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TICK INFESTATION: A 200-PATIENTS' SERIES

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Abstract

Background: A great number of zoonotic diseases with high mortality rate are transmitted by ticks. We performed this study in order to investigate patients admitted to emergency department following a tick bite. We examined the patients and get knowledge about the infestation and we followed up them for possible tick-conducted disease symptoms and laboratory findings both clinically and serologically.
Materials and Methods: The study presented was hold for one year, between 01.01.2012 and 31.12.2012. 200 tick infested cases, admitted to Emergency Department of Haydarpasa Numune Training and Research Hospital, were subjected in the study. Demographic patterns of the patients and the region they come from, infested area on body, admission time and blood analyzing results were detected.
Results: Rate of adult patients to pediatric was 2:1; gender distribution was similar to each other. The most common body areas that ticks were removed from were lower extremity. The highest tick bite incidence was in summer and on weekends. No tick bite incident of Istanbul surrounding from the year 2012 progressed to a zoonotic disease.
Conclusions: Although non-of the patients of our study has been diagnosed with Crimean-Congo hemorrhagic fever we informed all of them for the incubation period and call for observation during the time. Tick borne infections may present with vary of symptoms, the most sever of which is hemorrhagic diathesis and patients should be informed for the risks. Knowledge of local area fauna risks may guide physicians so studies on this topic are essential.

Key Words: Emergency department, tick bite, Crimean-Congo Hemorrhagic fever.

Introduction

Ticks are the most important, blood-feeding arthropod vectors that carry zoonotic disease agents to humans. More than 900 species of ticks present and *Hyalomma marginatum marginatum and Hyalomma anatolicum anatolicum* types are the most common in Turkey (Aydın, 2009). Tick bites may result in many diseases, such as Lyme disease, Rocky Mountain spotted fever, ehrlichiosis, Colorado tick fever, babesiosis, etc. Crimean-Congo hemorrhagic fever (CCHF) is an acute and severe hemorrhagic fever syndrome, caused by Nairovirus of the *Bunyaviridae* family, transmitted via ticks. The CCHF virus causes severe viral haemorrhagic fever outbreaks, with a case fatality rate of 3–40% (Kaya et al., 2011; "World Health Organisation Reports, Crimean-Congo haemorrhagic fever," January 2013).

The syndrome was named *Crimean* after being isolated in a case of massive bleeding and fever in Tajikistan in 1944, and later in 1956, the same pathogen with Crimean hemorrhagic fever was seen in *Congo* and the two names was combined as *Crimean-Congo hemorrhagic fever* (Kandis et al., 2012). CCHF is geographically widespread and occasionally seen in travelers returning from endemic areas, so every year more than 1000 human cases are reported worldwide and Turkey is the epicenter of the disaster (Sunbul et al., 2015). The first mortal case of CCHF in Turkey was reported 2003 after a nurse contaminated by stabbing syringe of virus infected patient (Ozkurt et al., 2006; Sunbul et al., 2015).

Transmission of the CCHF virus agent among humans may have 3 main forms. The first one is through the bite of a carrier tick that is Hyalomma genus in particular (Basol et al., 2013; Bursali et al., 2013). Second, a patient who developed CCHF takes role of disease transmitter during the acute phase of the disease. Finally, it can also be transmitted by means of blood and the tissues of infected farm animals (Basol et al., 2013). In association, therewith incubation periods of the agent show variability. The incubation period of the agent is usually one to three days, with a maximum of nine days following a tick bite. The incubation period following contact with infected blood or tissues is usually five to six days, with a documented maximum of 13 days ("World Health Organisation Reports, Crimean-Congo haemorrhagic fever," January 2013). Nevertheless, literature gives data of CCHF cases with much longer incubation periods (max 53 days) (Kaya et al., 2011).

