

Species diversity and season changes of ixodidae ticks in Kalaibar city in 2015

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ABSTRACT

Ticks are very important in animal husbandry and they can transmit different disease. Different disease transmitted by the ticks which, theileriosis and babesiosis are widely distributed in our studied area. The aim of current study was to obtaining epidemiological importance aspects of sheep disease caused by ixodidae ticks of sheep in Kalaibar region. The samples was collected from sheep of kalaibar livestock and markets from all parts of body every two weeks and then stored in 70% ethanol, and transported to the laboratory. Identification of ticks was based on available taxonomic keys. Based of our results in this study the species diversity of founded ticks were *Rhipicephalus bursa*, *Rhipicephalus sanguineus*, *Hyalomma anatolicum anatolicum*, *Hyalomma anatolicum excavatum*. Of the 500 sampled ticks: *Hyalomma anatolicum anatolicum* with 32.6% (163) and *Rhipicephalus sanguineus* with 15.2% (76) have the highest and lowest infestation rate, respectively. *Rhipicephalus bursa* 29.3% (150), *Hyalomma anatolicum excavatum* 22.2% (111) were observed with highest infection rate, respectively. *Rhipicephalus* and *Hyalomma* species are commonly distributed in the Kalaibar city and suburbs. Further investigations are needed to distinct the role of tick species as vectors of infectious diseases.

Keywords: Kalaibar, hard tick, ixodidae, sheep

INTRODUCTION

Increasing ticks and diseases transmitted to livestock after feeding by tick are of the problems which cause diseases and mortality in livestock farms. Due to the lack of complete awareness of tick role and the ways of the tick-borne diseases transmission as well as lack of proper implementation of scientific methods to eradicate them, the loss rate has been often heavy. Furthermore, the tick-borne diseases impose much loss to the country's livestock industry each year. The hard ticks (Ixodidae) are hematophagous arthropods and have wide distribution. Hard ticks are obligatory parasites of animals and humans [2, 14].

The hard ticks play an important role in economic losses. Milk production decrease and weight loss, paralysis, anemia, skin irritation and transmission of various pathogens are complications due to hard ticks infections [10]. Ticks are important vectors of theileriosis, babesiosis and anaplasmosis. In addition, Lyme disease, ehrlichiosis, babesiosis, rocky mountain fever, Colorado tick fever, tularemia, Q fever, spotted fever, tick paralysis and tick encephalitis are the most common diseases which have been transmitted to human by ticks [16]. *Rhipicephalus* species are transmit ovine babesiosis and ovine ehrlichiosis [7], and *Hyalomma anatolicum* transmits *Theileria lestoquardi*, *Th. annulata* and Crimean-Congo hemorrhagic fever virus [3].

The aim of this study is to assess the diversity of sheep infection with different species of hard tick and to determine species diversity of tick found in the region of Kalaibar. The epidemiological aspects of ticks, their importance, and their control at Kalaibar region will be more clarified by conducting this study; so, tick-borne disease epidemiological situation can be evaluated by getting knowledge about vector tick, their position and presence in every region.

MATERIALS AND METHODS

This study was conducted in 2015 and in different seasons in order to evaluate the hard tick-infection among sheep of Kalaibar city and suburbs. In order to collect samples the sheep of Kalaibar livestock and livestock market were examined (all body parts, including the tail, around the anus, ear, under shoulder, groin) every two weeks; so, all ticks of their body were collected and their number and location were recorded. To separate ticks from the animals' body, alcohol-soaked cotton was put on tick for a few seconds and then it picked up using forceps in the direction that had stuck to body.

The collected samples were put in containers containing a mixture of glycerin and 75% alcohol with a ratio of 1:9 which prevented the sample from drying and possibly fractures. The samples were transferred to Tabriz Islamic Azad University Laboratory of Parasitology, Faculty of Veterinary to determine the species of tick. The samples were placed inside a Petri dish and alcohol of the ticks was removed using filter paper. Then, particles on the ticks were removed using a small painting brush, and finally their genus and species were identified using loop and microscopes as well as diagnostic keys [13, 15].

RESULTS

In this survey 500 ticks were collected and assessed from all understudied sheep of the city of Kalaibar during a year. Tick species found in this study were including: *Hyalomma a. anatolicum*, *Hyalomma. excavatum*, *Rhipicephalus sanguineus*, and *Rhipicephalus bursa*.

Table 1: genus and species of the ticks and their abundance on infected sheep

Genus	Species	Sub-Species	Number	Percentage
Rhipicephalus	Bursa		150	30
Rhipicephalus	Sanguineus		76	15.2
Hyalomma	Anatolicum	Excavatum	111	22.2
Hyalomma	Anatolicum	Anatolicum	163	32.6

As shown in Table 1, *Hyalomma a. anatolicum* (N=163, 32.6%) had the highest rate and *Rhipicephalus sanguineus* (N= 76; 15.2%) had the lowest rate. Between these two ticks there are *Rhipicephalus bursa* (N=150; 30%), and *Hyalomma a. excavatum* (N=111; 22.2%) had high rates, respectively.

