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RELATIONSHIP BETWEEN *ENTEROBIUS VERMICULARIS* INFECTION AND PELVIC INFLAMMATORY DISEASES IN CHILDREN AT SOHAG GOVERNORATE, EGYPT

By

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Abstract

A cohort of children presented with pelvic inflammatory diseases (gastro-intestinal and/or genitourinary surgical conditions) and had concomitant infection with *E. vermicularis*. To find out this relationship, a total of 135 patients suffering from different gastro-intestinal and genitourinary surgical conditions were selected from Departments of Surgery and Gynecology. They were subjected to stool analysis, peri-anal swabs and blood examination mainly for eosinophilia.

The results showed that 26 patients out of 135 (19.2%) had. *E. vermicularis* with high eosinophilia in 30 cases (22.2%). Identification of *E. vermicularis* by peri-anal swab test in the cohort was successful (16.30%). Males were more affected than females with ratio 2.2:1 and age mean 7.13±1.92. As to residence and housing, rural children with bad housing (73.08% & 88.46% respectively) were more affected than those living in urban areas with healthy housing (26.92% and 11.54% respectively).

Keywords: Egypt, children, *Enterobius vermicularis*, pelvic inflammatory diseases,

Introduction

Enterobiasis (threadworm or pinworm disease) is caused by the small nematode *E. vermicularis*. It is probably the most common helminthes to infect humans; prevalence rates of up to 100% have been recorded in north Western Europe and USA (Cook, 1990). Infection usually occurs by ingestion of eggs by contaminated hands, food, and less commonly water. Local irritation caused by migrating worms (or their eggs) produces the classic symptom that is pruritus ani. Further spread to the environment from finger contamination and autoinfection follows local scratching (Cook, 1990). There is much debate as to whether *E. vermicularis* causes serious disease in the gastrointestinal tract or is merely a ‘‘passenger’’. Certainly, ectopic infections, seen mainly in females, can cause significant morbidity as well in children aged 5 to 10 years. The most often encountered clinical presentation of *E. vermicularis* infection is pruritus ani. Occasionally, it presents with enterocolitis, appendicitis and female genital tract infections (Jardine *et al,* 2006). Rarely, infections have been reported with perianal abscesses (Mahomed *et al,* 2003). The most common complication is secondary bacterial infection of broken anal skin. Cases colitis secondary to *E. vermicularis* infection was reported (Macedo *et al, 2000*). Patients present with pain, rectal bleeding, fever, nausea, vomiting and increased frequency of stools, and in all instances symptoms resolve with anti-parasitic therapy alone (Liu *et al,* 1995). Scratching of the perineum also makes the female genital organs prone to be infected by the parasite. A majority of cases were caused by *Chlamydia trachomatis*, but many other organisms were implicated. Ectopic enterobiasis should be considered in the differential diagnosis of pelvic infections of gynecological origin (Craggs *et al,* 2009). Vulvovaginitis, salpingitis, oophoritis or pelvic inflammatory disease due to *E. vermicularis* was previously reported (Tandan *et al,* 2002). Recurrent vaginal enterobiasis despite complete treatment and in absence of gastrointestinal involvement suggested the vagina as a potential reservoir for *E. vermicularis* supported the theory of rare ectopic enterobiasis through the ascending pathway of female genital tract (Kashyap *et al,* 2014).

Pin worm was in patients' specimens who underwent surgery for acute appendicitis, with eosinophil and white blood counts elevation predicting preoperative *E. vermicularis* (Akkapulu and Abdullazade, 2015). Besides, Bartholin gland abscess was caused by *E. vermicularis* itself or by secondary bacterial infection (Melahat *et al,* 2014).

The present study aimed at the evaluation of *Enterobius vermicularis* as a causative parasitic agent either directly or indirectly among children underwent surgical conditions.

Patients, Materials and Methods

This study was carried out from June 2014 to February 2015 on 135 children selected from surgery and gynecological departments of Tahta, El-Maragha and Guhina Hospitals at Sohag Governorate. The inclusion criteria having various pelvic inflammatory diseases in the form of anal abscess, appendicitis, anal fistula, bartholin abscess, oophoritis and/or salpingitis. They were subjected to full history taking; age, sex, type of housing, family income and employment with stressed on socioeconomic status and residence. They were 55 female and 80 males with age range 1-10 years. Diagnosis of concomitant *E. vermicularis* infection was accomplished by detection of adult worms or eggs, or both. Stool examination was done macroscopically and by approval of parents peri-anal Scotch tape 'Cellotape' swab was done (Garcia, 2007), and/or obtained by subungucal deposit by scraping and cutting off finger nails (Requena *et al*, 2007). Aseptic blood sample was collected and examined for eosinophilia.

Statistical analysis: Data were tabulated and analyzed using STATA intercooled version. Quantitative data student T-test compared means of two groups and compared using Chi square or fisher exact test. Odd ratio was calculated using exact method. P less than 0.05 were considered significant.

