CLINICAL AND LABORATORY FEATURES OF STRONGYLOIDIASIS AT THE NATIONAL HOSPITAL FOR TROPICAL DISEASES

Manh Hung Than[1,2], Van Manh Phan[1] , Hai Yen Le Thi[2], Thu Hoai Bui Thi[2]

Objectives: Describe clinical and laboratory features of strongyloidiasis at the National Hospital for Tropical Diseases from November 2018 to January 2024.

Subjects and methods: A cross-sectional, retrospective study. Inclusion criteria were based on direct microscopy of Strongyloides stercoralis larvae in body fluid specimens (stool, gastric fluid, respiratory tract fluid, cerebrospinal fluid, etc.).

Results: 48 patients were included in the study, 85.42% of cases were male, with a median age of 64.5 years. 83.33% of patients had comorbidities. 60.42% of patients were in the intensive care unit (ICU). There were 33.33% of uncomplicated strongyloidiasis and 66.67% of severe strongyloidiasis. Severe strongyloidiasis had higher rates of fever and neutrophilia than uncomplicated disease. 20.83% of cases had co-infection with sepsis; 27,08% of cases had bacterial co-infection in cerebrospinal fluid. The most common bacteria were *E. coli* and *K. pneumoniae*.

Conclusions: Patients were mainly male, aged > 60, and had comorbidities. The rate of patients with severe strongyloidiasis is 66.67%. Severe strongyloidiasis had significantly higher rates of fever and neutrophilia than uncomplicated strongyloidiasis.

Keywords: Strongyloidiasis, *Strongyloides* stercoralis.

INTRODUCTION

Strongyloidiasis is a neglected disease caused by *Strongyloides* stercoralis, a soil-transmitted helminth mainly diffused in tropical and subtropical regions including Vietnam.[1] Strongyloidiasis is usually diagnosed by microscopic identification of Strongyloides stercoralis larvae (rhabditiform and occasionally filariform) in the stool, duodenal fluid, and/or biopsy specimens, and possibly sputum in disseminated infections. Worldwide, the prevalence of strongyloidiasis is estimated at 380 - 600 million people. Southeast Asia is the region with the highest prevalence, about 12% of the population.[1,2] In Vietnam, the seroprevalence of *S. stercoralis* in humans is 20 - 30%.[3,4] This roundworm can cause chronic and lifelong disease in the host due to its autoinfection cycle. The clinical spectrum is diverse, ranging from subclinical manifestations to nonspecific clinical manifestations and life-threatening syndromes. Under certain conditions, patients may develop severe strongyloidiasis, including hyperinfection syndrome and disseminated strongyloidiasis, as a result of accelerated parasite replication and larval dissemination to organs where migration usually does not occur. The mortality rate in these cases is over 50%.[5] Limitations of diagnostic tests and nonspecificity of symptoms may cause missed diagnoses in clinical practice. Therefore, we conducted this study to describe the clinical and laboratory features of strongyloidiasis.

(1) National Hospital for Tropical Diseases

(2) University of Medicine and Pharmacy, Vietnam National University, Hanoi

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Responsibility for scientiffic content of the article:

Van Manh Phan

Tel: 0366585068. Email: phanmanh.hmu@gmail.com

SUBJECTS AND METHODS

Subjects: 48 patients diagnosed with strongyloidiasis, treated at the National Hospital for Tropical Diseases from November 2018 to January 2024.

Inclusion criteria:

- Patients ≥ 18 years old.

- *S. stercoralis* larvae were found in patient specimens (stool, gastric fluid, respiratory fluid, cerebrospinal fluid, etc.).

Exclusion criteria:

- Outpatient.

- Patient medical records missing information.

Methods: Cross-sectional descriptive, retrospective study.

Sample size and sampling method: convenient sample, all patients meeting the study criteria were selected for analysis.

