

Original Article

Seasonal distribution of CCHF vectors in Khouzistan province, Iran during 2013-2014

Mahtab Daftari¹, Zahra Nourmohamadi¹, Sadegh Chinikar², Zakkyeh Telmadarraiy^{3*}

¹ Cell and Molecular Biology Department, Faculty of Biological Science, Science and Research University, Tehran, Iran

² National Reference Laboratory for Arboviruses and Viral Hemorrhagic Fevers, Pasture Institute of Iran, Tehran, Iran

³ School of public Health Tehran University of Medical Sciences, Medical Entomology and Vector Control, Tehran, Iran

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Abstract

Background: Crimean-Congo Hemorrhagic Fever (CCHF) is a severe tick-born illness caused by the CCHFV. Ruminant animals are the main host to ticks, and ticks are a vector of CCHF. Therefore, this survey was carried out in 2013 on ticks of Khouzistan province, in the Southwest of Iran, to specify tick species parasitizing live stocks and their seasonal population dynamics. **Materials and Methods:** During a survey for possible tick population of Khouzistan province as one of the critical epidemiologic areas in Iran, ticks were collected from the body of infested animals by a tweezer and then transported to the laboratory of Medical Entomology, School of Public Health, Tehran University of Medical Sciences and finally were identified to genus and species level using identification key. **Results:** A total number of 372 hard ticks were collected randomly from 458 live stocks in 7 different cities. Shosh was the most infected city in this study. Ticks infection rate on sheep, goat and cow was 84.12%, 12.69 % and 3.17%, respectively. In the study 2 genus and six species of hard ticks were identified including *Rhipicephalus sanguineus*, *Hyalomma anatolicum*, *Hyalomma asiaticum*, *Hyalomma sp.*, *Hyalomma marginatum* and *Rhipicephalus turanicus*. *Rhipicephalus sanguineus* was the most frequent species in the study area. **Conclusion:** Outbreak of human cases of CCHF in parallel with ticks' distribution shows the importance of this survey. Despite of studies that have been done on ticks distribution and ticks infestation in Iran recently no study has been conducted yet about this field in this province.

Keywords: CCHFV, Ixodidae, Tick, *Rhipicephalus*, Khouzistan

*Corresponding Author: Zakkyeh Telmadarraiy. Email: ztelma@yahoo.com

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Introduction

Crimean-Congo haemorrhagic fever (CCHF) is a severe tick-borne illness caused by the CCHFV which is a member of the Nairovirus genus (Family: Bunyaviridae) [1, 2] with negative-sense, single-strand, three segmented RNA genome (L, M, S) [3-6]. It is asymptomatic in infected animals, but it is a serious threat for humans [7]. The disease is reported from many countries of Asia, Europe, and Africa [8]. It seems that CCHF have been reported as early as

1110 AD, as per the description of a hemorrhagic syndrome associated with ticks in the Thesaurus of the Shah of Khwarazm, compiled by Dzurzhoni [9, 10]. In 2009, Shamsi zade reported 2 cases of CCHF in Ahvaz due to tick bites. Whitehouse in his paper in 2004 cited that occurrence of CCHF closely approximates the known world distribution of ixodid ticks belonging to the genus *Hyalomma* [11].

Ticks are hematophagous arthropod belonging to class of Arachnids [12] which transfer a greater

variety of infective microorganisms and viruses than any other arthropod vector group and are among the most important vectors of diseases to domestic ruminant, humans and animals that living close to human such as tick-borne encephalitis, lyme disease, babesiosis and theileriosis [13, 14]. The biological role of ticks is important as viral vectors and also as reservoirs of the virus [4, 7, 15]. At least 31 species of ticks (hard ticks and soft ticks) have been detected that to be infected with CCHF virus [2, 7]. CCHFV remains in several species of hard ticks through its life stages from larve to nymph to adult (trans-stadial transmission), and can also be transmitted transovarially (i.e., from infected mother to egg stage) [17-18].

Asgarian et al. in their paper mentioned that genera of *Hyalomma*, *Rhipicephalus*, *Haemaphysalis*, *Ixodes* and *Dermacentor* are the most common types of ticks in Iran. In 2007, *Rhipicephalus sanguineus* is reported as a common tick in Iran [19]. As ectoparasites causes irritation bites, they cause vast harm to their hosts .In details, they lead to decrease in growth due to anemia, allergy, paralysis, the skin damage and anorexia [14, 20]. In 1810, Dupre published a paper on the biology and distribution of ticks in Iran [15, 21]. Abassian published a list of Iranian ticks in 1960 [15]. In 1968, Maghami published the book entitled “Ectoparasites of domestic animals’ ticks” [21]. Rahbari in 1995 carried out a study on ecological aspects of various species of ticks in West Azarbidjan [22].

