Original Investigation/ *Özgün Araştırma*

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The Evaluation of Clinical and Laboratory Findings of Pediatric Patients Applying with Tick Exposure

Kene Tutunması ile Başvuran Çocuk Hastaların Klinik ve Laboratuvar Bulgularının Değerlendirilmesi

Ayça Kömürlüoğlu[1], Kamile Arıkan[2], Eda Karadağ Öncel[2], Ateş Kara[2], Mehmet Ceyhan[2], Ali Bülent Cengiz[2]

[1] *Clinic of Pediatric Health and Diseases, Gurun State Hospital, Sivas, Turkey*
[2] *Department of Pediatric Health and Diseases, Hacettepe University School of Medicine, Ankara, Turkey*

Abstract

Objective: Crimean-Congo hemorrhagic fever (CCHF) is the most widespread, tick-borne viral disease affecting humans. CCHF first emerged in Turkey in 2002, and the prevalence of the disease has been found to be increased. Central Anatolia Region is endemic for the disease where sporadic cases or even outbreaks are being observed every year. The study was aimed to evaluate sociodemographic, clinical and laboratory parameters of children admitted due to tick bite and prediagnosis of CCHF and to discuss necessity of repeated blood sampling in asymptomatic cases.

Material and Methods: Between January 2014 and December 2016, hospitalized or outpatient pediatric cases (< 18 years) whom had tick bite in the Infectious Diseases Unit of Hacettepe University İhsan Doğramacı Children's Hospital were enrolled in the present study. Gender, age, contact region with tick, physical examination and laboratory findings of cases and occurence of CCHF were evaluated.

Results: In this study, 74 female (45.4%), 89 male (54.6%), a total of 163 cases were evaluated. The mean age of our cases was 7.49 ± 3.9 years. The most common admission was seen in the month of August. Tick was frequently removed from the region of the head and neck (56.1%). Among patients 6 of whom diagnosed CCHF and discharged without any complication. In patients without CCHF (90.4%) had any symptoms during follow-up and most of them (92.3%) had normal laboratory findings on admission, 3 and 7-10 days. Symptoms such as fever, malaise, vomiting, abdominal pain, headache and rash was significantly common in patients with CCHF (all of them p< 0.001) and they had at least one abnormal laboratory parameter on admission.

Özet

Giriş: Kırım Kongo kanamalı ateşi (KKKA), insanlarda görülen en sık kene ilişkili hastalıktır. KKKA Türkiye'de ilk olarak 2002 yılında görülmüş ve prevalansı giderek artmıştır. Orta Anadolu hastalık için endemiktir ve her yıl sporadik olgular ya da salgınlar görülebilmektedir. Bu çalışmada kene tutunması şikayetiyle hastanemize başvuran çocuk hastaların demografik özelliklerinin belirlenmesi, klinik bulgularının incelenmesi ve laboratuvar sonuçlarının değerlendirilmesi, asemptomatik olgularda erken dönemde laboratuvar tetkiklerinin gerekliliğinin tartışılması amaçlanmıştır.

Gereç ve Yöntemler: Ocak 2014-Aralık 2016 tarihleri arasında Hacettepe Üniversitesi İhsan Doğramacı Çocuk Hastanesi'ne kene ısırığı şikayetiyle ayaktan başvuran çocuk hastalar (< 18 yaş) bu çalışmaya dahil edildi. Cinsiyet, yaş, kenenin tutunduğu bölge, fizik muayene ve laboratuvar bulguları ve KKKA meydana gelme durumu değerlendirildi.

