

## Original Article

# Adult Patients with an Endoscopic Diagnosis of Hookworm Infection: One-year Experience in a Primary Referral Hospital in Indonesia

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### ABSTRACT

**Aim:** This study was aimed to investigate the clinical profiles of adult patients with hookworm infection in a primary referral hospital in Indonesia.

**Methods:** A descriptive study was conducted from January to December 2018. The medical records of hospitalized adult patients diagnosed with hookworm infection in Waled General Hospital, Cirebon, West Java, Indonesia were reviewed. The diagnosis of ancylostomiasis was based on microscopic examination of stool specimens and/or endoscopic findings. The clinical profile encompassed clinical characteristics and in-hospital clinical outcomes. Data was analyzed using descriptive statistics.

**Results:** There were 12 subjects in this study. The mean age was 57.17 years old. Their occupations included homemaking (41.7%), farming (33.3%), and traditional trading (25.0%). The chief complaints of the patients included fatigue (58.3%), followed by melena, and nausea-vomiting. The laboratory results showed anaemia in all subjects with half of them having severe anaemia. None of the faecal specimens revealed hookworm eggs. The endoscopic findings showed duodenitis in all subjects. Histologic speciation of the worms revealed *A. duodenale* in all cases and *N. americanus* in 8.3% of cases. Most subjects (83.3%) required blood transfusions with mean volume of blood transfused being 4.4 blood bags. 33.3% of subjects required endoscopic hemostasis. There were no reported deaths. The mean length of hospital stay was 8.4+1.4 days.

**Conclusion:** Hookworm infection in adult patients has a high burden of morbidity. Due to its intriguing clinical characteristics, the identification of an at-risk population is highly needed. Endoscopy has a role in the diagnosis and management of hookworm infection.

**KEYWORDS:** Hookworm infection; *A. duodenale*; *N. americanus*.

### Introduction

Hookworm infection is one among the soil-transmitted helminths (STH) infections that belong to the category of neglected tropical diseases (NTDs).<sup>1,2</sup> It is a serious public

health problem because it has a substantial economic and health burden globally.<sup>3</sup> It is estimated that hookworm infection affects 472 million people worldwide.<sup>4</sup> Its

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burden causes as high as 4 million disability-adjusted life-years (DALYs) with productivity losses of up to US\$ 139 billion annually.<sup>3</sup>

Two species of hookworm are mainly responsible for human infections, *Ancylostoma duodenale* and *Necator americanus*. It occurs commonly in tropical and subtropical regions. *A. duodenale* is endemic in the Mediterranean region, Egypt, South America, northern India, and China, while *N. americanus* is found worldwide especially in sub-Saharan Africa, the Americas, and Asia.<sup>2,4,5,6</sup> It is prevalent in adults though it is not uncommon in children.<sup>2,4</sup>

Risk factors for developing hookworm infection are low socioeconomic status, infected soil exposure, barefoot walking, poor sanitation, and poor personal hygiene. The transmission of hookworm infection relies upon many factors including warm-and-moist climate, inadequate safe water supply, and poor sanitation. The common routes of transmission are skin penetration, oral ingestion, and vertical (mother-to-infant) transmission. Skin penetration is acquired through skin exposure, often unprotected hands or feet, to contaminated soil. Rarely, oral ingestion transmission occurs in contaminated food and water containing *A. duodenale*. The vertical transmission allows larvae migration from mother to infants via transplacental route or breast milk during breast feeding.<sup>2,7</sup>

The diagnosis of hookworm infection is intriguing. Clinical manifestations of hookworm infection are usually non-specific. Stool examination under a microscope is still the mainstay diagnostic tool. It is helpful in the identification and quantification of hookworm eggs. However, the diagnosis may be missed due to the absence of eggs of the parasites in a single stool specimen. Some reports reveal that upper gastrointestinal endoscopy (UGIE), double-balloon enteroscopy, and capsule endoscopy may have a role in identifying hookworm infection in patients with gastrointestinal bleeding who had negative findings in stool examination.

The objective of this study is to study the clinical profile of patients with hookworm infection in a primary referral hospital in Indonesia. The study was done to increase the awareness of hospital-based healthcare providers about hookworm infection.

