A study to assess the awareness of risk factors of cystic echinococcosis in Turkey

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ABSTRACT

الأهداف: تحديد المعرفة و المواقف والممارسات والوعي لعوامل خطر المرتبط بالمكورات المشوكة بين مربي الحيوانات و الممرضين وطلاب التمريض و إخصائي التغذية ومهني التغذية و غيرهم من المجموعات في تركيا.

الطريقة: تم إعداد استمارات الاستبيان بما يتفق مع تنوع الأفراد و تم انشاء الدراسة الاستقصائية حول العوامل ووسائل النقل و علم الأوبئة و عوامل خطر بالمكورات المشوكة . تم اجراء المسح الوصفي في شهر مايو 2015 إلى مايو 2016 عن الطريق التواصل وجه لوجه .جمعت البيانات من 647 شخصا متضمنه 95 مربي حيوانات . 92 ممرضة و 249 طلاب تمريض و 49 أخصائي تغذية و 28 مهني تغذية و ١٣٤اشخاص من جماعات اخرى من تركيا. وقد تم تقييم بيانات المسح من حيث النسب المئوية والوسائل وتحليلها من اختبار مربع تشي بيرسون واختبار مان – ويتني U لتحديد العلاقات بين إجابات الاستبيان والخصائص الاجتماعية والديموغرافية، مثل العمر والجنس والمستوى التعليمي والمهنة . تمت مقارنة المتغيرات غير الفئوية من خلال تحليل ارتباط سبيرمان مع دلالة إحصائية عند مستوى 0.05.

النتائج: تم تحديد انخفاض مستوى الوعي من ناحية غسل الخضروات والخضروات النية و واستهلاك مخلفاتها والدورات الأعلامية والتواصل مع الكلاب وإدارة العقاقير المضادة لطفيليات الكلاب

الخاتمة: لا يمتلكون المشاركين في هذه الاحصائية المعرفة الكافية فيما يتعلق في المكورات المشوكة حيث أننا ندعو لتنفيذ برامج تدريبية لتطوير الوعي العام بهذه الأمراض الهامة

Objectives: To determine the knowledge, attitudes, practices, and awareness for risk factors associated with cystic echinococcosis (CE) among animal breeders, nurses, nursing students, dietitians, food professionals and other public groups in Turkey.

Methods: Questionnaire forms were prepared in compliance with the individuals' diversity, and a survey was created about agents, transmission modes, epidemiology, treatment, and risk factors for CE. The descriptive survey was performed between May 2015 and May 2016 by face-to-face communication.

Data were collected from a total of 647 individuals, including 95 animal breeders, 92 nurses, 249 nursing students, 49 dietitians, 28 food professionals and 134 people from other public groups from Turkey. Survey data were evaluated in terms of percentages and means and analyzed by the Pearson's chi-square test and Mann-Whitney U test to determine the relationships between questionnaire answers and socio-demographic attributes, such as age, gender, educational level, and profession. Non-categorical variables were compared via Spearman's rho correlation analysis with statistical significance set at the 0.05 level.

Results: We determined low awareness for vegetable washing, raw vegetables and offal consumption, informative courses, contact with dogs, and administration of antiparasitic drugs to dogs.

Conclusion: The participants of this survey were found to be with insufficient knowledge regarding risk factors of CE. We advocate the implementation of training programs to improve public awareness on this important disease.

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Parasites are commonly observed in tropical and subtropical climatic regions and known to cause chronic diseases with high morbidity and mortality. Cystic echinococcosis (CE), a globally important zoonotic parasitic disease, is caused by the larvae of the cestode *Echinococcus granulosus* infecting intermediate hosts such as herbivores and humans.[1] It is transmitted to humans by dogs, infected animals, and contaminated food and can cause severe symptoms and death in intermediate hosts; furthermore, it leads to decreased livestock productivity and considerable economic loss.[2-4] Cystic echinococcosis is a major public health problem that has re-emerged in many countries despite innovations in diagnoses, treatments, and control programs for the disease.[5,6] Several factors influence the spread of CE.[7] Illiteracy and improper practices (personal and environmental hygiene deficiency, wrong feeding habits, lack of water and inadequate sanitation, and so forth) contribute significantly toward the difficulties associated with preventing many diseases, including parasitic diseases.[8-11] Since CE is an important public health problem and has a variety of factors in epidemiology, we care about training activities for every segment of society to combat the disease influentially. Since Turkey presents geographic properties suitable for animal breeding and livestock production, parasitic diseases are common in the country. Cystic echinococcosis is an important zoonotic disease that is widespread in animals and humans in Turkey.[12] According to the literature review there is no sufficient study to evaluate the awareness, practices, and potential risk factors for CE in animal breeders, healthcare professionals, and other public groups in Turkey. Although control programs for CE have been implemented, the disease remains a critical problem worldwide and is considered a re-emerging disease.[5,13-15] Because public education has critical significance to struggle with CE, awareness and practices should be determined among variety groups of public. This descriptive study aims to determine the knowledge, attitudes, practices, and awareness of potential risk factors of CE among animal breeders, nurses, nursing students, dietitians, food professionals and other public groups from different provinces in Turkey.

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Methods.