Bulgular: Bu çalışmada 74 (%45.4)'ü kız, 89 (%54.6)'u erkek olmak üzere toplam 163 olgu değerlendirildi. Olguların ortalama yaşı 7.49 ± 3.9 yıldı. En sık başvuru Ağustos ayında görüldü (%19). Kene sıklıkla baş-boyun bölgesinden çıkarılmıştı (%56.1). Bu hastalardan altısı KKKA tanısı aldı ve hepsi komplikasyonsuz olarak taburcu edildi. KKKA gelişmeyen hastaların %90.4'ünde takip boyunca herhangi bir semptom görülmedi ve bunların büyük kısmının (%92.3) başvuru, üçüncü ve 7-10. günlerde laboratuvar bulguları normaldi. Ateş, halsizlik, kusma, karın ağrısı, başağrısı ve döküntü gibi semptomlar KKKA olan hastalarda istatistiksel olarak daha sıktı (tüm değerler için p< 0.001) ve hepsinin başvurudaki laboratuvar parametrelerinden en az biri anormaldi.

Correspondence Address / Yazışma Adresi:

Kamile Arıkan
Hacettepe Üniversitesi Tıp Fakültesi, Çocuk Sağlığı ve Hastalıkları Anabilim Dalı, Ankara-Türkiye

E-mail: kamile.arikan5@gmail.com

Conclusion: Physical examination must be done carefully in patients presenting with tick bite and tick should be removed with an appropriate tecnique. Selected patients without any alarming symptoms may be follow-up without blood tests due to increased costs.

Keywords: Tick bite, Crimean-Congo hemorrhagic fever, symptoms, laboratory

Sonuç: Kene tutunması ile başvuran hastalarda fizik muayene dikkatli bir şekilde yapılmalı ve kene uygun bir teknikle çıkarılmalıdır. Ciddi semptomu olmayan seçilmiş hastalar artan maliyetler nedeniyle kan tetkikleri alınmadan izlenebilir.

Anahtar Kelimeler: Kene tutunması, Kırım Kongo kanamalı ateşi, semptomlar, laboratuvar bulgular

Introduction

Viral hemorrhagic fever (VHF) infections are clinical syndroms generated by different viruses in humans that progress with fever and hemorrhage. Symptoms such as diarrhea, muscle pain, cough, penumonia, encephalopathy, and hepatitis are seen during the course of this group of infections. Crimean-Congo Hemorrhagic Fever (CCHF) is a fatal disease with a mortality rate of 5-30%, whose agent is an RNA virus defined in the Nairovirus species in the family Bunyaviridea (1). The disease, for the first time in history, was seen in summer in the years of the Second World War among the Soviet soldiers helping rural works in Western Crimea and affected more than 200 people (2). The disease was determined to have transmitted by ticks and was referred to as Crimean Hemorrhagic Fever. The first case in Turkey was detected in Tokat province located in Kelkit Valley in 2002 (3). CCHF is seen endemically in the northeastern part (Tokat, Amasya, Sivas, Gümüşhane, Yozgat and Çorum) in Turkey. A total of 9069 CCHF cases were reported between the years 2002 and 2014, and 4.8% of these cases were lost (4-6).

CCHF virus circulates within the tick-vertebrata-tick cycle in nature and even though the virus is isolated from 30 types of tick, the most important tick types proved to be vectors today belong to the *Hyalomma* species (7,8). It is seen in studies that *Hyalomma marginatum, Hyalomma anatolicum* and *Dermacentor marginatus* have been detected in all geographical regions (9). CCHF virus is transmitted to humans by infected ticks that suck blood, through contact to blood or bodily fluids of CCHF patients or viremic animals or by crushing the infected ticks with bare hands. The course of the disease typically has four stages including incubation, prehemorrhagic, hemorrhagic and convalescence. The incubation period of the disease ranges from 3 to 14 days depending upon way of transmission, viral load and the state of host's immunity. The prehemorrhagic stage starts with complications such as sudden fever after the incubation period, extensive muscle pain, severe headache, cold, shivering, nausea-vomit, diarrhea, redness on the face and conjunctiva, photofobia and maculopapular skin eruption (1,9,10). Symptoms such as subcutaneous bleeding like petechial, purpura and ecimosis, and gingival, nasal, vaginal, gastro-intestinal, urinary, pulmonary and cerebral bleeding that belong to the hemorrhagic stage are seen during progressive periods of the disease (1,11,12). Impaired consciousness, agitation, hepatorenal failure, respiratory distress, disseminated intravascular coagulopathy, shock and coma can develop and progress into mortality in severe cases (13). In laboratory findings, increase in levels of thrombocytopenia, leucopenia, aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactate dehydrogenase (LDH) and creatine phosphokinase (CK) and prolongation in prothrombin time (PT), active partial thromboplastin time (aPTT) and in other coagulation tests are observed. Decrease in fibrinogen level and increase in fibrin catabolites can be encountered (1,14,15). Mortality is generally observed on the second week of clinical findings. Cases with a mild to moderate clinical course recover in 9-10 days. Full recovery process usually takes place in a time period of 2-6 weeks. Sequel is not usually observed in cases that recover (14). Definitive diagnosis of the disease is made by reverse transcriptase polymerase chain reaction (PCR) or by virus isolation in the early period and serologically by enzyme-linked immunosorbent assay (ELISA) and by the detection of specific IgM antibodies through indirect immunofluorescence antibody (IFA) after the seventh day of the disease (9).

