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### Evaluation of School-Based Creating Awareness of Cystic Echinococcosis: A Pilot Study

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**Abstract:** Human cystic echinococcosis (CE) is the most prevalent disease in Europe, and probably accounts for more than 95% of the estimated 2-3 million global cases. CE is a fatal and serious disease. Turkey is among the countries where this problem still poses a public threat. This study was a pilot study to create the awareness of CE among 10 different districts of Izmir province, Turkey. Awareness raising seminars are essential component of this study for students and schoolteachers. Questionnaire forms were created and applied before and after the presentations. Printed materials, posters and brochures were disseminated and posters put on the walls or boards where students can see continuously. Even 4090 students attended to the trainings, questionnaires were filled by 3793 of the students. Out of 3793 students, 1978 (52.1%) were female and 1815 (47.9%) were male. The majority of students (94.2%) did not know anything about this disease. 93.1% students were stated that there were stray dogs in their environment. More than half of the students were playing with stray dogs. Nearly 90% of the students answered correctly the questions which were asked after presentation. The total number of administrators and teachers who attended to the seminars were 242. This is the first pilot study regarding creating awareness on CE in the Izmir Province, Turkey that covers the big sample-size of children including schoolteachers. This study helped them understand the importance of the problem and how it can be solved by protecting themselves while respecting human and animal rights. It will be used for establishing nationwide control programme.

**Keywords:** Cystic echinococcosis, awareness, Echinococcus granulosus, Turkey

#### Kistik Ekinokokkozis Farkındalığının Okul Temelli Değerlendirilmesi: Pilot Çalışma

**Özet:** Kistik ekinokokkozis (KE), Avrupa'da çok yaygın bir hastalıktır ve dünyada yaklaşık 2-3 milyon olgunun % 95'inden fazlasını oluşturmaktadır. KE, ölümcül ve ciddi bir hastalıktır. Türkiye de bu sorunun halen halk sağlığı tehdidi oluşturduğu ülkeler arasındadır. Bu çalışma, İzmir ilinin 10 farklı ilçesinde KE farkındalığını yaratmak için yapılmış bir pilot çalışmadır. Farkındalık artırma seminerleri, öğrenciler ve okul öğretmenleri için bu çalışmanın temel bileşenidir. Ayrıca anket formları oluşturularak sunum öncesi ve sonrasında öğrencilere uygulanmıştır. Basılı materyaller, posterler ve broşürler dağıtılmış ve posterler öğrencilerin sürekli görebileceği duvar veya panolara asılmıştır. Eğitimlere 4090 öğrenci katılmış, ancak anketler öğrencilerin 3793'ü tarafından doldurulmuştur. 3793 öğrencinin 1978'i (%52.1) kız, 1815'i (%47.9) erkektir. Öğrencilerin çoğunluğu (%94,2) bu hastalık hakkında hiçbir şey bilmiyordu. Öğrencilerin %93,1'i çevrelerinde başıboş köpek olduğunu ve yarısından fazlası da sokak köpekleriyle oynadıklarını bildirmiştir. Sunum sonrasında sorulan soruları öğrencilerin yaklaşık % 90'ı doğru yanıtlamıştır. Seminerlere katılan yönetici ve öğretmenlerin toplam sayısı 242'dir. Bu çalışma, İzmir ilinde okul öğretmenleri de dahil olmak üzere çocukların büyük örneklemini kapsayan KE konusunda farkındalık yaratmaya yönelik ilk pilot çalışmadır. Bu çalışma, sorunun önemini, insan ve hayvan haklarına saygı göstererek kendilerini korumayı nasıl yapabileceklerini anlamalarına yardımcı olmuştur. Ülke çapında uygulanması planlanan kontrol programı oluşturmak için kullanılacaktır.

**Anahtar kelimeler:** Kistik ekinokokkozis, farkındalık, Echinococcus granulosus, Türkiye

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## INTRODUCTION

Cystic echinococcosis (CE) is an important parasitic disease originated from animals and can be transmitted to other herbivorous animals and humans. The adult tapeworm inhabits in the intestine of some carnivores (called definitive or final hosts), and the larval phase develops in the intermediate hosts, in which humans are included.

