

Long Term Investigations on Tick Infestations of Human

Özgür SELÇUK¹ Levent AYDIN¹ Ahmet Onur GİRİŞGİN¹
Bayram ŞENLİK¹ Cüneyt ÖZAKIN²

¹ Department of Parasitology, Faculty of Veterinary Medicine, Uludağ University, Görükle Campus TR-16059 Bursa - TURKEY

² Department of Microbiology, Faculty of Medicine, Uludağ University Görükle Campus, TR-16059 Bursa - TURKEY

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Abstract

In this study, a total of 19866 samples which were collected from humans who applied to the hospitals with tick bites in the western part of Turkey (Bursa) between the years 2007 and 2011 (from February to November) were examined. Approximately 10% (1985) of samples were found as non-ticks like bee stings, lice, fleas and other arthropods. The ticks were identified as *Rhipicephalus* spp. (72.98%), *Ixodes* spp. (18.96%), *Hyalomma* spp. (7.18%), *Dermacentor marginatus* (0.027%) and *Haemaphysalis parva* (0.005%). Based on localities, majority of the tick samples were reported from the urbanized areas (81%). Especially, *Ixodes* spp. species were commonly found in highland and forestry areas of Bursa.

Keywords: Tick infestation, Prevalence, Human

İnsanlarda Kene Enfestasyonları Üzerine Uzun Süreli Araştırmalar

Özet

Bu çalışmada Türkiye'nin batısında (Bursa) 2007 Şubat - 2011 Kasım yılları arasında kene tutunması vakasıyla hastaneye başvuran insanlardan toplanan 19866 örnek incelenmiştir. Toplanan örneklerin yaklaşık %10 (1985) kadarının kene olmadığı; arı iğnesi, bit, pire ve diğer artropodlar olduğu görülmüştür. Tür teşhisi yapılan kenelerin %72.98'u *Rhipicephalus* spp., %18.96'sı *Ixodes* spp, %7.18'si *Hyalomma* spp., %0.027'si *Dermacentor marginatus* ve %0.005'inin *Haemaphysalis parva* olduğu teşhis edildi. Kene örneklerinin %81'inin şehir kökenli olduğu ve özellikle *Ixodes* türü kenelerin Bursa'nın ormanlık alanlarında sıklıkla görüldüğü ortaya çıkarılmıştır.

Anahtar sözcükler: Kene enfestasyonu, prevalans, İnsan

INTRODUCTION

The tick fauna of Turkey consist of 46 species but there is very limited information about ticks infesting human. The seasonal activity, prevalence, and intensity of these ticks are not well known^[1,2]. Twenty two tick species were identified on ruminants and other wild domestic animals in Marmara region^[1]. In recent years with the increase of Crimean-congo hemorrhagic fever case, an increase was also observed in the number of humans who admitted to hospital with complaints of tick biting. In other words an increasing tick phobia has occurred in the society. So the tick bites of human became much more important^[3,4].

Most tick species are lack of host-specificity and attacking several vertebrates during their life cycle. Knowledge of the tick diversity attacking humans facilitates are required

to understand of epidemiological association between these hosts and tick-borne pathogens^[4,5]. For this reason, to determine species of collected ticks from human is essential for epidemiology of ticks and tick-borne pathogens

The objective of this long term investigation was to determine tick bite cases in human, species of ticks and their seasonal activity in west part of Turkey, during a five year period (between February of 2007 and November of 2011).

MATERIAL and METHODS

Study Area

Bursa Province is located (40°E, 28-30°N) in the south-eastern part of the Marmara Region of Turkey. The altitude



İletişim (Correspondence)



+90 224 2941 314, Fax: +90 224 2941 202



laydin@uludag.edu.tr

of the area is approximately 100 m above sea level. This region is characterized by hot and dry summers with some rainfall. The mean annual temperature in the area is 14-16°C with minimum and maximum averages of 5°C and 25°C.

Total precipitation averages are 686 mm/year, most of which is recorded in December; August has the least rainfall. The mean relative humidity is roughly 66%. The forest land is dominated by common oak, hornbeam, pine, beech, oak, linden and chestnut trees.

