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Case Report

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Ancylostoma duodenale and *Trichuris trichiura* co-infestation in a severely anaemic patient

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Abstract

Soil-transmitted helminth (STH) infestations are among the most prevalent neglected tropical diseases, especially in low- and middle-income countries. Helminth co-infestations are not uncommon in countries with a high prevalence of STH. We report a case of a 29-year-old lady with mental retardation and learning difficulties who presented with severe hypochromic microcytic anaemia and severe malnutrition, and diagnosed with concomitant *Trichuris trichiura* and *Ancylostoma duodenale* infestations. STH infestations can cause prolonged morbidity, but in our patient, infestations had led to complications of malnutrition and severe weight loss, thus inevitably leading to death.

Keywords: Hookworm, *Ancylostoma duodenale*, *Trichuris trichiura*, anaemia, pica

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INTRODUCTION

Soil-transmitted helminth (STH) infestations are among the most prevalent neglected tropical diseases, primarily affecting the low- and middle-income countries.[1] According to the World Health Organisation (WHO), more than 1.5 billion people, or approximately 24% of the global population, are infected with STH.[2] The main species of gastrointestinal nematodes classified in STH includes the roundworm (*Ascaris lumbricoides*), the whipworm (*Trichuris trichiura*), and hookworms (*Necator americanus* and *Ancylostoma duodenale*).[3]

STH infestations often lead to chronic infestation and extended morbidity, especially among children and women of childbearing age, rather than causing direct mortality.[2] They also contribute to physical and intellectual impairments, as well as cognitive retardation,

especially in children, thereby hindering educational advancement and economic development. STH infestations impose significant global health burden, with an estimated loss of 3.4 million disability-adjusted life-years (DALYs) worldwide in 2016 as reported by WHO.[3] In Malaysia, a study showed the most common STH identified was *T. trichiura* with a prevalence of 72%, followed by *A. lumbricoides* (39%) and hookworm (10%).[4] Here, we report a case of *Ancylostoma duodenale* and *Trichuris trichiura* co-infestation in an severely anaemic lady.

CASE REPORT

A 29-year-old lady with underlying mental retardation and learning disability presented with 5 days history of lethargy, dizziness, loss of appetite and vomiting and abdominal distension of one day. She also had chronic diarrhoea with five to 10 episodes per day and weight loss of 20 kg over the past one year. She had a habit of eating raw food, a behaviour known as "pica," including raw chicken liver, garlic, and onion. Unfortunately, she was never treated for any of these issues, likely due to poor social support, especially after her mother passed away a year ago. Since then, she had been living with her elder sister.

On examination, she appeared severely malnourished (35 kg), pale but alert and conscious. She was afebrile with blood pressure of 96/58 mmHg, and mild tachycardia (107/min) but no tachypnoea. Her abdomen appeared distended but was soft, with no hepatosplenomegaly noted. Examinations of her respiratory and cardiovascular systems were unremarkable. Chest radiograph revealed cardiomegaly, but abdominal radiograph showed no evidence of bowel dilatation.

Blood investigations showed severe hypochromic microcytic anaemia (haemoglobin-2.3 gm/dL; reference range: 11.6 – 15.1), mild leukocytosis (white cell count-15.8 x 10^9/L; 3.40 – 10.1), and thrombocytosis (platelet - 562 x 10^9/L; reference range: 158– 410). Eosinophil count was normal (0.11 x 10^9/L; 0.03–0.28). Blood film reported leucocytosis possible secondary to infection or inflammation, hypochromic microcytic anaemia likely due to iron deficiency anaemia and reactive thrombocytosis.

She was treated for severe symptomatic anaemia and was transfused two units of packed red blood cells. In view of the severe hypoalbuminaemia (20 g/L; 38 to 44) intravenous (IV) 20% human albumin solution (100 mL daily) was administered for three consecutive days.

Figure 1: Abdominal radiograph showing prominent air collection in the stomach (large arrow) and transverse colon (small arrow).