We divided patients into two groups:

- Group I (uncomplicated strongyloidiasis): patients with *S. stercoralis* larvae in gastrointestinal and/or respiratory specimens, including simple intestinal strongyloidiasis and mild hyperinfection syndrome. Simple intestinal strongyloidiasis is characterized by weight loss, abdominal discomfort, and loose stools, with or without eosinophilia. Mild hyperinfection syndrome has symptoms of intestinal strongyloidiasis plus respiratory symptoms (cough, wheezing, dyspnea) with or without immunosuppression (corticosteroids, HTLV-1 infection, malignancy, non-steroidal immunomodulating agents) and absence of signs of systemic toxicity or sepsis.[6]

- Group II (severe strongyloidiasis): including disseminated strongyloidiasis (larvae can be found outside the gastrointestinal and respiratory tracts), is a severe clinical syndrome characterized by Gram-negative or polymicrobial sepsis and/or meningitis, with evidence of end-organ failure, including acute renal failure, acute respiratory distress, impaired consciousness, coma.[6,7]

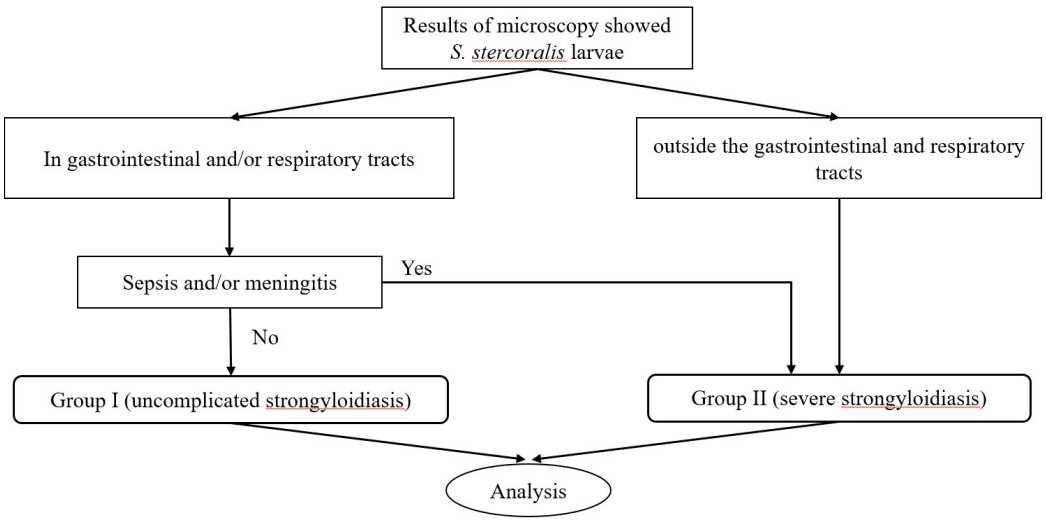

Figure 1. Research diagram

Data analysis: According to medical statistics methods in SPSS version 20.

Research ethics: This is a descriptive study without patient intervention.

RESULTS

From November 2018 to January 2024, we collected 48 qualified - research patients.

Table 1. Common characteristics of the research group (N = 48)

Variables	n(%), median (min-max)
Age (year)	64.5 (23 - 92)
< 40	4 (8.33)
40 - < 60	14 (29.17)
≥ 60	40 (62.5)
Gender	
Male	41 (85.42)
Female	7 (14.58)
Comorbidities	40 (83.33)
Long-term use of steroids	13 (27.08)
Gout	8 (16.67)
COVID-19	3 (6.25)
Diabetes mellitus	8 (16.67)
Hypertension	17 (35.42)
Cirrhosis	3 (6.25)
Alcohol abuse	3 (6.25)
HIV	1 (2.08)
Others	11 (22.92)
Department	
ICU	29 (60.42)
Non-ICU	19 (39.58)
Group	
I (uncomplicated strongyloidiasis)	16 (33.33)
II (severe strongyloidiasis)	32 (66.67)
Only sepsis	12 (25)
Only meningitis	9 (18.75)
Sepsis and meningitis	11 (22.92)

Comments: The median age is 64.5 years, with the over-60 age group being the majority. The male/female ratio is 5.86. 83,33% of patients had comorbidities. Common comorbidities include long-term use steroids, hypertension, gout, and diabetes mellitus. There were 60.42% of patients in the ICU. The rates of group I and group II were 33.33% and 66.67%, respectively.

