

A retrospective analysis of *Enterobius vermicularis* frequency for the last five years in Aydin, Turkey

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Abstract

Aim: *Enterobius vermicularis* (pinworm) is a parasitic nematode that infects humans and causes gastrointestinal symptoms mostly in children. This retrospective study aimed to analyze cellophane tape (CT) examination findings from a parasitology laboratory in Aydin, Turkey.

Materials and Methods: The present study included the CT examination results in Aydin Adnan Menderes University, Faculty of Medicine, Parasitology Laboratory from January 2016 to October 2020. Perianal CT preparations were screened for the presence of pinworm eggs with direct microscopy. Changes in the frequency of *E. vermicularis* by years and according to gender were evaluated. Statistical analyses were performed with Pierson Chi-square test.

Results: Pinworm eggs were detected in 436 (8.2%) of 5300 perianal CT preparations during the study period of time. There was a decrease in the frequency of parasite in the last two years ($p < 0.05$). In addition, males were more infected with the parasite than females; 9.5% and 7.2%, respectively ($p < 0.05$). The vast majority of infected cases (89%) were children. The average number of CT preparations, which sent to the parasitology laboratory, was lowest in 2020.

Conclusion: Our findings indicated that *E. vermicularis* was still considered as a public health problem in Aydin, despite the decrease in the last two years. As the average age of positive case in our study was considered, we came to conclusion that children should be informed about the pinworm infection and personal hygiene habits. The decrease in the average number of examined CT samples in 2020 could be related with novel coronavirus disease (COVID-19) pandemic that discouraged people to admit to hospitals.

Keywords: Aydin; *Enterobius vermicularis*; frequency; gender

INTRODUCTION

Enterobius vermicularis (*E. vermicularis*), also known as pinworm, is a common intestinal nematode parasite of humans. The fossil records confirmed the co-existence of pinworms with humanity back over many thousands of years (1). The average lifespan of the parasite is 2-3 months and it completes all its life stages in humans. The gravid female in cecum migrates to perianal region in night and lays out thousands of eggs in perianal skin folds. Because of perianal itching, hands are contaminated with embryonated eggs and larvae inside the egg mature in 4-6 hours. The infection spreads among the people through the fecal-oral route and transmission via contact with contaminated clothes, beddings, and personal items is possible (2). In addition, very rarely the infection can be transmitted by inhalation of parasite eggs. The pinworm eggs are digested by another person, larvae hatch in small intestines and released larvae gets into adult in the lumen of cecum. Autoinfection is another exclusive aspect of the parasite; infected individuals can be re-infected with parasites already in their body. As it spreads with

close contact, particularly with contaminated hands, the crowded areas are major risky places for acquiring the infection, such as kinder gardens, schools, and play lands (3).

Symptomatic pinworm infections (enterobiasis) are observed mostly in children, but occasionally in adults. Almost half of the infected people are asymptomatic (4). Pinworm infection is self-limiting because of short lifespan of the parasite; however, autoinfection may increase the severity of the symptoms. The most common symptom of enterobiasis is perianal pruritus particularly at night during sleep. Therefore, the parasite disrupts sleeping comfort and may cause childhood enuresis, as well as, decreases concentration of children (5). In addition, pinworm infection is reported as a predisposing factor for appendicitis, eosinophilic enterocolitis, and pelvic inflammatory disease (6).

Pinworms are not visible in most of infected individuals because oviposition happens on the anal folds. Direct microscopy of stool sample is not effective for diagnosis

Received: 20.10.2020 Accepted: 02.12.2020 Available online: 20.09.2021

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of the parasite, the adult forms are very rarely observed. The most common diagnostic tool for enterobiasis is cellophane tape (CT) examination in which parasite eggs are collected with adhesive tape and microscopic examination of the slides detects the characteristic eggs of the parasite (7).

Pinworm infection is one of the most common parasitic helminthes infection in humans with a global distribution. It can be observed at any social levels and it is common in moderate climates (8). Despite the decreasing pinworm infection rates in the last decade, it remains as a public health problem in Turkey (9). In this retrospective study, we aimed to analyze the results of CT examination in Aydin Adnan Menderes University, Faculty of Medicine, Parasitology Laboratory.

