

Distribution of Tick Species Infesting Domestic Ruminants in Borderline of Iran-Afghanistan

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Abstract

To determine the tick species parasitizing domestic ruminants in Zabol, Zahak and Qaen Counties which are located in east of Iran and are bordered with Afghanistan country, about 73 sheep, 44 goats and 27 cattle of 12 herds in several villages in Zabol, Zahak and Qaen Counties were inspected for tick infestation. Separated ticks were preserved in 70% alcohol and identified. About 464 ticks (252 male; 194 female) were collected; the occurrences of ticks on goats, cattle and sheep were about 17%, 15% and 26% respectively in all three Counties. The mean number of ticks on each animal was about 2 - 7 ticks per animal. Totally we found 3 genera hard ticks including *Hyalomma*, *Rhipicephalus* and *Dermacentor* in these regions. *Hyalomma anatolicum*, *Hy. marginatum*, *Hy. asiaticum*, *Hy. detritum*, *Rhipicephalus bursa*, *R. sanguineus*, *Dermacentor niveus*, and *D. marginatus*, were the tick species we found. *Hyalomma anatolicum* and *Hy. asiaticum* were the most abundant species in the study area. The result of this study is a survey of tick species from domestic animals in east part of Iran and implication of possible prevention measures for diseases transmitted by ticks.

Keywords

Tick, Ruminants, Borderline, Iran, Afghanistan

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1. Introduction

Ticks can transmit a variety of diseases such as Crimean Congo hemorrhagic fever, anaplasmosis, babesiosis, rickettsiosis, borreliosis and ehrlichiosis. Symptoms of these parasites vary from minor itching and irritation to extreme annoyance and fatigue, malnutrition and even death by infection to the parasites which are transmitted by ticks. Such diseases are considered as public health or veterinary problems in the communities. Fortunately, many control options are available to help farmers manage livestock. Tick species distribution in Iran is briefly reviewed on the basis of published records.

Tick studies were initiated by Delpy in Iran. Later, Abbasian-Lintzen and Mazlum compiled a list of adult ticks collected from domestic animals. Filippova *et al.* presented data for 642 ixodid ticks taken from small-sized mammals, mainly rodents in different zoogeographical zones of Iran. Hoogstral and Wassef studied ixodid ticks parasitizing wild sheep and goats in Iran focusing on maintaining natural foci of many hazardous diseases for human. Telmadarraiy *et al.* published a list of tick species and their prevalence in the northwest and the western part of the country [1]-[3]. Rahbari *et al.* published a primary report on distribution of various species of ticks on domestic animals in four geographical areas of Iran [4]. There are several reports on epidemiology, distribution, medical importance and susceptibility of different ticks through the country [2] [5]-[9]. The occurrence of nine ixodid tick species was determined from Qazvin province, Iran [10].

In another study in Qaemshahr region in Iran, *Rhipicephalus sanguineus* was the most abundant species in the study area [11]. Recently Sarani *et al.*, studied on distribution of ticks infesting domestic ruminants in Golestan province, Iran. They found five species of ixodid ticks in that region [12].

Since, thus far, only a few studies have been accomplished about the tick fauna in different areas of Iran, there still seems to be a gap in our knowledge about distribution of tick species in the country. Further, there is a lack of finding about the frequency of tick species from domestic ruminants in east part of Iran. Therefore, this study is aimed to figure out the frequency of ticks on domestic ruminants in Zabol, Zahak and Qaen counties which are located in east of Iran and are bordered with Afghanistan country.

Approximately 10% of the currently known 867 tick species act as vectors of a broad range of pathogens of domestic animals and humans and are also responsible for damage directly due to their feeding behavior [13]. Ruminants are also affected by direct tick damage including tick bite abscesses, tick paralysis, tick-induced dermatophilosis, etc. This present study is aimed at the survey of tick species in cattle, goats and sheep in Zabol, Zahak and Qaen Counties.

