MAS Journal of Applied Sciences
Uygulamalı Bilimler Dergisi
ISSN: 2757-5675
masjaps.com

OPEN ACCESS

DOI: http://dx.doi.org/10.5281/zenodo.13266832

Research Article

Determination of Ticks Removed From Patients Application to Health Facilities with Complaints of Tick Attachment in The Province of Kastamonu

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Received: 01.05.2023 **Accepted**: 05.06.2023

Abstract
Ticks, which threaten human and animal health in the world and in Turkey, can act as mechanical and biological vectors for bacterial, viral, protozoan, rickettsial, spirochetal and helminth disease agents. In this study, it was aimed to morphologically examine the ticks removed from patients complaining of tick bite in Kastamonu province and make species identification. The study material consisted of ticks collected from 134 patients who applied to health institutions in Kastamonu province due to tick bites between May 2022 and August 2022. It was determined that 61.2 % of the ticks collected in the study were Ixodes ricinus, 18.7 % were Dermacentor marginatus, 6 % were Haemaphysalis parva, 5.2 % were Hyalomma marginatum, 3.7 % were Haemaphysalis punctata, and 2.2 % were Rhipicephalus bursa. As a result, it is thought that our study can contribute to science by determining the cases of tick attachment to humans in the Kastamonu region and the species identification of attached ticks, but more comprehensive research will be useful and will contribute to new studies on the species distribution of ticks and diseases transmitted by ticks in Kastamonu and its neighboring provinces.

Keywords: Health, morphology, tick, vector

1. Introduction

Ticks, which threaten human and animal health in the world and in Turkey, can act as mechanical and biological vectors for bacterial, viral, protozoan, rickettsial, spirochetal and helminth disease agents (Uslu, 2021).

To date, 956 tick species have been identified in the world. There are 736 species in the Ixodidae family, 218 species in the Argasidae family, 1 species in the Nuttalliellidae family and 1 species in the Deinocrotonidae family. To date, 55 tick species belonging to the Argasidae and Ixodidae families have been identified in Turkey. Of these, 47 species belong to the genera Haemaphysalis, Rhipicephalus, Dermacentor, Hyalomma, Ixodes from the Ixodidae family, and 8 species belong to the Argasidae family. It has been reported that ticks in the Ixodidae family, except the genus Ambylomma, are seen in all regions of Turkey. Ticks of the genus Argas, from the family Argasidae, have been detected in all regions of Turkey, ticks of the genus Ornithodoros have been detected in the Marmara, Aegean, Mediterranean and Eastern Anatolia regions, and ticks of the genus Otobius have been detected in the Marmara and Southeastern Anatolia regions (Touray et al., 2023).

There are more studies on ixodid ticks, which are common in our country, compared to argasid ticks. *Ixodes ricinus*, *I. hexagonus*, *Hyalomma anatolicum*, *H. detritum*, *H. rufipes*, *H. dromedarii*, *H. excavatum*, *H. aegyptium*, *H. marginatum*, *Rhipicephalus turanicus*, *R. bursa*, *R. annulatus*, *R. sanguineus*, *R. kohlsi*, *Dermacentor marginatus*, *D. niveus*, *D. reticulatus*, *Haemaphysalis parva*, *Hae. punctata*, *Hae. sulcata*, *Hae. inermis* are the dominant species in Turkey (Yücesan et al., 2019; Altay et al., 2021).

Diseases such as Marseille fever, Q fever, Human Granulocytic anaplasmosis, Lyme disease, Colorado Tick Fever, Rocky Mountain Spotted Fever, Mediterranean Spotted Fever, Ehrlichiosis, Tularemia, Crimean-Congo Hemorrhagic Fever, Tick Borne Encephalitis, Powassan encephalitis, Babesiosis, Anaplasmosis, which can be transmitted to humans by ticks (Rymaszewska and Grenda, 2008; Nuhoğlu et al., 2008; Değer et al., 2010; Aydın and Coşkun, 2019).

The study was conducted to determine the types of ticks collected from patients who applied to health institutions in Kastamonu province with tick bite complaints. Since ticks are known to be vectors for diseases such as Crimean-Congo Hemorrhagic Fever, human granulocytic anaplasmosis, tick encephalitis, Colorado Tick Fever, tularemia, Mediterranean Spotted Fever, Q fever, Lyme disease, anaplasmosis, ehrlichiosis, babesiosis, species identification leads to the issue of what precautions should be taken. It is thought that it will contribute to the reduction of tick-borne diseases in the region.

