

Egg positive rate of *Enterobius vermicularis* and *Taenia* spp. by cellophane tape method in primary school children in Sivas, Turkey

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Abstract: The aim of the present study was to find out the number of students with enterobiasis and/or taeniasis in primary schools of Sivas. Among the 2,029 students in 6 primary schools, 316 (15.6%) were positive to *Enterobius vermicularis* eggs and 32 (1.6%) were positive to *Taenia* spp. eggs by the cellophane tape method. The egg positive rates of *E. vermicularis* and *Taenia* spp. ranged from 9.4% to 27.2% and from 0.8% to 2.6% respectively among six schools. The egg positive rate of *E. vermicularis* was found to be significantly different among these schools ($\chi^2 = 31.96$; $P < 0.05$), whereas there was no significant difference between the schools for *Taenia* spp. ($\chi^2 = 4.37$; $P > 0.05$). The rate (18.7%) of *E. vermicularis* in the urban slum regions was higher than the rate (11.5%) in the urban central regions ($\chi^2 = 19.20$; $P < 0.05$). Above results demonstrate that the egg positive rate of *E. vermicularis* and *Taenia* spp. was still prevalent among primary school children.

Key words: *Enterobius vermicularis*, *Taenia* spp., children, egg positive rate

Enterobius vermicularis infection is more common in children than in adults. Prevalence in children can be high despite of the difficulties in confirming the infection. Garcia and Bruckner (1993) wrote "You had this infection as a child; you have it now; or you will get it again when you have children!" The adult of *E. vermicularis* inhabits the cecum, appendix, and adjacent portions of the ascending colon (Beaver et al., 1984). The mode of transmission is contact-borne. The best method of diagnosing enterobiasis is the cellophane tape smear (CT) method (Shoup, 2001).

The tapeworm, *Taenia* spp., has a worldwide distribution. This infection can be diagnosed using the CT

method, which alone shows 80% diagnostic sensitivity (Kaminsky et al., 1991).

Sivas is the second largest city of Turkey in terms of area (28,488 km²) and is situated in the upper Kızılırmak region of central Anatolian (Fig. 1). This study was performed between November, 2003 and May, 2004. Six primary schools in central Sivas were randomly selected. The schools had different numbers of students with different socioeconomic backgrounds. Specifically, the schools were; Atatürk (total number of students 453), Danişment (1126), Gazi Osman Paşa (264), İzzettin Keykavus (253), Kızılırmak (551) and Vali Aydın Güçlü (total students 779). Children enter these schools at the age of 7 and graduate at the age of 15. The children are referred to as grades 1 to 8, the latter represents the minimum compulsory education requirement.

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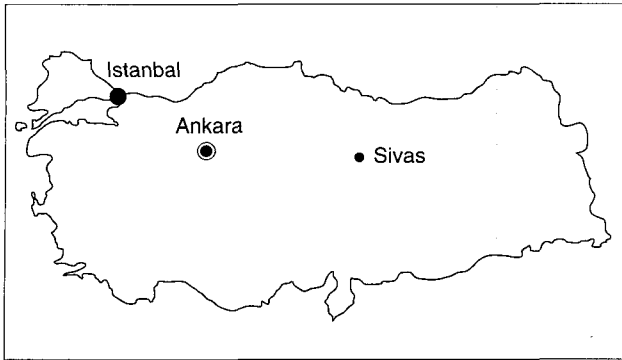


Fig. 1. The location of Sivas on the map of Turkey

The reasons, aims, and potential contribution to health were explained to children in grades 4 to 8, and to the parents of grade 1 to 3 children involved in the study and at the same time they were informed that students who had been treated with antiparasitic drugs during the previous three months would not be enrolled. Subsequently, CT preparations were distributed to all students, and their parents were instructed on their use. Briefly, the sticky side of the CT preparation was stuck 5-6 times on and about the anus of a stooping child while another person helped opening the buttocks from the sides. The material thus obtained was then fixed on a slide glass and wrapped in labeled paper for examination. For students in grades 1 to 3 this process was carried out by family or by the legal guardian. The CT preparations collected were kept at the room temperature until examination. The preparations were examined using a 10X objective, and when required a 40X objective either directly or after dropping 1-2 drops of xylol in between the slide and cellophane tape.