2. Materials and Methods

Our survey was carried out in Zabol County and Zahak County which are located in Sistan and Baluchestan province and also in Qaen County which is located in South Khorasan province. These two provinces are located in east of Iran and are bordered with Afghanistan country (Figure 1). Qaen County is a county in South Khorasan Province. The capital of the county is Qaen. The county's population is about 137,000 in 35,000 fami-



Figure 1. Map of Iran showing our study areas which are magnified. Qaen, Zahak and Zabol Counties are located in east of Iran and are bordered with Afghanistan.

lies. Zabol and Zahak Counties have a population about 300,000 in 67,000 families and 70,000 in 14,000 families respectively.

Samples collection: From June 2012 to May 2013, We tried to catch ticks from goats, cows and sheep from Tigab, Mahdi Abad, Farokhi and Pahnayi districts, in Qaen County, Hossein Abad, Heydar Abad, Fathollah and Bagher Abad which are located in Zabol County and Khomak, Bonjar and Hassankhoon which are located in Zahak County (**Figure 1**). Ticks were mostly found on shoulders and ears of the livestock. In total, 144 animals from 12 herds including 73 sheep, 44 goats and 27 cattle were selected randomly and examined individually for tick infestation. Thirty minutes were spent for each flock to collect ticks. All inspections and tick collections were carried out between 08:00 a.m. and 11:00 a.m. In case of infestation, ticks were collected using forceps and then preserved in 70% ethyl alcohol. All collected specimens were preserved in tubes and relative information was recorded. Specimens were transferred to the Entomology Laboratory, School of Public Health, Tehran University of Medical Sciences. All specimens were identified based on morphological characteristics and the keys given by Janbakhsh (1957) [14] and Walker (2003) [15] based on shape of capitulum, scutum, eyes, festoone and hypostome, spiracle, genital groove, spure of coxa, adanal shield and another characters; so these keys were used to identify each tick to species.

3. Results

Totally 446 ticks were collected and the occurrence of ticks on goats, cattle and sheep were about 17%, 15% and 26% respectively in all three study areas. The mean number of ticks on each animal was about 2 - 7 ticks per animal. Totally we identified 3 genus in study areas. *Hyalomma* and *Rhipicephalus* genus found in all three counties. Also we found *Dermacentor* genus, just in Qaen County. The results revealed that Qaen County had the most species diversity by 8 species in 3 genera. Details of the specimens are available in **Table 1**. The results showed that 311 out of 446 (69.7%) of all collected ticks were caught from Qaen County. Out of these 311 collected ticks, *Hy. anatolicum* was the most abundant (30.9%) tick in Qaen County and all three counties (13%).

Collected ticks from Qaen County revealed that most of the caught ticks from each species were male except *R. bursa*. We found 3 species from 2 genus in Zabol County. Out of 446 collected samples, 76 of them (17%) were caught from Zabol County. These 76 samples belonged to 3 species in 2 genera. Finally we found only 59 tick samples in Zahak County. We found only 2 genus and three species in Zahak County. Totally 59 specimens (13.2%) were collected from this area. The prevalence of ticks in Qaen County was more than two other Counties.

4. Discussion

As ticks are very important vectors of human and animal diseases, they are subject of many studies in Iran. There is very limited information about geographical distribution of tick infestation in a certain geographical areas, especially in Iran [12].

Our results demonstrate 8 tick species from 3 genera. They infest domestic ruminants in East part of Iran which is bordered with Afghanistan country. Most of ticks (69.7%) were collected from Qaen district. The number

Table 1. Details of caught ticks of Qaen County from South Khorasan Province and Zahak and Zabol Counties from Sistan and Baluchestan Province. Totally 446 ticks collected from these 3 study area.

Species	Qaen		Zahak		Zabol		Total
	Male	Total	Male	Total	Male	Total	
<i>Hy. anatolicum</i>	83	138	12	22	20	36	196
<i>Hy. asiaticum</i>	44	78	8	16	3	14	108
<i>R. sanguineus</i>	8	14	9	21	11	26	61
<i>Hy. marginatum</i>	25	33					33
<i>Hy. detrinium</i>	9	21					21
<i>D. marginatus</i>	11	13					13
<i>D. niveus</i>	5	9					9
<i>R. bursa</i>	4	5					5
Total	189	311	29	59	34	76	446