Table 2: The rate of the sheep infection in different seasons

	Spring	Summer	Autumn	Winter	Total
All Ticks	100	290	95	15	500
<i>Rh. Bursa</i>	33	87	29	4	150
<i>Rh. sanguineus</i>	15	44	14	3	76
<i>Hy. anatolicum excavatum</i>	22	65	21	3	111
<i>Hy. anatolicumanatolicum</i>	33	94	31	5	163

In this conducted survey on seasonal infection prevalence, the number of ticks in spring, summer, autumn, and winter were 100, 290, 95, and 15, respectively. So, the highest rate of infection was in summer followed by spring, and the lowest rate was in winter (Table 2). Based on the results of chi-square test infection rate in different seasons had significant differences ($p < 0.05$).

Table 3: Average number of ticks of infected sheep in different seasons

	Spring	Summer	Autumn	Winter
All Ticks	100	290	95	15
Number of infested sheeps	31	59	30	10
Mean of Ticks per sheeps	3.22	4.9	3.16	1.5

According to the information shown in table 3, average ticks in every understudied sheep in spring, summer, autumn and winter has been estimated as 3.22, 4.9, 3.16 and 1.5, respectively. So, the highest rate of infection was in summer and the lowest rate was in spring.

Table 4: Distribution of tick collected from different parts of the infected sheep body

	tail and around the anus	groin	ear	under the shoulder	Other parts	total
Number of Ticks	150	140	125	60	25	500
Percentage	30	28	25	12	5	100

According to the results, 500 ticks were found that 30, 28, 25, 12, and 5 percent were associated to under the tail and around the anus, groin, ears, under the shoulder, and other parts of the body. So, the highest rate of ticks was in the under the tail and anus and the lowest rate was under other parts of body (table 4). Based on the results of chi-square test infection rate in different parts of the animals' body had significant differences ($p < 0.05$).

DISCUSSION

Ticks are of the important parasites in livestock industry which have the ability to transfer different diseases. Some of diseases like theileriosis and babesiosis have high distribution in the understudied region and therefore this study was conducted on sheep's hard tick species diversity to find further epidemiological aspects of diseases caused by tick in Kalaibar regions sheep.

Considering that the different tick species have the ability to transfer certain types of pathogens, therefore, identifying different species of ticks in every region, their frequency, and their distribution have a great impact on the understanding of epidemiological diseases and consequently the diseases control. Furthermore, given that much research is being conducted on anti-tick vaccine, identify tick species of any region is important from this point of view.

Based on the results the tick species found in this study were: *Hyalomma a. anatolicum*, , *Rhipicephalus bursa*, *Hyalomma a. excavatum*, and *Rhipicephalus sanguineus*. Of 500 sampled ticks, *Hyalomma a. anatolicum* (N=163, 32.6%), had the highest rate and *Rhipicephalus sanguineus* (N= 79; 15.2%) had the lowest rate. Between these two ticks there are *Rhipicephalus bursa* (N=150; 30%) and *Hyalomma a. excavatum* (N=111; 22.2%) had high rates, respectively.

The *Rhipicephalus bursa* and *Rhipicephalus sanguineus* are the most common ticks in Iran and it was demonstrated that have a wide distribution in different parts of the country [9]. Study conducted on tick species diversity in Tabriz city and its suburbs indicated that *Hyalomma a. anatolicum* had the highest rate which was followed by *Rhipicephalus sanguineus* and *Rhipicephalus bursa*, and *Haemaphysalis sulcata* had the lowest rate [8]. In Mohabad city, the *Hyalomma a. anatolicum* had the highest rate which was followed by *Rhipicephalus bursa*, *Hyalomma a. excavatum*, and *Rhipicephalus sanguineus* while *Haemaphysalis punctata* had the lowest rate [5, 8]. Also, in Ardabil city it has been shown that *Rhipicephalus bursa* (32.4%) had the highest rate which was followed by *Rhipicephalus sanguineus* and *Hyalomma a. anatolicum* while *Hyalomma a. excavatum* had the lowest rate (15.6%) [4].

Based on the results of the present study the highest infection rate (32.6%) in Kalaibar city is associated to *Hyalomma a. anatolicum* and which are consistent with the results of studies in Tabriz and suburbs Khayatnouri and Hashemzadeh-Farhang [4]. It has been reported that *Hyalomma a. anatolicum* has the highest rate with 70.5% in Tabriz city and its suburbs [8]. Also in Mohabad city, the *Hyalomma a. anatolicum* had the highest rate of infestation [5, 8]. It was reported that in Marand and its suburbs, the *Hyalomma* ticks has the highest rate with 52.8% [1].