## Methods

This was a cross-sectional study conducted at Waled General Hospital (WGH), Cirebon, West Java, Indonesia. WGH is a primary referral hospital in the eastern Cirebon Regency.

We used retrospective data from medical records. The subjects were adult patients diagnosed with hookworm infection. The data collection was performed between January 01 and December 31, 2018.

The diagnosis of hookworm infection was based on the finding of hookworm eggs on stool examination and worms seen on upper gastro-intestinal endoscopy (UGIE). UGIE examinations were performed using standard video esophagogastroduodenoscopy. Once hookworms were identified, one of the worms was grasped by standard biopsy forceps, extracted, and examined by light microscopy. The clinical profile encompassed clinical characteristics and in-hospital clinical outcomes. Clinical characteristics included chief complaints, laboratory findings, stool examination, and endoscopic findings. The in-hospital clinical outcomes included blood transfusion, further treatment if any, the length of stay during hospitalization, and mortality.

Data analysis was performed. All of the data was descriptive; numerical data were expressed in the form of numbers and percentages, and endoscopic imaging findings were detailed.

Ethics approval was obtained from the Ethical Research Committee, Faculty of Medicine, Universitas Swadaya Gunung Jati.

## Result

In this study, there were 12 hospitalized patients diagnosed with hookworm infection. The age of the subjects ranged from 41 to 78 years with a mean age of 57.17 years. Most of the subjects had low educational levels. The sociodemographic characteristics of the subjects are shown in **Table 1**.

The chief complaints included fatigue, nausea, melena, constipation, and abdominal pain in order of frequency (**Table 2**). Only 1 subject had comorbidities.

All subjects admitted that they seldom wash their hands before having a meal or on daily activities. All subjects had anaemia with 50% of the subjects having severe anaemia. The mean level of haemoglobin was 5.78 mg/dL. All stool examinations of the subjects showed a negative result for hookworm eggs in this study.

Upper gastrointestinal endoscopies in all these patients revealed hookworm infestation in the duodenum. The endoscopic examination revealed the presence of hookworms along the duodenum and duodenal erosions in all subjects with duodenal ulcers in 1 subject, several erosions in the stomach in 9 subjects with a gastric ulcer in 4 subjects, and bleeding manifestation in three-fourth subjects. Histologic speciation of the worms in this study showed *A. duodenale* (100%) and *N. americanus* (8.33%).

For all subjects, pyrantel pamoate was the anthelmintic drugs administered for treatment at a dose of 11mg/kg orally daily for three days. The anthelmintic treatment was administered after endoscopic examination. Blood transfusion was performed as indicated in 83.3% of subjects with a range of 1-10 blood bags per subject and the mean blood volume transfused was 4.4 bags. Endoscopic hemostatic management was performed in 33.3% of subjects. None of the subjects was admitted into the intensive care unit. There was no mortality reported in this study. The subjects were hospitalized for a duration ranging from 6-10 days (mean 8.4 days).

## Discussion

Hookworm infection is a serious public health problem affecting more than 400 million people resulting in a considerable negative influence on health weighing on socioeconomic development with an estimated burden of 4 million DALYs.<sup>3</sup> As reported by some studies, this study showed that hookworm infection is more prevalent in males.<sup>8-10</sup> Among adults, Indira, *et al.*<sup>10</sup> showed that the age group of 40-60 years old had a lower prevalence of hookworm infection. However, in our study two-third of the study subjects were in the age group of 40 to 60 years. This was presumably caused by differences in case definitions and the population studied.

Dai, *et al.*<sup>9</sup> stated that there was a negative correlation between the level of education and infection

**Table 1: The sociodemographic characteristics of the subjects.**

Characteristics	n	%
<b>Gender</b>		
Male	7	58.3
Female	5	41.7
<b>Age (year)</b>		
18-40	0	0
>40-60	8	66.7
>60	4	33.3
<b>Educational Background</b>		
Low	10	83.4
Mid	1	8.3
High	1	8.3
<b>Ethnic</b>		
Sundanese	5	41.7
Javanese	7	58.3
<b>Occupation</b>		
Farmer	2	16.7
Traditional trader	3	25.0
Factory labor	2	16.7
Housewife	5	41.6

rates. Most of the patients in this study are a low level of education. High education level may impact the level of awareness, thus contributing to healthier habits. Further, it may also lead to better incomes resulting in better living conditions.