Study design. This was a descriptive study to assess the awareness of risk factors of CE among different occupational groups.[16] Questionnaire forms were prepared in compliance with the individuals' diversity. Participants were classified into 3 groups, and a different survey was created for each group. The first group included healthcare workers/students and food professionals, the second included animal breeders, and the third included other public groups. Questionnaires were developed to collect the socio-demographic attributes of each participant; questions concerning agent (*E. granulosus* s.l.), transmission, epidemiology, treatment, and risk factors of CE were also included (**Table 1**). We further investigated each of

Table 1 - Survey questions to collect the socio-demographic attributes of each participant; questions concerning agent, transmission, epidemiology, treatment, and risk factors of cystic echinococcosis (CE).

Q1, Qu1, Que1	Do you have some information about CE?
Q2	Is the agent of CE a bacteria, virus or parasite?
Q3, Que7	Which animal is the definitive host for CE?
Q4, Que3	Where do cysts in the intermediate host seen mostly?
Q5, Qu5, Que2	What should be done the infected internal organs?
Q6, Que4	Do cysts on internal organs of cattle, sheep and goats generate cyst also in humans?
Q7	By which way do people infect by CE?
Q8	How the disease is cured?
Q9, Que5	Does it play a role in transmission of the disease that not washing the vegetables that raw consumed?
Q10	Do you wash fruits and vegetables before consumption?
Q11	Do you use vinegar while washing the vegetables?
Q12	Do you eat salad in restaurants?
Q13	Do you think that meats consumed in restaurants are healthwise for life?
Q14, Que6	Do you keep a dog?
Q15	Do you wash your hands after touch on soil or dog?
Q16	Do you have offal consumption habit?
Q17, Que9	Have you ever participated to any informative course about CE?
Q18, Qu6, Que10	Is there any person who treated for CE around you?
Qu2	Can you identify CE during slaughtering?
Qu3	Have you ever identified CE during slaughtering?
Qu4	Do you have some information about mode of transmission for CE?
Qu7	Can your dogs freely enter to barns?
Qu8	Do you give offal and/or foetus to your dogs?
Qu9	Does a veterinarian examine your dogs regularly?
Qu10	Do you administrate antiparasitic drugs to your dogs?
Qu11	Do you administrate antiparasitic drugs to animals (sheep, goat, cattle)?
Que8	Do you think that dogs are reservoir for some other disease seen in humans?

the participant's practices and associations with dogs, potentially hazardous food consumption, participation in informative courses, and whether any person around them had been treated for CE.

The inclusion criteria in this study were determined to be 18 years or older and the approval of the participants. On the other hand, disapproval, non-literacy and mental retardation were accepted as criteria for exclusion. We obtained a letter from Faculty of Health Sciences, University of Karamanoglu Mehmetbey indicating no objection to do the study and emphasizing the study team worked in compliance with ethical rules.

Study area and sampling techniques. The surveys were distributed to nursing students and other public groups in Karaman Province and to animal breeders in Afyonkarahisar Province in Turkey. A pilot province was not selected, and data were collected from nurses, dietitians, and food professionals in different provinces of Turkey. Surveys were performed via face-to-face meetings for public groups (n=134), animal breeders (n=95), and nursing students (n=249) and by mail for other groups (nurses, dietitians and food professions; n=169) between May 2015 and May 2016. In summary, data were collected from a total 647 individuals, including 95 animal breeders, 92 nurses, 249 nursing students, 49 dietitians, 28 food professionals and 134 people from other public groups from 30 provinces in Turkey. Socio-demographic features, such as age, gender, education, and job status, were also recorded.

Statistical evaluation of data. To evaluate the data, the percentages of several variables were first determined, and all calculations were performed using SPSS (Statistical Package for the Social Science) Version 16.0 (SPSS Inc., Chicago, IL, USA).[17] Prior to analysis, normal distribution of variance of all variables was assumed with Kolmogorov-Smirnov test and homogeneity of variance of all variables was assumed with Levene's test. Qualitative data were evaluated using the Pearson's Chi-square test. Since the data were not normally distributed, Mann-Whitney U test was used to determine differences in the mean and standard deviation of data among groups. Non-categorical variables were compared by Spearman's rho correlation analysis. Statistical significance was evaluated at levels of 0.05 and 0.01.

Results. ***Evaluation of knowledge, attitudes, practices, and awareness of risk factors related to CE in people from other public groups.*** The answers reported by this group were evaluated in terms of educational level, profession, and gender. Dog ownership statistically significantly decreased as the educational level increased ($p<0.05$, $p=0.020$). About 23.1% of the participants in informative courses held an associate degree, and nobody held a high school and under degree, trained ($p<0.01$, $p=0.008$). This group was divided into subgroups of academicians, public employees, students, and worker-housewife, and 75% of the members of the worker-housewife group reported having some information on CE (75%). In terms of having information about CE, there was a statistically significant difference among this groups ($p<0.05$, $p=0.013$). There was a statistically significant difference for the number of participants who keep a dog between students and academicians ($p<0.01$, $p=0.005$). About 28.9% of the students and 0% of the academicians kept dogs. A statistically significant difference was detected among the subgroups in terms of offal consumption ($p<0.05$, $p=0.016$); such consumption was prevalent among public employees (54.5%) and academicians (52%). When we evaluated answers with respect to gender, the rates of correct answers for the question "where are cysts in the intermediate host mainly seen" was statistically significantly higher in women than in men and the question "how is the disease cured" was statistically significantly higher and in men than in women ($p<0.05$, $p=0.013$, $p=0.016$). About 45.3% of the women reported proper vegetable washing practices (namely, with vinegar) ($p<0.01$, $p=0.000$) (**Tables 2 & 3**).

