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Preliminary Study on Hard Ticks (Acari: Ixodidae) of Sheep in Some Areas of Thamar Governorate, Yemen

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ABSTRACT

The objective of this study was to identify and determine the prevalence of tick species infesting sheep in some areas of Thamar governorate, Yemen. A total of 392 indigenous sheep breeds of either sex and different age were randomly selected and examined for presence of ticks using standard parasitological techniques from December, 2010 to May, 2011. The results revealed that the overall prevalence of tick infestations on sheep was 43.37 %. Of total 875 ticks collected, Seven species of ixodid ticks were identified. The species on hierarchy of overall prevalence abundance were *Rhipicephalus sanguineus* (13.01%), *Rhipicephalus (Boophilus) decoloratus* (9.69%), *Rhipicephalus evertsi evertsi* (5.87 %), *Hyalomma marginatum* (4.59 %), *Amblyomma variegatum* (4.34%), *Rhipicephalus (Boophilus) annulatus* (3.06%), *Haemaphysalis sulcata* (2.04%). *Rhipicephalus (Boophilus) decoloratus* species is recorded for first time in Thamar governorate and Yemen as well as. Statistically, there was significance difference ($P<0.05$) in the prevalence among different species identified. The highest prevalence rate of ticks infestations was recorded in month of May (62.90%); whereas the lower rate in the month of December (26.67 %). Prevalence of tick infestations was influenced significantly ($P<0.05\%$) by Month variation (season). The effect of associated risk factors (determinants) i.e. age, sex, breed of host and area in distribution of ticks was non-significant. Attention should be given to the control and prevention of tick infestations on sheep reared under traditional management in study areas.
Keywords: Preliminary study, Prevalence, Sheep, Thamar, Tick.

INTRODUCTION

The livestock sector represents a significant part of the global economy, particularly in the developing world. Thus, livestock provide energy, food, raw materials, and manure for crops. It is therefore not surprising that the livestock sector has emerged as an important economic source for a vast majority of the rural population

and a target for agribusiness in the dairy, meat, and various other products in the processed foods sector [1, 2, 3, 4].

The livestock sector contributes about 16% of the total National Gross Domesticated Product (GDP) and over 23.3% of the Agricultural GDP [5]. The current population of livestock in Yemen is estimated as 19.7 million and is predicted to increase 3.2 % per year to reach 30 million by 2025 [6].

The livestock sector has increasingly become eminent in terms of its contribution to household nutrition and food security. However, sustainability of this sector has been negatively affected by the high prevalence and incidence of animal diseases and pests [7].

Tick infestation presents a serious challenge to farmers of small ruminants in developing countries like Yemen. They exert a major hindrance to improving animal production and livestock industry. Economically, ticks impact the availability of good quality hides and skins to the leather industry. Severe irritation, allergy, and toxicosis often plague livestock growers. In addition, in both small and large ruminants, ticks reduce milk production, increase mortality, and transmit serious diseases such as babesiosis, theileriosis, and anaplasmosis [8, 9, 10].

The control of ticks and tick borne diseases is a major component of animal health programme for the protection of livestock and enhances global food security. Successful control strategy of ticks and the diseases they transmit depends on improving our understanding on the epidemiology, distribution and dynamics of the ticks in the field [11, 12].

Since the previous surveys on ticks infesting livestock in some agro-ecological zones of Yemen [13,14,15,16], to our best knowledge, no work has been carried out on tick infestation on sheep and other ruminants in Thamar. Therefore, this study aimed to identify, determine the prevalence of tick species infesting sheep and associated risk factors (determinants) in some areas of Thamar governorate, Yemen.

MATERIALS AND METHODS

Study area

The study was carried out in some areas of Thamar governorate in the period from December, 2010 to May, 2011. Geographically, Thamar is located at 14.58′N latitude, 44 43′E longitude and at an altitude of 2425 meter above sea level (m. a. s. l). It enjoys a temperate, rainy summer and a cool, moderately dry winter with temperatures occasionally dipping below 0°C . The mean minimum and maximum annual temperatures for the area are 8.8°C and 25.05°C respectively. The area receives an average annual rainfall of about 22.27 mm and relative humidity of about 44.33%.

Study population

The study population constitutes indigenous sheep (Thamari and Ainsi/Boni)

breeds kept under traditional management system. The animals depend on grazing for their feed sources, the flocks are regularly moved to pasture for daytime grazing in the morning and are brought back to the villages in the evening. In house, animals are occasionally supply with crop residues and house-wastes.

