Study of distribution of *Enterobius vermicularis* in province of Wasit

Assistant Lecture Israa Najm Abed

Ministry of Education

Abstract :

Background. Infestation with the pinworm, *Enterobius vermicularis*, is a prevalent problem, especially among youngsters.

Aims. The purpose of this research was to identify risk factors for E. vermicularis infection among Waist, Iraq's preschool-aged children.

Method. Three hundred eighty pre-schoolers were surveyed cross-sectionally for a research that included all six main governorates in. Infestation with E. vermicularis was identified using the perianal cellophane tape technique. Participating children's parents or legal guardians filled out a questionnaire that asked for information such as the children's demographics, hygiene habits, prior infestation history, and symptom presence.

Result. Eighty-five (22.1%) of the 384 kids tested positive for E. vermicularis. There were statistically significant correlations between E. vermicularis infestation and many demographic factors, including age (P = 0.04), governorate (P = 0.01), residence (P = 0.03), number of household members (P 0.001), and frequency of handwashing following bathroom use (P = 0.01).

Conclusions. In Wasit, E. vermicularis is a significant helminthic infection affecting young infants. Primary care centers need to be prepared to handle sick children and hygiene education has to be emphasized.

Keywords. (*Enterobius vermicuIaris*, prevaIence, risk factors; preschooI chiIdren).

Introduction

Parasite infestations are global public health problem, especialy in impoverished countries where they account for a disproportionate share of deaths and illnesses caused by infectious agents (1,2). The pinworm, or *Enterobius vermicularis*, is the least dangerous of intestinal parasites. namely nematodes, and is seen more as an annoyance than a life-threatening condition. Its natural host is humans, making it the most widely distributed parasitic helminth (3,4). As far as we can tell, *Enterobius vermicularis* is also the earliest parasitic helminth to infect prehistoric human communities (5). High rates of E. vermicularis prevalence have been documented throughout many age groups and regions of the world, including 30%-80% in North America, 18% in China, and 17% in Tanzania (6,7). Many regions of the world have a prevalence of over 20%, according to other research (8). In most cases, there are no outward signs of a nematode infestation in the digestive tract. Perhaps this is why E. vermicularis and other gastrointestinal nematode infections have received so little attention and support from the public health and scientific communities (1).

Worldwide, between 4 and 28 percent of children are infected with *Enterobius vermicularis* (9,10), with cases concentrated in overcrowded living quarters. Most cases of this parasite have been documented in youngsters living in daycares, institutions, or big households. Reinfestation is common after treatment, and the disease is easily transmitted among family members (11-13). The presence of E. vermicularis has also been linked to maternal employment and family income (14). Itching around the anus, brought on by E. vermicularis, has been linked to disturbed sleep and irritability. Mechanical dermatitis of the vulvar or perineal areas (15) is a potential sequel lesion caused by this pruritus. Abdominal discomfort, constipation, tenesmus, and vaginitis might result when there are several adult worms in the intestines at once (4,15,16). Secondary enuresis has been linked to E. vermicularis infection (17,18). E. vermicularis infection has also been linked to difficult instances of appendicitis (19,20). Research has

linked E. vermicularis to 7% of instances of acute appendicitis (21). In addition, this infestation has been linked to inflammatory conditions (22, 23,24,25,26) that can stunt children's development.

The primary purpose of this research was to identify the frequency, associated risk factors for infection among Wasit, Iraq's preschool-aged children.

Method

Each family was given two cellophane tapes to utilize over the course of two nights. Both written and visual instructions were provided to parents on how to use the cellophane tapes. Under a light microscope, the tapes were examined on glass slides. The pre

Questionnaire

Information on the child's and parents' demographics, socioeconomic level, personal cleanliness, medical history of previous infestations, and clinical symptoms was gathered through the use of a questionnaire (completed by parents). The demographics section requested information such as the child's age and gender, place of residence (city, hamlet, or refugee camp), maternal employment, and monthly household income. In the part on personal hygiene, respondents were asked about things like how often they changed their underwear and whether or not they washed their hands after using the restroom and before eating. Five clinical symptoms associated with E. vermicularis infestation were also asked about in the questionnaire: abdominal pain and discomfort, perianal itching, sleep disturbance, enuresis, and change in appetite. The questionnaire also inquired as to whether or not the respondent had ever used antihelminthic treatment for pinworms before, and whether or not it had been herbal or pharmaceutical in nature. The questionnaire's foundation was a systematic literature evaluation of potential contributors to an E. vermicularis infestation (6,7,12,14,27). We checked the items' content and face validity on our own to make sure they accurately reflected the goals of the study and included all relevant information about E. vermicularis. We next administered this version with no additional modifications to content to a group of mother volunteers to assess its face validity, linguistic adequacy, and completion time.

sence of E. vermicularis was confirmed if egg were discovered by our way .