According to the World Health Organization (WHO), human CE represents a worldwide health and economic problem of people in many countries. Human CE is the most prevalent disease in Europe. The 2015, WHO Foodborne Disease Burden Epidemiology Reference Group (FERG) estimated echinococcosis to be the cause of 19.300 deaths and around 871.000 disability-adjusted life-years (DALYs) globally each year. Annual costs of CE are estimated to be US\$ 3 billion.

This multi-host disease is one of the most important public health infection diseases in Middle East too (Galeh et al., 2018). It is endemic in sheep-raising regions of the world, such as Turkey. As the disease poses a threat for public health, it is taken under control in developed countries.

Turkey is among the countries where this problem still poses a public threat. CE has been recognized in Turkey since 1861 and still is a major health and economic problem. Echinococcus granulosus infection in dogs ranges is between 0.32% and 40%. The prevalence of CE in domestic animals ranges from 3.5% to 58.6%. In humans, the estimated surgical cases rates ranged from 0.87 to 6.6 per 100,000 inhabitants between 1987 and 1994 (Altintas, 2003). This disease has been included within the scope of notifiable diseases since 2005 in Turkey. Newer epidemiologic studies disclosed higher prevalence rates. According to the data of the Ministry of Health; 408 cases were reported in 2008, and this number reached 1,702 by the end of 2019. The morbidity rate reported as 0.57 per 100.000 in 2008 was reported as 2.08 in 2019. According to the records of the Ministry of Health, Izmir province is in fourth place with a total of 680 cases with

131 cases between 2010 and 2014, with 402 cases between 2015 and 2019 (Altintas et al., 2020).

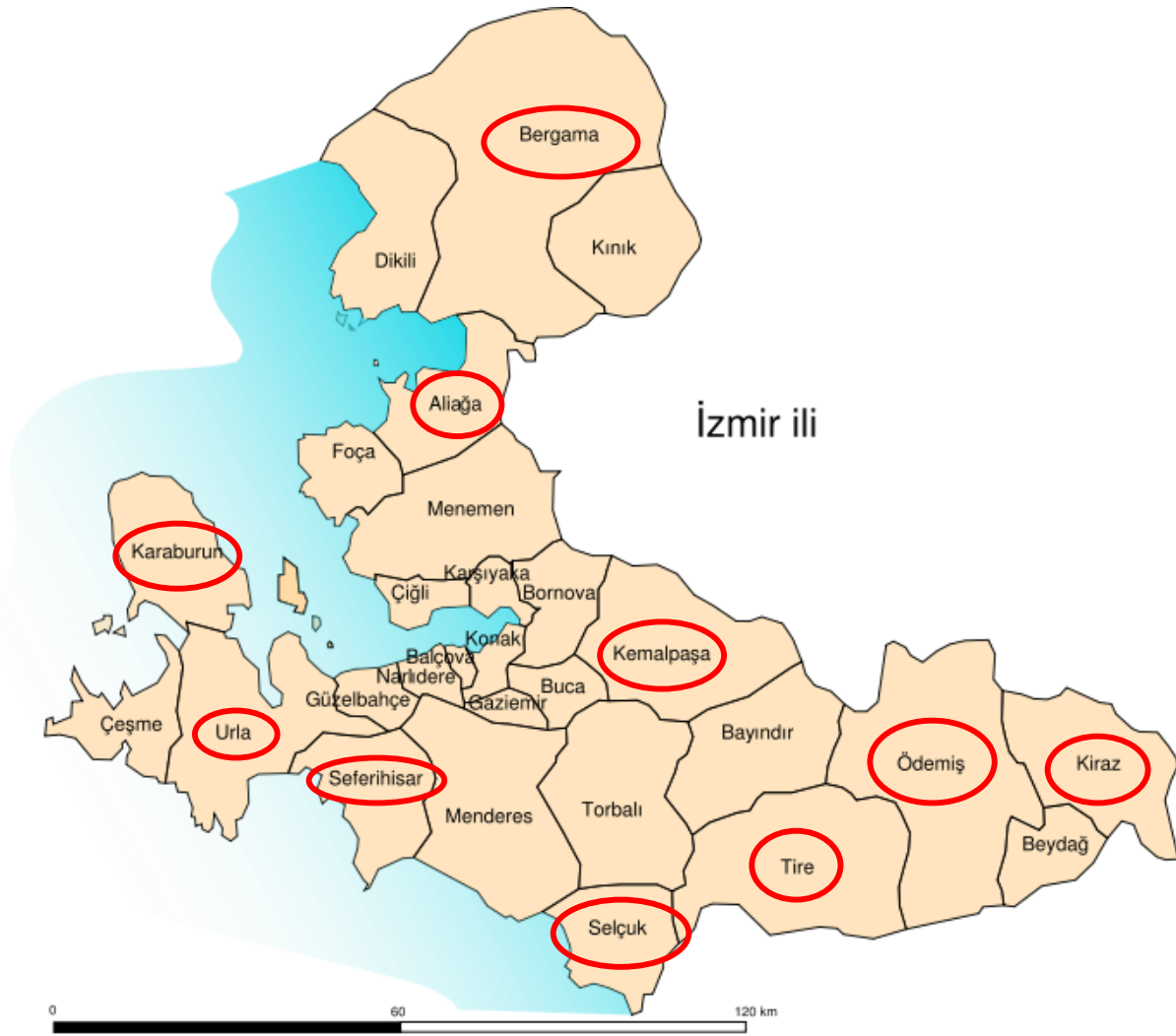
The disease is often seen in women aged between 30 and 50 years who are more likely to be in contact with animals in rural areas (Yolasmaz et al., 2006, Orsten et al., 2018). But it poses risk to children who do not pay attention to hygiene and sanitation rules at early ages. Because this disease is especially taken up during childhood and emerged at an older age. Our study aims to take an initial step towards overcoming this problem by raising awareness and educating especially children and teachers and informing authorities. This is the first pilot study regarding creating awareness on CE in Izmir Province which includes 10 districts of Izmir Province between January 2019 to January 2020.