A positive correlation between number of correct answers in knowledge-related questions and age of participants was detected ($p<0.05$, $p=0.045$, r=0.173; Spearman's rho correlation).

Knowledge of CE was evaluated according to an individual's training status. While a total of 17.3% of the participants who had information about the disease participated in informative courses related to CE, none of the individuals who had no information about CE participated in any related course ($p<0.01$, $p=0.001$; Pearson's chi square test). People who declared that they have some information about CE provided more correct answers to CE-related questions than those who did not have information about the disease ($p<0.01$, $p=0.002$; Mann-Whitney U test).

Knowledge levels and practices related to CE among animal breeders. A total of 54.7% of the animal breeders surveyed declared having information about CE. Animal breeders who declared they have high school and higher education were found to be well-informed about CE compared with lower-education groups ($p<0.05$, $p=0.040$). About 31.6% of the animal breeders declared they could identify cysts if they see after slaughtering, and 24.2% reported their ability to identify the cysts while slaughtering before. Most

Table 2 - Percentage of answers given by people according to their education levels, professions and gender.

		Education levels				Professions				Gender		Total
Question	Answer	High school and under	Associate degree	Bachelor's degree	Postgraduate	Academician	Public Employee	Student	Worker-housewife	Male	Female	
Q1	Yes	14 (77.8)	22 (56.4)	27 (54.0)	12 (44.4)	8 (32.0)	36 (65.5)	19 (50.0)	12 (75.0)	46 (56.8)	29 (54.7)	**75 (56.0)**
	No	4 (22.2)	17 (43.6)	23 (46.0)	15 (55.6)	17 (68.0)	19 (34.5)	19 (50.0)	4 (25.0)	35 (43.2)	24 (45.3)	**59 (44.0)**
Q2	Right	10 (55.6)	20 (51.3)	27 (54.0)	13 (48.1)	10 (40.0)	34 (61.8)	17 (44.7)	9 (56.2)	44 (54.3)	26 (49.1)	**70 (52.2)**
	Wrong	8 (44.4)	19 (48.7)	23 (46.0)	14 (51.9)	15 (60.0)	21 (38.2)	21 (55.3)	7 (43.8)	37 (45.7)	27 (50.9)	**64 (47.8)**
Q3	Right	6 (33.3)	11 (28.2)	20 (40.0)	11 (40.7)	8 (32.0)	26 (47.3)	9 (23.7)	5 (31.2)	31 (38.3)	17 (32.1)	**48 (35.8)**
	Wrong	12 (66.7)	28 (71.8)	30 (60.0)	16 (59.3)	17 (68.0)	29 (52.7)	29 (76.3)	11 (68.8)	50 (61.7)	36 (67.9)	**86 (64.2)**
Q4	Right	13 (72.2)	31 (79.5)	36 (72.0)	18 (66.7)	16 (64.0)	39 (70.9)	33 (86.8)	10 (62.5)	53 (65.4)	45 (84.9)	**98 (73.1)**
	Wrong	5 (27.8)	8 (20.5)	14 (28.0)	9 (33.3)	9 (36.0)	16 (29.1)	5 (13.2)	6 (37.5)	28 (34.6)	8 (15.1)	**36 (26.9)**
Q5	Right	16 (88.9)	30 (76.9)	48 (96.0)	24 (88.9)	23 (92.0)	48 (87.3)	33 (86.8)	14 (87.5)	73 (90.1)	45 (84.9)	**118 (88.1)**
	Wrong	2 (11.1)	9 (23.1)	2 (4.0)	3 (11.1)	2 (8.0)	7 (12.7)	5 (13.2)	2 (12.5)	8 (9.9)	8 (15.1)	**16 (11.9)**
Q6	Right	13 (72.2)	34 (87.2)	43 (86.0)	19 (70.4)	17 (68.0)	46 (83.6)	33 (86.8)	13 (81.2)	63 (77.8)	46 (86.8)	**109 (81.3)**
	Wrong	5 (27.8)	5 (12.8)	7 (14.0)	8 (29.6)	8 (32.0)	9 (16.4)	5 (13.2)	3 (18.8)	18 (22.2)	7 (13.2)	**25 (18.7)**
Q7	Right	15 (83.3)	34 (87.2)	39 (78.0)	21 (77.8)	18 (72.0)	43 (78.2)	34 (89.5)	14 (87.5)	62 (76.5)	47 (88.7)	**109 (81.3)**
	Wrong	3 (16.7)	5 (12.8)	11 (22.0)	6 (22.2)	7 (28.0)	12 (21.8)	4 (10.5)	2 (12.5)	19 (23.5)	6 (11.3)	**25 (18.7)**
Q8	Right	13 (72.2)	30 (76.9)	36 (72.0)	24 (88.9)	21 (84.0)	43 (78.2)	28 (73.7)	11 (68.8)	68 (84.0)	35 (66.0)	**103 (76.9)**
	Wrong	5 (27.8)	9 (23.1)	14 (28.0)	3 (11.1)	4 (16.0)	12 (21.8)	10 (26.3)	5 (31.2)	13 (16.0)	18 (34.0)	**31 (23.1)**