On the third day of admission, she developed vomiting, abdominal distension, and worsening septic parameters, and was treated for intraabdominal sepsis and possible intestinal obstruction. IV ceftriaxone 2 gm 12 hourly and metronidazole 500 mg 8 hourly were initiated. In view of severe cachexic state and poor intake, a combination of total parenteral nutrition and Ryle's tube feeding was started. She was referred to the surgical team. A repeat abdominal radiograph showed prominent air bubbles seen in stomach and transverse colon (**Figure 1**), leading to a suspicion of small bowel obstruction, with possibility of superior mesenteric artery (SMA) syndrome. However, abdominal ultrasound scan ruled out SMA syndrome (aortomesenteric angle - 42 degrees; normal range: 18 – 70 degrees and the aorto-mesenteric distance - 15 mm: normal range: 10-28mm). There was presence of ascites with bilateral pleural effusion. It also showed aperistaltic bowels with bowel wall thickening, suggestive of paralytic ileus.

Abdominal and pelvic computed tomography (CT) scan and angiography showed no opacifications of the intrahepatic, extrahepatic, confluence of portal vein, and splenic vein and superior mesenteric vein, with filling defect suggestive of thrombosis. These findings indicate extensive venous thrombosis involving portal, superior mesenteric and splenic vein. The distal

Figure 2: Oesophagogastroduodenoscopic findings showing multiple adult worms (*Ancylostoma duodenale*) in the duodenum (A-C) (arrows).

jejunum and proximal ileum bowel walls are thickened and slightly dilated, with presence of moderate ascites. Overall features represent CT hypoperfusion complex secondary to sepsis. The diagnosis of superior mesenteric (SMV) and portal vein thrombosis, likely chronic, ischaemic enterocolitis and worm bolus infestations with underlying malnutrition was made. The patient was started on heparin infusion and tablet aspirin. She was transfused with a total of 4 units of packed cells during admission, and her haemoglobin raised to 11.7 gm/dL. Her serum iron was 1.0 µmol/L (reference range: 6.6 -26.0 µmol/L) and her total iron binding capacity was 36.3 µmol/L (reference range: 40.8 – 76.6 µmol/L) indicative of severe iron deficiency anaemia.

On 14th day of admission, she developed upper gastrointestinal bleeding- melaenic stool and coffee ground fluid in the Ryle's tube. An oesophagus-gastroduodenoscopy showed multiple worms with bleeding from the raw area at D1 and D2 segments of the duodenum (**Figure 2 A-C**), duodenitis, oesophagitis with an ulcer in the lower oesophagus, erosion at stomach body, and an ulcer at the antrum of the stomach seen. Worm specimen was sent to the parasitology laboratory and *Ancylostoma duodenale* was identified (**Figure 3a**). The patient was started on albendazole syrup 400 mg for three days. The stool analysis for ova and cysts was positive for *Trichuris trichiura* (**Figure 3b**) and hookworm ova (**Figure 3c**).

On 19th day of admission, she was allowed for discharge. Unfortunately, a month after her discharge, she was brought to the emergency department with unresponsiveness, severely cachexic, lethargy, dyspnoea, vomiting, and abdominal distension. On examination, she had poor GCS (6/15), tachypnoeic, tachycardic and her oxygen saturation was only 70 percent under room air. Her capillary blood sugar was low. Her abdomen was distended with ascites. Chest X-ray showed right lung homogenous consolidation with massive right

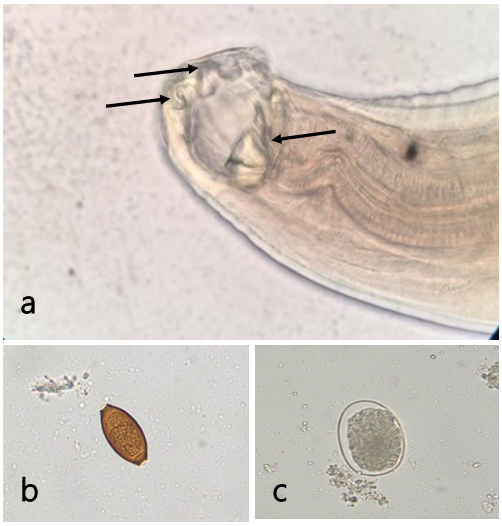

Figure 3: a) Magnified light microscopic image (X 40) of the head of *Ancylostoma duodenale* showing cutting teeth (arrows), b) Photomicrographs showing the ova of *Trichuris trichiura* and c) hookworm (magnification X 10).