2. Materials and Methods

The study material consisted of ticks collected from 134 patients who applied to health institutions in Kastamonu province due to tick bites between May 2022 and August 2022.

Information about the age and gender of the patients from whom ticks were removed, whether they were engaged in animal husbandry or not, where the ticks attached to the body, the date, whether the ticks could be removed from the body in one piece, and in which district of Kastamonu they lived were included.

2.1. Removing ticks

Patients with tick bites were first told to remain calm. First of all, personal protection measures were taken by the healthcare personnel who would remove the tick. The tick was then removed from the body with the help of a thin-tipped clamp or tweezers. The area where the tick was removed was cleaned with skin disinfectant.

2.2. Hiding ticks

The ticks removed from the patients were placed in tubes filled with 70 % ethyl alcohol and the mouth of the tube was

tightly closed. The characteristics of the patient from whom the tick was removed (patient's age, gender, profession, where the ticks attached to the body, which district of Kastamonu they lived in, and the date they were removed from the body) were written on a barcode and affixed to the tube. It was then stored in the refrigerator at +4 °C until species identification.

2.3. Examination of ticks

The ticks were removed from the tubes containing 70 % ethyl alcohol in which they were stored, and the ticks were placed in an empty petri dish and cleaned with a thin brush. Ticks were placed in a petri dish with fine-tipped forceps and identified using a Nikon SMZ 745T model stereo microscope and NIS Elements-D software imaging program. All ticks whose morphological integrity was determined to be intact were identified as genus and species.

Figure 1., Figure 2., Figure 3., Figure 4. show the diagnostic stages of the tick in the laboratory environment after collection.

Figure 1. Projecting the tick on the computer at the stage of diagnosis

Figure 2. Stereo microscope used in tick diagnosis

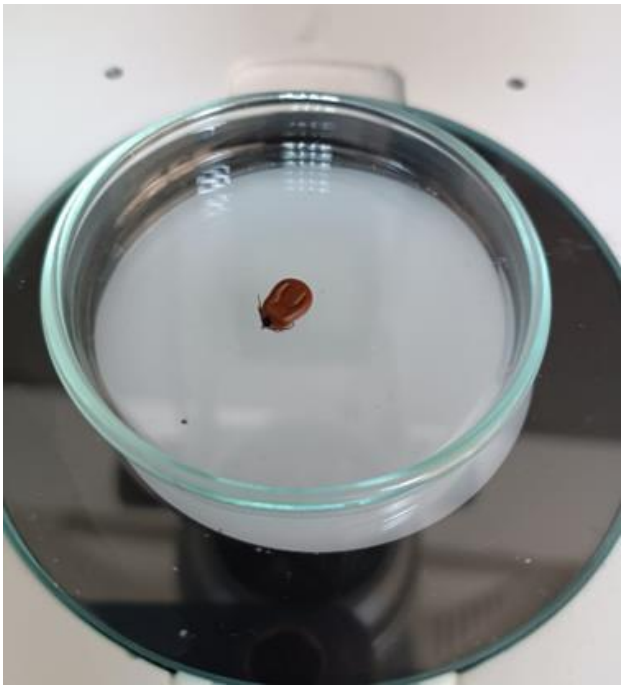

Figure 3. Placing the tick in a petri dish

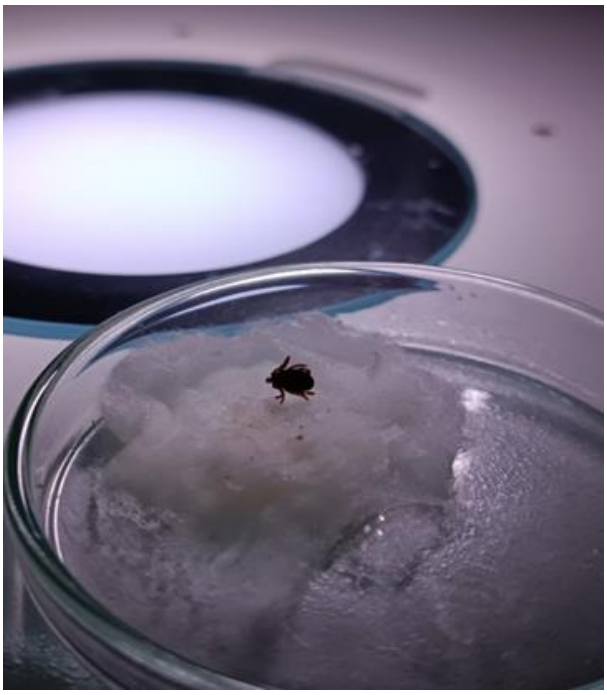

Figure 4. Fixing the tick at different angles for detailed examination

While determining the species of ticks, the book titled 'Ticks of Europe and North Africa A Guide to Species Identification' was used (Estrada-Peña et al., 2018).