Q9	Right	14 (77.8)	31 (79.5)	38 (76.0)	21 (77.8)	19 (76.0)	43 (78.2)	30 (78.9)	12 (75.0)	63 (77.8)	41 (77.4)	**104 (77.6)**
	Wrong	4 (22.2)	8 (20.5)	12 (24.0)	6 (22.2)	6 (24.0)	12 (21.8)	8 (21.1)	4 (25.0)	18 (22.2)	12 (22.6)	**30 (22.4)**
Q10	Yes	18 (100.0)	38 (97.4)	49 (98.0)	27 (100.0)	25 (100.0)	53 (96.4)	38 (100.0)	16 (100.0)	79 (97.5)	53 (100.0)	**132 (98.5)**
	No	-	1 (2.6)	1 (2.0)	-	-	2 (3.6)	-	-	2 (2.5)	-	**2 (1.5)**
Q11	Yes	4 (22.2)	13 (33.3)	14 (28.0)	6 (22.2)	5 (20.0)	15 (27.3)	15 (39.5)	2 (12.5)	13 (16.0)	24 (45.3)	**37 (27.6)**
	No	14 (77.8)	26 (66.7)	36 (72.0)	21 (77.8)	20 (80.0)	40 (72.7)	23 (60.5)	14 (87.5)	68 (84.0)	29 (54.7)	**97 (72.4)**
Q12	Yes	14 (77.8)	37 (94.9)	46 (92.0)	24 (88.9)	22 (88.0)	50 (90.9)	36 (94.7)	13 (81.2)	76 (93.8)	45 (84.9)	**121 (90.3)**
	No	4 (22.2)	2 (5.1)	4 (8.0)	3 (11.1)	3 (12.0)	5 (9.1)	2 (5.3)	3 (18.8)	5 (6.2)	8 (15.1)	**13 (9.7)**
Q13	Yes	7 (38.9)	7 (17.9)	10 (20.0)	5 (18.5)	6 (24.0)	10 (18.2)	5 (13.2)	8 (50.0)	20 (24.7)	9 (17.0)	**29 (21.6)**
	No	11 (61.1)	32 (82.1)	40 (80.0)	22 (81.5)	19 (76.0)	45 (81.8)	33 (86.8)	8 (50.0)	61 (75.3)	44 (83.0)	**105 (78.4)**
Q14	Yes	3 (16.7)	10 (25.6)	5 (10.0)	-	-	6 (10.9)	11 (28.9)	1 (6.2)	9 (11.1)	9 (17.0)	**18 (13.4)**
	No	15 (83.3)	29 (74.4)	45 (90.0)	27 (100.0)	25 (100.0)	49 (89.1)	27 (71.1)	15 (93.8)	72 (88.9)	44 (83.0)	**116 (86.6)**
Q15	Yes	18 (100.0)	33 (84.6)	48 (96.0)	26 (96.3)	23 (92.0)	53 (96.4)	33 (86.8)	16 (100.0)	75 (92.6)	50 (94.3)	**125 (93.3)**
	No	-	6 (15.4)	2 (4.0)	1 (3.7)	2 (8.0)	2 (3.6)	5 (13.2)	-	6 (7.4)	3 (5.7)	**9 (6.7)**
Q16	Yes	4 (22.2)	17 (43.6)	22 (44.0)	14 (51.9)	13 (52.0)	30 (54.5)	10 (26.3)	4 (25.0)	37 (45.7)	20 (37.7)	**57 (42.5)**
	No	14 (77.8)	22 (56.4)	28 (56.0)	13 (48.1)	12 (48.0)	25 (45.5)	28 (73.7)	12 (75.0)	44 (54.3)	33 (62.3)	**77 (57.5)**
Q17	Yes	-	9 (23.1)	3 (6.0)	1 (3.7)	1 (4.0)	9 (16.4)	3 (7.9)	-	6 (7.4)	7 (13.2)	**13 (9.7)**
	No	18 (100.0)	30 (76.9)	47 (94.0)	26 (96.3)	24 (96.0)	46 (83.6)	35 (92.1)	16 (100.0)	75 (92.6)	46 (86.8)	**121 (90.3)**
Q18	Yes	1 (5.6)	6 (15.4)	6 (12.0)	1 (3.7)	1 (4.0)	7 (12.7)	4 (10.5)	2 (12.5)	11 (13.6)	3 (5.7)	**14 (10.4)**
	No	17 (94.4)	33 (84.6)	44 (88.0)	26 (96.3)	24 (96.0)	48 (87.3)	34 (89.5)	14 (87.5)	70 (86.4)	50 (94.3)	**120 (89.6)**

Values are presented as number and percentage (%)

of the animal breeders (80%) were uninformed about the transmission modes of the disease. About 42.1% of the individuals surveyed knew how to handle infected internal organs, and no statistically significant difference among these participants was found in terms of educational level ($p>0.05$, $p=0.172$) and extra work except livestock raising ($p>0.05$, $p=0.327$). The percentage of participants reporting individuals who had contracted CE around them was 2.1% (**Table 4**).

A total of 70% of the animal breeders surveyed who confirmed their ability to recognize CE also stated that they had previously identified cysts during animal slaughter. By comparison, 3.1% of the individuals surveyed declared that they could not recognize CE cysts ($p<0.01$, $p=0.000$; Pearson's chi square test).

We determined the means and standard deviations of the numbers of slaughtered animals according to answers for cyst identification while slaughtering ($p<0.01$, $p=0.001$) and found that the number of slaughtered animals per year positively influenced

Table 3 - *P*-values for each question according to their education levels, professions, and gender.

