

Capillaria philippinensis: a cause of chronic diarrhea in Upper Egypt

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Background/aim

Capillaria philippinensis is a rare zoonotic intestinal parasite that is endemic in Philippines and Thailand. A few cases have been reported in Japan, Iran, Egypt, and Taiwan. The outcome of *C. philippinensis* may be fatal if untreated in due time.

C. philippinensis is an emerging infection in Egypt as a cause of chronic diarrhea; thus, we carried out this study to determine the presence and frequency of *C. philippinensis* in patients with chronic diarrhea in Upper Egypt.

Patients and methods

The study included 113 patients with chronic diarrhea attending the Department of Tropical Medicine and Gastroenterology, Assiut University Hospital. All patients were subjected to full history taking, clinical examination, and laboratory investigations including stool examination, complete blood count, and assessment of blood urea and serum creatinine, serum albumin, and electrolytes (sodium, potassium, and calcium). Also, gastroduodenoscopy, duodenal biopsy for histopathological examination, and colonoscopy were performed for every patient.

Results

C. philippinensis was reported in seven patients. All of them were young female patients with severe chronic diarrhea, associated with vomiting, abdominal pain, anorexia, borborygmi, weight loss, and ankle edema; three patients had mild ascites. The seven patients had hyponatremia, hypocalcemia, marked hypokalemia, and hypoalbuminemia. The diagnosis of *C. philippinensis* was established on finding the characteristic egg of *C. philippinensis* in the stool of all cases; histopathological examination of the duodenal biopsies indicated heavy cellular infiltration around the adult worm in one of them and larvae in another one. Six patients recovered completely with albendazole treatment 200 mg twice daily for 21 days, whereas one patient died of heart failure because of severe hypoalbuminemia and hypokalemia.

Conclusion

Capillariasis is one of the parasitic causes of chronic nonbloody diarrhea in patients in Upper Egypt.

Keywords:

Capillaria philippinensis, chronic diarrhea, intestinal capillariasis

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Introduction

Diarrhea is a common symptom worldwide and, especially in developing countries, most cases of diarrhea are assumed to have an infective origin. Chronic diarrhea is one of the most common reasons for referral to a gastroenterology clinic [1]. *Capillaria* spp., being round worms, are members of the superfamily *Trichinelloidae*. Only three major genera of this group cause human diseases: *Trichuris*, *Trichinella*, and *Capillaria*. These worms have an esophagus that is surrounded by glandular cells or stichocytes. This esophageal pattern is called a stichosomal esophagus. *Capillaria* spp. are parasites in many vertebrate animals but only three species infect humans: *Capillaria hepatica*, *Capillaria aerophila*, and *Capillaria philippinensis*. *C. philippinensis*, which causes intestinal capillariasis, is the most important and is found to infect

humans more than other species [2]. Fish-eating birds are the definitive natural host [3]. Humans are infected when they ingest raw or insufficiently cooked freshwater fish; this parasite has the unusual ability to multiply within the host and female parasites can produce infectious larva, which can lead to autoinfection and massive parasite burden in the small bowel [4].

C. philippinensis causes intermittent or continuous diarrhea, abdominal pain, vomiting, borborygmi, muscle wasting, edema, and weight loss. If patients with intestinal capillariasis are not treated, they will develop severe muscle wasting, cachexia, edema, and ultimately die. Most patients die because of electrolyte loss, which results in heart failure and or septic shock [5,6]. Infection because of *C. philippinensis* presents as a chronic severe malabsorption syndrome as nematodes infect the mucosa

and lamina propria of the jejunum and cause induration and villous atrophy [3,4,7].