2.4. Data analysis

Data were evaluated with SPSS 29.0 program using chi-square test and Fisher's Exact test. Table 1 shows the gender distribution of the participants. 41% of the participants are men and 59% are women.

Table 1. Gender information of the participants

Gender	n	%
Male	55	41.0
Female	79	59.0
Total	134	100

Table 2. Distribution of Tick Biting Cases According to the Body Part Bitten by the Tick

Body part	n	%
Foot	10	7.5
Neck	8	6.0
Chest	9	6.7
Intraocular	1	0.7
Abdominal area	31	23.1
Groin, genital area	16	11.9
Arm	7	5.2
Armpit	5	3.7
Ear	9	6.7
Scalp	7	5.2
Back and shoulder	12	9.0
Thigh and leg	16	11.9
Face	3	2.2

Table 2 shows the distribution of body parts bitten by ticks. Figure 5. shows the number of cases according to the months in which tick infestation was observed. While the lowest number of cases was seen in May with 9.7%, the highest number of cases was seen in July with 35.07%.

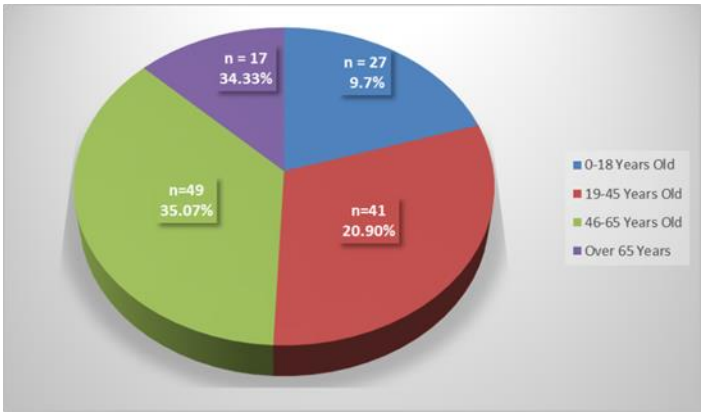

Figure 5. Number of cases by months

Table 3. Districts where tick infestation occurs

District	n	%
Ağlı	10	7.5
Devrekani	70	52.2
İnebolu	1	0.7
Araç	1	0.7
Küre	2	1.5
Merkez	30	22.4
Seydiler	20	14.9
Total	134	100

Table 3 shows the distribution of the districts where tick infestation occurs. Table 4. shows the number of people engaged in agriculture and animal husbandry. While 42.5% of individuals are engaged in agriculture and animal husbandry, 57.5% are not.

Table 4. Distribution of individuals engaged in agriculture and animal husbandry

Agriculture-Livestock	**n**	**%**
Yes	57	42.5
No	77	57.5
Total	**134**	**100**

3. Results and Discussion

In this study, tick types, gender of ticks, body parts where ticks attach, tick types by district and distribution of patients by age groups were evaluated.

Table 5. Distribution of tick species

Kene türü	**n**	**%**
Dermacentor marginatus	25 (18 female, 7 male)	18.7
Haemaphysalis parva	8 (7 female, 1 male)	6.0
Haemaphysalis punctata	5 (4 female, 1 male)	3.7
Hyalomma marginatum	7 (3 female, 4 male)	5.2
Ixodes ricinus	82 (69 female, 13 male)	61.2
Rhipicephalus bursa	3 (2 female, 1 male)	2.2
Broken	4	3.0
Total	**134**	**100**