## MATERIALS and METHODS

### Study area

This study was organized to create the awareness of risk factors of CE among different districts of Izmir province. Izmir is located in Western part of Turkey with a population of 4 320 519 which is third big city in Turkey, where agriculture and animal husbandry is common. Izmir has 30 districts and according to the Ministry of National Education (2018) there are 654 primary schools and 442 secondary schools and approximately 258 800 elementary and secondary school students. Awareness raising seminars are essential component of this study. The seminars were organised in 10 districts: Aliağa, Bayındır, Bergama, Karaburun, Kemalpaşa, Kiraz, Ödemiş, Selçuk, Tire and Urla (Circled in the Map) (Fig 1).





**Figure 1.** Map of ten districts of İzmir Province.

### Study design

Health education was conducted through the schools. Verbal, visual methods were employed during this training conducted from January 2019 to January 2020.

**Visiting stakeholders;** The study was carried out together with the public authorities in terms of decision-making and also in the process by which decisions are implemented. 40 visits were made to the various actors and stakeholders (such as Governorate, Province and District Directorates of National Education, Schools, Municipalities, Province and District Directorates for Health). The Project Team presented the project and delivered an awareness raising seminars in 10 districts of İzmir Province.

**Creating awareness for CE disease;** Awareness raising seminars were organised in 10 districts of İzmir Province: In each district, these seminars were held to the target groups in schools for students, teachers, administrators.

**Awareness raising activities for students, teachers and/or administrators in schools;**

### Visiting schools

Within the scope of the study, 26 schools were visited in 10 districts and 51 training seminars as power-point presentations were performed. During the selection of elementary schools, the authorized persons in the Private Bureau affiliated to the National Education Directorate of each district were contacted. The selection of primary schools with high number of students and conference halls was prioritized to reach more students. In some schools, which did not

have a conference room, the trainings were given in the classrooms.

#### Questionnaires

Questionnaire forms were created and these paper-based questionnaire applied before and after the presentations in order to see the effects of the presentations to the students. Also the presentations prepared according to the capacity of the students. Elementary school 3rd and 4th year students were selected as the target audience in order to communicate easily and to apply the given questionnaire correctly. Printed materials such as posters and brochures were disseminated at these presentations and posters put on the walls or boards where students can see continuously.