Number of patients applying to emergency services due to tick exposure increases in spring and summer months. Basic approach in patients with tick exposure includes the appropriate removal of the tick from the body and clinically following the case closely. The aim of this study was to determine the demographic characteristics of pediatric patients applying to our hospital with tick exposure, examine clinical findings, evaluate laboratory results and discuss the necessity of laboratory tests in the early period in asymptomatic cases.

Materials and Methods

The files of 163 patients applying to the Pediatric Infectious Diseases Outpatient Clinic of Hacettepe Üniversitesi İhsan Doğramacı Children's Hospital between 01.01.2014-31.12.2016 for tick exposure were retrospectively examined after approval from Non-invasive Clinical Research Ethics Board had been received. Demographic characteristics of the patients, application date, county/province of the patient, complaints on application, the area of tick exposure, the time

elapsed between tick exposure and application to hospital, physical examination and clinical findings, full blood count on admission, third, and 7-10 days, blood biochemistry, hemorrhage parameters and state of admission to hospital were recorded.

A thorough physical examination was performed in all cases that applied with the complaint of tick exposure and all areas of the body were inspected. In cases with tick on their bodies, the tick was removed with a curve-tipped forceps, and wound cleaning was carried out with antiseptic solution. Patients applying due to tick exposure whose full blood count, AST, ALT, LDH, CK, aPTT, PT and international normalized ratio (INR) values were sent were retrospectively reviewed. After initial examination on the day of application, the patients were re-evaluated on days 3,7-10. Patients with suspected CCHF were admitted to Pediatric Infectious Diseases Unit. Viral genom and/or CCHF immunoglobulin M antibody was investigared with real-time PCR (RT-PCR) by having sent blood samples from suspected cases to Public Health Agency of Turkey in Ankara.

After having received the approval of the ethics board, the data of all patients included into the study was examined retrospectively from computer records. Anemia, leucopenia and thrombocytopenia were defined as being under the lower limit of hemoglobin, leucocyte and thrombocyte count with regard to age groups. When ALT, AST, CK, LDH, aPTT, INR values were twofolds the laboratory reference values, they were evaluated as high ALT, AST, CK, LDH and prolonged INR and aPTT.

SPSS (Statistical Package for Social Sciences) for Windows 21 was used for statistical analyses. Conformity of the variables to normal distribution was examined through visual (histogram and probability graphics) and analytic methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). Defining statistics were carried out by number and percentage for categorical variables, by giving mean ± standard deviation for continuous variables with normal distribution and median (minimum-maximum) for continuous variables without normal distribution. Pearson Chi-Square test was used for the comparison of categorical variables. The variabes were compared between the groups using Student-T test and Mann-Whitney U test. P value below 0.05 was considered statistically significant.

