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Evaluation of the Status of Infectious Diseases in Military Personnel Who Visit Clinics Due to Tick Bite

Kene Isırması ile Gelen Askeri Personelde İnfeksiyöz Hastalık Olma Durumunun Değerlendirilmesi

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Abstract

Introduction: Tick bite has been a big risk for the military personnel who have to perform their profession, both in operations and training, in rural areas with a high risk of tick bites. The considerable increase in the number of those visiting the emergency departments of military hospitals and the increase in the pauses in the military exercises or operations due to tick bites have caught the attention of military physicians, and so they have started to look for better ways to prevent such problems by making military equipment more resistant. This study aims to evaluate and present the findings obtained from medical diagnosis and follow-up of military personnel admitted to the relevant units due to tick bites.

Material and Method: In this study, which was planned as a single-center observational study, all volunteer military patients who applied to the Emergency Service of Military Medical Faculty Hospital with the complaint of tick bite between December 2012 and December 2013 were included. . The Hospital, where the study was conducted, is a third-level hospital that accepts patients by referral from neighboring provinces and is the largest military hospital in Turkey.

Results: 101 of 89421 patients had a complaint of tick bite. 79 of these patients consisted of military personnel. Of the 79 patients, 76 were found to be male (96%) and 3 were female (4%). The average age was 24 years. The ticks attach to the body of 12 (15%) of 79 patients were removed by the medical personnel. The bites were observed to be in the head and neck (8.8%), torso (17.7%), upper extremity (24%), lower extremity (45.5%) and genital area (3.8%). There was no statistically significant relationship between the change in vital symptoms of patients and the presence of ticks in their physical examination, as well as between the change in vital findings and the location of bite site (p>0,05). In addition, there was no statistically significant relationship between the change in leukocyte, AST, ALT, LDH, PTZ and other biochemical parameters and the presence of ticks in the examination, as well as a change in biochemical parameters and the bite site (p>0.05). Patients were followed for 10 days. None of the 79 patients progressed the disease; no patients died, and all of them recovered and were discharged from the hospital.

Conclusion: The clinical and laboratory findings related to tick bite may not be always observed on the visiting military personnel, and different diseases such as Crimean-Congo hemorrhagic fever, hantavirus infections, leptospirosis and borreliosis diseases could be observed; therefore, the interrupt of military operation is not thought to be necessary due to tick bite related causes Only all tick bites in endemic areas and patients in the risk group with complaints can be followed up and if necessary, it can be ensured that they do not participate in military operations and trainings.

Keywords: Soldier, military operation, tick, tick bite, emergency service

Öz

Giriş: Kene ısırması riskli yüksek olan kırsal bölgelerde gerek operasyonlar, gerekse eğitimler şeklinde mesleğini icra etmek zorunda olan askeri personel bu hastalıklar açısından riskli grupların başında gelmektedir. Kene ısırması nedeniyle askeri hastanelerin acil servislerine başvuru sayısında ciddi bir artış olması ve askeri tatbikat ya da operasyonda kene ısırmaları nedeniyle yavaşlama-durmalar bu hastalığa askeri hekimlerin ilgisini arttırmış, bu tür kayıpların önlenmesi için askeri teçhizatın dirençli hale getirilmesi de dahil ciddi arayışlar içerisine girilmesine yol açmıştır. Bu çalışmanın amacı; kene ısırması nedeniyle başvuran askeri personelin tıbbi tanı ve takibinin değerlendirilerek sunulmasıdır.

Gereç ve Yöntem: Tek merkezli gözlemsel çalışma olarak planlanan bu çalışmaya Aralık 2012-Aralık 2013 tarihleri arasında kene ısırması şikayetiyle müracaat eden gönüllü tüm asker hastalar dahil edildi. Çalışmanın yapıldığı Hastane, çevre illerden sevk ile hasta kabul eden 3. basamak bir hastanedir ve Türkiye'nin en büyük askeri hastanesidir.

Bulgular: Toplam 89421 hastadan 101 tanesinde kene ısırması şikayeti vardı. Bu hastaların 79 tanesi askeri personelden oluşuyordu. 79 hastanın 76'sı erkek (%96) ve 3'ü kadındı (%4). Hastaların ortalama yaşı 24 idi. 79 hastadan 12(%15) hastadaki kene sağlık personeli tarafından çıkarıldı. Isırmalar vücut bölgeleri sırasıyla baş-boyun (%8,8), gövde (%17,7), üst ekstremite (%24), alt ekstremite (%45,5) ve genital (%3,8) görüldü. Hastaların vital bulgularında değişiklik ile muayenesinde kene bulunması arasında ve vital bulgularında değişiklik ile ısırılma bölgesi arasında istatistiksel olarak anlamlı ilişki saptanmadı ((p>0,05). Ayrıca lökosit, AST, ALT, LDH, PTZ ve diğer biyokimyasal parametrelerde değişiklik ile muayenesinde kene bulunması arasında ve biyokimyasal parametrelerde değişiklik ile ısırılma bölgesi arasında istatistiksel olarak anlamlı ilişki saptanmadı (p>0,05). 79 hastanın hiçbirinde hastalık gelişmedi, ölen hasta olmadı ve tamamı iyileşerek taburcu edildi.