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Incubation period is the first phase of clinical cycle of CCHF. The disease is characterized by 4 phases during its clinical course (Basol et al., 2013; Bodur et al., 2012; Maltezou & Papa, 2011). After 2 to 9 days of incubation period, pre-hemorrhagic period of the disease begins, which passes clinically silent and nonspecific and the worst patients may experience are symptoms such as fever, malaise, fatigue, muscle pain, rash, headache, and nausea (Basol et al., 2013). Duration of the second phase is generally shorter than a week. The third period gives name to the disease and is characterizes with bleeding symptoms; petechiae, conjunctival hemorrhage, hematuria, hematemesis, or melena may occur. Patients can develop disseminated intra-vascular coagulation or shock in this period and this can be fatal. During this period, sever symptoms of the central nervous system from delirium to coma may also occur. The hemorrhagic period lasts even shorter than a week. Convalescence-the recovery period- begins 10–20 days after the onset of the disease. During this period, symptoms such as tachycardia, polyneuritis, breathing difficulty, and blurred vision can be seen or patients can be asymptomatic after recovering from the hemorrhagic period (Ergönül, 2006; Tarantola, 2007). Patients diagnosed with CCHF usually need hospitalization.

There is no vaccine available for humans or animals (Krajacich et al., 2015; "World Health Organisation Reports, Crimean-Congo haemorrhagic fever," January 2013).

Protection and prophylaxis strategies focus on education, vector habitat reduction, indoor residual spraying and individual insect repellents (Miller et al., 2011). Whereas treatment options for CCHF include antiviral agents (Ergönül, 2006; Ozkurt et al., 2006).

Emergency departments play a significant role in the management of this disease, especially in endemic areas (Basol et al., 2013). As usual, patients with complaints of a tick bite are admitted to emergency departments first. A tick is removed from the body by emergency medicine physicians, and the first systemic examinations of patients are performed in emergency departments. Patients with no abnormalities or symptoms are discharged from the hospital but they are warned to present immediately in case of the symptoms such as fever, fatigue, and nausea. Thus, the first diagnosis for CCHF, as it is true for the many diseases, is performed by emergency services. In endemic regions CCHF has to be considered in patients with fever of unknown origin even if there is no complaint of a tick bite,

In this study, we aimed to evaluated 200 cases with complaints of a tick bite admitted to the Emergency Department of Haydarpasa Numune Training and Research Hospital. We aimed to study features of the tick infested patients and share our annual analyses in order to contribute literature in the world as well as to raise the awareness of emergency medicine physicians about CCHF.

Material and Methods

Study design and data collection

This study involved 200 patients admitted to ED of Haydarpasa Numune Training and Research Hospital between Jan. 01, 2012 and Dec. 31, 2012. The hospital database was used to compile the information for the study; a one-year period data was screened for diagnosis codes A98.0 (Crimean-Congo hemorrhagic fever), B88.9 (Infestation, unspecified), T63.8 (Toxic effect of contact with other venomous animal), T63.9 (Toxic effect of contact with unspecified venomous animal), X25 (contact with other venomous arthropods) and X27 (contact with other specified venomous animal) according to the International Classification of Diseases 10.

Collected information was noted to the study forms that involved data including: patients' demographic features (age, gender), admission time (weekly and seasonal distribution), body area infested with tick (upper extremity, lower extremity and trunk) and laboratory findings for possible tick transmitted infection (complete blood count for platelet and hematocrits, AST, ALT, BUN, Cr, and INR). Blood tests were performed after tick removal.

Excluding criteria

Patients were also questioned for the region they came from. Patients initially infested with a tick from urban and surrounding area of Anatolian part of Istanbul were included to the study.

A 30-year old male was excluded from the study; he had contact with tick in another region that is known as highly endemic for CCHF.

Also, the cases of contaminations through blood and tissues were not included to the study.

Patient management and follow up

Ticks were removed from patients admitted to ED with tick bites with required procedures. Patents were examined for possible symptoms; venous blood samples were taken and acknowledge about tick conducted infections were given.

Patients with no complain and no abnormalities on blood samples were discharged from ED and were instructed to readmit to infectious disease outpatient policlinic for further follow up.

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Patients with abnormal laboratory findings who need further treatment and diagnosis of CCHF with PCR were hospitalized.

Statistical analysis

The obtained data of 199 patients was analyzed with statistical software SPSS 17.0. P values below 0.05 were considered statistically significant. Categorical variables were expressed in numbers and percentage. Continuous variables were presented as mean (standard deviation) with the range and the chi-square tests were used to evaluate categorical variables used in the study.