Collection and Identification of Ticks

Between February 2007 and November 2011, ticks were collected from human who applied to the city and town hospitals with complaints of tick bites in Bursa province, and date of tick bites, related patients data's were recorded. In the laboratory process, adult ticks were identified at the species basis, while larvae and nymphs at the genus basis. Identifications were performed by stereo microscope according to taxonomic key [6-8]. Additionally non-tick samples such as lice, fleas, nevus or papilloma have been determined and recorded in the data sheet.

RESULTS

A total of 17881 tick samples have been sent to our laboratory from different hospitals located at Bursa. As seen in the Table 1, 85% of ticks were sent from urban areas while 15% from rural areas. Approximately 10% of tick complaints of human admitted to hospital have been found as non-tick samples such as lice, fleas, bee stings, acne, skin reproduction and other insects (Table 1).

Seven of 17881 (0.04%) ticks (*Argas persicus*) were identified as Argasidae and all remaining ticks (99.96%) were identified as Ixodidae. The distribution of Ixodid ticks at the level of genus was found as follow; 72.98% *Rhipicephalus* spp. (11709 adult, 1083 nymph, and 258 larvae), 18.96% *Ixodes* spp. (2783 adult, 489 nymph and 119 larvae), 7.18% *Hyalomma* spp. (1371 adult and 56 nymph), 0.027% *Dermacentor marginatus* (5 adult) and 0.005% *Haemaphysalis parva* (1 adult). Adult of *R. sanguineus* (n=9125, 51.03%) was the most common species, followed by *I. ricinus*, *R. turanicus* and *H. aegyptium*. Ticks were found

mainly attached to human extremities and followed by inguinal region, underarm, body and any other region with low infestation rate.

During the Human's complaint period between February and November, cases of tick bites were reported each month from 2007 to 2011. Most cases were observed between mid of April and late of July, reaching to a peak level with 6555 cases (36.65%) in June. Adults of *I. ricinus* was observed in winter but mid stages were found between late spring and summer. *Hyalomma marginatum* adults were found reaching to peak in June and *Hyalomma* nymphs were observed between late of March and mid of May (Table 2).

Rhipicephalus sanguineus adults were mainly observed as dominant species between late of March and early November and reaching to a peak at late of May and June. Adults of *R. turanicus* were recorded between mid of February and early October, reaching to a peak in June. *Rhipicephalus* spp. larvae reached to highest level in March, the nymphs are most determined in early May. Human non-tick complaints were observed between late of March and late of August, reaching to peak in late of May up to mid of June (Table 2). Human tick complaints decreased in following years (Table 1).

DISCUSSION

Although Turkey's tick fauna consist of 46 species, 38 species within Ixodidae family, *Hyalomma*, *Haemaphysalis*, *Rhipicephalus*, *Dermacentor* and *Ixodes* genus have medical and veterinary importance [1,2]. Previous studies performed on ruminants indicated the existence of different tick species in six genus in Bursa province [6]. On the other hand, human infestation with ten ixodid tick species and two argasid species were recorded in Northern Marmara region [7]. In previous studies conducted at Thrace region and İstanbul, nine different tick species within six genus (5 Ixodidae, 1 Argasidae) biting humans have been determined [9,10]. Especially, *Rhipicephalus* spp. (larvae, nymph and adult) are the most dominant genus and *R. sanguineus* is found as main species biting humans. In this study, extensive presence of *Rhipicephalus* spp. ticks and most of the cases as recorded urban origin.

Table 1. Status of prevalences of human tick complaints according to years

Tablo 1. İnsan kene tutunma şikayetlerinin yıllara göre dağılımı

Years	Ticks	Non- Ticks	Total
2007	2.623	786	3.409
2008	3.150	512	3.662
2009	3.482	357	3.839
2010	4.051	218	4.269
2011	4.575	112	4.687
Total	17.881	1.985	19.866

Table 2. Number of tick species infested human according to months**Tablo 2.** İnsanlara tutunan kene türlerinin aylara göre dağılımı