Sonuç: Kene ısırması ile gelen askeri personelde her zaman klinik ve laboratuar bulgu olmayabileceği, Kırım Kongo Kanamalı Ateşi, hantavirüs enfeksiyonları, leptospirosis, borelliozis ve riketsiyoz gibi farklı hastalıkların olabileceği, bu sebepten askeri operasyonlara ara verilmesine gerek olmadığı düşünülmektedir. Yalnız endemik bölgelerdeki tüm kene ısırıkları ve şikayeti olan risk grubundaki hastaların takibi yapılabilir ve gerekirse askeri harekat ve eğitimlere katılmamaları sağlanabilir.

Anahtar Kelimeler: Asker, askeri operasyon, kene, kene ısırması, acil servis

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INTRODUCTION

Ticks transmit many infectious diseases. These diseases may cause serious symptoms such as bleeding as well as some other initial symptoms such as fever. They can even be fatal by affecting many other organs, showing a severe course.[1-3] These diseases may include Crimean-Congo Hemorrhagic Fever, Hantavirus infections, leptospirosis, borreliosis and rickettsiosis.[4,5] Of the 878 known tick species, 30 carry the agents causing the disease. In nature, the cycle is in the form of tick-vertebrate-tick. It can be found in cattle, sheep, hedgehogs, rabbits, horses, donkeys, goats and pigs.[6] The only hosts in which the disease has been identified are humans, and they do not cause disease in animals.[6-8] Ticks usually live in thickets, grasses, lawns, forests, animal shelters.[9] When ticks bite, they do not hurt because they secrete narcotizing liquid, and meanwhile, they infect viruses and bacteria in the digestive system.[6] The diseases can be observed in various parts of the world, especially in Europe and Africa, and some of them may even be endemic.

As can be understood from the geographical location of Turkey, being close to Europe and Asia, it is one of the countries where tick-borne diseases are common. Another factor affecting the epidemiology of the disease, other than geographical location, is the professions of those infected with this disease.[3] Military personnel who have to perform their profession in rural areas, where they are more likely to be exposed to tick bites, are among the groups at the highest risk for this disease.[2,3] The fact that the disease can lead to loss during the military training performed except the times of conflict, the considerable increase in the emergency visits to military hospitals due to tick bite, the pause and slow down in the military exercises or operations due to tick bite have attracted the attention of military physicians, and they have started to look for solutions such making military equipment more resistant to prevent serious losses. Some of these are long-acting drugs such as Permethrin, which is rarely absorbed from the skin and can stay for a long time, insect repellents called 'Repellent' (Dietiktoluamide) are absorbed into people's clothing in the form of spray or liquid and are safe drugs as their toxicity is low.[10,11]

Favourable climatic conditions throughout Europe and Turkey, the abundance of ticks, the trade of wild animals and their interaction with domestic animals, tourist and refugee movements have been the basis for the disease and its spread. The risk of developing potentially fatal diseases in soldiers exposed to tick bites causes great concern in military medicine. Turkey is among the most populous armies in the world with over 450 thousand soldiers. Hospital, which is a third-level hospital that accepts patients by referral from neighboring provinces, is Turkey's largest military hospital. This study aims to examine the medical diagnosis and follow-up of patients admitted to the Emergency Department of Hospital due to tick bites and present the relevant findings.

MATERIALS AND METHOD

This study was designed as a single-center observational study. Relevant permission was received from the Ethics committee of Hospital on 05.12.2012 and numbered 2012/11. Of the 89421 patients who applied to Hospital Emergency Department between December 2012 and December 2013, 101 had a complaint of tick bites. Of these patients, 79 were military personnel who voluntarily agreed to participate in the study. Other patients who were not volunteers and were not military personnel were excluded from the study.. In the study, sociodemographic data form and tick bite follow-up form prepared specifically for this study were used. In this form, the patients' socio-demographic data, along with how the bite occurred (the place where you were bitten, bitten body part, species of biting ticks) initial vital symptoms and physical examination findings, initial laboratory measurement values (hemogram, biochemical parameters, bleeding parameters), and whether drug treatment was needed, if needed, the reasons for this and the interventions applied; and physical examination and laboratory findings during the follow-up period. As a standard all of the cases were reinvited to the Emergency Department for follow-up evaluation after 10 days and the related parameters were filled through follow-up measurements and evaluations in the relevant form.