Human intestinal capillariasis caused by *C. philippinensis* is a rare parasitosis that was first found in Philippines in the 1960s [8,9]. Subsequently, cases have been reported from other Asian countries such as Thailand [10,11] and Taiwan [6,12]. A few cases have been reported from other countries such as Egypt, Iran, India, and Colombia [13]. *C. philippinensis* was first described in Egypt in 1989 by Youssef *et al.* [14]. At least 44 cases – with many likely unreported cases – have been described since then; some cases have been reported from the El-Menia governorate by El-Karaksy *et al.* [15] and some in the Nile Delta [3]. About 84% of the Egyptian patients were women; most, but not all, patients reported having eaten raw fish, with some reporting the consumption of partially cooked fish [3]. The largest groups of Egyptian patients are housewives, who report preparing fish, which raises the possibility of carrying the infective stage of *C. philippinensis* (the larva) under the fingernails after fish evisceration [16]. The diagnosis of *C. philippinensis* is indicated by severe diarrhea and metabolic disorders and is established by finding the characteristic egg of *C. philippinensis* in the stool. Because the infection of *C. philippinensis* results in a severe disease that may be fatal if untreated, early diagnosis is very important. In the present study, we aimed to determine the presence and frequency of *C. philippinensis* as a cause of chronic nonbloody diarrhea in Upper Egypt.

Patients and methods

The present study included 113 patients with chronic nonbloody diarrhea attending the Tropical Medicine and Gastroenterology Department, Assiut University Hospital (Assiut, Upper Egypt) from July 2007 to January 2010. All patients were subjected to full history taking, clinical examination, abdominal ultrasonography, and laboratory investigations including assessment of complete blood count, blood urea, serum creatinine, serum electrolytes (sodium, potassium, and calcium), and serum albumin. Thorough stool examination for *C. philippinensis* egg and/or larva was performed at the Department of Parasitology. Colonoscopy and gastrointestinal endoscopy were also performed and biopsy samples were taken from the second part of the duodenum for histopathological examination at the Department of Pathology, Assiut University Hospital.

The study was carried out in accordance with the ethical standards of human experimentation and was approved by the Ethics Committee, Faculty of Medicine, Assiut University.

Statistical analysis

The statistical package for social science, version 10 (SPSS Inc., Chicago, Illinois, USA), was used for the statistical analysis. Simple statistics such as frequency, mean, and SD were calculated.

Results

The present study included 113 patients with chronic nonbloody diarrhea. Table 1 shows the different causes of chronic diarrhea in our patients.

All the seven patients who were found to have *C. philippinensis* were women, 29.3 ± 7.2 years of age. All of them lived in Upper Egypt with no history of traveling abroad, and all of them were housewives; only three patients reported consuming partially cooked fish and all of them reported that they had not consumed raw fish. The seven patients had chronic diarrhea for 2–6 months; other symptoms included abdominal pain borborygmi, vomiting, anorexia, and weight loss. All of them had lower limb edema, whereas mild ascites were found in three cases (Table 2). Laboratory findings showed hyponatremia, hypocalcemia, marked hypokalemia, and hypoalbuminemia; the blood count indicated anemia in five cases and eosinophilia in six cases (Table 3). Other laboratory findings including leukocytic count, platelet count, blood urea, and serum creatinine were normal. Stool examination indicated the characteristic egg of *C. philippinensis*. Gastrointestinal endoscopy in our patients showed positive findings only in three (28.9%) cases (Table 4), whereas duodenal biopsies of all cases showed chronic nonspecific inflammation and partial villous atrophy. One of them showed marked cellular infiltration around the adult *C. philippinensis* worm, whereas another biopsy indicated the larvae of the worm (Fig. 1).

Discussion

The present study showed that *C. philippinensis* was the cause of chronic nonbloody diarrhea and malabsorption in seven (6.2%) of 113 patients. This is in agreement with Bair *et al.* [9], who considered *C. philippinensis* as one of the etiologies of malabsorption syndrome. Also, Soukhathammavong *et al.* [17] have reported that intestinal capillariasis may be confused with chronic diarrhea of unclear origins such as tropical sprue, celiac disease, collagenous colitis, and Crohn's disease. All the seven patients had diarrhea; other clinical manifestations included abdominal pain borborygmi and lower limb edema. Three of the patients had mild ascites; also, all of them had