Results

When a total of 163 patients applying with tick exposure for a period of 3 years were retrospectively reviewed, it was concluded that six of the patients were admitted to Pediatric Infectious Diseases Unit with a preliminary diagnosis of CCHF and 157 patients were followed as outpatients and CCHF did not develop. Seventy-four (45.4%) of the patients were females and 89 (54.6%) were males; mean age was 7.49 ± 3.9 years (minimum 1.5-maximum 18 years). When the patients were evaluated as regards age groups, forty-nine (30.1%) patients were between 1-5 years, 85 (52.1%) were between 6-10 years and 29 (17.8%) were 10 and over.

It was confirmed that seventy (42.9%) of the applications were made in 2014, 48 (29.4%) in 2015 and 45 (27.7%) in 2016. Thirty-one (19%) applications were determined to have been made in August (Figure 1). It was seen that the majority of applications for tick exposure were from Ankara and its counties (n=142, 87.1%). Figure 2 shows the regional distribution of the applications.

The site of tick exposure of 123 out of 163 cases could be reached in patient records. Tick exposure was mostly encountered in the head-neck region (n= 69, 56.1%). The tick

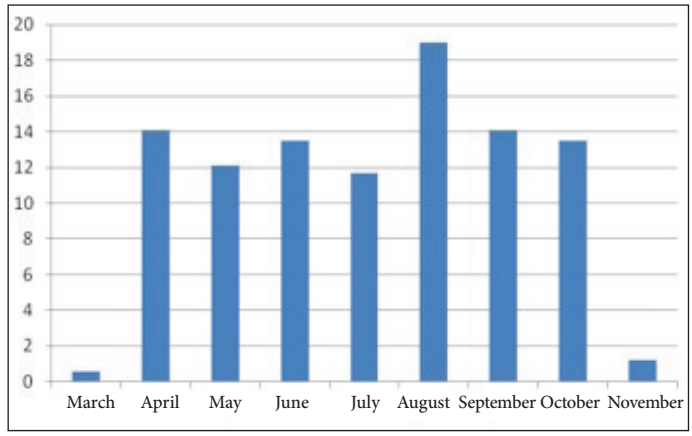

Figure 1. Case distribution according to months (%).

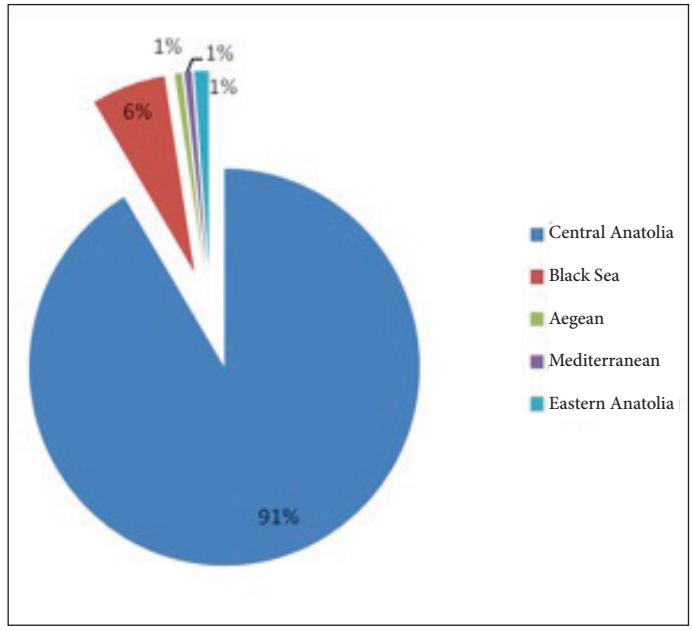

Figure 2. Regional distribution of the cases applying with tick exposure.