CCHF is endemic in Iran and several confirmed human cases were reported in Khouzistan province but no study has been done yet to assess the present of vectors of the CCHFV in this province.

The aim of this study was to study seasonal distribution of hard ticks (families: Ixodidae) in Khouzistan province.

Methods

Study area. Khouzistan Province is located in west south of Iran (Fig. 1). This province shares a border with Iraq from west. In current study, 7 different cities (Shosh, Dezful, Masjed Soleiman, Eize, Baghmalek, Ahvaz and Mahshahr) were selected and survey conducted in these cities.

Tick collection. A total of 458 livestock were

tested for tick invasion on the body of each animal. We collected ixodid ticks from 2013 to 2014 in the cities of Shosh, Dezful, Mahshahr, Eize and Baghmalek. Ticks collection was carried out from livestock (sheep, goat and cow) by a tweezer. After collection they were transferred into the holding tubes with the lables containing characteristic of specimen include date, place of collection and host of tick, and were kept alive on dry ice. Then, they were sent to the Entomology laboratory, School of Public Health and Institute of Public Health Research, Tehran University of Medical Sciences for species identification. Finally, they were determined by stereomicroscope and using to identification keys of Hoogstraal (1956)(23), Janbakhsh (1956) [24].

Results

Among 458 invested livestock, 223 were found to be infected. During the study period, 372 collected hard ticks were morphologically identified based on the species level. All of ticks recovered included 2 genus (*Rhipicephalus* and *Hyalomma*) and six species of hard ticks (*Rhipicephalus sanguineus*, *Rhipicephalus turanicu*, *Hyalomma anatolicum*, *Hyalomma asiaticum*, *Hyalomma* sp, *Hyalomma marginatum*). The species of ticks have been shown in



Figure 1. Study area in Khouzistan Province, Iran.

Table 1: Percentage of prevalence of hard ticks in the study area in Khouzistan, 2013-2014.

Species	Percentage
<i>Rh. sanguineus</i>	84.9
<i>Rh. Turanicus</i>	1.1
<i>Hy. anatolicum</i>	5.9
<i>Hy. asiaticum</i>	1.9
<i>Hy. Sp.</i>	5.1
<i>Hy. Marginatum</i>	1.1

Table 2: The frequency of collected hard ticks in different seasons in the study area in Khouzistan, 2013-2014.

Species	Seasons				
	Spring	Summer	Autumn	Winter	Total
<i>Rh. sanguineus</i>	85	37	55	-	316
<i>Rh. Turanicus</i>	4	-	-	-	4
<i>Hy. anatolicum</i>	4	18	55	-	22
<i>Hy. asiaticum</i>	-	7	-	-	7
<i>Hy. Sp.</i>	-	15	4	-	19
<i>Hy. Marginatum</i>	-	4	-	-	4
Total	147	169	56	-	372

Table 1. As shown, *Rhipicephalus sanguineus* (84.9%) were the most prevalent ticks in the mentioned area.

Table 2 shows the frequency of collected hard ticks in different seasons. Accordingly, the highest seasonal frequency occurred in spring, and they were not found in winter. In all seasons, *Rhipicephalus sanguineus* has the highest frequency.

All of specimens were collected from sheep, goat and cow. The frequency of different tick's species on 3 different hosts has been demonstrated in Table 3. It can be concluded that the sheep was found the most common host for hard ticks.

Table 4 shows numbers of collected hard ticks in studied cities in Khouzistan province during 2013-2014. As shown in this table, Shosh was the most infected city.

Discussion

Determination of the tick distribution is important for the control of tick-borne diseases. During this study 372 partially engorged ticks from Khouzistan province were collected indicating the incidence of 2 genus and 6 species of hard ticks in this area. Ixodid ticks distribution was more

Table 3: Numbers of collected hard ticks hosts in Khouzistan province during 2013-2014.