Question	Education levels		Professions		Gender	
	x^2	*P*-value	x^2	*P*-value	x^2	*P*-value
Q1	5.011	0.171	10.737	0.013*	0.056	0.813
Q2	0.337	0.953	4.484	0.214	0.356	0.551
Q3	1.696	0.638	5.876	0.118	0.535	0.465
Q4	1.416	0.702	5.755	0.124	6.183	0.013*
Q5	7.628	0.054	0.460	0.928	0.830	0.362
Q6	4.719	0.194	3.881	0.275	1.716	0.190
Q7	1.517	0.678	3.855	0.278	3.109	0.078
Q8	3.079	0.380	1.578	0.664	5.781	0.016*
Q9	0.154	0.985	0.149	0.985	0.003	0.955
Q10	1.074	0.783	2.916	0.405	1.328	0.249
Q11	1.296	0.730	5.231	0.156	13.698	0.000**
Q12	4.379	0.223	2.524	0.471	2.911	0.088
Q13	3.706	0.295	9.671	0.022*	1.123	0.289
Q14	9.857	0.020*	12.756	0.005**	0.949	0.330
Q15	6.953	0.073	4.567	0.206	0.156	0.693
Q16	4.059	0.255	10.264	0.016*	0.827	0.363
Q17	11.789	0.008*	5.575	0.134	1.230	0.267
Q18	2.918	0.404	1.489	0.685	2.148	0.143

*$p<0.05$; **$p<0.01$; Chi-square test

knowledge regarding CE ($p<0.01$, $p=0.005$; Mann-Whitney U test).

We analyzed the relationship between CE knowledge and experience-related questions. While 50% of the animal breeders reporting knowledge of the disease stated that they could identify cysts while slaughtering animals, 9.3% of the individuals who did not have this information confirmed their ability to identify cysts ($p<0.01$, $p=0.000$; Pearson's chi square test). Another 40.4% of the animal breeders with CE knowledge confirmed that they had previously identified cysts, and 4.7% of the individuals without this information declared that they previously identified cysts while slaughtering ($p<0.01$, $p=0.000$; Pearson's chi square test). Finally, 36.5% of the animal breeders with CE knowledge reported an awareness of its of transmission modes; none of the animal breeders without CE knowledge had this awareness ($p<0.01$, $p=0.000$; Pearson's Chi square test).

The number of animals possessed by individuals who stated that they had knowledge of the disease was found to be significantly higher than those who did not have this information ($p<0.01$, $p=0.006$; Mann-Whitney U test).

Dog owners' practices. A total of 75.8% of the animal breeders kept one or more dogs, and 67.6% of these breeders reported that their dogs could freely enter their barns or were fed offal. Animal breeders who had graduated from primary school were more likely to feed offal and/or fetus to their dogs compared with other groups ($p<0.05$, $p=0.049$; Pearson's chi square test). The answers given by animal breeders to CE-related questions were evaluated in terms of extra work status. All breeders without extra work did not visit their veterinarians regularly. In particular, 80.4% of all farm laborers and 40% of all other worker types reported being unable to visit their veterinarians regularly; this difference is statistically significant ($p<0.05$, p-value= 0.023; Pearson's Chi square test). In addition, 77.5% of all dog owners admitted to not administering antiparasitic drugs to their dogs, although 61.1% of the animal breeders administered these drugs to farm animals (for example, cattle, sheep, goat). Among dog owners who administered antiparasitic drugs to their dogs, 25% of them declared quarterly administration, 37.5% of them declared semiannual administration, and 37.5% of them declared yearly administration.

Knowledge levels regarding CE among healthcare and food professionals. Among the study participants, 89.1% of the nurses, 53.1% of the dietitians, 42.9% of the food professionals, and 69.3% of the nursing students declared some knowledge of CE ($p<0.01$). Nursing students knew how infected internal organs should be treated (87.3%) and where cysts are mostly seen in intermediate hosts (87%). While food professionals knew whether cysts in the internal organs of cattle, sheep, and goats also generate cysts in humans (89.3%), nurses knew whether improper vegetable washing played a role in disease transmission (92.4%) and dietitians knew whether dogs are responsible for transmitting CE (95.9%) with highest rates ($p<0.05$, $p=0.000$, $p=0.023$). About 48.9% of the nurses, 18.4% of the dietitians, 21.4% of the food professionals, and 19.9% of the nursing students reported participation in informative courses on CE ($p<0.01$, $p=0.000$). As well, 18.5% of the nurses, 2.0% of the dietitians, 10.7% of the food professionals, and 8.2% of the nursing students reported someone around them being treated for CE ($p<0.01$, $p=0.008$). No statistically significant difference in terms of dog ownership was observed among health professionals ($p>0.05$, $p=0.206$) (**Table 5**).

Discussion. Parasites leading to chronic diseases can be fatal to humans and animals in warm and temperate climate countries. Turkey is a country where parasitic diseases are widespread because of its geographical characteristics, wide variety of animal populations, and various other environmental and socio-cultural factors. Cystic echinococcosis is a prevalent helminthic disease

Table 4 - Percentage of answers given by animal breeders according to their education levels and extra work except livestock raising.