When the distribution of tick species removed from humans by body area was examined, it was seen that 70 % of the ticks removed from the foot area were *Ixodes ricinus*, 10 % were *Rhipicephalus bursa*, 10 % were fragmented and 10 % were *Hyalomma marginatum*. All ticks removed from the neck area were *I. ricinus*. 78 % of the ticks removed from the chest area were *I. ricinus*, 11 % were *Haemaphysalis punctata* and 11 % were *Dermacentor marginatus*. All ticks removed from the eyelid were *I. ricinus*. 52 % of the ticks removed from the abdominal area were I. ricinus, 19% were D. marginatus, and 7 % were Hae. punctata, 7 % *Hae. parva*, 6 % is *H. marginatum*, 6 % is fragmented and 3 % is *Rhipicephalus bursa*. of the ticks removed from the groin and genital area, 69 % were *I. ricinus*, 13 % were *H. marginatum*, 12 % were *D. marginatus* and 6 % were *R. bursa*. 43 % of the ticks removed from the arm were *I. ricinus*, 29 % were *Hae. parva*, 14 % *D. marginatus* and 14 % *Hae. punctata*. 40 % of the ticks removed from the armpit were *I. ricinus*, 20 % were fragmented, 20 % were *H. marginatum* and 20 % were *Hae. parva*. 56 % of the ticks removed from the ear were *I. ricinus* and 44 % were *D. marginatus*. 57 % of the ticks removed from the scalp were *I. ricinus* and 43 % were *D.marginatus*. 75 % of the ticks removed from the back and shoulder area were *I. ricinus* and 25 % were *D. marginatus*. 44 % of the ticks removed from the thigh and leg were *I. ricinus*, 31 % were *D. marginatus*, and 13 % were *Hae. parva*, 6% *Hae. punctata* and 6 % is *H. marginatum*. Of the ticks removed from the face, 67 % were *I. ricinus* and 33 % were *Hae. parva*. The genders of ticks are indicated in Table 6.

Table 6. Gender of the tick

Gender of the tick	n	%
Female	96	71.6
Male	20	14.9
Coupled	14	10.4
Broken	4	3.0
Total	**134**	**100**

Figure 6 shows tick species by district. When the infestation rates or the distribution of collected ticks by districts were examined, no statistically significant relationship was found between the districts (p=0.497).

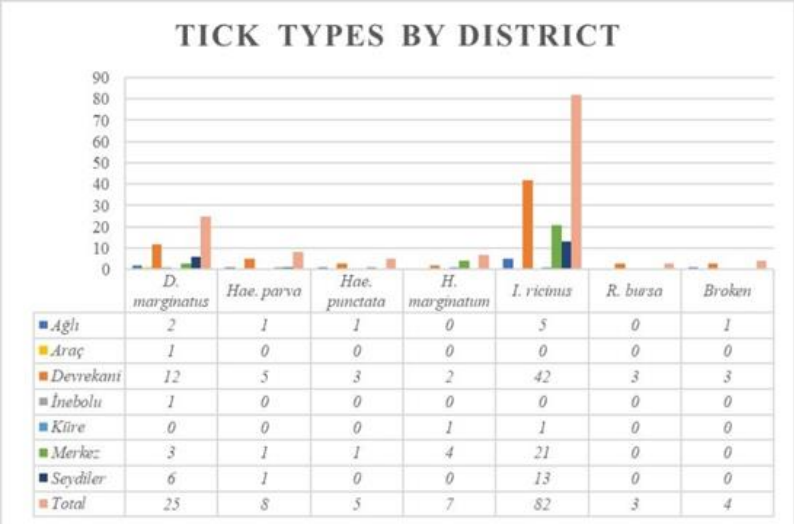

Figure 6. Tick species by district

Figure 7. shows the distribution of patients according to age groups. The mean age and standard deviation values of 134 patients were determined as 41.89±21.1 years. The minimum age is 7 months and the maximum age is 82. The age range with the highest involvement is 46-65 with 36.6% (n=49).