Statistical analysis

To handle and analyze the data, we utilized SPSS 21. When applicable, we also include frequency counts alongside our reported means and standard deviations (SDs). We conducted statistical analysis using the chi-squared test and a significance threshold of P 0.05.

Ethical considerations

The study protocol was accepted by the institutional review board of Al Zahraa-Hospital. Teachers were briefed about the suggested approach (diagnostic using cellophane tape) and its potential dangers and advantages. Teachers were the primary point of contact between the program and the families of the children who took part. All participating children's parents signed a consent form, and those who had children who tested positive were notified.

Results

Mothers, fathers of 384 kids followed plan which utilize the tape for two nights in a row. E. vermicularis infected 85 of the 384 kids, or 22.1%. Approximately 53.6% of the sample consisted of males. Table 1 shows that whereas boys had a higher prevalence of E. vermicularis infection (24.3% vs. 19.7%). The mean age of the kids who took part was 4.42 (SD = 0.77) years old, and their ages varied from 3 to 5. Alkut had a prevalence of E. vermicularis infection of 30.4%, second only to Essaouira (29.5%), then Al Husayniyah (28.8%), and finally Numaniyah (26.3%) (Table 1). There were an average of 5.81 people per home (standard deviation: 1.68) and a wide range, from 3 to 12 people. The greatest rate of infection (44.7%). was seen in children from homes with less than nine members. Children under the age of nine in a family was 2.31 (SD = 0.95) with a range of 1. The highest rate of infestation (66.7%) was seen in households with five or more children less than nine, although this difference was not statistically significant. was the most infested (64.9%) (Table 1). The prevalence of E. vermicularis infestation was shown to be significantly related to age (P = 0.04), governorate (P = 0.01), and number of people living in the home (P 0.001). Eighty-four percent of kids' households used a seated toilet. There was a statistically significant correlation between handwashing after toilet use and E. vermicularis infestation (P = 0.04). Statistical analysis of the relationship between E. vermicularis infection and other hygiene behaviors (Table 1) indicated no significant relationships. Among the 384 kids studied, 78 (20.3%) had either personally or indirectly been infected with E. vermicularis.

Seventy-three of these patients had already been treated; four with herbal therapy and 69 with pharmaceutical therapy. Previous infection was not associated with present infestation in any way (P = 0.93). Table 2 shows that there was no statistically significant correlation between any of the symptoms and E. vermicularis infection.

Table 1. Dispersion of Children by Socioeconomic Status and Infestation with *Enterobius vermicularis*

Variable	No. (%) (n = 384)	Infected	Non infected	P-value
Male	206 (53.6)	50 (24.3)	156 (75.7)	0.27
Female	178 (46.4)	35(19.7)	143 (80.3)	
Age				
3	71 (18.5)	8 (11.3)	63 (88.7)	0.04
4	106 (27.6)	27 (25.5)	79 (74.5)	
Governorate				
in Alkut	131 (34.4)	17 (12.9)	114 (87.1)	0.01
Essaouira,	103 (27.1)	30 (28.8)	73 (71.2)	
Al Husayniyah	22 (6.0)	7 (30.4)	15 (69.6)	
Numaniyah	60 (15.9)	18 (29.5)	42 (70.5)	
Zubaydiyah	36 (9.9)	10 (26.3)	27 (73.7)	
Aziziyah	25 (6.8)	3 (11.5)	22 (88.5)	
Household members				
< 5	101 (26.3)	15 (14.9)	85 (85.1)	< 0.001
5–8	245 (63.8)	53 (21.6)	191 (78.4)	
≥ 9	38 (9.9)	17 (44.7)	21 (55.3)	
Children < 9 years				
≤ 2	247 (64.6)	54 (21.8)	193 (78.2)	0.17
3–4	132 (34.6)	29 (21.8)	103 (78.2)	
≥ 5	3 (0.8)	2 (66.7)	1 (33.3)	
Mother employment status				
Works outside the home	99 (25.8)	22 (22.2)	77 (77.8)	0.98
Does not work outside the home	285 (74.2)	63 (22.1)	222 (77.9)	

Significant at P < 5%

Table 2. Dispersion of Children with *Enterobius vermicularis* Infestation Based on the Presence of Symptoms and Infestation.