Table 1. Distribution of tick exposure sites according to age groups

Age (year)	Head-Neck n (%)	Truncus n (%)	Upper extremity n (%)	Axilla n (%)	Groyne-genital region n (%)	Lower extremityn (%)
1-5	18 (52.9)	4 (11.8)	5 (14.7)	3 (8.8)	2 (5.9)	2 (5.9)
6-10	42 (61.8)	9 (13.2)	2 (2.9)	3 (4.4)	9 (13.2)	3 (4.4)
>10	9 (42.9)	3 (14.3)	2 (9.5)	0 (0)	3 (14.3)	4 (19)
Total	69 (56.1)	16 (13)	9 (7.3)	6 (4.9)	14 (11.4)	9 (7.3)

was re moved from the scalp in 26 of these patients, behind the ear in 27, from the neck in 14 and from the cheek in 2. Other frequent sites of tick exposure were truncus (n= 16, 13%) and groyne and genital region (n= 14, 11.4%). Table 1 demonstrates the age groups of the cases and tick exposure sites. Head-neck region involvement was found to be higher in small age groups and involvement in truncus, groyne-genital region and lower extremity was more frequently observed in cases > 10 years of age; however, a statistically significant difference was not found between tick exposure sites as regards the age groups (p= 0.17).

Although tick typing is not recommended in routine practice, ticks belonging to the *Hyalomma* species were detected in 22 and ticks belonging to the *Rhipicepholus* species were found in 3 of the 25 cases sent to Public Health Agency of Turkey for tick typing. The elapsed time between tick exposure and application to our hospital was 1 ± 2.08 days (minimum same day- maximum 10 days). One hundred and twenty (73.6%) of the patients applied to hospital the day the tick was removed, and the tick was removed by the patient him/herself or by emergency service doctors on the day of application. Eight patients (4.9%) applied to hospital on the first day of tick removal, 2 patients (1.2%) on the second day, 16 patients (9.8%) on the third day, 4 patients (2.5%) on the fourth day, 12 patients (7.4%) on the seventh day and 1 patient (0.6%) on the tenth day.

Six of the 163 cases included into the study received CCHF diagnosis, of whom 3 were females (50%) and 3 were males (50%). Mean age was 11.3 ± 5.03 years (minimum 3 years 9 months, maximum 17 years 8 months). The patients applied to hospital in May, June, August, October and November. While CCHF is seen more frequently between the months April and October, it was regarded interesting for one case, age 6, from Çorum to have applied in November. Leading provinces where the disease is extensively encountered include Erzurum, Erzincan, Gümüşhane, Bayburt, Tokat, Yozgat, Sivas, Amasya, Çorum, Çankırı, Bolu, Kastamonu, and Karabük. In our study, two patients were from Çankırı, 1 from Kastamonu, 1 from Mardin, 1 from Çorum, and 1 from Ankara Kızılcahamam. Even though Mardin is a province where these cases are not frequently seen, CCHF was diagnosed in a 15-year-old patient from Mardin in August 2014. This situation can be explained by the recent expansion of the area the disease is seen and by the reports of sporadic cases from nearly every corner of our country. T negativity and bradycardia were confirmed on electrocardiography during ribavirin use in one patient from Mardin and the patient recovered after ribavirin use was stopped. It was found out that patients from Çankırı (aunt) and Kastamonu (grandmother) were that patient's relatives treated for CCHF.

Tick exposure site in three patients was recorded as head-neck region. Along with not recommending tick typing in routine practice, tick type in two patients was detected as *Hyallomma* spp. The mean time elapsed between tick exposure/removal to hospital application was 3.83 ± 1.94 days (minimum same day maximum 7 days) .

90.4% (142/157) of the patients who applied with tick exposure but in whom CCHF did not develop did not have an active complaint during application. All of the patients in whom CCHF developed had at least one complaint during application. Table 2 shows the most frequently observed complaints during application in groups in whom CCHF developed and did not develop. Fever, malaise, vomiting, headache and rash was seen statistically more in patients in whom CCHF developed (p< 0.001 for all values). Laboratory tests on application, day 3 and days 7-10 of the 131 patients out of 142 (92.3%) who were asymptomatic during application and did not develop CCHF were found normal. Laboratory examinations on application, day 3 and days 7-10 of the patients who applied with tick exposure and did not develop CCHF were normal in 89.8% (n= 141). While at least one anomaly was detected in cases with CCHF diagnosis (6/6), anomaly in laboratory findings in the group that did not receive CCHF diagnosis was present in only 10.2% of the patients (16/157). Anemia was seen in two of the patients (33.3%) that developed CCHF, leucopenia in 3 (50%) and thrombocytopenia in 5 (83.3%). AST elevation was detected in 4 patients (66.6%), ALT elevation in 2 (33.3%), CK elevation