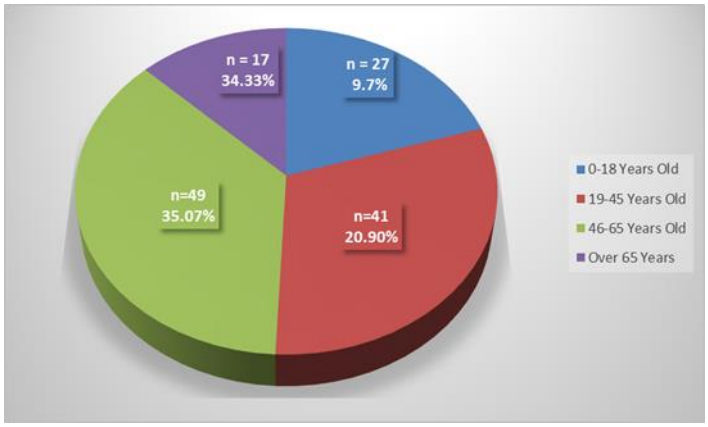

Figure 7. Distribution of patients by age groups

Ticks, which are widely found around the world and in Turkey, are important for public health and animal health. Ticks are the most important ectoparasites that must parasitize vertebrate creatures and suck blood from them in order to complete their developmental period. Among the pathological effects that tick bite may cause are; toxicity, paralysis, loss of work capacity, secondary infections and death. Today, ticks maintain their importance because they serve as biological or mechanical vectors for more than 200 agents (Parola, 2004; Parola, 2005; Keirans and Durden, 2005). Frequency of diseases caused by ticks; It depends on factors such as tick density, species, climatic characteristics of the region, vegetation and population density in the region (Vatansever et al., 2008).

Ixodes spp., *Hyalomma* spp., *Dermacentor* spp., *Haemaphysalis* spp. diagnosed in this study. and *Rhipicephalus* spp. İnci et al. in view of the frequent involvement of the genus in humans. It is similar to their work (İnci et al., 2016).

In a study conducted in Istanbul in 2008; When species identification of ticks collected from 1,054 tick bite cases was made, the highest rate was seen in *Hyalomma aegyptium* with 52.85% (Vatansever et al., 2008). In this study, the highest rate was found in *I. ricinus*, 61.2%. It was predicted that the reason for the difference with the study in Istanbul might be the number of samples collected and geographical differences.

Polat et al. in his research, he stated that among the adult ticks, the *Ixodes ricinus* species clings to humans the most (Polat et al., 2009).

Karaman et al., Karaer et al. reported that, as a result of their research on tick infestation in humans, adult ticks of the *Hyalomma marginatum* species were identified (Karaman et al., 2009; Karaer et al., 2009).

Deger et al. they stated that they encountered *Hyalomma excavatum* type ticks more frequently (Değer et al., 2009). It has been reported that the *Haemaphysalis parva* species was most commonly diagnosed by examining the ticks collected from patients who applied to the hospital with tick bite complaints from Ankara center and surrounding districts (Tezer et al., 2009). Gargılı et al. as a result of their research on tick infestation in humans in the Thrace provinces, they determined that adult ticks most frequently belonged to the *Rhipicephalus sanguineus* species (Gargılı et al., 2009). In this study, it was determined that ticks belong to five different genera, and the dominance of *I. ricinus* species belonging to the Ixodes genus with a rate of 61.2% is noteworthy. It is thought that the reason for the differences between the studies is the geographical region, climate and soil diversity where the samples were collected. In older studies, it is thought that the high infestation rates were due to the inadequacy of tick control methods. It is thought that the reason why ticks are less common in recent studies may be due to more conscious application of control methods, regular disinfection of the environment and animals, as well as efforts to reduce tick infestations.

In the study conducted by Beyhan et al. in Ankara with 1562 samples collected from patients with tick infestation in humans between January 2011 and December 2013, the first three species seen at the highest rates were *Rhipicephalus sanguineus* with a rate of 21.51%, *Haemaphysalis parva* with a rate of 16.10%, and *Hyalomma marginatum* with a rate of 12.56%. ticks (Beyhan et al., 2016). In another study conducted in Ankara, where the species identification of 458 ticks attached to humans was made between May 2015 and April 2018, the first three dominant species were 28% *Haemaphysalis parva*, 19% *Rhipicephalus turanicus*, and 10% *Hyalomma marginatum*, respectively (Yücesan et al., 2019). In this study, the three most dominant species were identified as *Ixodes ricinus* with a rate of 61.2%, *Dermacentor marginatus* with 18.7%, and *Haemaphysalis parva* with 6%,

respectively. The three tick species that were dominant in this study were identified by Beyhan et al. and Yücesan et al., is thought to be due to the small number of identified samples and the collection of ticks from different regions (Beyhan et al., 2016; Yücesan et al., 2019).

