

Study of the Most Prevalent Parasitic Diseases Especially Pinworm Among Children Aged (5–12 Years) in Various Areas of Dhi Qar Governorate

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Abstract

Objective: This study included investigating the quality and prevalence of external and internal (intestinal) parasites among children in various regions at Dhi Qar government. The current study also aimed to focus on and find out the relationship between pinworm infection and appendicitis.

Methods: The study was conducted during the period between February and July in the year 2023. The study included 100 patients infected with one or more types of ecto or intestinal parasites of both sexes, their ages ranged from 5 to 12 years. A clinical examination was performed for them by a pediatrician and they were sent to the laboratory to conduct the necessary laboratory tests.

Results: The current study revealed that a number of parasitic infections, whether external or internal, are associated with anemia and malnutrition in children, in addition to poor psychological condition. Some cases of parasitic worms, especially pinworms, were associated with acute appendicitis. A number of histopathological changes were found after examining the excised organ histologically. These changes included necrosis of the sub mucosal layer, erosion of the mucosal lining, and an abundance of fibroblasts in the muscle and serum layers.

Conclusion: Acute appendicitis due to *E. vermicularis* is a very rare occurrence. The histopathological analysis of resected specimens should pay special attention to search for this parasite for adequate post-operative treatment of patients.

Keywords: Parasitic infestations, *Enterobius vermicularis*, appendicitis, diagnosis, children

Introduction

Parasitic infestations pose serious issues for public health in developing nations. Appendicitis is a commonly observed condition among individuals experiencing intense abdominal pain that necessitates immediate surgical intervention.¹ Based on the findings of the Global Burden of Disease (GBD) reports in 2015, it was observed that there were an estimated 11.6 million instances of appendicitis, resulting in approximately 50,100 fatalities.² The typical clinical presentation of appendicitis often encompasses symptoms such as pain in the lower right abdomen, nausea, vomiting, and a decrease in appetite (anorexia).³ Despite recent advancements in antibiotic therapy, laparoscopic appendectomy has continued to be the conventional approach for the treatment of acute appendicitis.⁴

There exist multiple theories elucidating the etiology of this pathological condition; nevertheless, due to the multifactorial nature of appendicitis, the precise underlying cause remains uncertain.¹ The controversial nature of the relationship between infectious diseases and the development of acute appendicitis has persisted for over a century.⁵ Several reports have emphasized the potential correlation between appendicitis and infectious agents such as *Fusobacterium* spp. and herpes simplex virus. However, it has been suggested that the nematode parasite *Enterobius vermicularis* may be a likely factor contributing to the development of appendicitis.⁶

Enterobius vermicularis is a widely distributed parasite and ranks among the most prevalent helminths that infect humans in regions characterized by temperate and cool climates, including developed nations.⁷ The transmission of this parasite typically occurs through direct contact between individuals who are infected and those who are not, as well as through the ingestion and inhalation of the eggs.⁸ The

straightforward mode of transmission of *E. vermicularis* contributes significantly to the prevalence of reinfection, which is a primary factor in the progression of the infection. Nevertheless, the comprehensive life cycle of the helminth, encompassing the developmental stages from egg to adult worm, typically spans a duration of 2 to 4 weeks.⁹ The infection caused by *E. vermicularis* typically manifests with perianal pruritus.¹⁰ Additionally, there have been reports linking it to chronic abdominal pain, urinary tract infection, salpingitis, eosinophilic ileocolitis, and pelvic abscess.¹¹ Several potential hypotheses have been proposed to elucidate the correlation between *E. vermicularis* and appendicitis, with the prevailing notion being the ectopic migration of the parasite.¹² Intermittently, the irregular migration of eggs and larvae has the potential to induce the development of granulomas in various anatomical locations, such as the appendix,¹² kidney,¹³ peritoneal cavity,¹⁴ male urinary tract,¹⁵ and female genital tract,¹⁶ thereby potentially resulting in diagnostic errors. In the context of appendicitis, the obstruction and inflammation of the appendix can occur as a result of the release and accumulation of eggs from female *E. vermicularis*.¹⁷

In recent decades, there has been a substantial body of literature published on the global epidemiology and association between *Enterobius vermicularis* and appendicitis. This study presents a comprehensive global systematic review and meta-analysis that aims to evaluate the prevalence of *E. vermicularis* infection in cases of appendicitis.

Methods

The affected individuals may initially present with a diffuse onset of acute abdominal pain. The individual experienced a reduction in their desire to eat, without experiencing any

symptoms of nausea or vomiting, within a period of 12 hours following the initial onset. The intensity of the patient's abdominal pain progressively escalated, accompanied by the characteristic relocation of the pain to the right lower quadrant. The individual demonstrated a slight elevation in their body temperature. The laboratory results revealed an elevated total white blood cell count of $11,000/\text{mm}^3$, with no concomitant increase in eosinophils. All supplementary tests, including the ultrasound examination, yielded outcomes that were within the predetermined range of normal values.

Upon palpation, the abdominal examination revealed the presence of tenderness and rigidity in the lower right quadrant. The Rovsing's sign and rectal tenderness examination yielded favorable outcomes. The diagnosis of acute appendicitis was established through the identification of characteristic symptoms, a typical progression of symptoms, and the observation of tenderness in the right lower quadrant. As a result, a determination was made to proceed with surgical intervention for the purpose of removing the appendix.

During the pathological examination, a macroscopic examination was conducted, which indicated that the appendix displayed a normal appearance. The histopathological confirmation of this observation was established. The lumen harbored parasites exhibiting characteristics consistent with those of *Enterobius vermicularis*. Following a successful recovery, a medical prescription for mebendazole was prescribed to both the affected individual and all members residing in their household. The figure provided can be referenced or utilized (Figure 1 and 2).

