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Prevalence of *Echinococcus granulosus* detected using enzyme immunoassay and abdominal ultrasonography in a group of students staying in a state dormitory in Turkey

Aim: In this study our aim was to analyse the seroprevalence of cystic echinococcosis and prevalence of lesions (with abdominal ultrasonography) in a group of young adult university students staying in a state dormitory in Bornova, İzmir, Turkey.

Materials and methods: The study group was consisted of 750 students (360 women, 390 men, mean age 20.92 ± 1.82 years, min 17, max 29). Informed written consent was obtained from each student and they were requested to fill a questionnaire form (sociocultural and economic condition, area of living, and demographic data). Blood sampling was performed by intravenous puncture and sera were obtained after centrifugation. Anti-*E. granulosus* antibodies were detected using enzyme immune assay (EIA). All participants were given an appointment for abdominal ultrasonography.

Results: Of the 750 students, 99 (13.2%) were seropositive for anti-*E. granulosus* Ig G. A total of 250 students (49 seropositive and 201 seronegative) were performed abdominal ultrasonography. Of the 250 students, 2 (1 in liver and 1 in kidney, both seropositive) had cystic lesions and were referred to surgery.

Conclusion: Our findings suggest that cystic echinococcosis is prevalent in Turkey. Epidemiologic studies combining EIA and abdominal ultrasonography are warranted.

Key words: Echinococcosis, student health, seroprevalence

Bir devlet yurdunda kalan öğrencilerde enzim immünoassay ve abdominal ultrasonografi ile *Echinococcus granulosus* prevalansı

Amaç: Bu çalışmada Kredi ve Yurtlar Kurumu İzmir Bornova Öğrenci Yurdu'nda kalan genç erişkin üniversite öğrencilerinde kistik ekinokokkoz seroprevalansının ve lezyon prevalansının (abdominal ultrason ile) belirlenmesi amaçlanmıştır.

Yöntem ve gereçler: Çalışma grubu 750 öğrenciden oluşmaktaydı (360 kadın, 390 erkek, yaş ortalaması $20,92 \pm 1,82$ yıl, en düşük 17, en yüksek 29). Her öğrenciden yazılı gönüllü bilgilendirme formu alındı ve anket formunu (sosyokültürel, ekonomik durum, daha önce yaşanılan yer ve demografik sorular içeren form) tam olarak doldurmaları istendi. İntravenöz yolla kan örnekleri alındı santrifüj ile serum örnekleri ayrıldı. Anti-*E. granulosus* antikorları enzim immün assay (EIA) yöntemi ile saptandı. Tüm katılımcılara abdominal USG için randevu verildi.

Bulgular: Yedi yüz elli öğrencinin 99'unda (% 13,2) anti-*E. granulosus* Ig G pozitif olarak saptandı. Toplam 250 öğrenciye (49 seropozitif ve 201 seronegatif) abdominal ultrasonografi uygulandı. 250 öğrenciden 2 tanesinin kistik lezyonları (1'i karaciğerde, 1'i böbrekte, her ikisi de seropozitif) vardı, bu öğrenciler cerrahi kliniğine yönlendirildi.

Sonuç: Bizim bulgularımız kistik ekinokokkozun Türkiye'de yaygın olduğunu belirtmektedir. EIA ve abdominal ultrasonografinin birlikte kullanıldığı epidemiyolojik çalışmalar yapılması önerilir.

Anahtar sözcükler: Ekinokokkozis, öğrenci sağlığı, seroprevalans

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Received: May 26, 2008
Accepted: April 02, 2009

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Introduction

Cystic echinococcosis (CE), caused by the larval form of *Echinococcus granulosus*, is one of the most important and widely distributed parasitic zoonosis in the world. The infection is transmitted primarily in a domestic cycle that involves dogs as the definitive host and sheep, cattle, and accidentally humans as the intermediate hosts (1). High prevalence of CE was recorded in the East and North Africa, Mediterranean countries, Middle East, The People’s Republic of China, South America, Australia, and India (2).

CE is endemic in the rural and urban areas of Turkey. Although cases of CE are reported since 1872, seroepidemiologic studies are very scarce. Data about the disease are primarily from the retrospective analysis of the records of the general surgery clinics. According to these data, the number of new cases is 2000-2500/year. In recent studies from Turkey CE prevalence was reported to be 0.291%-0.585% (3,4).

In this study it was aimed to analyse the seroprevalence of CE and prevalence of lesions (with abdominal ultrasonography) and to analyse the association of place of living and socioeconomic status with CE seropositivity in a group of young adult university students who were staying in a state dormitory in Bornova, İzmir, Turkey.