Species	Host		
	Sheep	Goat	Cow
<i>Rh. sanguineus</i>	161	25	0
<i>Rh. Turanicus</i>	3	0	0
<i>Hy. anatolicum</i>	3	0	7
<i>Hy. asiaticum</i>	3	0	0
<i>Hy. Sp.</i>	15	3	0
<i>Hy. Marginatum</i>	3	0	0
Total	188	28	7

Table 4: Numbers of collected hard ticks in some cities in Khouzistan, Iran during 2013-2014.

Species	cities				
	Shosh	Dezful	Eaze	Baghmalek	Mahshahr
<i>Rh. sanguineus</i>	124	76	22	3	91
<i>Rh. Turanicus</i>	4	0	0	0	0
<i>Hy. anatolicum</i>	4	0	18	0	0
<i>Hy. asiaticum</i>	0	0	7	0	0
<i>Hy. Sp.</i>	0	0	4	11	4
<i>Hy. Marginatum</i>	0	0	0	4	0
Total	132	76	51	18	95

significant in plateau area [8] that is partly true about this province. Results showed that the population's frequency of species *Rh. sanguineus* was higher than the other species (Table 1), but variation among *Hyalomma* was more demonstrated. In parallel with our study, results of Ghaemshahr in Mazandaran showed that *Rhipicephalus sanguineus* was the most abundant species in the study area. Result of the study in ghaemshahr revealed occurrence of sex species of ticks including *Rhipicephalus sanguineus*, *Rhipicephalus bursa*, *Ixodes ricinus*, *Boophilus annulatus*, *Haemaphysalis punctata* and *Haemaphysalis numidiana* [25]. In the other study carried out by Sofizadeh et al. in Golestan [26] and Telmadarraiy et al. in West Azerbaijan [21] *Rhipicephalus* ticks were dominant. In similar study in Yazd province, of the 583 collected ticks from this area 55.92%, 13.20%, 9.78%, 4.98%, 3.94%, 11.84% and 0.34% were of the *Hyalomma dromedarii*, *Hy. Marginatum*, *Hy. Anatolicum*, *Hy. Detritum*, *Hy. Asiaticum*, *Rhipicephalus sanguineus* and *Dermacentor marginatus* species, respectively [8], that was contradictory with current study, indicating

significant difference about tick species between different geographical areas.

The results of this study showed that the ixodid ticks were more prevalent during spring and summer respectively. Genus *Rh. sanguineus* and *Rh. turanicus* in spring, *Hy. anatolicum*, *Hy. asiaticum* and *Hy. marginatum* in summer were more prevalent (Table 2). Telmadarraiy et al. in their paper in Meshkinshahr mentioned that the frequency of ixodid ticks are most abundant in summer and spring and the sheep was the most frequent host [15], that is similar to current study. But in their study Hyalomma ticks were the dominant species [15] that is opposite to our finding. In the similar study in West Azerbaijan Province, the population frequencies of the species of genus Rhipicephalus were higher than the other genus. They also demonstrated that their highest seasonal frequency occurred in summer [21]. In West Azerbaijan survey, Davoudi et al. reported the highest rate of infestation occurs in spring [27] that our result is in agreement with their study.

Through viewpoint of tick infestation of livestock the percentage of tick per sheep, goat and cow were equal 48.7% (188 infected sheep among 386 examined), 49.1% (28 infected goat among 57 examined), 46.6% (7 infected cow among 15 examined) respectively. Tick infestation of sheep, goats, cattle, camel and horses in the study of Sofizadeh et al. in Golestan province (2014) was equal 72.1%, 77.3%, 75.8%, 69.3%, and 50.0% respectively [26]. In the study conducted by Rahbari et al. that it was carried out in four different geographical zones of Iran, tick infestation of cattle, sheep and goat was equal 62%, 55% and 57% respectively [27]. Thus tick infestation of animals in current study is lower than the results of Golestan and the study conducted by Rahbari. These results show considerable differences about tick abundance on different hosts in geographically different areas.

Conclusion

CCHF is an endemic disease in two neighboring countries, Iran and Iraq through the common border of Khouzistan province in Iran. Considering this, and because of migrating birds and transportation of livestock to or from the area, Khouzistan can be considered as a high risk area for

the illness. So, if the community and people who are involved in the high risk jobs, do not have enough education and information about the illness, the illness can become a cause of death in the area. Due to the abundance of ticks in the spring and summer, it is better to focus on controlling them during these two seasons.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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