Results

A total of 199 patients were admitted to ED and investigated for tick bite complications during Jan. 01, 2012 and Dec. 31, 2012. The mean age of the patients was 28.06 years (min.2-max.79, ±17.105). 54.7% of the patients were female (n=109), and 45.22% of the patients were male (n=90). 68.34% of the patients were adults (n=136), and 31.65% were individuals under 18 years old (n=63).

Presentations of the patients significantly increased on summer ($p<0.05$), but represented no difference between weekday and weekends ($p>0.05$), (Chart 1-2). Number of patients admitted to ED with tick bite complains were 148 (74.37%), 29 (14.57%), 22 (11%) and 0 (0%) respectively in summer, autumn, spring and winter.

Lower extremities were reported as significantly dominant areas for tick attachments (Chart 3). We removed 163 ticks (81.9% of the cases) from legs and feet, 27 (13.56%) from arms and hands, and 9 ticks (4.52%) from trunk.

The laboratory findings of the patients, both on admission and on the subsequent controls of infection diseases policlinics, represented no significant abnormality, and no hemorrhagic diathesis detected (Table1).

None of the patients included to the study needed hospitalization. None of the patients included to the study was PCR positive for CCHF virus.

Table 1: Blood analyzes of the patients on admission and later, combined values.

Laboratory data (reference range), mean value ±SD (minimum-maximum value)	
AST(5-30 U/L)	22.64 ±10.979 (10-109)
ALT (5-30 U/L)	20.39 ±20.284(6-231)
BUN (8-21 mg/dL)	12.70 ±4.272(5-35)
Cr (0.8-1.3 mg/dL)	0.68 ±0.15(0.2-1.17)
INR (0.9-1.2)	1.02±0.09(0.8-1.6)
Htc (40%-52% (men), 36%-47%)	38.5 ±4.8(20.0-52.0)
Plt (150-400 x 10^9/L)	343 ±101(145510)
SD: standard deviation, AST: aspartate aminotransferase, ALT: alanine aminotransferase, BUN: blood urine nitrogen, Cr: creatinine, INR: international normalized ratio, Htc: hematocrits, Plt: platelet.	

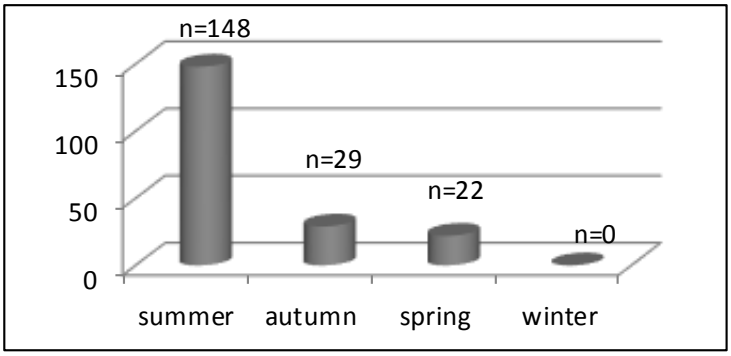

Chart 1: Seasonal distribution and number of patents admitted to ED with tick bite complain.

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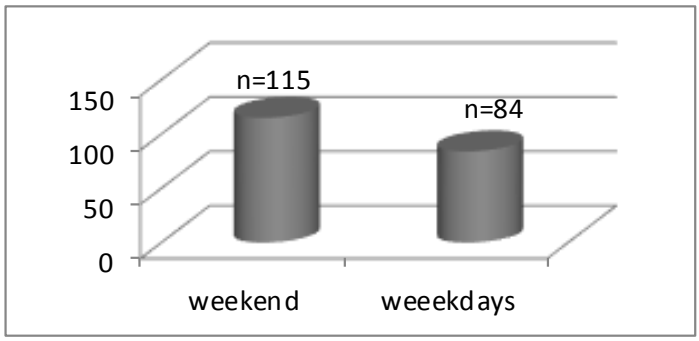

Chart 2: Daily distribution and number of patents admitted to ED with tick bite complain.