#### Data management and statistical analysis

To evaluate the data, descriptive analysis was determined for several variables and SPSS (Statistical Package for the Social Science) Version 23.0 (SPSS Inc. Chicago, IL, USA) were used for all calculations. The results of the pre- and post- presentation knowledge assessments were also evaluated. Statistical significance was evaluated if p-value is  $\leq 0.05$ .

Information activities in schools, analysis of data results, were delivered to the local authorities as well as the Ministry of Health, Ministry of Education and Ministry of Agriculture and Forestry.

## RESULT

### Visiting stakeholders

Within the scope of the study, 40 visits were made to the stakeholders and employees of 40 different institutions to give information during the whole project period (12 months).

### Awareness raising activities for students, teachers and/or administrators in schools

Necessary permit letters were sent from Izmir Governorship to Provincial Directorate of National Education and all District Governorships of the study. Then necessary permits for the activities in the schools were sent

to the District National Education Directorates from these institutions.

The target group was primary school children. Therefore, brochures, roll-ups, PowerPoint presentations and a questionnaire forms were prepared. At the end of the trainings at schools, the data including the demographic characteristics, questions concerning knowledge about human CE, dog and livestock-related practices. After the surveys data were transferred to an electronic database (Microsoft Excel), and manually curated before.

Administrators and teachers were also attended to the PowerPoint presentations and informed about hydatid disease. They also provided support to the project team to coordinate students during the presentations.

Prior to this activity, easy-to-understand, PowerPoint presentations which enriched with animations and hand brochures were prepared in accordance with the knowledge level of the students. Elementary school 3rd and 4th year students were selected as the target audience in order to communicate easily and to apply the given questionnaire correctly. Questionnaire forms were created in order to see the effects of the presentations to the students. These questionnaire forms consisted of 17 questions in total. It was given importance to whether the students were aware of the disease and to reveal risk factors with the first 8 questions on the front side of the questionnaire. The remaining 9 questions on the back side of the questionnaire consisted of questions about the disease including ways of transmission, prevention and treatment. In this way, the students answered the questions on the front side before the presentation and the questions on the back side after the presentation. Aim was to evaluate the changes in the level of their knowledge.

After collecting the questionnaire forms, brochures were distributed to each student. Care was taken to prepare hand brochures at a level that children could easily understand and also attract their attention. The front and back sides of the brochure distributed to students are shown in Figure 2 (A and B) and poster in Figure 3 below.



Fig. 2. Brochure prepared for students (A: Front side, B: Back side).



Fig. 3. Poster prepared for students. Even 4090 students attended to the trainings, questionnaires were filled by 3793 of the

students. 1978 (52.1%) of these students were female students and 1815 (47.9%) were male students (Table 1). According to the information of the questionnaire forms: 1903 (50.17%) students consisted of 3rd grade students and 1890 (49.83%) consisted of 4th grade students. Table 1. Number of students educated in elementary schools selected in 10 districts and distribution by gender.

According to the responses given before the presentation on the front side of the questionnaire are shown in Table 2. In this table, asked questions and options and the answers given by the number of students were seen.

Table 2. Students' responses before the presentation.

The answers given by the students to the questions on the back side of the questionnaire forms after PowerPoint presentations are also shown in Table 3.

Table 3. Students' responses after the presentation.

As a result; according to the survey data the majority of students (94.2%) stated that they did not know anything about this disease before presentations. In addition, the big majority of students were stated that (93.1%) there were stray dogs in their environment. More than half of the students stated that they were playing with stray dogs. Only 28% of students stated that animal slaughtering was carried out in slaughterhouses during Sacrifice Feast. Nearly 90% of the students answered correctly the questions which were asked after presentation. In the 16<sup>th</sup> question of the questionnaire, 97.3% of the students were understood and learned about this disease.

The total number of administrators and teachers who attended to the presentations together with the students was 242. Of these, 150 were female (62%) and 92 were male (38%). After our activities, feedbacks were received from administrators and teachers. They informed that these awareness trainings were very effective and useful for children even for them.