Results

Of the 135 children, 26 (19.2%) had *E. vermicularis* and 30 patients had high eosinophilia, 26 infected cases and 4 non-infected cases (Table 1). Regarding the sex and age males were more affected than females with ratio 2.2:1 and age mean (7.13±1.92, rang 1-10). The rural children in bad house showed (73.08% & 88.46% respectively) more affected than urban with healthy ones (26.92% &11.54% respectively). The results were given in tables (1, 2, 3 & 4) and figure (1).

Table 1: Distribution of *E. Vermicularis* in studied cases

Variables	Statistical analysis	
Enterobius vermicularis	Negative 109 (80.74%)	Positive 26 (19.26%)
	121 (89.63%)	14 (10.37%)
Macroscopic	117 (86.67%)	18 (13.33%)
Microscopic	113 (83.70%)	22 (16.30%)
Anal swab &/or nails	105 (77.77%)	30 (22.33%)
Eosinophilia	105 (77.77%)	30 (22.33%)

Table 2: Characteristics of *E. vermicularis* cases

Variables	Negative (N=109)	Positive (N=26)	Total	P value
Age in year: Mean (SD)	6.46 ±2.21	7.13 ±1.92	6.59±2.17	
Age in year: Median (range)	7 (1-10)	7 (4-10)	7 (1-10)	0.16
Male	62 (56.9%)	18 (69.2%)	80 (59.2%)	
Female	47 (43.1%)	8(30.8%)	55(40.8%)	<0.0001
House: Healthy	102 (93.58%)	3 (11.54%)	105 (77.78%)	
House: Unhealthy	7 (6.42%)	23 (88.46%)	30 (22.22%)	<0.0001
Income: Low	9 (8.26%)	23 (88.46%)	32 (23.70%)	
Income: Middle	100 (91.74%)	3 (11.54%)	103 (76.30%)	<0.0001
Family number: mean (SD)	6.58 (2.08)	10.96 ±2.67	7.42± 2.80	
Family number: median (range)	6 (3-14)	11 (6-16)	7 (3-16)	<0.0001
Residence: rural	13 (11.93%)	19 (73.08%)	32 (23.70%)	
Residence: urban	96 (88.07%)	7 (26.92%)	103 (76.30%)	<0.0001

P value considered significant < .05

Table 3: Distribution of associated disease in cases

Associated disease	Number (percentage)
Anal abscess	52 (38.52%)
Appendicitis	35 (25.93%)
Anal fistula	24 (17.78%)
Bartholin abscess	18 (13.33%)
oophoritis	5 (3.70%)
salpingitis	1 (0.74%)

Fig. 1: Distribution of associated disease in cases

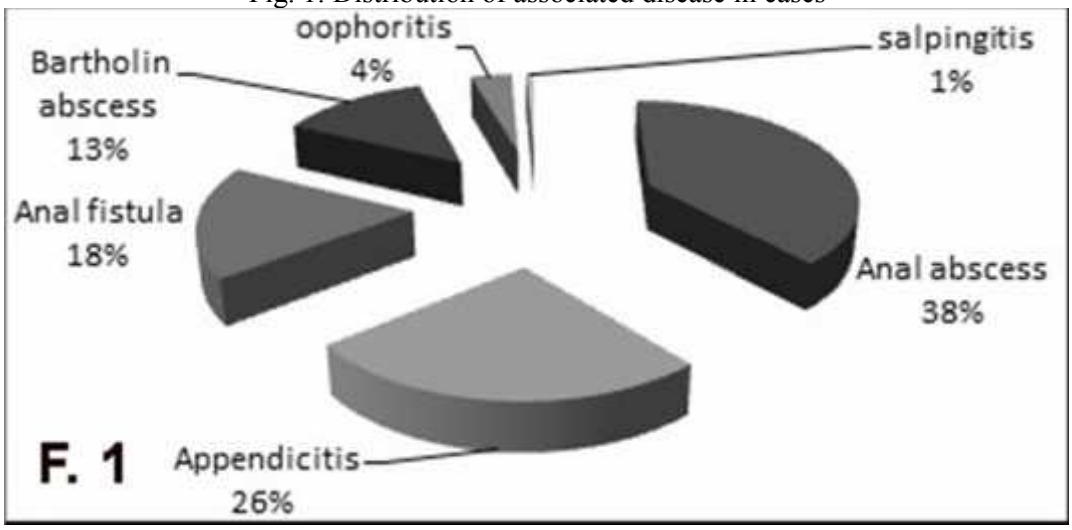

Table 4: Relation between associated disease and *E. vermicularis* infection.

Variables	*E. Vermicularis* infection		Odds ratio (95% CI)	P value
	Negative (N=109)	Positive (N=26)		
Anal abscess	45 (41.28%)	7 (10.00%)	0.52 (017.-1.44)	0.18
Appendicitis	31 (28.44%)	4 (15.38%)	0.46 (0.11-1.51)	0.17
Anal fistula	20 (18.35%)	4 (15.38%)	0.81 (0.18-2.78)	0.72
Bartholin abscess	10 (9.17%)	8 (30.78%)	4.4 (1.30-14.21)	0.004
Oophoritis	2 (1.83%)	3 (11.54%)	6.98 (1.10-66.16)	0.02
Salpingitis	1 (0.92%)	0	Can't calculated	0.62

P value considered significant < .05

Discussion

E. vermicularis is a common human intestinal parasite among pre-school and primary school children (Lee *et al,* 2000). Children are in contact each other more frequently in kindergartens and primary schools than children of other ages, and are also exposed to unsatisfactory sanitary environments (Kim *et al,* 2003). Despite this high prevalence, enterobiasis was not usually considered to be a serious disease, although ectopic infections, commonly in females, can cause significant morbidity (Russell, 1991) and adults can spread from anal margin to various sites. The local inflammatory response or secondary bacterial infections cause symptoms and clinical presentation (Tandan *et al,* 2002).