Table 2. Clinical and laboratory features (N = 48)

Variables	All (N = 48)	Group I (N = 16)	Group II (N = 32)	p-value
Clinical features				
Fever	36 (75)	7 (43.75)	29 (90.63)	0.001
Weight loss	32 (66.67)	11 (68.75)	21 (65.63)	0.829
Rash	6 (12.5)	2 (12.5)	4 (12.5)	1
Gastrointestinal symptoms	31 (64.58)	12 (75)	19 (59.38)	0.286
Abdominal pain	12 (25)	5 (31.25)	7 (21.88)	0.500
Diarrhea	20 (41.67)	8 (50)	12 (37.5)	0.408
Gastrointestinal bleeding	6 (12.5)	2 (12.5)	4 (12.5)	1
Laboratory features				
Hemoglobin (g/L)	102 (59 - 160)	94 (60 - 99)	94.5 (59 - 160)	
Anemia	41 (85.42)	13 (81.25)	28 (87.5)	0.672

Variables	All (N = 48)	Group I (N = 16)	Group II (N = 32)	p-value
WBC (G/L)	12.7 (3.6 - 27)	13.1 (9-15.3)	12.75 (3.6 - 21.2)	
Leukocytosis	1 (2.08)	0 (0)	1 (3.13)	1
Leukopenia	33 (68.75)	10 (62.5)	23 (71.88)	0.509
Neutrophil (%)	82.9 (28.1 - 98.7)	61.5 (56.1 - 80.3)	88.15 (50.5 - 98.7)	
Neutrophilia	32 (66.67)	6 (37.5)	26 (81.25)	***0.002***
Eosinophil (%)	1.55 (0 - 40.5)	0.4 (0 - 12.8)	0.8 (0 - 32.5)	
Eosinophilia	10 (20.83)	7 (43.75)	3 (9.38)	***0.01***
PLT (G/L)	225 (10 - 778)	159 (123 - 408)	196 (10 - 778)	
Thrombocytopenia	13 (27.08)	2 (12.5)	11 (34.38)	0.170
AST (U/L)	31.35 (8 - 149.9)	28.1 (10 - 79)	38.3 (8 - 149.9)	
Increase	20 (41.67)	5 (31.25)	15 (46.88)	0.301
ALT (U/L)	34 (6 - 226.7)	25 (8 - 172.7)	34 (6 - 226.7)	
Increase	15 (31.25)	4 (25)	11 (34.38)	0.509
Ure (mmol/L)	5.7 (0.94 - 83)	4 (1.3 - 74.3)	6.25 (0.94 - 83)	
Increase	17 (35.42)	3 (18.75)	14 (43.75)	0.088
Creatinin (µmol/L)	60.4 (26.1 - 200)	60.4 (26 - 200)	60.5 (26.1 - 187)	
Increase	4 (8.33)	1 (6.25)	3 (9.38)	0.318
Albumin (g/L)	27.9 (15 - 98)	29 (15 - 39.3)	26 (16 - 98)	
Decrease	33 (68.75)	10 (62.5)	23 (71.88)	0.509
CRP (mg/L) (N=43)	44 (1.50 - 206.9)	30.2 (26.85 - 91.3)	83.05 (1.7 - 206.9)	
Increase	37 (86.05)	9 (69.23)	28 (93.33)	0.058
Pro-calcitonin (ng/mL) (N = 30)	0.93 (0.10 - 36.04)	0.7 (0.24 - 5.54)	1.06 (0.11 - 36.04)	
Increase	30 (100)	4 (100)	26 (100)	

Chi-square, Fisher's exact test

Comments: Severe strongyloidiasis had significantly higher rates of fever and neutrophilia than uncomplicated strongyloidiasis. In contrast, the rate of eosinophil increase was higher in uncomplicated strongyloidiasis. This difference was statistically significant with $p < 0.05$.