Statistical Analysis

Jamovi version 1.6.18 program was used in the statistical analysis of the data, The data were expressed in the form of mean, standard deviation and percentage. The Kolmogorov-Smirnov test was used to check the distribution of the data. The continuous variables with a nonparametric distribution were compared with the Wilcoxon test, and the continuous variables with parametric distribution were compared with the Paired T-test. The McNemar test was used to examine the relationship between the two variables. The discrete variables (gender, presence of tick, bite site) were compared with the Chi-Square test. $P<0.05$ value was considered statistically significant.

RESULTS:

Of the 79 patients, 76 were male (96%) and 3 of them were female (4%). The average age of the patients was 24 (19-48) (**Table 1**). Medical personnel at the hospital removed the ticks in 12 (15%) patients. When all admission and control laboratory tests of the patients were compared, no statistically significant relationship was found between them. ($p>0.05$) (**Table 1**). Bites were observed in the following body parts; genital 3 (3.8%) head-neck 7(8.8%), torso 14 (17.7%), upper extremity 19 (24%), lower extremity 36 (45.5%), respectively (**Table 2**). There was no statistically significant relationship between the bite area and the increase in vital symptoms; between the rise in vital symptoms and the presence of the tick in the initial

examination (**Table 2**). Of the patients, 4 (5%) had fever at the initial stage and 5 (6%) had leukocytosis. There was no statistically significant relationship between the laboratory tests of patients at the arrival and control stage when they were compared with the McNemar test (p>0.05) (**Table 3**). In addition, there was no statistically significant relationship between an increase in biochemical parameters and the presence of ticks in the examination, as well as an increase in biochemical parameters and bite site (p>0.05). None of the 79 patients developed the disease; no patients died, and all of them recovered and were discharge from the hospital.

Table 1. Demographic and Clinical Characteristics of All Patients

	Average	Min-Max
Age	24.0	(19-48)
Gender (Female/Male)	3/79	
Initial fever measured	36.6	(36.3-38.7)
Pulsation on arrival	72	(61-88)
Arterial Pulse on arrival	110/70	(90/60-130/80)
Control fever	36.7	(36,5-36,8)
Control pulse	70	(64-86)
Control arterial pulse	110/70	(90/60-130/80)

Table 2. The Statistical evaluation of patients who visit the clinic with ticks on examination

	Tick on examination Yes	No	Total	p value
Bite site, lower extremity	8	28	36	
Bite site, upper extremity	3	16	19	
Bite site, torso	1	13	14	
Bite site, genital	0	3	3	
Bite site, head and neck	0	7	7	
Bite site	**12**	**67**	**79**	**0.422**
Vital symptoms on follow-up (higher)	0	4	4	
Vital symptoms on follow-up (remain normal)	12	63	75	
Vital symptoms on follow-up	**12**	**67**	**79**	**0.385**
Control laboratory value (higher)	1	4	5	
Control laboratory value (remain normal)	1	16	17	
Control laboratory value	**2**	**20**	**22**	**0.334**
Control laboratory value (higher)	3	25	28	
Control laboratory value (remain normal)	9	42	51	
Control laboratory value	**12**	**67**	**79**	**0.412**

Table 3. Control Laboratory Values of All Patients on Arrival

	N	Mean	SD	Median	p value
Initial Wbc	79	7.89	1.71	7.60	
Control Wbc	79	7.68	1.35	7.60	0.354
Initial LDH	79	349	82.1	336	
Control LDH	79	340	67.4	338	0.622
Initial CK	79	174	364	106	
Control CK	79	160	211	102	0.226
Initial AST	79	24.3	9.19	23.0	
Control AST	79	23.4	7.82	23.0	0.117
Initial ALT	79	22.7	6.43	23.0	
Control ALT	79	23.1	6.15	23.0	0.221
Initial Plt	79	274	53.2	274	
Control Plt	79	272	53.3	271	0.824
Initial PT	79	14.3	1.53	14.0	
Control PT	79	14.6	1.22	15.0	0.123
Initial Sed	79	10.1	3.81	10.0	
Control Sed	79	10.0	3.69	10.0	0.933

Wbc: White blood cell, LDH: Lactate dehydrogenase, CK: Creatine phosphokinase, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, Plt: Platelet, PT: Prothrombin time, Sed: Sedimentation.