2610 tick samples collected between January and October 2007 from patients complaining of tick bite in 9 different provinces of Turkey (Afyon, Denizli, Izmir, Manisa, Muğla, Uşak, Burdur, Isparta, Antalya) were identified. As a result of diagnosis, 25.53% *Rhipicephalus bursa*, 23.41% *R. turanicus*, 12.10% *Hyalomma aegyptium*, 3.92% *H. excavatum*, 2.35% *H. anatolicum*, 2.13% *Dermacentor marginatus*, 1.46% *Ixodes ricinus*, 1.46% *R. sanguineus*, 1.00% *Haemaphysalis parva*, 0.45% *H. scupense* and 0.11% *H. rufipes* species were determined (Bakırcı et al., 2019). In this study, 6 species were identified, with the highest rate of 61.2% being Ixodes ricinus. In the study of Bakırcı et al., 11 species and Rhipicephalus bursa were seen with the highest rate of 25.53%. The reason for this difference is thought to be the diversity of the number of provinces where samples were collected, sociocultural structure difference, climate difference, number of samples collected, and seasonal difference in the period when the samples were collected.

The genus determination of 5999 ticks collected from people in Tokat between April 2008 and September 2008 was carried out by Bursalı et al. As a result of diagnosis, 67.89% *Hyalomma* spp., 16.54% *Rhipicephalus* spp., 11.09% *Haemaphysalis* spp., 3.23% *Dermacentor* spp., 1.25% *Ixodes* spp. was determined as (Bursali et al., 2010). In this study, *Ixodes* spp. with a rate of 61.2%. has been diagnosed. It is thought that the reason for this difference is related to the closeness of the period when the Crimean-Congo Hemorrhagic Fever disease was epidemic in Tokat and the time when the study was conducted (Alkan-Çeviker et al., 2019).

The species identified in this study have important vector functions. *Ixodes ricinus* causes Lyme disease, Human Granulocytic Anaplasmosis, Tick Borne Encephalitis and babesiosis; *Hyalomma marginatum* causes Crimean-Congo Hemorrhagic Fever disease; *Dermacentor marginatus* and *Haemaphysalis* spp. anaplasmosis, babesiosis diseases; Rhipicephalus bursa causes babesiosis (Altay et al., 2021).

Gargılı et al. In their study conducted in Kocaeli and Sakarya between May and November 2007, they examined 3121 ticks collected from people who applied to hospitals with tick bite complaints. As a result of diagnosis, 52.87% *Ixodes* spp., 41.78% *Hyalomma* spp., 4.2% *Rhipicephalus* spp., 0.7% *Haemaphysalis* spp., 0.35% *Dermacentor* spp. and 0.03% *Argas* spp. They encountered 6 different tick species, including (Gargılı et al., 2009). In this study; *Ixodes* spp., which includes 5 genera: *Ixodes, Rhipicephalus, Hyalomma, Dermacentor, Haemaphysalis,* and the highest rate of 61.2% *Ixodes ricinus* species. genus has been identified. It is thought that the reason why the genus diversity in Gargılı et al. study was higher than in this study is due to the number of samples collected. The fact that Ixodes spp. is the dominant genus in both studies is similar. It is thought that the reason for this is the dominance of the Black Sea climate in the region where both studies were conducted.

Yücesan et al. (2019), in their study conducted in Ankara in 2019 between May 2015 and April 2018, they determined that the rate of female ticks clinging to humans was 34.7% and the rate of male ticks was 37.6%. In this study, the rate of female ticks was diagnosed as 71.6% and the rate of male ticks was 14.9%. 3 It is thought that the reason for this difference may be the short working period and many different variable reasons.

It was reported that the patients who came to Batman State Hospital with the complaint of tick bite were mostly people between the ages of 20-40 with a rate of

41.0%, and the second most common were children under the age of 10 with a rate of 28.2% (Al et al., 2008).