Study design and sampling strategy

A cross-sectional study design was employed to address the objective of this study. Multistage cluster random sampling was used as described by Thrusfield [17] to select a total of 392 sheep of either sex and different age from five localities of Thamar, namely, Da`r Alhanash, Livestock Market, Manqadha, Mawahep and Yafa`a. All selected animals were examined thoroughly for the presence of ticks.

Tick collection and identification

The selected animals were restrained; all visible ticks were collected from whole body of animal. Ticks were removed carefully and gently from body surface of animal with forceps. The collected ticks were preserved in universal bottles containing 70% ethyl alcohol and labeled with the date of collection (months), age, sex and breed of the hosts. The specimens were brought to laboratory, Department of Veterinary Parasitology, College of Agriculture &Veterinary Medicine, Thamar University, for counting and identification. The ticks were counted and subsequently identified to species level using stereomicroscope according to identification keys given by Urquhart et al. [18] and Walker et al. [19].

Data analysis

The data obtained were uploaded into Microsoft Excel spreadsheet and summarized by using tables. Statistical analyses were performed by using SPSS 17.1[20]. Descriptive statistics like prevalence, percentages, counts and Ratio were calculated to display the status of ticks relative to some considered variables. Chi-square was used for comparison of binary variables. *P* value less than 0.05 was considered significant.

RESULTS

Out of a total 392 sheep examined for presence of the hard ticks, 170 were found to be infested by one or more tick species. The overall prevalence of ticks recorded was 43.37 %. Ticks have shown a permanent presence through the study period.

Table 1.The overall prevalence of tick infestation on sheep in Thamar governorate

Animal species	No. of animals examined	No. of animals infested	Percentage %
Sheep	392	170	43.37

Table 2. The prevalence of tick species identified on sheep in Thamar governorate

Species	No. of animals infested (n=392)	Prevalence (%)	*P* value
A. variegatum	17	4.34	0.000
H. marginatum rufipes	18	4.59	
H. sulcata	8	2.04	
R. evertsi evertsi	23	5.87	
R. sanguineus	54	13.78	
R.(Boophilus) decoloratus	38	9.69	
R. (Boophilus)annulatus	12	3.06	

Table 3. Sex ratio and distribution of ticks on body of sheep

Site of attachment	Ear	Sternum & flank	Hand leg & udder	Other Body parts	Total of ticks	Female ticks	Male ticks	Ratio
No. of Ticks & Percentage	331 (36.9%)	136 (15.1%)	282 (26.9%)	149 (16.6%)	875	523 (59.8%)	352 (40.2%)	1.3: 0.9

Of total 875 ticks collected from sheep, Seven species of ticks were identified, which they are belonging to four genera, namely, *Rhipicephalus, Hyalomma, Amblyomma and Haemaphysalis*. The species on hierarchy of overall prevalence abundance were *R. sanguineus* (13.01%), *R.(Boophilus) decoloratus* (9.69 %), *R. evertsi evertsi* (5.87 %), *H. marginatum* (4.59 %), *A. varigatum* (4.34%), *R.(Boophilus) annulatus* (3.06 %), *H. sulcata* (2.04%) as indicated in Table 2. Statistically, there was significant difference ($p<0.05$) in the prevalence among the different species of ticks collected from sheep. *R.(Boophilus) decoloratus* species is recorded for first time in study areas of Thamar governorate and Yemen.

The sex ratio (female/ male) and distribution of the ticks on body parts of sheep are presented in Table 3. As shown, females ticks were dominant on sheep compared to males. Various body sites were categorized based on attachment preference. The ears (36.9 %), were primary sites of attachment, followed by hand leg & udder (26.9 %), sternum & flank (15.1 %) and other parts of the body (16.60%), as depicted in Table 3.

Considering the analyses of the prevalence of tick infestion on sheep and associated risk factors, namely, Month variation (season,), age, sex, breed of host and area. The effect of month variation (season) on distribution of tick infestation is presented in Table 4. As shown, the higher prevalence rate was recorded in month of May (62.90%); whereas the lower rate in month of December (26.67%).

Significant difference ($p<0.05$) was observed between prevalence of ticks and month variation (season).