DISCUSSION

In this study, medical status and follow-up data of 79 military personnel admitted to the emergency department due to tick bites were presented. As much as we know, this study is the follow-up study conducted with the most extensive sample examining the tick bites in military personnel. In a study conducted in 2008/2009 and 2012-2014, during a total of 36 months of training, the tick bites and emerging diseases of 1156 fresh military personnel were examined through their medical records. In this study, 66 cases of tick bites were found during 317,059 hours of field training. In only one of these cases, the bite resulted in an infection that required treatment. It was found that the risk of tick bites is associated only with the season. Similarly, our study found no relationship between the risk of tick bite and other variables and did not result in an infection requiring treatment.[12] In a study conducted by LG Goldfarb et al., one out of every five people who go to the hospital due to a tick bite reported developing a tick-borne infection and reported a 0.215' probability of developing the disease.[13] In a study conducted on tick-borne disease in Turkey, 90% of cases are farmers,[1,14,15] the second most affected group is health workers.[3] In a large-scale study conducted between 2002 and 2010, 4453 patients were infected with a tick-borne infection and 218 of them died.[16]

In a study conducted on a civilian population in the same region as this study in Turkey, it was found that 9 out of 70 patients (12.9%) died in a hospital due to an infection that developed after a tick bite.[17] It is noteworthy that 94 percent of the patients who developed an infection in this study were farmers. In addition, the average age of the patients in this study is 49. This may be related to the type of ticks that live on agricultural land, as well as to the predisposition of elderly patients to the disease.

Similar to the results obtained with this study, it is observed that in many studies, no predictive relationship could be established between the prognosis and blood parameters after a tick bite, since the infection development rates are very low. However, in a study conducted by D. Öztürk Engin et al., it is stated that leukocytosis was measured in the initial parameters of a patient who died.[18] In a study on tick bites in 6 patients out of 8 cases and fever was experienced in all of them; leukopenia was measured in 8 patients and thrombocytopenia was measured in 7 patients.[18] Aspartate aminotransferase (AST) (mean 107 U/L) and alanine aminotransferase (ALT) (mean 117 U/L) were found to be high in all cases. Lactate dehydrogenase (LDH) (mean 636 U/L) was high in 6 of them, and creatine phosphokinase (CK) (mean 266 U/L) was found to be high in 4 of them.[18] In another study, the increase in AST, the decrease in platelet count and the increase in Activated Partial Thromboplastin Time (aPTT), Prothrombin Time (PT) and International Normalized Ratio (INR) values were found to be statistically significant.[17]

In many studies, the mean ALT level was 137 U / L in the surviving patients, but there were no significant differences.[15,17] The CK values of the lost patients were measured as 588 and 1307, respectively, but there was no statistically significant difference between them and the surviving patients.[17] In our study, although leukocytosis was observed in 5 (6%) patients initially, the clinical findings of these patients did not worsen and these values returned to normal after follow-up. AST (mean 24 U/L) was found to be high in 4, LDH was high in 4 (mean 349 U/L), and CK was high in 15 (mean 173 U/L). ALT (mean 22 U/L), PLT (mean 274 x10.e3/microL) and other tests were found to be normal in all patients (**Table 3**).

In our study, no clinical infection development was observed in any case. Although one of the reasons for this could be that serological examination has not been performed and possible asymptomatic transmission cannot be measured, the low seroprevalence of the tick-borne virus could also be considered as a factor. Only 3 (1.16%) of 516 blood donors were positive in a serological study informing about the circulation of the causative agent of tick-borne infection in asymptomatic individuals in Spain.[19] Interestingly, it was found that one-fifth of these individuals are engaged in animal husbandry.[19] In addition, in the study investigating the tick exposure of military personnel in the field of military training in Germany between January and December 2009, 566 personnel were exposed, and the overall seroconversion rate was found to be 1.7%.[20]

The results obtained with this study support studies that have revealed that tick-borne infections observed in military personnel are less risky than in people engaged in animal husbandry and farming. However, these results do not support the former studies suggesting that military personnel take extra precautions such as using factory-treated, long-lasting permethrin-impregnated clothing for tick bites in field operations or even pausing military operations due to tick bites.[11]

However, it should be remembered that there may not always be clinical and laboratory signs in military personnel visiting clinics due to a tick bite.[21] For this reason, it is recommended to have tracking algorithms and follow-up protocols for patients coming to military hospital emergency departments due to a tick bite.

CONCLUSION

The clinical and laboratory findings related to tick bite may not be always observed on the visiting military personnel, and different diseases such as Crimean-Congo hemorrhagic fever, hantavirus infections, leptospirosis and borreliosis diseases could be observed; therefore, the interrupt of military operation is not thought to be necessary due to tick bite related causes. Only all tick bites in endemic areas and patients in the risk group with complaints can be followed up and if necessary, it can be ensured that they do not participate in military operations and trainings.

Limitations

The Hospital, where the study was conducted, is a third-level hospital that accepts patients by referral from neighboring provinces and is the largest military hospital in Turkey. Despite this, the lack of significant difference between the variables may be due to the small number of participants. Since there are not many recent studies on military personnel, it has been compared with a limited number of studies.

ETHICAL DECLARATIONS

Ethics Committee Approval: Relevant permission was received from the Ethics committee of Hospital on 05.12.2012 and numbered 2012/11.

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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