Habits and occupation may influence the rate of hookworm infection.<sup>8,9</sup> This study showed that patients are in the at-risk population in terms of habits and occupation. Poor hand hygiene and walking with barefoot are prevalent in this study contributing to the hookworm infection pathway through percutaneous and oral routes. Homemakers and traditional traders with poor hand hygiene have risky habits by handling and eating unclean fruit and vegetables. Besides the risk of handling unclean fruit and vegetables, farmers and factory labourers are also at risk of contact with soil polluted with filariform larvae.

Hookworm infections are usually asymptomatic.<sup>11,12</sup> Clinical manifestations are related to the stage of parasite development, the site of an

**Table 2: The clinical characteristics of the subjects.**

Characteristics	n	%
<b>Chief complaint</b>		
Fatigue	6	50.0
Nausea-vomitus	2	16.7
Melena	2	16.7
Constipation	1	8.3
Abdominal pain	1	8.3
<b>Comorbidity(ies)</b>		
Type 2 diabetes mellitus	1	8.3
Hypertension	0	0
Dyslipidemia	0	0
Chronic kidney disease	0	0
Chronic obstructive pulmonary disease	0	0
<b>Habit</b>		
Poor hand-hygiene	12	100.0
Raw vegetable consumption	7	58.3
Barefoot	9	75.0
Smoking	7	58.3
Herbal consumption	6	50.0
Nonsteroidal anti-inflammatory drug consumption	6	50.0
<b>Hemoglobin level (g/dL)</b>		
<6.0	6	50.0
6.0-<10.0	4	33.3
10.0-<12.0	2	16.7
≥12.0	0	0
<b>Stool examination for worm</b>		
Positive	0	0
Negative	12	100
<b>Endoscopic finding</b>		
Normal	0	0
Gastritis	9	75.0
Gastric ulcer	4	33.3
Duodenitis	12	100.0
Duodenal ulcer	1	8.3
<b>Bleeding manifestation (by endoscopic examination)</b>		
Yes	9	75.0
No	3	25.0
<b>Histology of worms</b>		
<i>A. duodenale</i>	12	100
<i>N. americanus</i>	1	8.3
<b>Necessity of endoscopic hemostatic management</b>		
Yes	4	33.3
No	8	66.7
<b>Blood transfusion</b>		
Yes	10	83.3
No	2	16.7
<b>Length of stay (days)</b>		
≤5	0	0
>5	12	100

affected host, and complications.<sup>11,12</sup> This study showed fatigue due to anaemia as the most frequent symptom. Other symptoms in this study are related to nonspecific abdominal symptoms as a result of worm infestation in the small intestine. All patients in this study were anaemic with 50% of them having severe anaemia.

Stool examination is the mainstay tool for diagnosis, further, it is useful in identifying quantifying hookworm eggs.<sup>5,12</sup> All stool examinations in this study showed a negative result for hookworm. UGIE was performed in all patients in this study. It showed duodenitis in all patients and bleeding manifestations were present in three-fourth of patients. All hookworm infections in this study were diagnosed based on endoscopic findings. The hookworms histologically identified in this study were *A. duodenale* (100%) and *N. americanus* (8.3%).

Hookworm infection causes significant morbidity. This study showed that the management of hookworm infection encompasses the administration of anthelmintic agents, blood transfusions with relatively large volumes of blood transfused and endoscopic hemostatic management with a mean duration of hospitalization of more-than-5-days.

## Conclusion

Hookworm infection in adult patients has a high burden of morbidity. The most frequent clinical manifestations being fatigue and anaemia. Besides the anthelmintic agents, it necessitates frequent blood transfusions with large volume transfusions, endoscopic hemostatic management, and a prolonged duration of hospitalization. It is imperative to identify the population at risk for hookworm infection. This study also showed the role of UGIE in the diagnosis and management of hookworm infection.

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