Table 3. Characteristics of bacterial coinfection (N = 48)

Culture specimens	Positive (n(%))	Bacteria (n)
Blood	10 (20.83)	*Escherichia coli* (5) *Klebsiella pneumoniae* (4) *Enterococcus faecium* (1) *Enterococcus faecalis* (1) *Staphylococcus aureus* (1) *Acinetobacter lwoffii* (1)
Cerebrospinal fluid	13 (27.08)	*Escherichia coli* (7) *Klebsiella pneumoniae* (2) *Enterococcus faecium* (2) *Enterococcus gallinarum* (1) *Streptococcus gallolyticus* (1)

Comments: The rates of bacterial growth in blood and cerebrospinal fluid cultures were 20.83% and 27.08%, respectively. The most common bacteria in both specimens were *E. coli* and *K. pneumoniae*.

DISCUSSION

Common characteristics of the research group

In our study, the majority of patients were male (85.42%) and elderly (median age is 64.50 years old). The study of Nguyen Trung Cap et al. also showed that the majority were male (77%) and the median age was 62.9 ± 13.4 years in the severe strongyloidiasis group.[8]

Immunosuppressed individuals are at risk for developing Strongyloides hyperinfection syndrome and disseminated strongyloidiasis.[1,2] Conditions associated with impaired immunity include corticosteroid administration, Human T-lymphotropic virus type I (HTLV-I) infection, malignancy, diabetes, alcoholism, etc. Chronic gout patients often abuse corticosteroids, so their rate was also high in our study. Current treatments for patients with moderate and severe COVID-19 include the use of immunosuppressive drugs, such as dexamethasone and tocilizumab. Thus recent studies have shown that patients with COVID-19 may have severe strongyloidiasis. HIV/AIDS is not closely related to strongyloidiasis.[9] There was only one HIV-infected patient in our study.

Most of our patients were admitted to the ICU (60.42%). 66.67% of patients were in group II (severe strongyloidiasis), in which clinical groups included sepsis (25%), meningitis (18.75%), or both (22.92%).

Clinical and laboratory features of the research group

Larva currens are a specific sign of acute strongyloidiasis due to the movement of larvae under the skin. However, this sign is rarely observed. The features of chronic strongyloidiasis are often nonspecific and involve the GI tract and/or the skin, and more rarely, the respiratory system. Eosinophilia, commonly seen in parasitic infections, accounted for 20.83% of our study and was more common in the uncomplicated strongyloidiasis group. In severe strongyloidiasis patients, their symptoms are often mixed with systemic infection. Patients are usually febrile and have manifestations of sepsis or meningitis. In our study, 90.63% of patients had fever and 81.25% had neutropenia in the severe strongyloidiasis group, which was significantly higher than in the uncomplicated group.

In severe strongyloidiasis such as hyperinfection syndrome and disseminated disease, the overgrowth of *S. stercoralis* allows intestinal bacteria to penetrate the intestinal mucosal barrier into the bloodstream, causing systemic infection.[2] In our study, 20% of patients had positive blood cultures and 10% had positive cerebrospinal fluid cultures. Co-infecting organisms included enterobacterales (e.g. *E. coli, K. pneumonia*) and enterococci (e.g. E. faecium, E. faecalis). Patients with persistent or severe infections due to these organisms should be actively screened for strongyloidiasis.[5]

CONCLUSIONS

- Our patients were mainly male, elderly, and had comorbidities. 66.67% of patients had severe strongyloidiasis and 60.42% were admitted to the ICU.

- Clinical and laboratory features were often nonspecific. Severe strongyloidiasis had significantly higher rates of fever and neutrophilia than uncomplicated strongyloidiasis.

- The main co-infecting bacteria were enterobacterales (e.g. *E. coli, K. pneumonia*) and enterococci.

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