In a study conducted in Beydağı, it was determined that the average age of patients complaining of tick bite was 24.6 years (Karaman et al., 2009). Kandiş et al. (2010), it was stated that the average age was 41.3±18.3 in the study by Yardan et al. (2010), and the average age was 46.5±17.2 in the study by Yardan et al. The most common age range of 336 patients who applied to Uludağ University Faculty of Medicine Emergency Service, the youngest being 18 years old and the oldest being 79 years old, was the 30-39 age group with 27%, and the average age was calculated as 43.85±13.88 (Küfeciler, 2011). In a study investigating the demographic characteristics of 451 patients complaining of tick bite, the body part bitten by the tick, and the location where the incident occurred, 74.8% (339 people) of the cases were between the ages of 20-61, and 13.7% (61 people) were 61 years and over (Korkmaz et al., 2011). In his study, Uluğ reported that 60.7% of 61 patients (37 people) were 17 years of age and above, that is, in the adult age group (Uluğ, 2011). In the study conducted with 840 people, where the epidemiological and laboratory findings of patients presenting with tick bite complaints were examined, 9.8% were 18 years of age and under (82 people), 80.6% of 758 patients (611 people) in the adult age group were in the 18-65 age group, and 19.4% were in the 18-65 age group. (147 people) were determined to be over 65 years of age (Çıtıl et al., 2020). In the research conducted in Sivas, no child patients were found, and 78.6% of the cases were found to be between the ages of 18-65, and 21.4% were found to be 66 years old and over (Topcu, 2021). In our study, the mean age and standard deviation values of 134 patients were found to be 41.89±21.1 years. The minimum age is 7 months and the maximum is 82 years. The age range with the highest involvement is 46-65 with 36.6%. It is compatible with the literature. The reason why the age range is 46-65 is that people are still actively engaged in agriculture and animal husbandry, as well as having social activity habits, engaging in activities such as picnics and nature trips in rural areas on weekends, and women in this age range being especially engaged in agriculture and animal husbandry.

Bakırcı et al. In their study conducted in the Southwestern Anatolia region of Turkey, they reported that among 2610 cases, tick bites occurred most in the 0-6 age group with a rate of 24.56%, and in the 13-18 age group with a rate of at least 6.32% (Bakırcı et al., 2019). In this study, it was determined that it was most common in individuals between the ages of 46-65 with 36.6%, and at least in individuals over the age of 65 with 13%. It is thought that the reason for this is the difference in the number of cases, sociocultural habits, development levels of the provinces, the fact that the young population of Kastamonu in this study has migrated and the fact that it is a province with a high concentration of elderly population.

When 39 cases admitted to Batman State Hospital emergency department with tick bite were examined, it was seen that the gender ratio was 35.9% (14 people) female and 64.1% (25 people) male patients (Al et al., 2008). In the study conducted with 409 children who applied to Ankara Dışkapı Children's Training and Research Hospital from Ankara center and surrounding districts, it was determined that the gender ratios were 52.3% boys and 47.7% girls. In the study conducted by Arıkan et al. in 2009, they examined 253 children's cases; They reported that 34% of the cases were girls and 66% were boys (Arıkan et al., 2009). Sümer explained in his study that 87 of 168 cases were male (51.8%) and 81 were female (48.2%) (Sümer, 2010). It was determined that 171 (50.9%) of the 336 cases that came to the Uludağ University Faculty of Medicine Emergency Service were men and 165 (49.1%) were women (Yardan et al., 2010). In the study conducted by Çıtıl et al. with 840 cases

presenting with tick bites, it was determined that the gender ratio was 60% men (504 people) and 40% (336 people) women (Çıtıl et al., 2020).

In a study conducted in Sivas with 84 patients complaining of tick bites, it was reported that 64.3% of the cases were men and 35.7% were women (Topcu, 2021). In this study, it was determined that 41% of the patients complaining of tick infestation were male and 59% were female. When the literature was examined, it was reported that involvement in women was less than in men. In this study, it was observed that tick infestation was more common in women. The reason of this; In the Black Sea region where the study was conducted, women are actively involved in agriculture and animal husbandry, there may be geographical regional differences, people's education levels, and socio-cultural behavioral differences compared to the studies examined in the literature. No research has been found in the literature showing that ticks are selective in their involvement according to gender, but it is thought that other studies can be conducted on this subject. The research, conducted with 67 cases who applied to Karadeniz Technical University and three different primary health care institutions with tick bite complaints, determined that ticks mostly attach to the abdomen, groin, leg and foot areas of humans (Gündüz et al., 2008). In a study conducted with 39 people who applied to Batman State Hospital, it was determined that people mostly held on to the head, neck, thigh and leg areas (Gargılı et al., 2011). Sümer stated that it clings mostly to the legs with a rate of 34.52% and to the trunk with a rate of 11.9%, Taşkesen et al. Kandiş et al. reported that ticks mostly attach to the legs with a rate of 37% and to the trunk with a rate of 21%. 23.2% stated that they held on to the legs the most (Taşkesen et al., 2008; Sümer, 2010; Kandiş et al., 2010). It has been reported that the most common site of tick bite in Beydağı State Hospital is the genital area (Karaman et al., 2009). When the data of 336 patients who applied to Uludağ University Faculty of Medicine Emergency Service were examined, the areas where ticks attached were determined to be the lower extremities with a rate of 27.4%, the upper extremities with a rate of 16.4% and the abdomen with a rate of 14.69%, respectively (Küfeciler, 2011). In this study, it was determined that tick infestation was most common in the abdomen with a rate of 23.1%, in the thigh and leg with a rate of 11.9%, and in the groin and genital area with a rate of 11.9%. The result of this research is similar to the research results in the literature. The reason why ticks are more common in the three body parts where they are most frequently involved is that it is easier for the tick to attach to the host's body parts, especially those close to the ground and open. Knowing the attachment points of ticks is extremely important for protection. A study reported that 20% of ticks cling to places where the host cannot see them, and that those in endemic areas should periodically check their entire bodies in order to detect ticks early (Gündüz et al., 2008). Our research reveals that it is extremely important to periodically examine the ear, scalp and neck area in children.