Question	Answer	Educational level					Extra work except livestock raising					Total
		Primary school n (%)	Secondary school n (%)	High school and upper n (%)	x^2	*p*-value	Farm labourer n (%)	Only livestock raising n (%)	Others n (%)	x^2	*p*-value	
Qu1	Yes	15 (44.1)	18 (50.0)	19 (76.0)	6.436	0.040*	41 (57.7)	7 (53.8)	4 (36.4)	1.763	0.414	**52 (54.7)**
	No	19 (55.9)	18 (50.0)	6 (24.0)			30 (42.3)	6 (46.2)	7 (63.6)			**43 (45.3)**
Qu2	Yes	8 (23.5)	12 (33.3)	10 (40.0)	1.891	0.388	19 (26.8)	6 (46.2)	5 (45.5)	3.021	0.221	**30 (31.6)**
	No	26 (76.5)	24 (66.7)	15 (60.0)			52 (73.2)	7 (53.8)	6 (54.5)			**65 (68.4)**
Qu3	Yes	5 (14.7)	8 (22.2)	10 (40.0)	5.148	0.076	16 (22.5)	3 (23.1)	4 (36.4)	1.003	0.606	**23 (24.2)**
	No	29 (85.3)	28 (77.8)	15 (60.0)			55 (77.5)	10 (76.9)	7 (63.6)			**72 (75.8)**
Qu4	Yes	4 (11.8)	8 (22.2)	7 (28.0)	2.552	0.279	15 (21.1)	2 (15.4)	2 (18.2)	0.252	0.882	**19 (20.0)**
	No	30 (88.2)	28 (77.8)	18 (72.0)			56 (78.9)	11 (84.6)	9 (81.8)			**76 (80.0)**
Qu5	Right	10 (29.4)	18 (50.0)	12 (48.0)	3.524	0.172	33 (46.5)	4 (30.8)	3 (27.3)	2.235	0.327	**40 (42.1)**
	Wrong	24 (70.6)	18 (50.0)	13 (52.0)			38 (53.5)	9 (69.2)	8 (72.7)			**55 (57.9)**
Qu6	Yes	-	-	2 (8.0)	5.720	0.057	1 (1.4)	1 (7.7)	-	2.373	0.305	**2 (2.1)**
	No	34 (100.0)	36 (100.0)	23 (92.0)			70 (98.6)	12 (92.3)	11 (100.0)			**93 (97.9)**
Qu7**	Yes	20 (76.9)	20 (71.4)	8 (47.1)	4.495	0.106	39 (69.6)	7 (70.0)	2 (40.0)	1.872	0.392	**48 (67.6)**
	No	6 (23.1)	8 (28.6)	9 (52.9)			17 (30.4)	3 (30.0)	3 (60.0)			**23 (32.4)**
Qu8**	Yes	22 (84.6)	15 (53.6)	11 (64.7)	6.018	0.049*	38 (67.9)	8 (80.8)	2 (40.0)	2.443	0.295	**48 (67.6)**
	No	4 (15.4)	13 (46.4)	6 (35.3)			18 (32.1)	2 (20.0)	3 (60.0)			**23 (32.4)**
Qu9**	Yes	7 (26.9)	4 (14.3)	3 (17.6)	1.421	0.491	11 (19.6)	-	3 (60.0)	7.581	0.023*	**14 (19.7)**
	No	19 (73.1)	24 (85.7)	14 (82.4)			45 (80.4)	10 (100.0)	2 (40.0)			**57 (80.3)**
Qu10**	Yes	6 (23.1)	6 (21.4)	4 (23.5)	0.034	0.983	12 (21.4)	1 (10.0)	3 (60.0)	4.960	0.084	**16 (22.5)**
	No	20 (76.9)	22 (78.6)	13 (76.5)			44 (78.6)	9 (90.0)	2 (40.0)			**55 (77.5)**
Qu11	Yes	20 (58.8)	23 (63.9)	15 (60.0)	0.204	0.903	42 (59.2)	7 (53.8)	9 (81.8)	2.386	0.303	**58 (61.1)**
	No	14 (41.2)	13 (36.1)	10 (40.0)			29 (40.8)	6 (46.2)	2 (18.2)			**37 (38.9)**

*$p<0.05$; Chi-square test, **Only dog owners answered

in humans and animals that has been detected in all geographical regions of Turkey. According to data of the Ministry of Health, 51,500 new human CE cases were diagnosed between the years of 1965 and 1995 in Turkey.[12] Furthermore, another 482 CE cases were determined from hospital records between 2010 and 2017 in Karaman Province, Turkey (unpublished data). All of these reports demonstrate that CE is of great importance to public health considerations in the country.[15] The level of knowledge of Turkey's citizens must be increased to enable the successful control of parasites.[18] Besides climatic, geographic, and ecological factors, socio-economic factors and educational level have been identified to influence the spread of CE.[9,15] Several studies determining high risk groups for CE and discussing the theory of "lack of knowledge can increase the disease" have been published.[19-26]

People from other public groups. According to our study, 56% of the people from other public groups surveyed had some knowledge about CE. The corresponding rate was 50% in Morocco, 65.9% in China, and 17% in Chile.[10,27,28] The potential risk factors we identified for CE in this group included a lack of knowledge, improper vegetable washing, salad consumption in restaurants, offal consumption, non-participation in informative courses, and age. A statistically significant difference in the use of vinegar to wash vegetables was observed between males and females ($p<0.01$), and 45.3% of the female surveyed confirmed this practice. We believe that salads in restaurants carry some risk of transmitting CE, likely because of improper handling. Dog ownership has been determined to be a risk factor for CE.[8,29] According to our results, students were more likely to keep dogs (28.9%) than other professionals ($p<0.01$), and these students may be unable to cover the expenses related to antiparasitic treatment for their dogs. We propose that dog owners without an income make use of free medical care for their pets.