The schools surveyed were chosen from 65 primary schools in central Sivas using a simple random sampling method according to school numbers which were allocated before the study. The χ^2 -test was used to compare data and to determine the significances of differences between two proportions. The level of significance was set at $P < 0.05$. All statistical analyses were performed using SPSS for Windows (version 10.0).

The 2,029 (59.2%) of the 3,426 students in the 6 primary schools were invited to take part in this study.

In these schools, the mean egg positive rates of enterobiasis and taeniasis were 15.6 % and 1.6% respectively. The distribution of students infected with *E. vermicularis* and/or *Taenia* spp. according to school grade and school are provided in Table 1. Egg positive rate of *E. vermicularis* was found to be significantly different between the schools ($\chi^2 = 31.96$, $P < 0.05$), but no such difference was found for taeniasis ($\chi^2 = 4.37$; $P > 0.05$). Of the 2,029 students, 1,151 were living in urban slum area and 878 in urban central area (Table 1). The rate (18.7%) of *E. vermicularis* in schools (İzzettin Kekaş; 27.2%, Vali Aydın Güçlü; 17.2%, Danişment; 16.7%) located in the urban slum regions of the city was found to be higher than that (11.5%) in the other schools (Kızılırmak; 13.6%, Gaziosman Paşa; 11.3%, Atatürk; 9.4%) from central urban regions ($\chi^2 = 19.20$; $P < 0.05$). However, the rate (1.4%) of *Taenia* spp. among children in urban slums was not significantly different from its rate (1.8%) among children students located in inner city ($\chi^2 = 0.28$; $P > 0.05$). The frequencies of *E. vermicularis* and *Taenia* spp. among all children were compared by school grade. No significant difference in the infection rates of *E. vermicularis* was found by grade ($\chi^2 = 10.95$; $P > 0.05$), whereas *Taenia* spp. infection rates were significantly different ($\chi^2 = 24.73$; $P < 0.05$). Specifically, the number of *Taenia* infections was greater among children in the upper grades (class VI-VIII).

When the sex distribution of students with enterobiasis and taeniasis was compared in six primary schools, there were no statistically significant differences ($\chi^2 = 3.30$; $P > 0.05$ for enterobiasis, $\chi^2 = 1.15$; $P > 0.05$ for taeniasis, respectively).

The overall prevalences of enterobiasis and taeniasis in Turkish primary schools are 5.4-67% and 0-12.1%, respectively, (Doğan and Akgün, 1998; Otkun et al., 2000). Thus, the rates of parasite infections found during this investigation confirm to those previously reported in Turkey. According to many previous studies in Sivas (Özçelik et al., 2001; Saygı et al., 2002) the rates of enterobiasis and taeniasis have been variously reported to be 23.5-63.4% and 2.2-20.8%, respectively, at different times. The prevalences of enterobiasis and taeniasis greatly depend upon

Table 1. The prevalence of *E. vermicularis* and *T. saginata* in the primary students according to the classes and the schools of this region