Symptom	No. (%) (n = 384)	infected	Non infected	P-value
Abdominal pain				
Yes	89 (23.2)	17 (19.1)	72 (80.9)	0.43
No	294 (76.8)	68 (23.1)	226 (76.9	
Perianal itching				
Yes	76 (20.1)	20 (26)	56 (74)	0.36
No	306 (79.9)	64 (21.2)	242 (78.8)	
Sleep disturbance				
Yes	35 (9.1)	4 (11.4)	31 (88.6)	0.11
No	348 (90.9)	81 (23.2)	267 (76.8)	
Enuresis				
Yes	42 (10.9)	9 (21.4)	33 (78.6)	0.90
No	341 (89.1)	76 (22.2)	265 (77.8)	
Change in appetite				
Yes	61 (15.9)	13 (21.3)	48 (78.7)	0.86
No	322 (84.1)	72 (22.3)	250 (77.7)	
Asymptomatic				
Yes	193 (50.5)	44 (23.2)	149 (76.8)	0.61
No	190 (49.5)	40 (21.1)	150 (78.9)	

Significant at $P < 5\%$

Discussion

The primary purpose of this research was to identify the frequency of E. vermicularis infestations and the variables associated with them in southeastern and central Iraq. E. vermicularis was reported to have a prevalence of 22.1%. The unease many parents experienced with the cellophane tape test may help explain its low response rate of 29.5%. The minimal sample size was met; therefore, the generalizability of our results is unaffected by the low response rate. Preschool-aged kids in the middle and south of Iraq are disproportionately affected by the parasite illness caused by it . These results in line with those of research that used the same cellophane tape technique to discover E. vermicularis in children aged 6-11 in the Khan-Younis governorate of Gaza, Palestine. Among the children surveyed, 20.9% were infected, with boys being more likely to be infested than girls (27, 29). These studies instead relied on stool sample analysis, it's likely that the lower estimates resulted from using a different diagnostic method. Our

findings on the global distribution of E. vermicularis are consistent with those of other investigations. Using a sticky cellophane swab, Chinese research indicated that 17.8 percent of children between the ages of 2 and 12 were infected with E. vermicularis in nine different autonomous areas of China. The prevalence of E. vermicularis infestation was 4.2% in infants, 16.7% in preschoolers, and 26.3% in school-aged children in a cross-sectional study conducted in coastal Tanzania to evaluate Enterobiasis spp. and Strongyloidiasis spp. and associated coinfections and morbidity markers (7). There was a non-significant trend showing that boys had a greater frequency of E. vermicularis infection (24.3% vs 19.7%) than girls. Researchers concluded that boys were more likely to be infested than girls because they were less likely to practice good hygiene (30). E. vermicularis was most common in children aged 4 and 5, with a frequency of 25.5% and 24.2%, respectively. The additional responsibility that comes with this age, including personal cleanliness, may leave youngsters unable to deal with the consequences of poor hygiene practices. Alkut governorate, which is primarily agricultural, has the greatest frequency of infestation, followed by Essaouira, Al Husayniyah, and Numaniyah. A few studies have shown that cockroaches are reservoirs for E. vermicularis, which may explain why it is more common in rural regions with weaker infrastructure than in urban areas (27,33), despite the fact that humans are the sole host of E. vermicularis. E. vermicularis infection was more likely in homes with a high population density. with regards to our research. This makes sense given the ease with which E. vermicularis can spread from person to person via the sharing of infested clothing or linens, as well as the increased risk of infection in densely populated settings like schools and daycares (32). There was no statistically significant correlation between E. vermicularis infection and either mother's employment or monthly family income. These results agree with previous studies which reported no correlation between E. vermicularis infestation and demographic variables such as parental education level or income level in the home (34). It is reasonable to suppose that children who engage in