MATERIALS and METHODS

Study Population and Ethical Approval

This retrospective study included the CT examination results in Aydin Adnan Menderes University, Faculty of Medicine, Parasitology Laboratory. The data was acquired from laboratory records and hospital information system from January 2016 to October 2020. Individuals were informed to collect CT sample early in the morning before using the toilet or bath. They used sticky side of the tapes to collect the specimen in perianal area and returned to the laboratory in the same day. The specimens were examined under light microscope with 10X and 40 X magnification. The research was reviewed and approved by the local ethical committee of human studies in Aydin Adnan Menderes University (2020/204).

Aydin is located in Southwest of Turkey and has an approximate population of one million. Agricultural and touristic activities are main source of income in the region.

Statistical Analysis

The changes in frequency of *E. vermicularis* in years and its' comparison according to the age were evaluated with Statistical Package for the Social Sciences (SPSS) version 19.0 package program. Chi-square tests were used to compare categorical variables; statistical significance was set at $p < 0.05$.

RESULTS

In the study, a total of 5300 CT preparations were screened for the presence of *E. vermicularis* eggs between January 2016 and October 2020. The overall positive rate of *E. vermicularis* was 8.2% (n=436). Statistical analysis showed that there was significant difference in the last two years in terms of *E. vermicularis* positivity (Pearson chi-square: 13.92; $p=0.008$). The positive rate of *E. vermicularis* according to the years was presented in Table 1. The age of individuals varied from one to 71 years old and the children at the age of seven accounted the highest number of infected cases (Figure 1).

Of the CT samples 2427 (45.8%) were from males and 2873 were from (54.2%) females, when we compared the frequency of *E. vermicularis* according to the gender a significant difference was noted (Pearson chi-square:

9.271; $p=0.02$). Table 2. represents the comparison of *E. vermicularis* positivity according to the gender.

The monthly average numbers of CT preparations were as follows: 82 samples (monthly) were sent to parasitology laboratory in 2016; 118 in 2017; 111 in 2018; 87 in 2019; and 53 in 2020.

Year	<i>E. vermicularis</i>		Total
	Positive	Negative	
2016			
Count	88	887	975
%	9.0%	91.0%	
2017			
Count	129	1289	1418
%	9.1%	90.9%	
2018			
Count	122	1211	1333
%	9.2%	90.8%	
2019			
Count	70	971	1041
%	6.7%	93.3%	
2020			
Count	27	506	533
%	5.1%	94.9%	
Total			
Count	436	4864	5300
%	8.2%	91.8%	100.0%

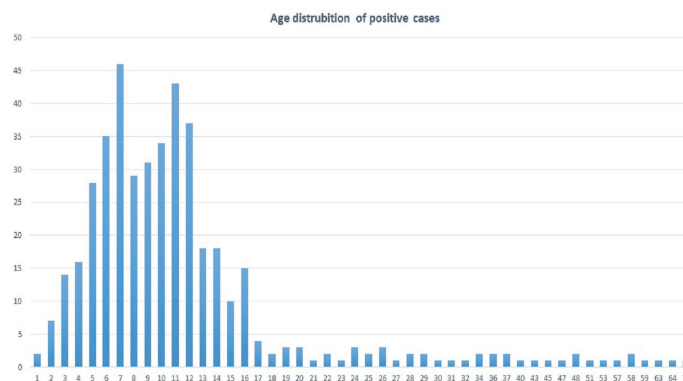


Figure 1. The distribution of *E. vermicularis* positive cases according to age

Gender	<i>E. vermicularis</i>		Total
	Positive	Negative	
Male			
Count	230	2197	2427
%	9.5%	90.5%	
Female			
Count	206	2667	2873
%	7.2%	92.8%	
Total			
Count	436	4864	5300
%	8.2%	91.8%	