of collected ticks in Zabol district was 76 ticks (17%); also the number of collected ticks in Zahak district was 59 (13.2%); so the number of ticks in these two districts was very low. The most abundant species in our investigation belongs to *H. anatolicum* with a prevalence of 43.9 % in all collected specimens. This is a very important point due to this fact that *H. anatolicum* has been incriminated as a vector of Crimean-Congo hemorrhagic fever in Hamadan, Iran [16]. The prevalence of this tick in Qaen, Zahak and Zabol is 44.3, 37.2 and 47.3 percent respectively; so this shows that *H. anatolicum* may transmit Crimean-Congo hemorrhagic fever in all 3 districts. The other abundant caught tick belongs to *H. asiaticum* with a prevalence of 24.2% in all collected specimens. The prevalence of *H. asiaticum* in Qaen, Zahak and Zabol districts is 25%, 27.1% and 18.4% respectively. This was in agreement with studies which demonstrated that *H. asiaticum* was the second abundant tick infesting sheep (48.5%) in south Khorasan province and *H. anatolicum* was the most frequent species with 71.5% of the ticks of Domestic Ruminants in the Southern Khorasan-e-Razavi province, Iran [17] [18]. In a recent investigation in Iran, *H. anatolicum* and *H. asiaticum* were found with a prevalence of 5.9% and 3.9% respectively, in mountainous areas of Golestan province, north of Iran [12]; a similar prevalence was reported in investigations in Mazandaran Province (north of Iran) and Yazd province (center of Iran) [2] [19], whereas *H. anatolicum* was the infrequent species with prevalence of 0.4% among collected species in Qazvin province [10]. We collected *Hy. anatolicum*, *Hy. marginatum*, *Hy. asiaticum*, *Hy. detritum*, *R. bursa*, *R. sanguineus*, *D. niveus*, and *D. marginatus* in Qaen district; while we could just find *Hy. anatolicum*, *Hy. asiaticum* and *R. sanguineus* in Zahak county and in Zabol county. Our results show that *H. anatolicum*, *H. asiaticum* and *R. sanguineus* are found in all of our study areas. These ticks infest domestic ruminants in Zabol, Zahak and Qaen.

The brown dog tick, *R. sanguineus*, was the third frequent collected tick in our study. The prevalence of this tick in all collected samples was 13.6%. The prevalence of this tick in Qaen, Zahak and Zabol districts was 4.5%, 35.5% and 34.2% respectively. This tick is widely distributed around the world and it has been collected widely across the country [4]. This tick was the most frequent and abundant species with prevalence of 66.7% in Golestan province [12], while it was found with prevalence of 14.06% from Golestan province [20]; also in a study by sofizadeh et al., *R. sanguineus* was the most abundant species in that study area [21]. This tick commonly infests dogs and it can also feed on other animals and man [22].

In this study, we collected 5 species from Qaen County, which were not seen in Zahak County and Zabol County. The prevalence of *Hy. marginatum*, *Hy. detritum*, *D. marginatus*, *D. niveus* and *Rhipicephalus bursa* in Qaen collected specimens was 10.6%, 6.7%, 4.1%, 2.8% and 1.6% respectively. Recently, we have investigated on infection of ticks to *Anaplasma* and *Ehrlichia* pathogens in Zabol and Zahak County in Sistan and Baluchestan Province which are bordered with Afghanistan. Molecular studies on these samples showed that *Ehrlichia*'s DNA and *Anaplasma*'s DNA were found in 26.4% of collected ticks [23]. The results showed the infection of *Rhipicephalus sanguineus* and *Hyalomma anatolicum* with *Anaplasma*. Also we saw infection of *H. anatolicum* and *H. asiaticum* ticks to *Ehrlichia*spp [23]. These results demonstrate the infection of ticks collected from livestock in borderline of Iran-Afghanistan; so application of control measures with emphasis on control of *R. sanguineus* could prevent *Anaplasma* transmission in this region.

The tick infestation has thus been shown to occur in different areas of Iran, and this may indicate that special attention should be directed to certain areas concerning certain ticks [11]. A long time has passed since the previous studies on tick fauna in Iran, and the intensity of livestock has been changing in different places. Together with climatic changes of recent years, these factors can influence the diversity of ticks in Iran, and it is planned to apply new suggested key criteria and biological methods to investigate tick species in Iran.

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