Cystic echinococcosis can be transmitted by ingesting food, soil, and water contaminated with the feces of infected dogs. In our study, 81.3% of the people from other public groups surveyed knew of the transmission modes of CE. This number is much

Table 5 - Percentage of answers given by healthcare and food professionals.

Question	Answer	Professions				X^2	*p*-value
		Nurse (n:92) n (%)	Dietitian (n:49) n (%)	Food profession (n:28) n (%)	Nursing student (n:249) n (%)		
Que1	Yes	82 (89.1)	26 (53.1)	12 (42.9)	169 (69.3)	32.599	0.000**
	No	10 (10.9)	23 (46.9)	16 (57.1)	75 (30.7)		
Que2	Right	69 (75.0)	35 (71.4)	20 (71.4)	200 (87.3)	12.879	0.005**
	Wrong	23 (25.0)	14 (28.6)	8 (28.6)	29 (12.7)		
Que3	Right	80 (87.0)	42 (85.7)	16 (57.1)	149 (63.9)	24.939	0.000**
	Wrong	12 (13.0)	7 (14.3)	12 (42.9)	84 (36.1)		
Que4	Right	75 (81.5)	34 (69.4)	25 (89.3)	199 (86.5)	9.529	0.023*
	Wrong	17 (18.5)	15 (30.6)	3 (10.7)	31 (13.5)		
Que5	Right	85 (92.4)	32 (65.3)	21 (75.0)	188 (77.7)	16.161	0.001**
	Wrong	7 (7.6)	17 (34.7)	7 (25.0)	54 (22.3)		
Que6	Yes	12 (13.0)	2 (4.1)	4 (14.3)	-	3.164	0.206
	No	80 (87.09	47 (95.9)	24 (85.7)	-		
Que7	Yes	84 (91.3)	47 (95.9)	21 (75.0)	90 (36.1)	122.872	0.000**
	No	8 (8.7)	2 (4.1)	7 (25.0)	159 (63.9)		
Que8	Yes	88 (95.7)	46 (93.9)	22 (78.6)	-	9.060	0.011*
	No	4 (4.3)	3 (6.1)	6 (21.4)	-		
Que9	Yes	45 (48.9)	9 (18.4)	6 (21.4)	49 (19.9)	31.399	0.000**
	No	47 (51.1)	40 (81.6)	22 (78.6)	197 (80.1)		
Que10	Yes	17 (18.5)	1 (2.0)	3 (10.7)	20 (8.2)	11.828	0.008**
	No	75 (81.5)	48 (98.0)	25 (89.3)	225 (91.8)		

*p<0.05; **p<0.01; Chi-square test

higher than the 61.5% reported for Peru and the 67.4% observed in China.[10,30] We found that 11.9% of the people from other public groups had improper practices in terms of annihilation of infected internal organs. In a previous study, 67% of the people surveyed reported feeding dogs with ruminant organs.[27] We believe this improper practice contributes to CE transmission. We found high offal consumption among public employees (54.5%) and academicians (52%). Offal consumption was reported by 45.5% of the participants surveyed. We thus propose that this factor presents an important risk factor for CE among humans. According to epidemiological studies, estimated CE surgical case number is 0.87-6.6 per 100.000 people in Turkey.[12] When we asked this group "has anyone around you been treated for CE," 10.4% of them said "yes." Yazar et al reported 58 CE cases between 2001 and 2005 in Karaman Province.[31] Our results clearly show that CE remains a significant issue for public in the studied area.

Hydatid cysts develop slowly and cyst development may occur over many years. Although radical dissection of hydatid cysts is the most common treatment method for the disease, some surgeons prefer percutaneous aspiration, injection, and re-aspiration. Before surgery, anthelmintic treatment is advised. This information was known by 76.9% of the participants in this study.

When asked "do you wash your hands after touching the soil or dog", 93.3% of the participants said yes and no statistically significant difference among groups in terms of educational level, profession and gender was observed (p>0.05). In a study performed by Bakal et al a statistically significant relation was found between CE and hand hygiene (p<0.01).[32]

The prevalence of *E. granulosus* in dogs varies between 0.32% and 40%.[12] Dogs, foxes, and other canids are definitive hosts of *E. granulosus*. This information was known by 35.8% of the study participants. In Morocco, only 21% of the subjects surveyed knew of the same information.[27] We believe that a lack of knowledge of the risk factors of CE contributes to disease transmission. Hydatid cysts mainly occur in the liver and lungs but can also be found in the spleen, kidneys, brain, bones, heart, and joints.[33] This information was known by 73.1% of the study participants.

It was shown that when age of the people is increased the awareness about CE increased too.[16,34] The participants generally knew more about CE as their age increased (p<0.05). In a recent study by Othieno et al female gender, age beyond 40 years, and open

spring water sources were the main risk factors for CE in humans.[29] Yang et al also found that age, dog ownership, and female gender were risk factors for CE.[8] Although older people in this group knew more about CE than younger ones, the occurrence of CE was more common in the former than in the latter.[8,29] This result indicates that while CE knowledge is important in efforts to control the disease, also improper practices trigger the occurrence of CE too.[27]

Li et al reported that a lack of knowledge of CE is an important risk factor for *E. granulosus* transmission.[10] When we compared the training status of participants according to their knowledge of the disease, we determined that more people who participated in informative courses knew more about CE than those who did not. We validated the results of our survey by analyzing the number of correct answers provided by the participants who confirmed having knowledge of CE and high correct answer rates were obtained (p<0.01).