certain poor hygiene practices are more likely to become infected with E. vermicularis. It has been shown (8,34) that the transmission of E. vermicularis is facilitated by the host's failure to properly disinfect their hands after using the restroom. Our results also showed that other hygienic practices, such as chewing nails, changing undergarments often, supporting the notion that E. vermicularis infestation is frequently asymptomatic (3). The use of a non-probabilistic sampling approach and the difficulty we had in finding participants both introduce the possibility of selection bias that may understate the true frequency of pinworm among preschoolers. Pinworm transmission is thought to be influenced by environmental conditions; however, we did not collect environmental samples for this investigation. Preschool-aged Iraqi children in the centre and south of the country are disproportionately affected by E. vermicularis infection, according to our research. Infestation rates were highest in the center and northern regions of Iraq, where there were also correlations with factors including children's ages, household sizes, people's cleanliness habits, and their geographic locations. We suggest that the Iraqi Ministry of Health raise awareness of the E. vermicularis problem, make sure that affected children and their families have access to treatment at primary care centers, and stress the need of good hygiene practices, notably hand washing, among preschoolers.

Acknowledgement

I'd want to thank everyone who helped get this done from the bottom of my heart.

References

1. Stepek G, Buttle DJ, Duce IR, Behnke JM. Human gastrointestinal nematode infections: are new control methods required? Int J Exp Pathol. 2006;87:325–41. https://doi.org/10.1111/j.1365-2613.2006.00495.

2. Medkour HH, Amona I, Laidoudi Y, Davoust B, Bitam I, Levasseur A, et al. Parasitic infections in African humans and non-human primates. Pathogens. 2020;9(7):561. https://doi.org/10.3390/pathogens9070561

3. Parasites [Internet]. Atlanta: Centers for Disease Control and Prevention; (https://www.cdc.gov/parasites/index.html, accessed 17 June 2021).

4. Chitnis A, Azimi DY, Sabri S, Dhebri A. *Enterobius vermicularis*: a parasitic cause of appendicular colic. Cureus. 2020;12(6):e8524.

5. Paknazhad N, Mowlavi G, Dupouy Camet J, Jelodar ME, Mobedi I, Makki M, et al. Paleoparasitological evidence of pinworm (*Enterobius vermicularis*) infection in a female adolescent residing in ancient Tehran (Iran) 7000 years ago. Parasit Vectors. 2016;22:9:33.

6. Chen YD, Wang JJ, Zhu HH, Zhu TJ, Zang W, Qian M-B, et al. [*Enterobius vermicularis* infection status among children in 9 provinces/autonomous regions/municipalities of China.] [Chinese J Parasitol Parasit Dis]. 2013;31(4):251–55.

7. Salim N, Schindler T, Abdul U, Rothen J, Genton B, Lweno O, et al. Enterobiasis and strongyloidiasis and associated co-infections and morbidity markers in infants, preschool- and school-aged children from rural coastal Tanzania: a cross-sectional study. BMC Infect Dis. 2014;14:644.

8. Chen KY, Yen CM, Hwang KP, Wang LC. *Enterobius vermicularis* infection and its risk factors among pre-school children in Taipei, Taiwan. J Microbiol Immunol Infect. 2018;51(4):559–64.

9. Altun E, Avci V, Azatcam M. Parasitic infestation in appendicitis. A retrospective analysis of 660 patients and brief literature review. Saudi Med J. 2017;38(3):314–8.

10. Zouari M, Louati H, Abid I, Trabelsi F, Ben Dhaou M, Jallouli M, et al. *Enterobius vermicularis*: a cause of abdominal pain mimicking acute appendicitis in children. A retrospective cohort study. Arch Iran Med. 2018;21(2):67–72.

11. Gonzalez S, De la Cabada FJ. Parasitic infections of the colon and rectum. Baillieres Clin Gastroenterol. 1987;1(2):447–67.

12. Cook GC. *Enterobius vermicularis* infections. Gut. 1994;35(9):1159–62.

13. Kucik CJ, Martin GL, Sortor BV. Common intestinal parasites. Am Fam Physician. 2004;69(5):1161 9.

14. Muge OA, Baykan Z, Artan C. Enterobiasis among preschool children: a study from Kayseri, Turkey. Jpn J Infect Dis. 2008;61(6):482–3.

15. Kacker PP. Vulvo-vaginitis in an adult with thread-worms in the vagina. Br J Vener Dis. 1973;49(3):314–5. https://doi.org/10.1136/sti.49.3.314

16. Mentessidou A, Theocharides C, Patoulias I, Panteli C. *Enterobius vermicularis*-associated pelvic inflammatory disease in a child. J Pediat Adolescent Gynecol. 2016;29(2):e25–e7.