In the present study, of 135 children (1-10years) 26 (19.2%) had *E vermicularis*. The relationship between *E. vermicularis* infection and pelvic inflammatory diseases were approved by many authorities, Avolio *et al.* (1998) reported 13 cases of *E. vermicularis* presenting as perianal abscess or granuloma, all of which required surgery. Ajao *et al.* (1997) reported *E. vermicularis* causing appendicitis in a 14-year-old boy. Presence of the pinworm in the lumen of the appendix may produce the clinical picture of appendicitis. Perforation of the appendix can facilitate the spread of *E. vermicularis* into the peritoneal cavity. The present results

showed a high significance between *E. vermicularis* infection and gynaecological problems, which agreed with Kashyap *et al.* (2014) who reported recurrent vaginal *E. vermicularis* infection. This relation necessitates the diagnostic tests for enterobiasis in adults suffering from these gynecological complaints and its treatment or else there will be recurrence of them.

In the present study, 14 cases were diagnosed by gross examination, microscopical examination of stool samples and peri-anal swab test, four cases by microscopical examination of stool samples only and 8 cases were diagnosed by peri-anal swab only. These results agreed with Armengol *et al.* (1997) who found that of 1917 Spanish children ages 6 to 10 years *E. vermicularis* was diagnosed in 20% by using stool analysis and the perianal swab. In the present study, males were more affected than females with age (7.13±1.92). This agreed with Burkhart *et al.* (2005) who reported that *E. vermicularis* was the commonest parasite in the developed world mainly children aged 5 to 10 years. John and Burce (1992) reported that males more affected than females, this agrees with the present results. *E. vermicularis* infection was found to be prevalent in all ages from 3 to 10 years, and boys were more highly infected than girls (Jae *et al,* 2005). Inadequate personal hygiene could also increase *E. vermicularis* risk among children, particularly boys. Other factors including playing on the ground, nail biting, a failure to wash hands before meals, and living in non-apartment dwellings were associated with enterobiasis prevalence (Sung, 2001).

As to the residence and housing, the rural children living in bad house (73.08% and 88.46% respectively) were more affected than urban one in healthy housing (26.92% & 11.54% respectively). Family number and income are other factors that cause spread of *E. vermicularis* infection in these areas as a result of overcrowding, bad general conditions and malnutrition. The repeated health education concerning improving the personal hygiene and regular inspections and mass chemotherapy with the appropriate anthelmintics are essentially required to control enterobiasis (Jae *et al,* 2005).

Generally speaking, enterobiasis *vermicularis* is an ancient parasite. Horne (2002) stated that numerous archaeological sites, especially in the arid American southwest, yielded pinworm positive fecal samples dated back 10,000 year. He added that reports of pinworm from the Old World are scarce and evidence of pinworm infection from Roman-occupied (30 BC-AD 395) Egypt. The UNICEF (2000) declared that in Egypt, 56.0% and 47.0% of children suffered from intestinal parasites and anemia. Besides, many authors reported enterobiasis mainly among school children such as Awad *et al*. (1985) in Cairo, Bayoumy *et al*. (2010) in Nile Delta region, El-Sherbini and Gneidy (2012), in El-Fayoum, El-Sherbini and Abosdera (2013) in Sohag, Hegazy *et al*. (2014) in El-Behera and Eraky *et al*. (2014) in Qualyobia as well as in handicapped children (El-Sherbini *et al,* 2008)

Conclusions

Enterobius vermicularis must be taken into consideration as a common cause of pelvic inflammatory diseases, especially in high risk areas (rural areas, with unhealthy houses where inhabitants have low socioeconomic status). Although, pinworm infection can affect all people, it is commonest among the children, the institutionalized persons, and household members of persons with pinworm infection. The commonest symptom of pinworms is an itchy rectal area. Symptoms are worse at night during female crawls out of the anus to deposit their eggs. Once a child proved infected, therapy with routine prescription medications should be given with preventive hygiene measures to avoid autoinfection.

Recommendations

In general, the pinworm infection (enterobiasis or oxyuriasis) causes itching around the anus which can lead to difficulty sleep-

ing and restlessness. Good hand hygiene is the most effective means of prevention. If pinworm infection occurs again, the patient should be retreated with the same two-dose treatment. The infected person's household contacts and caretakers also should be treated. If pinworm infection continues to occur, the source of the infection should be sought either indoors and/or outdoors and must be treated.

The playmates, schoolmates, close conta- cts outside the home, and the household members should be considered possible sources of pinworm infection. Each infected person should receive the recommended treatment.

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