Materials and methods

Study population was 750 (out of 2100) students who volunteered to participate in our study in Bornova State Dormitory in İzmir, Turkey. Informed written consent was obtained from each student and they were requested to fill a questionnaire form to gather demographic data, such as gender, age, area of living (city-town-village), and socioeconomic status (low-intermediate-high). Socioeconomic level was determined by the students. After the questionnaire, 5 mL venous blood was obtained from each student for serological analysis. All students in the study group were given an appointment for abdominal ultrasonography. Abdominal ultrasonography was performed with a 3.5 MHz transducer, Sonoline, Elegra-Siemens.

Blood samples were centrifuged at 3500 g and were stored at -20 °C until the day serologic analysis was

performed. Anti-*E. granulosus* antibodies (Anti-EG) were detected by enzyme immunoassay test (EIA). The EIA was performed using microtiter plates coated with whole sheep cyst fluid antigens as previously described (5). The negative cut-off optical density (OD) value was calculated as the mean +3 SD of the OD values of negative sera from the study group.

Results

A total of 750 students (360 woman, 390 men, aged 20.92 ± 1.82 years, min 17, max 29) were included in the study. Of the 750 students, 90 (13.2%) were found to be anti-EG positive. The age and gender distribution of seropositive patients are shown in the Table. Seropositivity rate of females was higher than males (17.2% vs 9.4%, $P < 0.05$, chi-square test). Ages of the seropositive and seronegative patients were similar (20.8 ± 1.6 vs 20.9 ± 1.8 $P > 0.05$, Student's t test).

Of the 250 students who came to the abdominal ultrasonography appointment, 2 (0.8%) had detectable CE lesions. Both patients were female with an age of 20 years. The first patient had multiple lesions in the liver, with the biggest lesion with a diameter of 9 cm. The other patient had a solitary calcified lesion in her left kidney (diameter: 15 mm). Both patients had very high anti-EG antibody titres. First case was operated on. Both patients were under routine control.

In terms of economic status, seropositivity rates of students, low level income 9.5% (11/116), intermediate level income 13.3% (74/558), and high level income 18.4% (14/76), were similar ($P > 0.05$, chi-square test). Seropositivity rates according to the place of living (city 11.3%, 41/363; town 14.6%,

Table. Distribution of seropositive cases by age and gender.

Age	SEROPOSITIVE CASES	
	FEMALE (%)	MALE (%)
<20	17.33 % (13/75)	10.00% (8/80)
20-24	17.08 % (48/281)	14.67% (27/284)
25-29	25.00% (1/4)	7.69% (2/26)
Total	17.22%	9.48%

43/294; village 16.1%, 15/93) were also similar ($P > 0.05$, chi-square test).

Discussion

Systematic determination of carriage of asymptomatic CE disease is important for evaluating the prognosis of the disease and showing the epidemiologic profile. Reports about CE from Turkey are primarily derived from the records of general surgery clinics (6,7). Data are lacking about the seroprevalence of the disease due to transportation and economical problems.

Seropositivity rate of 13.2% in our study is higher than an earlier report from our region. This may be attributed to the more heterogeneous study population, from every part of Turkey (8). Shambesh et al. reported a seropositivity rate of 23% in Libyan females and 19% in Libyan males (9). Bai et al. reported a seropositivity rate of 8.6% in a population in 20-29 years old age group (10). In both studies seropositivity rate was reported to be higher in the patients aged more than 50 years.

Diagnosis of CE depends on serologic and radiologic analysis (ultrasonography, X-ray, etc.) Since 1980 serologic diagnosis of CE evolved and many population based prevalence studies have been performed (11). After 1990 ultrasonography and serologic tests were used widely (9,10,12,13). In addition there are studies in which findings of chest X-ray is used as an additional parameter (14,15).

Serologic tests are the most widely used method. Main disadvantages of serologic tests are the requirement of blood sampling and difficulty of interpretation of the results. Despite these disadvantages, serologic tests are applicable and not time consuming. It is hard to speculate about low antibody titres in patients with extra hepatic CE in Turkey where CE seroprevalence is very high. Some authors have interpreted the serologic tests with other tests (15). Some of the seropositive cases may be considered as abortive CE infections or extra abdominal CE.

Abdominal ultrasonography is a non-invasive, applicable method that can detect the exact

localization and size of CE lesions accurately. Unfortunately large-scale studies from developing countries are lacking due to economic problems (absence of portable ultrasonography, transportation, personnel expenditure, etc). Ultrasonography may be helpful in the diagnosis of early infections (before the enhancement of immune response). Although there are several studies showing that abdominal ultrasonography is superior to serologic analysis in the diagnosis of hepatic CE, a combination of serology and abdominal ultrasonography is reported to be better for mass screening (12-14).