pleural effusion. Echocardiography revealed poor contractility and low ejection fraction as well as pericardial effusion. Blood investigations showed hypoalbuminaemia and coagulopathy evidenced by prolonged prothrombin time and activated partial thromboplastin time. She also had mild eosinophilia with eosinophils count of 0.44 x 10^9/L (reference range (0.03–0.28 × 10^9/L). Despite supportive care, her condition worsened, and she eventually succumbed to her illness.

DISCUSSION

Concomitants or co-infestations with multiple STH species are not uncommon, especially in developing countries with high prevalence. Although the exact global incidence of co-infestations is not well defined, rates of 30-60% of infected individuals in some endemic regions have been reported.[5,6]

It is postulated that co-infestations may act synergistically, reducing the host's protective immune response by downregulating specific pro-inflammatory T-helper 1 (Th1) response, creating a more suitable environment for the parasites to survive in human hosts. Thus, creating a favourable situation compared to single parasite infestation.[7]

A few studies have demonstrated a strong positive association between *Trichuris trichiura* and hookworm infestations, indicating that co-infestation with these two species frequently occurs in endemic communities. In other words, infestation with one intestinal helminth increases the likelihood of infestation with another. However, the exact mechanisms underlying this phenomenon remain unclear, particularly because the two parasites have different modes of transmission. *T. trichiura* is typically transmitted through ingestion of embryonated eggs from soil, while hookworm infects the host via skin penetration by filariform larvae. Their co-occurrence may be due to shared risk factors such as poor sanitary conditions, overlapping geographic distribution, and a weakening or modulation of the host's immune response, which may increase susceptibility to additional infestations.[5,8,9]

There is lack of information study on specific risk factors for co-infestation, otherwise, the identified general risk factors for STH infections include poor sanitary behavior, inadequate water supply and sanitation, habits of playing with soil or dirt, lack of footwear, poverty, overcrowding, lack of access to health care, and low levels of education.[10,11]

Hookworm and *Trichuris* co-infestations have been associated with higher levels of anaemia. [12,13] As in our case, severe iron deficiency anaemia was likely due chronic blood loss in the upper small intestine from the hookworms and chronic inflammation, impaired nutrient absorption and in some severe cases, rectal bleeding from the while *T. trichiura* infestations.[12]

Parasitic infestations have become an important major cause of malnutrition, especially among children in STH endemic regions. In moderate to heavy hookworm infestation, undernutrition arises when chronic blood loss exceeds the host's dietary intake and nutrient reserves leading to hypoalbuminaemia and hypoproteinaemia. In trichuriasis, malnutrition occurs due to chronic intestinal mucosal inflammation, disruption of epithelial barrier and loss of absorptive surface area which impair nutrient absorption.[14] Hypoalbuminemia lowers oncotic pressure, leading to fluid accumulation in the peritoneal cavity, resulting in ascites in this patient.

Mesenteric venous thrombosis (MVT) is an uncommon but potentially serious condition that can present as acute (within days), subacute (one to four weeks), or chronic (more than 4 weeks). In the present case, the clinical findings were consistent with chronic presentation. MVT may arise from a variety of aetiologies, including direct vascular injury (e.g. post-surgical or post-traumatic), inflammatory and infectious conditions, congestive state such as cirrhosis or heart failure, hematological malignancies, and both inherited and acquired thrombophilia.[15] Although there is no established direct causal link between chronic parasitic infestation and superior mesenteric vein thrombosis, the former can still contribute to indirect mechanisms of thrombosis.

In this patient, persistent mucosal injury, chronic inflammation and immune-mediated endothelial activation due to parasitic infestation, compounded by long standing malnutrition with severe protein loss, likely contributes to a hypercoagulable state and enhances the thrombotic risk. Additionally, she had congestive cardiac failure due to severe anaemia. Thrombosis within the mesenteric veins impairs venous drainage, resulting in bowel congestion, bowel wall thickening due to oedema and progressive ischaemia. These changes impair normal peristaltic activity and lead to the development of paralytic ileus, manifesting clinically as a functional rather than mechanical intestinal obstruction.