DISCUSSION

Pinworm infection is amongst the most common parasitic nematode diseases in Turkey (9,10). In the present study, we analyzed almost last five-year frequency of *E. vermicularis* in the university hospital in Aydin. The overall egg positive rate of *E. vermicularis* was 8.2% in study period of time. The intestinal parasites were investigated in preschool children in Aydin and they reported that the frequency of pinworm was 3% (11). Another study included food workers in the same city and reported 8.6% positivity of *E. vermicularis* (12). A number of study reported *E. vermicularis* frequency from different cities of Turkey and the rates greatly varied between these studies. Similar to our study population, the positivity of *E. vermicularis* for 10 years hospital records was analyzed in Izmir and the overall positivity was 4.6% (13). In a study from Sivas reported 5.4% of CT samples were positive for the presence of *E. vermicularis* eggs according to the hospital records (14). The positive ratio of *E. vermicularis* was found as 2.3% in a five years retrospective analysis of hospital data in Eskisehir (15). The analysis of three years period in a parasitology laboratory in Ankara showed that the frequency of *E. vermicularis* was 2.4% (10). A study from Kayseri reported 10.4% of *E. vermicularis* frequency in schoolchildren (16). The retrospective analysis of hospital records in Istanbul revealed 16% positive rate of pinworm infection (17). In overall, the positivity in Aydin was in accordance with the prevalence of *E. vermicularis* in Turkey, the rates great varied between the studies (10,16,18). Because of the fact that study groups were quite different from each other, therefore, it is difficult to make a reliable comparison between the positive rates. In addition, the frequency of *E. vermicularis* was lower in 2019 and 2020 as compared to the previous years. It is necessary to monitor the *E. vermicularis* positivity in forthcoming years whether the decrease will continue or not. Therefore, it seems not possible to make a conclusion for now. An obvious decrease in *E. vermicularis* prevalence infection was noted in Sivas, from 45.9% to 16%, they compared two period of time: 1985-2000 and 2000-2008 years (19). The monthly average of CT numbers in the laboratory was declined to 53 in 2020, it was 87 in 2019; a possible explanation may be the coronavirus disease (COVID-19) pandemic that effected the number of patients who admitted to the hospital.

Children are more vulnerable to pinworm infection and do not have adequate hygiene habits as in adults (4,20). Consistent with the literature, the great majority (89%) of the infected cases in our research was children, under 18 years old. In our study, we found a significant difference between males and females in terms of pinworm positivity, the rates were 9.5% and 7.2% respectively. There are conflicting reports in the literature about the gender and *E. vermicularis* positivity. Some studies found higher frequencies in males than females, indicating a risk factor for the infection (21). In addition, the positivity was 9.5% among males and it was 7.7% among females in another study (22). However, the difference was not statistically significant. Another study reported that *E. vermicularis*

was more common in girls than boys (23). Most of these studies were relied on the data from schoolchildren. As previously reported in Slovakia, they found that *E. vermicularis* frequency was 4% in boys and 3.2% in girls (24). In contrast to our findings, most studies reported that there was no statistical association between gender and *E. vermicularis* (19,25).

CONCLUSION

In the present study, we analyzed *E. vermicularis* frequency for almost a five years period. The results showed that enterobiasis is frequent in our study population and keeps its significance for public health. These types of researches are necessary for a better understanding of the current status of *E. vermicularis* in Aydin and Turkey. As children are the most vulnerable and risky group for spread of the infection, the educational activities should be carried out.

Competing Interests: The authors declare that they have no competing interest.

Financial Disclosure: There are no financial supports.

Ethical Approval: The study was reviewed and approved by the local ethical committee of human studies in Aydin Adnan Menderes University (No. 2020/204).

REFERENCES

1. Jaeger LH, Gijón-Botella H, Del Carmen M, et al. Evidence of helminth infection in guanache mummies: integrating paleoparasitological and paleogenetic investigations. *J Parasitol* 2016;102:222-8.
2. Kim DH, Cho MK, Park MK, et al. Environmental factors related to enterobiasis in a southeast region of Korea. *Korean J Parasitol* 2013;51:139-42.
3. Burkhart CN, Burkhart CG. Assessment of frequency, transmission, and genitourinary complications of enterobiasis (pinworms). *Int J Dermatol* 2005;44:837-40.
4. Kubiak K, Dzika E, Paukszto L. Enterobiasis epidemiology and molecular characterization of *Enterobius vermicularis* in healthy children in north-eastern Poland. *Helminthologia* 2017;54:284-91.
5. Zhao YE, Zhang H, Chang Y, et al. The relationship between the infection of pinworm and personal-social factors and its influence on the children's growth. *Chin J Parasit Dis Con* 2001;14:268-71.
6. Tandan T, Pollard AJ, Money DM, et al. Pelvic inflammatory disease associated with *Enterobius vermicularis*. *Arch Dis Child* 2002;86:439-40.
7. Wendt S, Trawinski H, Schubert S, et al. The diagnosis and treatment of pinworm infection. *Dtsch Arztebl Int* 2019;116:213-9.
8. Dutto M, Montù D, Raineri G. Enterobiasis in pediatric subjects in north-western Italy: a study of home remedies. *Ann Ig* 2012;24:81-4.
9. Polat E, Ozdemir S, Sirekbasan S. The distribution of intestinal parasites in patients presenting to a university hospital in Istanbul: a seven-year retrospective analysis. *Turkish J Parasitol* 2020;44:139-42.