In our study 49 of 99 seropositive students came to abdominal ultrasonography appointment and CE lesions were detected in 2 of them. None of the seronegative patients had CE lesions. Incidence of 0.8% (2/250) with abdominal ultrasonography is in concordance with results of Shambesh et al. (0.7%) (9). In another study from our region, the rate of lesions in abdominal ultrasonography was reported to be 0.3% (8). The difference may be attributed to the low number of positive cases.

There was no statistically significant difference between seropositive and seronegative groups in terms of place of living or economic status. High seropositivity rates in patients living in urban areas or in patients with high economic status maybe speculated to be due to the lack of adequate control systems in domestic animals and the high number of stray animals in cities, respectively. Higher rate of seropositivity in females is in concordance with findings of Shambesh et al. (9). In the present study, both patients with lesions in abdominal ultrasonography were female.

The fact that 2/3 of our study population did not come to the ultrasonography appointment is the main disadvantage of our study. We suggest that the ultrasonography should be performed in the field just after the blood sampling in future studies.

Our serologic and ultrasonographic findings show that CE is an important public health problem in Turkey and a combination of EIA and abdominal ultrasonography is more successful in the diagnosis of CE.

References

1. Romig T. Epidemiology of echinococcosis. *Langenbecks Arch Surg* 2003; 388: 209-17.
2. Eckert J, Schantz PM, Gasser RB, Torgerson PR. Geographic distribution and prevalence. In J Eckert, MA Gemmell, FX Meslin, ZS Pawlowski (Eds). WHO/OIE Manual on Echinococcosis in humans and animals: a public health problem of global concern. WHO, pp.100-142, 2002.
3. Altıntaş N. Cystic and alveolar echinococcosis in Turkey. *Annals of Tropical Medicine and Parasitology* 1998; 92: 637-42.
4. Alkan Z. Sero-epidemiological investigations on hydatid disease. Ph.D. Thesis. Department of Parasitology, School of Medicine, Ege University, İzmir, Turkey.
5. Wen H, Craig PS. Immunglobulin G subclass response in human cystic and alveolar echinococcosis, *Am J Trop Med Hyg* 1994; 51: 741-48.
6. Altintas N. Past to present: echinococcosis in Turkey. *Acta Trop* 2003; 85: 105-12.
7. Altintas N, Yazar S, Yolasiğmaz A, Akisu C, Sakru N, Karacasu F et al. A sero-epidemiological study of cystic echinococcosis in İzmir and its surroundings area. *Helminthologia*,1999; 36: 19-23.
8. Özkol M, Kilimcioğlu AA, Girginkardeşler N, Balcıoğlu İC , Sakru N, Korkmaz M et al. A discrepancy between cystic echinococcosis confirmed by ultrasound and seropositivity in Turkish children. *Acta Trop* 2005; 93: 213-6.
9. Shambesh MK, Craig PS, Ibrahim MM, Gusbi AM, Eghtuish EF. A high prevalence of cystic hydatid disease in North Africa. *Ann Trop Med Parasitol* 1997; 91: 957-9.
10. Bai Y, Cheng N, Jiang C, Wang Q, Cao D. Survey on cystic echinococcosis in Tibetians, West China. *Acta Trop* 2002; 82: 381-5.
11. Varela-Diaz VM, Colcorti EA, De Zavaleta O, Perez-Caviglia H, Zabert EI, Guarnera EA. Immunodiagnosis of human hydatid disease: Applications and contributions to a control programme in Argentina. *Am J Trop Med Hyg* 1993; 32: 1079-87.
12. Carmona C, Perdomo R, Carbo A, Alvarez C, Monti J, Grauert R et al. Risk factors associated with human cystic echinococcosis in Florida, Uruguay: results of mass screening study using ultrasound and serology. *Am J Trop Med Hyg* 1998; 58: 599-605.
13. Cohen H, Paolillo E, Bonifacino R, Botta B, Parada L, Cabrera P et al. Human cystic echinococcosis in a Uruguayan community: a sonographic, serologic and epidemiologic study. *Am J Trop Med Hyg* 1998; 59: 620-7.
14. Nahmias J, Goldsmith R, Schantz P, Siman M, El-On J. High prevalence human hydatid disease (echinococcosis) in communities in northern Israel: epidemiologic studies in the town Yirka. *Acta Trop* 1991; 50: 1-10.
15. Babba H, Messedi A, Masmoudi S, Zribi S, Grillot R, Ambriose-Thomas P et al. Diagnosis of human hydatidosis: Comparison between imagery and six serologic techniques. *Am J Trop Med Hyg* 1994; 50: 64-8.