Table 2. Symptoms and findings in patients applying with tick exposure

Clinical findings	Cases with CCHF diagnosis (n= 6)	Cases without CCHF diagnosis (n= 157)	p
Fever	6 (100)	8 (5)	< 0.001
Headache	3 (50)	1 (0.6)	< 0.001
Nasal discharge	1 (16.6)	2 (1.2)	0.1
Stomachache	4 (66.6)	4 (2.4)	< 0.001
Skin eruption	3 (50)	1 (0.6)	< 0.001
Nose bleed	-	2 (1.2)	0.78
Vomiting	5 (83.3)	6 (3.8)	< 0.001
Malaise	5 (83.3)	3 (1.9)	< 0.001
Petechia/purpura	3 (50)	-	< 0.001
Data were shown as n (%) value.			

Table 3. Laboratory results of the patients on application

Laboratory data	Cases with CCHF diagnosis (n= 6)	Cases without CCHF diagnosis (n= 157)	p
Hb (g/dl)[a]	12.4 ± 0.97	12.7 ± 1	0.49
BK ($x10^3$/µL)[a]	5.58 ± 5.3	9.25 ± 3.3	0.019
Thrombocyite[a] ($x10^3$/µL)	93.4 ± 47.9	317 ± 76.4	< 0.001
AST (U/L)[a]	110 ± 76.4	34.5 ± 34.2	< 0.001
ALT (U/L)[b]	45 (11-88)	34.5 (16-420)	0.371
LDH (U/L)[a]	391.3 ± 173.2	286.5 ± 180.8	0.17
CK (U/L)[b]	324 (47-1010)	116 (8-22680)	0.86
aPTT(sn)[a]	33.1 ± 6.2	29.6 ± 21.3	0.72
INR[α]	1.22 ± 0.31	1.08 ± 0.089	0.003
AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, LDH: Lactate dehydrogenase, CK: Creatine kinase, aPTT: Active partial thromboplastin time, INR: International normanlized ratio, [a]: Data shown as mean ± standard deviation, [b]: Data shown as median (minimum-maximum).			

in 4 (66.6%), LDH elevation in 3 (50%), and two patients (33.3%) had prolonged INR and one had prolonged aPTT. While leucopenia was ecountered in two (1.2%) and anemia in 1 (0.6%) patient in the group that did not develop CCHF, thrombocytopenia was not seen in any cases. AST elevation was seen in two (1.2%), ALT elevation in 3 (1.9%), and LDH and CK elevation in 5 patients (3.1%) each. INR prolongation was present in eight (5%) and aPTT elevation was seen in 2 (1.2%) patients. Table 3 demonstrates the laboratory results of the cases in both groups.

Diagnosis was established in 3 (50%) of the 6 patients that received CCHF diagnosis by RT-PCR and by immunoglobulin M antibody positivity in the remaining 3 patients. All of these patients were discharged without sequel.

Discussion

Demographic characteristics, clinical features and laboratory results of pediatric patients that applied to hospital with tick exposure were evaluated in our study. Together with print and mass media coverage of tick exposure and related deaths, serious concern, sensitivity and awareness have developed in our public. As a consequence, application to emergency services or infectious diseases outpatient clinics for tick exposure have risen in recent years in comparison to past years (9).