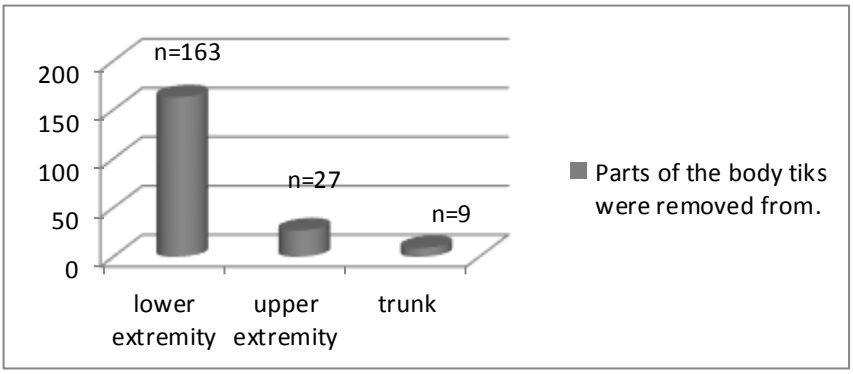

Chart 3: Distribution and locations of removed ticks on body.

Discussion and Conclusion

As with worldwide, incidence of tick bite infestations and also tick-borne diseases, have increased markedly in Turkey during the past decade, so understanding the risk factors, quantification of probable hazardous and safe regions in order to classify risks, description of tick attachment features and definition of population under risk are required.

Considering contemporary trips overseas in the entire world, and situations such as immigrations it is obviously hard to isolate the risk of virus migration. Nevertheless, it is important to create your own risk map of endemic and frequently observed areas.

In the current study admissions, all-around Anatolian part of Istanbul were taken under consideration. Literature shows that Istanbul is a moderate risky area for tick-borne diseases again, some studies show that many of them are misdiagnosed (Celebi et al., 2010; Şengöz et al., 2009). In our study, we stated that tick fauna environs Istanbul is less likely to transport viral infections for in none-of the patients included to the study a zoonotic disease progressed. Although liver function tests (ALT-AST) showed mild elevation in some patients on follow up, none developed any organ fairly or hemorrhagic diathesis. CCHF is a highly fatal disease that is endemic in Africa, Asia and Middle East.

Among factors that affect tick infestation rate are not only geographical floral features of regions but also climate is very important for ticks' proliferation (Bursali et al., 2012). Also, none of the species of the ticks cause viremia though out all the year (Bursali et al., 2012). Some studies that were hold in Turkey to determine periodic intensity of tick infestations stated that the most intense month is August (Gargili et al., 2010). Again, some studies report that CCHF shows seasonal character because vector ticks are affected of temperature (GÜNAYDIN et al., 2010) and appeared most during June-August (Gönen, 2011). Our study data support literature, and even though some studies report CCHF onset on January, we report no case of tick infestation during winter months.

Endemicity studies report that rural areas are riskier for tick infestations, as also farmers, livestock raisers, militaries and countryside population (Ghane Kisomi et al., 2016; Uluğ, 2011; Yilmaz et al., 2009). In their study on CCHF epidemiology, Taskesen et al. report rural origin of 53% of their cases (Taşkesen et al., 2008), and Sumer et al report it 54% (Sümer, 2010). All the patients we include to our study were urban population. This may explain the extreme low rate of identified CCHF or any other tick-borne disease in our study- we may state Anatolian part of Istanbul as a non-endemic province.

Risks of tick infestations and CCHF virus contamination present in all ages and all gender. Nevertheless, literature, as nearly similar as in our study, often report this as disease of men and young adults (Basol et al., 2013), which is quite reasonable considering active lifestyles of these population and probability to contact with a tick.
Patients, exposed to a tick, first admit to ED, and if it is still on the body it is essential that tick is removed immediately and properly. Studies show that longer contact of the vector increases risks of viremia (Due et al., 2013; Ergönül, 2006), but the location on body does not affect contamination prognosis. In our study, we report that ticks most detected on lower extremities, it is similar with many studies (Celebi et al., 2010; Hossain et al., 2015). Even if it known that attachment area doesn't affect the process, it is important to know to develop protection strategies.

Laboratory study is important in initial diagnosis of tick-borne infections. Considering the incubation period of the disease it is also essential to follow up the patients after removal of the tick during particular time. Literature gives may documentation on significance of thrombocytopenia and leukopenia, also of highly elevated ASL-ALT levels for diagnosis of tick-borne diseases (Basol et al., 2013; Hofhuis et al., 2013; Ozkurt et al., 2006). Our study supports this via negative data; our patients were asymptomatic cases and laboratory follow-up showed no significant elevation in any of the tests.