10. Selek MB, Bektore B, Karagoz E, et al. Distribution of parasites detected in stool samples of patients admitted to our parasitology laboratory during a three-year period between 2012 and 2014. *Turkish J Parasitol* 2016;40:137-40.
11. Yaman Karadam S, Ertabaklar H, Ertug S. Distribution of intestinal parasites in children in two different day nurseries and a kindergarten in Aydin. *Turkish J Parasitol* 2008;32:257-60.
12. Yazici V, Siriken F, Ertabaklar H, et al. Investigation of intestinal parasites in food workers in hospitals in Aydin, Turkey. *Turkish J Parasitol* 2007;31:136-8.
13. Ulsan O, Zorbozan O, Yetismis K, et al. The distribution of the intestinal parasites detected in Ege University Medical Faculty Parasitology Direct Diagnosis Laboratory; 10-years evaluation. *Turk J Mikrobiyol Soc* 2019;49:86-91.
14. Degerli S, Ozcelik S, Celiksz A. The distribution of intestinal parasites in patients presenting at the Parasitology Laboratory of the Cumhuriyet University. *Turkish J Parasitol* 2005;29:116-9.
15. Dogan N, Demirustu C, Aybey A. The prevalence of intestinal parasites according to the distribution of the patients' gender and parasite species for five years at the Osmangazi University Medical Faculty. *Turkish J Parasitol* 2008;32:120-5.
16. Yazgan S, Cetinkaya U, Sahin I, et al. The investigation of prevalence of *Enterobius vermicularis* (L.1758) in primary school age children and its relation to various symptoms. *Turkish J Parasitol* 2015;39:98-102.
17. Kirkoyun Uysal H, Akgul O, Purisa S, et al. Twenty-five years of intestinal parasite prevalence in Istanbul University, Istanbul Faculty of Medicine: a retrospective study. *Turkish J Parasitol* 2014;38:97-101.
18. Hazir C, Gundesli H, Ozkirim A et al. Distribution of *Enterobius vermicularis* among the Schoolchildren of two primary schools with different social-economic status in the Ankara Province. *Turkish J Parasitol* 2009;33:54-8.
19. Degerli S, Malatyali E, Ozcelik S, et al. Enterobiosis in Sivas, Turkey from past to present, effects on primary school children and potential risk factors. *Turkish J Parasitol* 2009;33:95-100.
20. Giray H, Keskinoglu P. The prevalence of *Enterobius vermicularis* in schoolchildren and affecting factors. *Turkish J Parasitol* 2006;30:99-102.
21. Laoraksawong P, Pansuwan P, Krongchon S, et al. Prevalence of *Enterobius vermicularis* infections and associated risk factors among schoolchildren in Nakhon Si Thammarat, Thailand. *Trop Med Health* 2020;48:83.
22. Keskin N, Bektas Ay A. The prevalence of *Enterobius vermicularis* in primary school which have different socioeconomic level in Ankara. *Turkish J Parasitol* 2014;38:159-65.
23. Amiri SA, Rahimi MT, Mahdavi SA, et al. Prevalence of *Enterobius vermicularis* infection among preschool children, Babol, North of Iran. *J Parasi Dis* 2016;40: 1558-62.
24. Dudlová A, Juriš P, Jarčuška P, et al. The Incidence of pinworm (*Enterobius vermicularis*) in pre-school and school aged children in the Eastern Slovakia. *Helminthologia* 2018;55:275-80.
25. Wang S, Yao Z, Hou Y, et al. Prevalence of *Enterobius vermicularis* among preschool children in 2003 and 2013 in Xinxiang city, Henan province, Central China. *Parasite* 2016;23:30.