Table 1 Causes of chronic nonbloody diarrhea in the patients studied

Causes	N (%) (n = 113)
Functional diarrhea	37 (32.7)
Irritable bowel syndrome	21 (18.6)
Celiac disease	16 (14.2)
Tuberculous enteropathy	12 (10.6)
Capillariasis	7 (6.2)
Giardiasis	7 (6.2)
Diabetic enteropathy	3 (2.7)
Eosinophilic gastroenteritis	3 (2.7)
Thyrotoxicosis	2 (1.8)
Lymphoma	1 (0.9)
Chronic pancreatitis	1 (0.9)
Laxative abuse	1 (0.9)
AIDS enteropathy	1 (0.9)
Collagenous vascular disease	1 (0.9)

AIDS, acquired immune deficiency syndrome.

Table 2 Clinical findings in patients with capillariasis

Case number	Diarrhea	Abdominal pain	Borborygmi	Vomiting	Weight loss	Lower limb edema	Ascites
1.	+	–	–	–	–	+	–
2.	+	–	–	–	–	+	–
3.	+	–	–	–	–	+	–
4.	+	+	+	–	+	+	–
5.	+	+	–	+	+	+	+
6.	+	+	+	–	+	+	+
7.	+	+	+	+	+	+	+
Percentage	100%	57.1%	42.8%	26.6%	57.1%	100%	42.8%

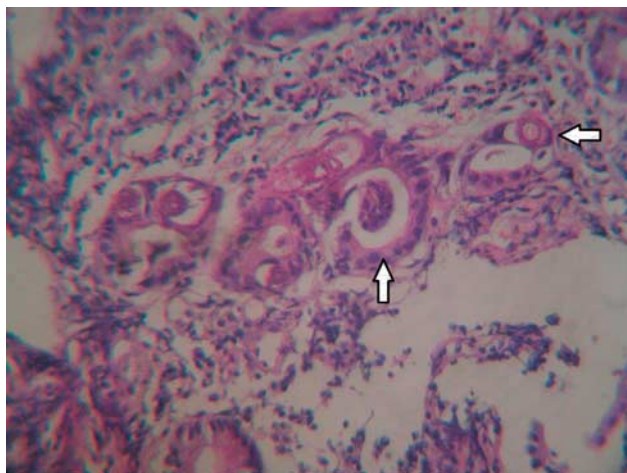
Table 3 Laboratory findings in patients with capillariasis

Case number	1	2	3	4	5	6	7
Blood urea (2.5–8 mmol/l)	3.5	4.2	4.9	3	5.1	4.8	6
Serum creatinine (62–115 μ mol/l)	85	91	78	81	102	90	105
Serum albumin (3.5–5 mg/dl)	1.9	1.6	1.3	1.5	1.1	0.9	0.9
Serum sodium (135–145 mg %)	122	125	124	121	118	120	115
Serum potassium (3.5–5 mg %)	2.3	2.9	3	3.1	2.4	2	1.7
Serum calcium (9–11 mg %)	7.8	8	8.1	8.2	8.5	8.1	7.6
HGB level (11–14 mg/dl)	11.5	11	9.5	10.8	9.4	9.2	8.2
WBC count ($3.5\text{--}10 \times 10^3/\text{mm}^3$)	4.5	6.1	5.5	7.2	6.8	8	9.1
Eosinophils (1–4%)	4	4.5	5	4	2	6	5
Platelet count ($150\text{--}390 \times 10^3/\text{mm}^3$)	200	260	320	250	300	350	210
Stool ova	+	+	+	+	+	+	+

(), normal ranges; HGB, hemoglobin; WBC, white blood cell.