Animal breeders. In our study, 54.7% of the animal breeders surveyed were informed about CE; this rate is much lower than the 89.8% reported by butchers in Karaman Province, Turkey.[35] This difference may be explained by butchers naturally slaughtering more livestock than animal breeders. Also 59.2% of butchers' practices were wrong in terms of annihilation of infected internal organs in Karaman province.[35] This result is similar to our findings. Our results show that 57.9% of the animal breeders' practices were wrong in terms of annihilation of infected internal organs, and no statically significant difference was found among animal breeders when classified by educational level (p>0.05). A statically significant difference was observed among animal breeders in terms of answers given to the question of annihilation of infected internal organs when stratified according to educational level in Kars Province, Turkey (p<0.05).[26]

In Turkey, animal breeder's job is made by people with low education levels generally.[26,36] We tried to reach all the train status for animal breeders. We detected statically significance difference for having information about CE among the animal breeders in terms of educational level. We also determined that when the education level increases the knowledge level about CE increases too. CE is a common parasitic disease in Turkey, and animal breeders in the country must be able to identify the related cysts during animal processing. A total of 31.6% of the participants surveyed confirmed their ability to identify hydatid cysts. Most animal breeders who declared they could identify hydatid cysts were able to do so while slaughtering animals at least once (p<0.01).

We detected an important potential risk factor for CE. Among the animal breeders surveyed, 67.6% reported that their dogs could enter their barns freely. Acosta-Jamett et al emphasized that contact with dogs and dog feces were risk factors for human seropositivity of CE; these authors also found that dog copropositivity is associated with home slaughter of livestock.[28] Offal and/or fetus consumption by dogs was determined to be another risk factor for CE. Interestingly, 67.6% of the animal breeders surveyed reported that they gave offal or fetus to their dogs. This practice decreased as the breeders' educational level increased (p<0.01). In a study by Moro et al a statistically significant relationship between cases of CE and offal consumption by dogs was identified (p<0.01).[30] Varcasia et al further found that 17% of the farmers in their study used offal as dog meal.[37]

Socio-cultural, educational, economical, agricultural, and environmental factors contribute to CE transmission.[7,32] We determined several practices, including contact with dogs, offal consumption by dogs, and non-administration of antiparasitic drugs to dogs, as possible risk factors for CE. In a study performed by Bakal et al contact with dogs and poor hygiene conditions were found to be important risk factors for CE.[38] Non effective control programs for *E.granulosus* in dogs prevent eradication of this parasite.[39] In our study, 77.5% of all dog owners administered did not administer antiparasitic drugs to their dogs; in Sardinia, Italy, the corresponding rate was 90%.[37] We determined that knowledge about CE and experience in hydatid cyst identification increased as the number of slaughtered animals per year increased. Thus, this study was conducted to investigate the awareness of CE. Animal breeders who claimed to have some knowledge of the disease tended to provide the correct answers to related questions, while animal breeders without much knowledge of the disease tended to provide incorrect answers to the same questions (p<0.01).

Because dogs are definitive hosts of *E. granulosus*, we sought to determine whether dogs contributed to disease transmission. According to our findings, while none of animal breeders without extra job got veterinary services regularly, 80.4% of farm laborers/animal breeders and 40% of all other workers/animal breeders got veterinary services regularly (p<0.05). Akalin et al found that regular veterinary care and literacy on CE contributed to lowering the prevalence of the disease.[36] We thus propose encouraging animal breeders to seek regular veterinary care to inhibit the transmission of CE in the studied area.

Healthcare and food professionals. Knowledge levels regarding CE among nurses, nursing students, dietitians, and food professionals were evaluated for the first time in Turkey. According to our results, nurses were better informed than other professionals regarding CE ($p<0.05$). According to Nasrieh et al 7.8% of all university students surveyed knew of CE.[40] By comparison, in our study, 69.3% of the nursing students surveyed knew some information related to CE, likely because these students received training regarding related subjects.

Study limitations. This study was limited by small sample size for some occupational groups, not asking the same questions to all groups and refusing to participate to study by some people. Moreover, selection of some groups from specific regions may be found to be insufficient in terms of the universe of the study. Besides all of these, the absence of individuals with disease experience is among the limitations of the study.

In conclusion the present study provides detailed information on the level of knowledge, attitudes, and practices of various groups in Turkey. Among the professional groups surveyed, nurses were better informed than other professionals regarding CE. We assessed the knowledge about putative risk factors in the study population. We evaluate that, including lack of information, improper vegetable washing, salad consumption in restaurants, non-participation in informative courses, young age, contact with dogs, offal consumption by humans and dogs, and non-administration of antiparasitic drugs to dogs can contribute to transmission and epidemiology of CE in the studied area. Since CE is a widespread health problem in animals and humans with great economic impacts, we advocate the implementation of training programs to improve public awareness of CE. Further studies should be performed to further reveal the risk factors of CE be analyzing CE cases throughout Turkey and worldwide.

Since it is observed that people from different professions in the country do not have enough knowledge about CE, there is a need for awareness raising. In particular, increasing awareness of animal breeders and the public about CE is thought to seriously reduce the prevalence and incidence of this disease.

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