Table 4. Risk factors (determinants) influencing prevalence of tick infestation on sheep

Risk factors		No. of animals examined	No. of animals infested	Prevalence	*P* value
Month					
	Dec	75	20	26.67	0.000
	Jan	60	20	33.33	
	Feb	60	22	36.67	
	Mar	75	33	44.00	
	Apr	60	36	60.00	
	May	62	39	62.90	
Age					
	1 yr <	55	29	52.73	0.209
	1 yr	136	64	47.06	
	2 yrs	77	25	32.47	
	3 yrs	71	32	45.07	
	4 yrs	32	11	34.38	
	5 yrs and above	20	29	145.0	
Sex					
	Female	279	119	42.65	0.654
	Male	113	51	45.13	
Breed					
	Thamari	211	87	41.23	0.357
	Ainsi/Boni	181	83	45.86	
Area					0.777
	Da`r Alhanash	75	35	46.67	
	Livestock M	92	37	40.22	
	Manqadh	90	36	40.00	
	Mawahep	60	26	43.33	
	Yafa`a	75	36	48.00	

The results of age-wise showed that, the higher prevalence rate of tick infestation was recorded in young animals below one year (52.73 %), whereas the lower rate (32.9%) was recorded in animal groups with two-year old (32.47 %), as presented in Table 4.

Sex-wise results revealed that, sheep males (45.13%) were found to be more prone to tick infestation compared to females (42.65 %). No significance

difference (P<0.05) was observes between prevalence of tick infestation and sex of sheep (Table 4).

Ainsi sheep breed was more susceptible to tick infestation compared to Thamari breed. The prevalence rate recorded in both breeds was 45.86% and 41.23 % respectively.

The distribution of ticks in different localities (areas) of Thamar governorate included in this study are presented in Table 4. The higher prevalence rate was recorded in Yafa`a (48.0%), whereas the lower rate in Manqadh (40.0 %).

Statistically, analyses showed that no significant association (P<0.05) was observed between prevalence of tick infestation and hypothesized risk factors Viz. age, sex, breed and area.

DISCUSSION

An attempt was carried out to identify, determine the prevalence of tick species infesting sheep and associated risk factors in Thamar governorate. The problem of ticks on sheep in the study area seems to be very important as they are widely distributed, poor management and poor level of awareness of sheep owners regarding the effect of ticks are believed to be the main causes for wide spreading of ticks. In the present study, the overall prevalence of tick infestation was 43.37%. The results of this study are in agreement with findings of other workers [3, 4, 8, 21, 22] who studied the tick infestations in sheep and other domestic ruminants and reported the prevalence rate ranged from 12.8 to 89.90%. The higher prevalence rate reported by some of above workers could be attributed to size of samples, environmental conditions and topo- geography of study area.

Seven species of ticks were identified, which are belonging to four genera, namely, *Rhipicephalus, Hyalomma, Amblyomma and Haemaphysalis*. The species identified were *R. sanguineus, R.(Boophilus) decoloratus, R. evertsi evertsi, H. marginatum rufipes, A. varigatum, R. (Boophilus) annulatus, H. sulcata*. All species identified were previously reported by many workers in some geographical areas of Yemen [13,14,15,16] and other regions of the world [3, 8, 23, 24, 25]. Furthermore, these results support the findings of Friedhoff [26], who reported that majority of tick species belong to *Rhipicephalus, Haemaphysalis, Amblymma* and *Hyalomma* genera are the most common tick species infesting domestic animal in the Middle East. The absence of some species reported by above workers in current study may be due to the fact, the present study was limited to Thamar city and surrounding areas; whereas in previous studies different animal species from different geographical areas of Yemen and world were subjected to examination for the presence of ticks.

R.(Boophilus) decoloratus species is recorded for first time in study areas of Thamar governorate and Yemen. This could be attributed to importing live animals from Africa, for the purposes of meat consumption and scarifies during religious festivals, where is this species more prevalent [3, 12, 22, 27].

R. sanguineus tick was the most predominant species in sheep. These results are in line with findings of Shemshad et al [10], who studies species diversity and geographic distribution of hard ticks infesting domestic ruminants in Iran and reached to similar results. This could be explained that, the *R. sanguineus*, have ability to enjoy wide host range in domestic animals and high adapted to climatic condition of study area.