Table 4 Upper endoscopy findings in patients with capillariasis

Variables	N (%)
Normal findings	4 (57.14)
Absent duodenal folds	1 (14.29)
Mosaic appearance of mucosa	2 (28.57)

Figure 1

Cellular infiltration around the larvae of *Capillaria philippinensis* in the duodenal biopsy.

hyponatremia, hypocalcemia, marked hypokalemia, and hypoalbuminemia. These findings are in agreement with the results of many previous studies such as Tesana *et al.* [18], Bair *et al.* [9], EL-Karakasy *et al.* [15], and Lu *et al.* [6]. However, Tesana *et al.* [18] reported that the edema in these patients was because of hypoalbuminemia as albumin is the plasma protein that controls the fluid in

blood vessels by maintaining the osmotic pressure. If the osmotic pressure decreases, the plasma fluid in vessels leaks out of the capillaries into the interstitium and leads to edema in patients with intestinal capillariasis [18]. Malabsorption in these patients may have resulted from the secretion of a proteolytic substance by *C. philippinensis* or direct penetration of the intestinal wall, which causes cellular injury and dysfunction [19].

Also, Petersen *et al.* [3] have reported that *C. philippinensis* infection presents as a chronic severe malabsorption syndrome, where adult nematodes infect the mucosa of the jejunum and cause induration and villous atrophy, leading to protein-losing enteropathy and cachexia. Out of our seven cases, one patient died of heart failure secondary to severe hypoalbuminemia and hypokalemia. In agreement with our results, Dap and Cooper [20] found that *C. philippinensis* causes severe electrolyte imbalance and protein deficiency as a result of diarrhea, which can lead to the degeneration of both skeletal and cardiac myocytes; they also found that death is usually secondary to hypokalemia, which causes metabolically induced cardiomyopathy. In terms of the complete blood count, five of our patients were anemic (hemoglobin level <11 mg/dl) and four patients had eosinophilia (eosinophil ratio $>4\%$); these findings are in agreement with those of Lu *et al.* [6], Soukhathammavong *et al.* [17], and Petersen *et al.* [3].

Duodenal biopsies of our patients indicated chronic nonspecific inflammation and partial villous atrophy, whereas one of them showed heavy cellular infiltration around the adult worm and another showed larvae of the worm. In agreement with this, several previous studies have reported atrophied crypts and flattened villi and cellular infiltration, which were signs of intestinal cell injury [3,9,18].

The present study showed that the seven patients with *C. philippinensis* infection were women, but opposite contrasting result has been found in endemic areas such as Philippines and Thailand, where men tend to be easily infected than women [6]. However, our results are in agreement with those of previous Egyptian studies, which have shown that 84% of the Egyptian patients are women [3,16]. All of our patients reported that they had not consumed raw fish, whereas two patients only reported consuming partially cooked fish; the seven patients were housewives who report having prepared fish, which raises the possibility of carrying the infected stage of *C. philippinensis* (the larvae) under the fingernails after fish evisceration as reported by EL-Dib and Doss [16]. In agreement with the previous studies [3,6,9,15], six of our patients responded remarkably to albendazole 200 mg twice daily for 21 days; unfortunately, the seventh patient died because of delayed diagnosis (up to 6 months) and treatment, which highlights the fact that unawareness and delayed diagnosis of *C. philippinensis* may lead to serious medical problem. This issue had been highlighted in South Korea, Egypt, and India; it may be fatal (fatality rate was 30% in an outbreak in Philippines) according to Youssef *et al.* [14], Lee *et al.* [21], Austin *et al.* [22], EL-Karaksy *et al.* [15], and Soukhathammavong *et al.* [17]. Finally, we have to take into consideration that *C. philippinensis* is an emerging parasitic infection in Egypt. Although this infection is easily curable, it may be potentially severe and may result in a fatal outcome in case of a delayed diagnosis or inappropriate treatment. Therefore, this study raises questions about the risk factors for *C. philippinensis* infection in our locality, which could provide the basis for further community-based studies.

Conclusion

Capillariasis is one of the parasitic causes of chronic nonbloody diarrhea in patients from Upper Egypt; hence, meticulous stool examination in patients with chronic nonbloody diarrhea is very important. Albendazole treatment is effective in patients with capillariasis. Therefore, we recommend that any patient with symptoms of chronic diarrhea, borborygmi, abdominal pain, and weight loss should be investigated for *C. philippinensis*. The conditions of the modern world are favorable to the spread of the infectious diseases rapidly because of improvement in international travel.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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