Number of Exam.	Class I	Class II	Class III	Class IV	Class V	Class VI	Class VII	Class VIII	Total
Schools	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)	No (%)
Urban Slum Region (1151)									
İzzettin Keykaus (162)	24	20	20	30	24	16	17	11	
<i>E. vermicularis</i>	7 (29.2)	10 (50.0)	6 (30.0)	8 (26.7)	7 (29.2)	2 (12.5)	2 (11.8)	2 (18.2)	44 (27.2)
<i>T. saginata</i>	-	-	-	1 (3.3)	-	-	1 (5.9)	1 (9.1)	3 (1.9)
Vali Aydın Güçlü (527)	80	62	64	106	86	60	42	27	
<i>E. vermicularis</i>	7 (8.8)	16 (25.8)	12 (18.8)	28(26.4)	9 (10.5)	11 (18.8)	6 (14.3)	5 (18.5)	94 (17.3)
<i>T. saginata</i>	-	-	-	-	1 (1.2)	-	1 (2.4)	2 (7.4)	4 (0.8)
Danişment (462)	105	88	52	87	55	30	36	9	
<i>E. vermicularis</i>	20 (19.0)	12 (13.6)	18 (34.6)	16 (18.4)	6 (10.9)	1 (3.3)	3 (8.3)	1 (11.1)	77 (16.7)
<i>T. saginata</i>	-	4 (4.5)	1 (1.9)	1 (1.1)	-	2 (6.7)	-	1 (11.1)	9 (1.9)
Urban Central Region (878)									
Kızılırmak (317)	34	39	61	57	41	43	23	19	
<i>E. vermicularis</i>	8 (23.5)	5 (12.8)	5 (8.2)	6 (10.5)	6 (14.6)	10 (23.3)	2 (8.7)	1 (5.3)	43 (13.6)
<i>T. saginata</i>	-	1 (2.6)	1 (1.6)	-	-	-	2 (8.7)	1 (5.3)	5 (1.6)
Gaziosman Paşa (274)	43	39	40	32	21	33	41	25	
<i>E. vermicularis</i>	5 (11.6)	4 (10.3)	6 (15.0)	2 (6.3)	4 (19.0)	5 (15.2)	3 (7.3)	2 (8.0)	31 (11.3)
<i>T. saginata</i>	1 (2.3)	-	1 (2.5)	-	-	2 (6.1)	1 (2.4)	2 (8.0)	7 (2.6)
Ataturk (287)	42	38	56	43	43	41	7	17	
<i>E. vermicularis</i>	5 (11.9)	3 (7.9)	6 (10.7)	4 (9.3)	4 (9.3)	5 (12.2)	-	-	27 (9.4)
<i>T. saginata</i>	1 (2.4)	2 (5.3)	-	1 (2.3)	-	-	-	-	4 (1.4)
Total									
<i>E. vermicularis</i>	52 (15.9)	50 (17.5)	53 (18.1)	64 (18.0)	36 (13.3)	34 (15.2)	16 (9.6)	11 (10.2)	316 (15.6)
<i>T. saginata</i>	2 (0.6)	7 (2.4)	3 (1.0)	3 (0.8)	1 (0.4)	4 (1.8)	5 (3.0)	7 (6.5)	32 (1.6)

socioeconomic situations, education levels, and on personal hygiene and dietary habits. Whereas a lack of personal hygiene and close contact between people encourage the spread of *E. vermicularis*, eating of infected raw meat plays a certain role in the transmission of taeniasis (Altıntaş et al., 1993).

In the present study, we found that the infection rates of *E. vermicularis* in primary schools depended on school location, whereas this had no effect on taeniasis rates. These findings support that the poorer region shows higher enterobiasis rates (Polat et al., 2000). In addition, taeniasis frequencies were compared by grade for the six schools, and it was found that the proportion of students with taeniasis in the upper grades (class VI-VIII, aged 13-15 years) was higher than that in the lower grades. Local dishes called "bat" and "çiğ köfte", which are both prepared

with raw minced meat are very popular among the natives of Sivas and thus we attribute the high rate of taeniasis in the 13-15 age groups to the consumption of these dishes.

Although, some studies have reported significant differences in the incidences of enterobiasis and taeniasis in males and females (Kim et al., 2003), other studies including the present study failed to find a gender-related difference (Sung et al., 2001).

In conclusion, *E. vermicularis* and *Taenia* infections are lower than that found previously reported in Turkey, but were still prevalent among primary school children. Enterobiasis is seen higher among the primary school children in urban slum areas than the others in urban central areas.

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