In conclusion, proper management of tick bite and an early diagnosis of CCHF, which has a high mortality rate, are crucial for emergency medicine physicians, especially in endemic areas. The symptoms such as a tick bite, fever, and fatigue should be taken seriously in differential diagnosis for CCHF, and leukopenia and thrombocytopenia and elevated enzymes of liver function test should be taken into account. Not less important is to create a public awareness for tick-borne infections via public health activities, give knowledge about protection strategies and treatment, and to ensure that this disease is kept under control with proper and earl diagnosis.

Competing Interests: The authors have declared that no competing interests exist.

References

1. Aydın, L. (2009). Beekeepers: Attention to ticks. Arıcılar: Kenelere Dikkat. *Uludag Journal of Beekeepers. Uludağ Arıcılık Dergisi*.
2. Basol, N., Duygu, F., & Ayan, M. (2013). Detailed evaluation of patients admitted to emergency department with a tick bite complaint. *Medicina (Kaunas), 49*(8), 367-371.
3. Bodur, H., Akinci, E., Ascioglu, S., Onguru, P., & Uyar, Y. (2012). Subclinical infections with Crimean-Congo hemorrhagic fever virus, Turkey. *Emerging infectious diseases, 18*(4), 640-643.
4. Bursali, A., Keskin, A., & Tekin, S. (2012). A review of the ticks (Acari: Ixodida) of Turkey: species diversity, hosts and geographical distribution. *Experimental and applied acarology, 57*(1), 91-104.
5. Bursali, A., Keskin, A., & Tekin, S. (2013). Ticks (Acari: Ixodida) infesting humans in the provinces of Kelkit Valley, a Crimean-Congo Hemorrhagic Fever endemic region in Turkey. *Experimental and applied acarology, 59*(4), 507-515.
6. Celebi, S., Aydin, L., Hacimustafaoglu, M., Celik, U., Cakir, D., Emir, B. R., & Cetin, M. (2010). Evaluation of children cases admitted for tick bite in Uludag University Medicine of Faculty/Uludag Universitesi tip fakultesi'ne kene tutunmasi ile basvuran cocuk olgularinin degerlendirilmesi. *Journal of Pediatric Infection, 4*(4), 133-138.
7. Due, C., Fox, W., Medlock, J. M., Pietzsch, M., & Logan, J. G. (2013). Tick bite prevention and tick removal. *BMJ, 347*, f7123. doi:10.1136/bmj.f7123
8. Ergönül, Ö. (2006). Crimean-Congo haemorrhagic fever. *The Lancet infectious diseases, 6*(4), 203-214.
9. Gargili, A., Kar, S., Yilmazer, N., Cerit, C., Sonmez, G., Sahin, F., Vatansever, Z. (2010). Evaluation of ticks biting humans in Thrace Province, Turkey. *Kafkas Univ Vet Fak Derg, 16*(Suppl-A), 141-146.
10. Ghane Kisomi, M., Wong, L. P., Tay, S. T., Bulgiba, A., Zandi, K., Kho, K. L., Hassan Nizam, Q. N. (2016). Factors Associated with Tick Bite Preventive Practices among Farmworkers in Malaysia. *PLoS One, 11*(6), e0157987. doi:10.1371/journal.pone.0157987.
11. Gönen, İ. (2011). Clinical and laboratory findings of patients with Crimean-Congo hemorrhagic fever in the emergency department at hospital admission. *Journal of Microbiology and Infectious Diseases, 1*(01).
12. GÜNAYDIN, N., Aydin, K., YILMAZ, G., ÇAYLAN, H. R., & KÖKSAL, İ. (2010). Crimean-Congo hemorrhagic fever cases in the eastern Black Sea Region of Turkey: demographic, geographic, climatic, and clinical characteristics. *Turkish Journal of Medical Sciences, 40*(6), 829-834.
13. Hofhuis, A., Herremans, T., Notermans, D. W., Sprong, H., Fonville, M., van der Giessen, J. W., & van Pelt, W. (2013). A prospective study among patients presenting at the general practitioner with a tick bite or erythema migrans in The Netherlands. *PLoS One, 8*(5), e64361. doi:10.1371/journal.pone.0064361
14. Hossain, M., Mani, K. K., Sidik, S. M., Hayati, K. S., & Rahman, A. K. (2015). Randomized controlled trial on drowning prevention for parents with children aged below five years in Bangladesh: a study protocol. *BMC public health, 15*, 484. doi:10.1186/s12889-015-1823-1
15. Kandis, H., Katirci, Y., Baltaci, D., Saritas, A., Kara, I. H., & Geyik, M. F. (2012). Investigation of clinical and laboratory findings of 26 cases with Crimean-Congo hemorrhagic fever. *Biomedical Research, 23*(4), 589-595.