Results

A study conducted at separated regions especially Informal and poor areas involved a sample of 100 children. The findings revealed a high prevalence of parasitic infestations among the children, including Leishmaniasis (5.8%), pediculosis (18.4%), Scabies (23.5%), and intestinal parasites (40.3%). The prevalence of enterobiasis, also known as pinworms, is 11.7%. The study revealed that there were no statistically significant disparities in the prevalence of overall parasitic infections between males and females, with rates of 68% for males and 32% for females. The age group with the highest incidence rate was observed among individuals aged 5–7 years, accounting for 44% of the population. Conversely, the lowest percentage was found in the age group of 11–12 years, with a prevalence



Fig. 1 *Enterobius vermicularis* in an appendix removed from a 12 aged child.

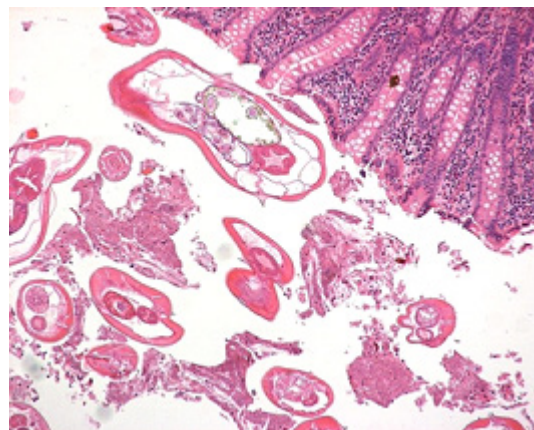


Fig. 2 *Enterobius vermicularis* in tissue.

of 17%. These findings indicate significant variations in incidence rates across different age groups. The group that exhibited the highest infection rate consisted of children who were reuniting with families from a socioeconomically disadvantaged background and with limited educational attainment, reaching a rate of 65.2%. Conversely, infection rates decreased as parental education levels increased and the standard of living improved, surpassing a certain threshold.

Table 1 showed the number of cases infected with one or more types of parasites which was (100) case and the significant differences according to gender, age, Weight and other studied characteristics in children's cases within the study.

Discussion

Pinworms are exclusively found in human hosts.¹⁸ The worldwide occurrence of gastrointestinal infection caused by *E. vermicularis* is widely recognized as the most prevalent helminth infection.¹⁹ Individuals from various socioeconomic backgrounds are susceptible to infection, although it is predominantly observed among children within the age range of 5 to 14 years.¹⁹ The initial stage of the life cycle involves gravid females depositing eggs in the perianal region. Subsequently, these eggs are ingested, leading to hatching and the production of larvae within the small intestine. The larvae then migrate to the caecum and appendix, which are commonly affected sites of infestation.²⁰

Infection caused by *Enterobius vermicularis* can result in various pathological alterations, encompassing lymphoid hyperplasia, acute and suppurative appendicitis, as well as cases where the appendix appears normal. However, symptoms may arise when the lumen of the appendix becomes obstructed by the presence of worms.²¹

The presence of *E. vermicularis* infestation can result in appendiceal colic. However, it is worth noting that the clinical symptoms can sometimes resemble those of acute appendicitis. This resemblance occurs due to the infestation by pinworms, which leads to an increase in lymphoid tissue growth. This, in turn, can trigger an inflammatory response, ultimately resulting in the clinical presentation of acute appendicitis. It is important to highlight that acute appendicitis is typically diagnosed when there is evidence of neutrophilic infiltration.²²

Nevertheless, it has been observed that *E. vermicularis* can sometimes lead to significant inflammation, ulceration,

Table 1. **The infection rate according to some variables related to the groups of children within the study**

Variables studied in children		100 infected with one or more types of parasites	Statistical analysis
Gender	Male	68 (68%)	Chi-Square = 25.920 P-value = 0.0007
	Female	32 (32%)	
Age	5–7 yrs	44 (44%)	Chi-Square = 18.570 P-value = 0.0006
	8–10 yrs	39 (39%)	
	11–12 yrs	17 (17%)	
Weight	Normal	22 (22%)	Chi-Square = 42.720 P-value = 0.0009
	Abnormal	78 (78%)	
The child's educational level	Educated	56 (56%)	ns Chi-Square = 2.880 P-value = 0.090
	Uneducated	44 (44%)	
Parents' educational level	Educated	12 (12%)	Chi-Square = 55.52 P-value = 0.00002
	Uneducated	88 (88%)	
Living standard	Bad	71 (71%)	Chi-Square = 66.87 P-value = 0.00003
	moderate	18 (18%)	
	Good	11 (11%)	
Areas where samples collected	Randomness with low cultural level	83 (83%)	Chi-Square = 87.120 P-value = 0.00002
	Civilized areas	17 (17%)	

and perforation. Therefore, based on our findings, we can conclude that the presence of *E. vermicularis* in appendectomy specimens seems to be coincidental rather than a direct cause of appendicitis.²³

Conclusion

To the best of our knowledge, this was one of the first studies to demonstrate the utility of preoperative SII evaluation in *Enterobius*-associated appendicitis. *Enterobius*-associated appendicitis should be kept in the differential diagnosis of

acute appendicitis. Early diagnosis of this condition will help reduce the number of negative appendectomies. This index can be routinely studied in the preoperative period in pediatric acute appendicitis patients. SII is a simple, non-invasive, easy-to-calculate indicator of *Enterobius*-associated appendicitis and aids in the preoperative differential diagnosis of acute appendicitis.

Conflict of Interest

None. ■

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