services Agency, Regional Metrological Office, Asossa, Ethiopia, Pp: 17-19.

Nuna, M.S. & Guder, D.G., 2018. Prevalence of Tick Infestation in Cattle in Bako District, West Shoa Zone, Ormia Regional State, Ethiopia. *Prevalence*, 8: (21).

Onu, S.H. and Shiferaw, T.Z., 2013. Prevalence of ectoparasite infestations of cattle in Bench Maji zone, southwest Ethiopia. *Veterinary World*, 6: (6) 291-294

Pegram, R.G., Hoogstraal, H., & Wassef, H.Y., 1981. Ticks (Acari: Ixodoidea) of Ethiopia. I. Distribution, ecology and host relationships of species infesting livestock. *Bulletin of Entomological Research*, 71: (3) 339-359

Regasa, T.D., KebedeTsegay, A., & Waktole, H., 2015. Prevalence of major ectoparasites of calves and associated risk factors in and around Bishoftu town, *African Journal of Agricultural Research*, 10: (10) 1127-1135.

Tadesse, B. and Sultan, A., 2014. Prevalence and distribution of tick infestation on cattle at Fitche Selale, North Shewa, Ethiopia. *Livest Res Rural Dev*, 26: (8).

Tamiru, T. and Abebaw, G., 2010. Prevalence of ticks on local and crossbred cattle in and around Asella town, southeast Ethiopia. *Ethiopian Veterinary Journal*, 14: (2) 79-89

Thrusfield, M., 2005. Survey in Veterinary Epidemiology, 2 ed. Blackwell Science, Limited, Cambridge, USA pp: 178-198.

Walker, A.R., 2014. Ticks and associated diseases: a retrospective review. *Medical and Veterinary entomology*, 28: (S1) 1-5

Walker, A.R., Bouattour, A., Camicas, J.L., Estrada-Pena, A., Horak, I.G., Latif, A.A., Pegram, R.G., Preston, P.M., 2003. Ticks of Domestic Animals in Africa. *A Guide to Identification of Species*

Wall, R. and Shearer, D., 2001. Veterinary ectoparasites: biology. *Pathology and Control, second ed.Blackwell Science, London*

Yacob, H.T., Ataklty, H., and Kumsa, B., 2008. Major ectoparasites of cattle in and around Mekelle, northern Ethiopia. *Entomological Research*, 38: (2) 126-130

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