16. Kaya, A., Engin, A., Guven, A. S., Icagasioglu, F. D., Cevit, O., Elaldi, N., & Gulturk, A. (2011). Crimean-Congo hemorrhagic fever disease due to tick bite with very long incubation periods. *Int J Infect Dis, 15*(7), e449-452ev. doi:10.1016/j.ijid.2011.03.007
17. Krajacich, B. J., Lopez, J. E., Raffel, S. J., & Schwan, T. G. (2015). Vaccination with the variable tick protein of the relapsing fever spirochete Borrelia hermsii protects mice from infection by tick-bite. *Parasit Vectors, 8*, 546. doi:10.1186/s13071-015-1170-1
18. Maltezou, H. C., & Papa, A. (2011). Crimean-Congo hemorrhagic fever: epidemiological trends and controversies in treatment. *BMC medicine, 9*(1), 1.
19. Miller, N. J., Rainone, E. E., Dyer, M. C., Gonzalez, M. L., & Mather, T. N. (2011). Tick bite protection with permethrin-treated summer-weight clothing. *J Med Entomol, 48*(2), 327-333.
20. Ozkurt, Z., Kiki, I., Erol, S., Erdem, F., Yılmaz, N., Parlak, M., Tasyaran, M. A. (2006). Crimean–Congo hemorrhagic fever in Eastern Turkey: clinical features, risk factors and efficacy of ribavirin therapy. *Journal of Infection, 52*(3), 207-215.
21. Sunbul, M., Leblebicioglu, H., Fletcher, T. E., Elaldi, N., Ozkurt, Z., Bastug, A., Beeching, N. J. (2015). Crimean-Congo haemorrhagic fever and secondary bacteraemia in Turkey. *The Journal of infection, 71*(5), 597.
22. Sümer, A. (2010). Kene Isırığı Nedeniyle Kaş Devlet Hastanesi Acil Servisine Başvuran Hastaların Değerlendirilmesi. *Kafkas Univ. Vet. Fak. Derg, 16*, 49-53.
23. Şengöz, G., Yıldırım, F., Kart Yaşar, K., Tözalgan, Ü., & Altuntaş Aydın, Ö. (2009). Fifty-six cases with Mediterranean spotted fever: evaluation of tick-borne spotted diseases in Turkey. *Turkderm, 43*(4), 139-143.
24. Tarantola, A., Ergonul, O., & Tattevin, P. (2007). Estimates and prevention of Crimean-Congo hemorrhagic fever risks for health-care workers *Crimean-Congo Hemorrhagic Fever* (pp. 281-294): Springer.
25. Taşkesen, M., Okur, N., & Taş, M. A. (2008). Kene Isırması nedeniyle başvuran 19 olgunun değerlendirilmesi. *Dicle Tıp Dergisi, 35*(2).
26. Uluğ, M. (2011). Kene Isırması Nedeniyle Başvuran Olguların Epidemiyolojik, Klinik ve Laboratuvar Bulgularının İrdelenmesi. *Klimik Dergisi, 24*(1), 40-43.
27. World Health Organisation Reports (2013), Crimean-Congo haemorrhagic fever. (January 2013). Retrieved from http://www.who.int/mediacentre/factsheets/fs208/en/
28. Yilmaz, G. R., Buzgan, T., Irmak, H., Safran, A., Uzun, R., Cevik, M. A., & Torunoglu, M. A. (2009). The epidemiology of Crimean-Congo hemorrhagic fever in Turkey, 2002–2007. *International Journal of Infectious Diseases, 13*(3), 380-386.