Climate change is one of the factors increasing prevalence in tick-born disease. Many cases occur in spring and summer months. It has been reported in studies conducted in our country that the incidence of ticks rise with the increase in temperature, show seasonal characteristics and occur between

the months May and September (16-21). These are the months when children go more frequently to countrysides and picnic areas, and thus, it is the period when contact risk with ticks is the highest. Emergency service applications due to tick exposure in our study were made mostly in August (19%) and application months of the patients were found similar to the data in the literature.

Tick bite cases are encountered at every age and in both genders. While the rate of female cases has been found as 56% in a study by Akarsu et al. carried out in pediatric age group (22), this rate has been determined as 68% in a study by Taşkesen et al. (23). Moreover, the rate of male cases has been respectively confirmed as 64% and 59% in studies by Al et al. (16) and Kandiş et al. (19). In our study, 45.4% of the cases were females and 54.6% were males, and male cases were found to be slightly higher.

While locating the tick in the visible parts of the body is easier, noticing the tick in non-visible parts of the body could be more difficult. Therefore, it should be kept in mind that there may be more than one region with the tick and all regions of the body should be examined vigilantly. The most frequent tick exposure sites in the study by Duman et al. have been reported as head-neck with 50%, truncus with 28.3% and arms and legs with 21.7% (20). Ticks have been encountered the most on legs (43%), truncus (12%) and in the axillary region (8) in the study by Sümer et al. (24) The most frequent tick exposure site in our study was the head-neck region (56.1%). While head-neck involvement has been found more frequent in small age groups in the study by Duman et al, lower extremity and foot involvement have been reported to be higher in older age groups (19). While head-neck involvement was higher in small age groups in our study, it was realized that truncus, lower extremity and groyne-genital region involvement was higher in older age groups; however, the results were not found to be statistically significant (p= 0.17). These results are crucial in terms of demonstrating the primary regions to be attentive to while looking for ticks in different age groups. The high rate of head-neck involvement shows that standard measures (boots and thick socks) are not sufficient to protect children from tick exposure and that leaving the children in this age group on the ground in the countryside and picnic areas is extremely risky.

It has been indicated that ticks belonging to the *Hyalomma* species are the most frequently detected of all in studies from Turkey (9). 55.6% *Hyalomma* species, 15.4% *Ixodidae* species and 12.5% *Rhiphicephalus* species were detected in the ticks whose species typing was made in the study by Duman et al. In our study, ticks from *Hyalomma* species were confirmed in 22 cases and ticks from *Rhiphicepholus* species were confirmed in 3.

It has been reported in studies regarding children with CCHF from our country or others that symptoms such as fever, nausea, vomiting, malaise, headache, hemorrhage, muscle pain and jaundice are seen during application and that conjunctival hyperemia and fever are the most frequently observed signs in physical examination (25,26). Similar to the literature, fever, vomiting, malaise, headache, and findings of respiratory tract infection were seen during application to hospital in our study, and petechia-purpura-ecchymosis and maculopapular skin eruption were seen at a lower late. Mortality in CCHF cases in our country is around 5% (4-6,27). All of the patients admitted to the pediatric infectious diseases unit with the diagnosis of CCHF were discharged with full recovery and no mortality was observed. There are studies in the literature indicating lower mortality in the pediatric age group in comparison to the adult age group. No fatal cases were seen in a study by Tezer et al. including 31 CCHF cases under the age of 16 (28). There were no cases lost in a study by Kızılgün et al. including 41 CCHF patients between the ages of 1 and 17 (29). Serum chemokines levels of pediatric patients that received CCHF diagnosis have been found lower than those of the adults in a multicenter study (30). Factors like hasty transfer of the pediatric age group to a health center and their lower chemokines response may explain low mortality in the pediatric age group.