According to [9], findings *Rhipicephalus bursa* and *Rhipicephalus sanguineus* were widespread ticks in Iran, while our investigation in Kalaibar region indicated *Hyalomma a. anatolicum* has highest rate of infestation with 32.6% and then *Rhipicephalus bursa*, *Hyalomma a. excavatum*, and *Rhipicephalus sanguineus* infestation rate was 30%, 22.2% and 15.2%, respectively.

Generally, *Hyalomma a. anatolicum* is one of the important ticks in diseases transferring since it involved in infectious diseases transfer like *Theileria annulata*, *Theileria parva*, Q fever, and Crimean Congo hemorrhagic fever (CCHF). In sheep, it was reported that the *Hyalomma a. anatolicum* is involved in *Theileria hirci* transmission, which is a malignant *Theileria* in Iranian sheep [6, 8].

Rhipicephalus bursa and *Rhipicephalus sanguineus* are of important ticks in Iran which have a role in pathogens transferring to sheep. In this regard it can be noted some important pathogens such as *Babesia mutasi*, *Babesia ovis*, *Theileria ovis*, and *Anaplasma marginale* [8].

According to [9], *Rhipicephalus bursa* is found in western parts of Iran such as Kordestan, Azarbaijan, and Lorestan provinces as well as other areas like Caspian Sea coast, Tehran and Khorasan provinces, while *Rhipicephalus sanguineus* is found mainly in south eastern part and generally in sheep and goats.

The results indicated that *Rhipicephalus bursa* with 30% infestation rate was second widespread ticks in Kalaibar regions in sheep and in consistent with [9] results which was indicated that the *Rhipicephalus bursa* is widespread in west of Iran.

The distribution of collected ticks from different parts of sheep body was evaluated according which 500 ticks were found that 30, 28, 25, 12, and 5 percent were associated to under the tail and around the anus, groin, ears, under the shoulder, and other parts of the body. These finding in agreement with Asadi Ghorbani and Nematollahi (2003) in Marand city [1]. The highest rate of ticks was under the tail an anus and the lowest rate was under the shoulder that is consistent with the results obtained by in Marand and its suburbs [1] and in Ardebil [4] but is inconsistent with the results of Tabriz and its suburbs [8], as well as in Mohabad [5] in which the ear area had the most infections.

Although most researchers have been reported especial hosts for ticks, there is no consensus about this idea. However, new experiments based on the parasites placement location prove that most of the ticks prefer especial parts of body for feeding. Also, the results of studies show that the areas of head and ear, groin, shoulder, and perineum are more exposed to the Ixodidae ticks. Considering that on one hand, the head and tail have a greater contact with grassland during pasture as well as the areas of under the shoulders and groin have also a greater contact during animal movement and sleeping, on the other hand these areas of the sheep body have a thin skin; so, the four mentioned areas have the most infections [8]. In this conducted survey on seasonal infection prevalence, the number of ticks in spring, summer, autumn, and winter were 100, 290, 95, and 15, respectively. So, the highest rate of infection was in summer followed by spring, and the lowest rate was in winter.

Also, according to the results of this study, the average ticks in every understudied sheep in spring, summer, autumn and winter has been estimated as 3.22, 4.9, 3.16 and 1.5, respectively. So, the highest rate of infection was in summer and the lowest rate was in winter, while in the study in Khorasan, the highest rate of infection was in summer but the lowest rate was in autumn (November) [12]. In Mohabad [5] and Tabriz [8] in summer there was highest and in winter the lowest rate of ticks prevalence was reported. Based on the observation of this study, tick-infection of sheep in Kalaibar was high in terms of the ticks number on the sheep such that the average number in each sheep was 3-4 ticks.

In the study conducted by Rahbari et al (1995), Hashemzadeh-Farhang et al. (2010), and Asadi ghorbani & Nematollahi (2003), it was reported that the ticks number of each sheep were 3-4 [1, 5, 11], and in agreement with our results. Although, results of researches in Ardabil indicate 2-3 ticks on sheep [4] and was not in consistent with our results.

Therefore, it can be concluded that tick infection of sheep in Kalaibar region is high in terms of ticks number on the sheep, and species diversity is very important which needs a sever control due to their capability of disease transmission; so blood parasitic diseases have a high prevalence in the sheep flocks of kalaibar region. One of the important findings of this study is the high prevalence of *Hyalomma a. anatolicum* and relatively high prevalence of *Rhipicephalus bursa* in understudies region; Although *Rhipicephalus sanguineus* [12] and *Rhipicephalus bursa* [9] widespread was reported in Iran, previously. So, the great importance of these tricks becomes clearer in terms of the transmission of theileriosis, babsiosis, and anaplasmosis. The importance of *Hyalomma a. anatolicum* in transmission of theileriosis especially *theileria hirci* which causes sheep malignant theileriosis in Iran and Q fever, CCHF, and theileria annulata and theileria parva will be distinct in regions.

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