Cardi et al. as a result of their research, they reported that tick bite cases were more common in May and August (Kartı et al., 2004). It was determined that the highest number of patients coming to Batman State Hospital Emergency Service with tick bite complaints was in June and July, with a rate of 69.23% (Al et al., 2008). In the research conducted to determine the seasonal density of tick infestation cases in Turkey, it was announced that the highest number of cases were seen in August (Gargılı et al., 2011). Arıkan et al.(2009), Kandiş et al.(2010) and Sumer (2010) stated that tick bite cases were most common between May and August. Bursalı et al.(2010) in their study with ticks collected from people in Tokat province between April 2008 and September 2008, they reported that the months with the highest tick infestation were June with 33.64% and July with

25.2%. The highest number of applications to Uludağ University Faculty of Medicine Emergency Service with tick bite complaints were in July with a rate of 33.3% and in August with a rate of 32.7% (Küfeciler, 2011). In their study on tick infestation in humans in Ankara, they reported that it was most frequently encountered in June with a rate of 24.38% and in July with a rate of 19.91% (Beyhan et al., 2016). In this research, the months with tick infestation were determined to be the lowest in May with a rate of 9.7% and the highest in July with a rate of 35.07%. This study is similar to the months in which tick infestations are high and low in studies in the literature. It is thought that the reason for this is that the months in which the study was conducted coincided with the summer period and ticks are more active in summer. It was reported that 82.05% of the cases who applied to Batman State Hospital Emergency Service with the complaint of tick bite lived in rural areas or had been in these areas in the last two weeks or had a history of contact with animals (Al et al., 2008). In their study, Yardan et al.(2010) reported that 25.9% of the cases were engaged in animal husbandry, 20.2% were agricultural workers, 16.3% were housewives, and 27% of the cases did not disclose their occupational information. In their study, Kandiş et al.(2010) he explained that tick bites are more common in people engaged in agriculture and animal husbandry. In his study, Topcu (2021) stated that 84.5% of the patients were engaged in farming or animal husbandry. In this study, it was found that 42.5% of the patients were engaged in agriculture and animal husbandry. In this study, the rate of tick infestation was found to be high in people not engaged in agriculture and animal husbandry, and it differs from studies in the literature. It is thought that the reason for this is that the population residing in Istanbul spends time on picnics and excursions in their hometown, Kastamonu, in the summer. In other studies, the reason for the high rate of tick infestation in people living in rural areas can be explained by the fact that the people's residence and the city they live in are the same.

4. Conclusions

As a result, it is thought that our study can contribute to science by determining the cases of tick attachment to humans in the Kastamonu region and the species identification of attached ticks, but more comprehensive research will be useful and will contribute to new studies on the species distribution of ticks and diseases transmitted by ticks in Kastamonu and its neighboring provinces.

Declaration of Author Contributions

The authors declare that they have contributed equally to the article. All authors declare that they have seen/read and approved the final version of the article ready for publication.

Declaration of Conflicts of Interest

All authors declare that there is no conflict of interest related to this article.

Ethical Committee Approval

Ethics committee approval was obtained from Selçuk University Animal Experiments Local Ethics Committee (Date: 15.02.2023, Number: 2023-01/002)

Acknowledgement

This study was produced from the master's thesis of the first author.

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To Cite: Şahin, P., Uslu, U., 2024. Determınatıon of Ticks Removed From Patients Application to Health Facılıtıes with Complaints of Tick Attachment in The Province of Kastamonu. *MAS Journal of Applied Sciences*, 9(3): 501–515.
DOI: http://dx.doi.org/10.5281/zenodo.13266832.