In general, the number of ticks collected from sheep was very low compared to similar studies [21, 22, 28] carried out in other regions of the world. This could be attributed to complicated interplay factors such as climate, vegetation, host density, host resistance and animal husbandry practices. The sex-ratio results showed that, female ticks were more compared to males. This may be due to sampling efficacy and male ticks are difficult to find on host compared to female [29].

Ticks are known to be distributed on different parts of the host body. In this study, the highest number of ticks were seen in ears of sheep, while their distribution on other body parts were with varying percentages. Solomon [30] suggested that factors such as host density, interaction between tick species, time and season and inaccessibility for grooming determine the attachment site of ticks.

As far as could be ascertained, no or a limited amount of literature is available on the tick infesting livestock and associated risk factors in Yemen [15, 16]. Such factors influencing prevalence of tick infestation on sheep are studied for first time in Thamar. As shown in Table 4, the prevalence infestation rate was the highest in May and the lower in December. The results of this study are in accordance with findings reported by other workers [2, 15, 23, 25, 31], who studied the relationship between the prevalence of tick infestations and month variation (season). The high prevalence rate of tick infestion in May, could be attributed to environmental conditions which were conducive for survival, development and breeding of ticks in study area.

The current study revealed that younger animals showed high susceptibility to tick infestations compared to adults. This could be explained as resistance in adult animals are building up as the age advance and the animals become more adaptable than in younger. In addition, the soft skin and tissue of younger animals may be easy to penetrated by mouth parts of ticks during feeding [9].

Sex-wise data revealed that males were slightly more infested by ticks compared to females. No significant difference was observed between prevalence rate and sex of animal. The higher prevalence rate recorded on males may be due to managemental factors.

In the present study, Anisi breed showed slightly more susceptible to tick infestation compared to Thamari breed. This could be attributed to genetical factors or may be due to the fact that, the farmers in study area have more interest in Thamari breed; thus, taking more care about this breed compared to Ainsi breed.

The highest prevalence rate of tick infestation was recorded in Yafa`as area; whereas the lower rate in Manqadh area. No significant difference was observed in prevalence rate of tick infestations among different areas surveyed. The higher

prevalence rate recorded in Yafa`a locality may be due to moving of livestock, animal husbandry practice and microclimate conditions of Yafa`a locality (area).

In conclusion, hard tick species are prevalent in Thamar governorate. The conducive environmental factors, poor veterinary infrastructure services and lack appropriate knowledge on tick impact on livestock are suggested to be the main causes for abundance of ticks**.** Further studies on epidemiology of ticks, tick-borne diseases and related factors are recommended as these may provide a valuable basis for designing and launching an all-round control programme in Thamar and other regions with similar environmental conditions.

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دراسة أولية عن القراد الصلب في الأغنام في بعض مناطق محافظة ذمار

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ملخص

أجريت هذه الدراسة للتعرف على أنواع القراد الصلب التي تصيب الأغنام ومعدل انتشارها في بعض مناطق ذمار في الفترة من ديسمبر 2010 إلي مايو 2011. تم اختيار 392 رأس من الأغنام عشوائيا من كلا الجنسين وبأعمار متفاوتة من مناطق مختلفة من محافظة ذمار. خضع كل حيوان للفحص العياني بحثا عن القراد الصلب في كل أجزاء الجسم و المختبري للتعرف على أنواع القراد. كشفت الدراسة إن معدل انتشار القراد الصلب في الأغنام (43.37%). تم التعرف على سبعة أنواع من القراد الصلب وهي: *Rhipicephalus sanguinues* (13.01%), *Rhipiceaphalus (Boophilus) decoloratus* (9.69%), *Rhipicephalus evertsi evertsi* (5.87%), *Hyalomma margienatum* (4.59%), *Amblyomma variegatum* (4.34%) *Rhipicephalus (Boophilus) annulatus* (3.06%), *Haemaphysalis sulcata* (2.04%). تنتمي إلي أربعة أجناس مختلفة. لوحظت فروق معنوية ($p<0.05$) بين نسب معدل انتشار الأنواع التي تم التعرف عليها. النوع *Rhipicephalus (Boophilus) decoloratus* سجل لأول مرة في محافظ ذمار و اليمن بشكل عام. كشفت الدراسة إن لاختلاف الموسم(الشهور) معنويا ($p<0.05$) في معدل انتشار القراد. يوصى بعمل برامج مكافحة للقراد الصلب والسيطرة عليها في منطقة الدراسة و المناطق المشابه لها جغرافيا و بيئيا.