Tick Species	Months										Total
	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	
<i>Ixodes ricinus</i>	925	572	188	21	-	-	-	11	389	677	2783
<i>Rhipicephalus sanguineus</i>	-	21	926	2945	3753	845	408	172	48	7	9125
<i>Hyalomma marginatum</i>	-	-	2	146	282	48	39	-	-	-	517
<i>Rhipicephalus turanicus</i>	11	87	196	814	927	304	214	27	3	-	2583
<i>Hyalomma aegyptium</i>	-	-	15	216	482	105	32	4	-	-	854
<i>Rhipicephalus annulatus</i>	-	-	-	-	-	-	-	-	1	-	1
<i>Dermacentor marginatus</i>	1	1	-	-	-	-	-	1	-	2	5
<i>Haemaphysalis parva</i>	-	-	-	-	-	-	-	-	1	-	1
<i>Argas percicus</i>	-	-	-	3	4	-	-	-	-	-	7
<i>Ixodes spp. Larvae</i>	4	8	21	86	-	-	-	-	-	-	119
<i>Ixodes spp. Nymph</i>	-	28	98	168	106	89	-	-	-	-	489
<i>Hyalomma spp. Nymph</i>	-	21	16	19	-	-	-	-	-	-	56
<i>Rhipicephalus spp. Larva</i>	17	86	52	29	58	16	-	-	-	-	258
<i>Rhipicephalus spp. Nymph</i>	-	38	319	507	219	-	-	-	-	-	1083
Non- ticks	-	2	116	687	724	326	130	-	-	-	1985
Total	958	864	1949	5641	6555	1733	823	215	442	686	19866

Hyalomma marginatum is known as a tick species which is closely associated with wild animals [6,11]. Larvae-nymph stages of this tick prefer mainly reptiles and ground feeding birds [8,12]. Increasingly, we found human infestations with *H. marginatum* adults and immature forms appear mostly at mountain villages located in valley system areas covered partially with agricultural land and forestry areas of Bursa. It is known that *H. marginatum* is the main vector of Crimean-Congo virus and 8 cases were reported between 2005 and 2010 in Bursa province (Personal communication with health service). Human *H. aegyptium* infestations were recorded in southern Marmara region between May and September before whereas in Aydın region it was seen between March and December [13]. In this study it is determined between mid of April and beginning of September, urban cases were found in higher percentage. Although nymphs of *Hyalomma spp.* are found between March and May, number of these ticks was found less than other researches. Overall tick bites were found mostly from urban areas (85%). These results indicated that wild animals play an important role in this ticks biology.

Although adults of *I. ricinus* have been reported between February and May on human in Aydın region [13], this species was found between May and August in Marmara region [9-11,14]. In our previous study conducted at Bursa cooperatively with Uludag University Faculty of Medicine Pediatric Emergency department, ticks were collected from children and classified. We obtained similar results with the current study and tick species were identified as follow: *Rhipicephalus spp.* nymphs (42.3%), *Rhipicephalus spp.* larvae (22.1%), *Rhipicephalus sanguineus* adults

(10.5%), *Rhipicephalus turanicus* adults (0.9 %), *Ixodes spp.* larvae (8.6 %), *Ixodes spp.* nymphs (6.7 %), *Hyalomma spp.* nymphs (4.8 %), *Hyalomma marginatum* adults (2.7%), *Hyalomma aegyptium* adults (0.9 %) [14].

Meanwhile in this study *I. ricinus* was not determined between July and August but has reached to peak level during winter. While larvae of *Ixodes spp.* were determined between February and May, nymphs were found between March and July. May and July are the most frequent time for larvae and nymphs. In a previous study in Bursa region *Ixodes* adults and immature forms were declared as the most common tick species of ruminants [6]. *Dermacentor marginatus* and *Haemaphysalis parva* were found at least grade. There is just one case of *R. annulatus* from Orhaneli district. Because of this tick species has one host life cycle this case can be considered as an accidental infestation.

Reducing numbers of non-tick cases during years should be thought as resulting from increased knowledge of society by media. Bursa region has heterogeneous geographic structure and climatic conditions. This features affect the activity of ticks should not be ignored. Especially people living in urban areas, veterinarians, soldiers and people visiting tick infested areas for picnic and camping have risk of tick bite whereas people living in rural areas panic because of info pollution.

In conclusion, tick bites occur more than estimated numbers in Bursa. High numbers of *Rhipicephalus* tick bites in central urban areas may be the result of high stray animal (dog and cat) numbers. Finally, results of this

study demonstrated that humans go to outdoor for picnic, camping, tracking, agriculture or any other reason should take necessary measures.

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