Thrombocytopenia and leucopenia, elevated liver enzymes, CK, LDH and coagulation parameters can be detected in CCHF cases. When Güngör et al. analyzed the full blood count and biochemical parameters of nine pediatric patients with CCHF disease, 55.5% of the patients had anemia and leucopenia, 77.7% had thrombocytopenia, 44.4% had prolonged PT, 66.6% had elevated CK, 77.7% had elevated AST and ALT, and 88.8% had elevated LDH (31). Yardan et al. have detected thrombocytopenia in 29.2% of patients with CCHF diagnosis, leucopenia in 8.3%, leukocytosis in 6.8% and anemia in 29.2% (32). Duksal et al. have detected thrombocytopenia in 80.6% of the cases, leucopenia in 70.8%, neutropenia in 50%, elevated AST in 73.6% elevated ALT in 26.4%, elevated in LDH in 71.6%, elevated CK in 68.1%, prolonged PT in 54.2% and prolonged aPTT in 52.8% in their study including 72 pediatric patients with CCHF diagnosis in Sivas (33). In our study, anemia was found as 33.3%, leucopenia as 50%, thrombocytopenia as 83.3%, ALT elevation as 33.3%m AST elevation as 66.6%, CK elevation as 66.6%, LDH elevation as 50%, aPTT prolongation as 16.6% and INR elevation as 33.3% in CCHF patients, and our data was established to show similarity with the literature.

There is no specific treatment of CCHF. World Health Organisation (WHO) recommends the use of oral and intravenous ribavirin(34). The basis of treatment in this disease consists supportive care. When necessary, the patients should

be given thrombocyte suspension, freshly frozen plasma and erythrocyte suspension; respiratory, dialysis, and parenteral nutrition support should be provided; and fluid-electrolyte balance should be monitored (30). In our study, two of the 6 patients receiving CCHF diagnosis were given ribavirin and the remaing 4 were followed with supportive care. T wave negativity and bradycardia were seen during ribavirin use in one patient.

Due to the fact that duration of tick exposure is one of the most important factors in determining transmission in diseases transmitted by ticks, the tick should be immediately detected and removed. The tick was realized within the first 24 hours post-contact in a majority of the cases (73.8%) in our study group and the patients applied to hospital. The reason for early detection and hospital application is the increase in public sensitivity thanks to the warnings made in printed and mass media and the fact that families look for ticks during bath time or while helping their children change clothes especially after returning from the countryside, and hence detect the tick at an early period. This situation can be regarded as a sign that these publications and broadcasts have increased awareness in the public.

No symptom and finding was detected upon application to hospital in 142 of the patients with tick exposure complaint. All laboratory examinations were found within normal limits in 131 (92.3%) of these patients and laboratory tests were repeated on application, on days 3,7-10 and no problem was observed in the follow-up of these patients. In the study by Duman et al., anomaly was confirmed in 27.3% of the laboratory tests of the patients applying with tick exposure, and it was seen that there was no correlation with clinical findings (19). In the study by Oğuz et al. where 84 tick exposure cases that applied to the pediatric emergency service were examined, clinical and laboratory anomaly was not detected in any of the patients (20). Anomaly was not determined in a majority of laboratory parameters of every patient who did not have clinical findings and applied with tick exposure. These results made us think that follow-up with laboratory tests is not necessary in every patient who does not have any clinical finding. Moreover, routine laboratory follow-ups without clinical findings lead to unnecessary increase in health expenses, and false negative results cause stress in the physician and the family. It is considered that clinical follow-ups on specific days, informing the families regarding symptoms that could develop and explaining the necessity of urgent hospital application in the event of symptom development are more crucial.

In conclusion, physical examination of the cases applying with the complaint of tick exposure should be attentively conducted, the tick should be removed with an appropriate technique, and the patients should be followed up in outpatient clinics by stating that they need to apply to hospital again if there is any complaint including sudden rise in body temperature, headache and muscle pain and malaise within ten days. It is taken into account that laboratory examinations from every case that does not have any additional complaint other than tick exposure increase the cost and do not provide extra profit in patient follow-up.

Ethics Committee Approval: Ethics committee approval was received for this study from Hacettepe University Medical Faculty's local ethics committee.

Informed Consent: Written informed consent was not received due to the retrospective nature of this study.

Peer-review: Externally peer-reviewed.

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