17. Mayers CP, Purvis RJ. Manifestations of pinworms. Can Med Assoc J. 1970;103(12):489–93.

18. Al-Qadhi BN, Al-Warid HSJ, Al-Qadhi MN. Enterobiasis and its relationship with enuresis among one of orphanage care children in Baghdad-Iraq. Iraqi J Sci. 2011;52(3):394–9.

19. Maki AC, Combs B, McClure B, Slack P, Matheson P, Wiesenauer C. *Enterobius vermicularis*: a cause of acute appendicitis in children. Am Surg. 2012;78(12):E523–4.

20. Martinez-Criado Y, Millan-Lopez A, Galan N, De-Agustin-Asensio JC. Acute appendicitis by *Enterobius vermicularis*: an unusual etiology in children. Rev Esp Enferm Dig. 2012;104(7):393–4.

21. Fleming CA, Kearney DE, Moriarty P, Redmond HP, Andrews EJ. An evaluation of the relationship between Enterobius vermicularis infestation and acute appendicitis in a paediatric population: a retrospective cohort study. Int J Surg. 2015;18:154–8.

22. Sodergren MH, Jethwa P, Wilkinson S, Kerwat R. Presenting features of *Enterobius vermicularis* in the vermiform appendix. Scand J Gastroenterol. 2009;44:457–61.

23. Akıncı A, Kepil N, Erzin YZ, Zengin AK. *Enterobius vermicularis* infestation mimicking rectal malignancy. Turkiye Parazitol Derg. 2020;44(1):58–60.

24. Bharathi K, Anuradha S, Chandrasekar VA, Thirunarayanan R. *Enterobius vermicularis* worm granuloma mimicking like a pseudo tumor in the anal canal: an unusual clinical presentation. Trop Parasitol. 2012;2(2):124–6.

25. Arkoulis N, Zerbinis H, Simatos G, Nisiotis A. *Enterobius vermicularis* (pinworm) infection of the liver mimicking malignancy: presentation of a new case and review of current literature. Int J Surg Case Rep. 2012;3(1):6–9. https://doi.org/10.1016/j.ijscr.2011.10.003

26. Elsaid N, Mahmood H, Tekkis P, Tan E. Enterobiasis-related inflammatory caecal polyp masquerading as a malignancy. BMJ Case Rep. 2014;2014:bcr2013201599.

27. Estimated population in Palestine mid-year by governorate, 1997–2021. Ramallah:

Palestinian Central Bureau of Statistics; 2021 (http://www.pcbs.gov.ps/Portals/_Rainbow/

Documents/2097-2017.html, accessed 17 June 2021).

28. Astal Z. Epidemiological survey of the prevalence of parasites among children in Khan Younis governorate, Palestine. Parasitol Res. 2004;94(6):449–51.

29. Mezeid N, Shaldoum F, Al-Hindi AI, Mohamed FSA, Darwish ZEA. Prevalence of intestinal parasites among the population of the Gaza Strip, Palestine. Ann Parasitol. 2014;60(4):281–9.

30. Hussein AS. Prevalence of intestinal parasites among children in northern districts of West Bank, Palestine. Trop Med Int Health. 2011;16(2):240–4.

31. Ali-Shtayeh MS, Hamdan AH, Shaheen SF, Abu-Zeid I, Faidy YR. Prevalence and seasonal fluctuations of intestinal parasitic infections in the Nablus area, West Bank of Jordan. Ann Trop Med Parasitol. 1989;83(1):67–72.

32. Gunawardena NK, Chandrasena TN, de Silva NR. Prevalence of enterobiasis among primary school children in Ragama, Sri Lanka. Ceylon Med J. 2013;58(3):106–10.

33. Chan OT, Lee EK, Hardman JM, Navin JJ. The cockroach as a host for Trichinella and *Enterobius vermicularis*: implications for public health. Hawaii Med J. 2004;63(3):74–7.

34. Li HM, Zhou CH, Li ZS, Deng ZH, Ruan CW, Zhang QM, et al. Risk factors for *Enterobius vermicularis* infection in children in Gaozhou, Guangdong, China. Infect Dis Poverty. 2015;4:28.