As a result of the project; 4090 students, 242 administrators and teachers were attended to the training seminars.

**Table 1.** Number of students educated in elementary schools selected in 10 districts and distribution by gender.

Name of the districts	No.of male students	No.of female students	Total
Urla	198	192	390
Karaburun	78	77	155
Aliğa	232	210	442
Bergama	410	364	774
Ödemiş	291	254	545
Bayındır	168	161	329
Kiraz	133	107	240
Tire	115	121	236
Selçuk	56	56	112
Kemalpaşa	297	273	570

**Table 2.** Students' responses before the presentation  
**Questions (Total number of Answers given answers )**

1. Have you ever heard of CYST HYDATID disease? (3756)	Yes No
2. Do you wash your hands after playing or loving dogs? (3786)	Always Sometimes Never I'm not playing with dogs
3. Do you wash vegetables and fruits before eating?	Always Sometimes Never
4. Are there stray dogs in your surroundings?	Yes No Never
5. How often do you play with stray dogs?	Sometimes Always
6. Do you raise livestock such as sheep, goats, cattle?	Yes No In slaughterhouse
7. Where does your family make animal slaughter on sacrifice feast?	In the garden of the house In public area We do not cut animal I don't have a dog
8. If you have a dog, does it take parasite treatment?	Sometimes Always Never

## DISCUSSION

*Echinococcus granulosus* is the main species of importance in relation to food producing animals. Intermediate hosts, in which hydatid cysts can be found predominantly in the lungs and liver, include cattle, sheep, pig, deer etc. Infection is through the ingestion of eggs

excreted in the faeces of the canine final host. Human infection occurs by ingestion of eggs present on the coats of dogs, or from vegetables and other foodstuffs contaminated by dog faeces (EFSA, 2010).

In Turkey, CE is common in people every part of the country but there is very little field work. Human cases are largely based on hospital records and community-based screening studies are very few. Although the present number of stray dogs and owned dogs is unknown in Turkey. According to some of the local studies, *E. granulosus* infection in dogs ranges between 0.32% and 40%. The prevalence of CE in domestic animals ranges from 3.5% to 58.6% has varied widely with geographical location (Altintas, 2019).

The sero-epidemiological study conducted for the first time in 1999, 3.45% seropositivity and 291 / 100.000 (6/2055) prevalence were found in 2055 people living in and around İzmir city (Altintas et al., 1999). In other studies conducted in İzmir Province, the number of the cases and the years were found as follow; 591 cases between 1997 and 1998, 840 between 1997 and 2001, and 1.274 cases between 2001 and 2005 (Ertabaklar et al., 2003, Yazar et al., 2008). Considering all the results of the surveys done in some of the regions approximately one of each 150-200 people (0.5-0.6%) can be considered to be infected with CE in Turkey (Altintas, 2019, Tamarozzi et al., 2018). This is also an indication that CE is one of the most important health problem in Turkey.

According to recent estimates, there are currently 60 million people at risk of infection and approximately 2-3 million cases of echinococcosis globally, with one-third of all cases occurring in children (McManus et al., 2012; Han et al., 2018; Tamarozzi et al., 2018). Cystic echinococcosis is especially taken up during childhood and emerged at an older age. They become exposed to the eggs of the tapeworm after close contact with an infected dog or its contaminated environment. The infected dogs also pass in their feces *E. granulosus* eggs that adhere to the dogs' hairs, and pass on to the children who are in the

**Table 3.** Students' responses after the presentation. course of playful and intimate contact with the infected dogs. In our study, the big majority of

students were stated that (93.1%) there were stray dogs in their environment. More than half of the students stated that they were playing with stray dogs.

Questions (Total number of given answers )	Answers	Number (%)
9. From which animal does this disease transmit to humans?	Cat	46 (%1,2)
	Dog	3577 (%94,6)
	Bird	21 (%0,6)
	Sheep	139 (3,7)
10. At what age is this disease transmitted most?	In childhood	3544 (%93,8)
	In infancy	149 (%3,9)
	In old age	86 (%2,3)
11. How is this disease transmitted to us?	From the feces of dogs	3489 (%92,6)
	From clean vegetables and fruits	182 (%4,8)
12. What should we do to prevent ourselves from this disease?	By human-to-human contact	96 (%2,5)
	Providing dogs to defecate outside	252 (%6,7)
	Washing our hands	3390 (%90,2)
13. What is the treatment of this disease?	Eating vegetables and fruits without washing	118 (%3,1)
	There is no treatment	274 (%7,3)
	Surgery	3363 (%89,1)
14. What should be done the cyst organs of the animals after slaughtered in sacrifice feast?	To be vaccinate	137 (%3,6)
	Should be given to cats and dogs	125 (%3,3)
	Should be thrown to rubbish	277 (%7,4)
15. What should be done the feces of your dog when you take it to walk around?	Should be buried in a deep pit	3349 (%89,3)
	Should be left where it is	69 (%1,8)
	Should be taken in a plastic bag and thrown it to rubbish	3611 (%95,9)
16. Did you learn about this disease at the end of the training?	Dog should not be defecated	8,4 (%2,2)
	Yes	3664 (%97,3)
	No	102 (%2,7)

For *E. granulosus* the highest prevalence rates among humans and animals occur where livestock production is extensive, where large numbers of dogs are kept, and where dogs have access to carcasses of dead livestock or offal after uncontrolled slaughter (Schantz et al., 1995; Ito et al., 2003; McManus et al., 2003). In parts of the our country, people make their living by raising animals such as these 10 districts of the Province of Izmir. Animal husbandry is a predominant occupation. In addition, Turkey is a secular country; 99% of the people living in Turkey are Muslims. So, once a year during the sacrificial festival, tens of thousands of sheep and cattle are slaughtered and infected intermediate hosts are

given to feed stray dogs (Babaoglu, 2015). And most of the children are involved during in this situation.

This pilot health-education intervention program was undertaken in 26 randomly selected municipal primary schools in 10 districts of Izmir Province, to increase awareness of students and schoolteachers regarding CE. The study suggests that education program for echinococcosis control should be initiated in school children because most infections acquire during childhood. Children have an increasing overall exposure risk with age. Even students were prime targets for educational intervention,

changing the knowledge, attitudes and practices of teachers regarding the disease leads to a multiplier effect as they pass on the message to many generations of students (Veena et al., 2012). So it's important to create awareness raising in schoolteachers and administrators for us.

Aim of this proposed project was helping to improve this situation by conducting a series of educational and awareness raising activities for the children and also schoolteachers. Such as; distributing brochures, posters and making presentations at primary and secondary schools for the children. In order to raising awareness about CE, it's thought that students will inform their family members with the brochures will be taken from school to their homes and affect their family members behavior. Because if you educate one child, it means you have reached the whole family members. A comprehensive program targeting echinococcosis should focus on not only strategies to improve early diagnosis and treatment but also educational campaigns to improve awareness about the disease and the sanitation and hygienic practices (Han et al., 2018). Because in addition to poor hygienic practices the lack of knowledge about echinococcosis transmission is also important determinant in infection transmission.

It is very important to evaluate the level of knowledge about the disease for effective control of echinococcosis. But it is also important that increasing awareness of risky practices that spread the disease within the community. CE urgently needs attention both for protecting public health and animal welfare in Turkey.

## **CONCLUSION**

The objective of this study was to obtain information on the current situation of knowledge, attitudes and practices about echinococcosis among the children of 10 districts of Izmir Province. In addition, the aim was also to provide helpful information for the improvement and formulation of health education policies for the future. Moreover, this is the first project to create awareness on CE in the Izmir Province, Turkey that covers the big

sample-size of children. These activities are mainly aimed to interrupt parasite transmission and ultimately reduce the burden of the disease. Final report derived from the results was sent to the local authorities as well as the Ministry of Education, Ministry of Health and Ministry of Agriculture and Forestry to be used for larger scale projects in this area, including codes of conduct and nationwide control programme.

## **Ethical approval**

Informed written consent was obtained from each participant.

## **Conflict of interest**

The authors do not have a conflict of interest.

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