Mebendazole or albendazole remain the mainstays of therapy. The recommended dosage for *T. trichiura* is albendazole 400 mg orally for 3 days or mebendazole 100mg orally twice/day for 3 days. For hookworm, albendazole 400 mg orally once or mebendazole 100mg orally twice/day for 3 days is typically effective. WHO recommended preventive chemotherapy or deworming using annual and biannual single-dose albendazole (400 mg) and mebendazole (500 mg) as a public health intervention for all young children, preschoolers, and school -age children in regions where the baseline prevalence is 20% or more in order to reduce the burden of STH infection.[16] However, this patient may not have access to preventive chemotherapy during her childhood due to her disability. Other prevention strategies include improvements in dietary nutrition, hygiene education, and sanitation.

Our patient had multiple social challenges such as poor family support, mental retardation and longstanding malnourishment that contributed to the severity of her illness. Although she managed to survive the initial treatment in the hospital, she came back with more

complications of the infestation and thus could not be revived.

CONCLUSION

STH infestations remain a significant public health concern, particularly in tropical and subtropical regions. Chronic helminthic infestations can result in serious complications, including malnutrition, severe weight loss, and profound anaemia. Our patient was severely affected and had extensive venous thrombosis, probably from a sustained inflammatory state. Concurrently, severe anaemia may have precipitated cardiac failure. Both complications are the most probable contributors to the patient's death. While STH infestations typically cause prolonged morbidity rather than acute mortality, this case highlights how chronic infestations can lead to a progressive systemic deterioration, with multiple complications that inevitably resulting in death

Take Home Message

- STH infestations remain public health concern in endemic areas.
- In patients presenting with anaemia and malnutrition, STH infestations should be considered.
- Chronic helminthic infestations, especially co-infections, can lead to severe malnutrition, protein-losing enteropathy, severe anemia, chronic diarrhea and gastrointestinal disturbances, as well as cognitive and educational impact.
- Although STH infestations typically cause morbidity, multiple complications can occasionally lead to mortality.

Abbreviations

STH	Soil transmitted helminths
WHO	World Health Organisation
IV	Intravenous
SMA	Superior mesenteric artery
CT	Computed tomography
MVT	Mesenteric vein thrombosis

Declarations

Conflict of interests

The authors declare no conflict of interests.

Patient Consent

Patient consent has been obtained.

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References

1. Montresor A, Mupfasoni D, Mikhailov A, Mwinzi P, Lucianez A, Jamsheed M, et al. The global progress of soil-transmitted helminthiases control in 2020 and world health organization targets for 2030. PLoS Negl Trop Dis. 2020;14:1–17.
2. Chen J, Gong Y, Chen Q, Li S, Zhou Y. Global burden of soil-transmitted helminth infections, 1990–2021. Infect Dis Poverty. 2024;13:1–10.
3. Gilmour B, Alene KA, Clements ACA. The prevalence of soil transmitted helminth infections in minority indigenous populations of south-east asia and the western pacific region: A systematic review and meta-analysis. PLoS Negl Trop Dis. 2021;15:1–30.
4. Silver ZA, Kaliappan SP, Samuel P, Venugopal S, Kang G, Sarkar R, et al. Geographical distribution of soil transmitted helminths and the effects of community type in South Asia and South East Asia – A systematic review. PLoS Negl Trop Dis. 2018;12:7–16.
5. Lepper HC, Prada JM, Davis EL, Gunawardena SA, Hollingsworth TD. Complex interactions in soil-transmitted helminth co-infections from a cross-sectional study in Sri Lanka. Trans R Soc Trop Med Hyg. 2018;112:397–404.
6. Fleming FM, Brooker S, Geiger SM, Caldas IR, Correa-Oliveira R, Hotez PJ, et al. Synergistic associations between hookworm and other helminth species in a rural community in Brazil. Trop Med Int Heal. 2006;11:56–64.
7. Geiger SM, Alexander NDE, Fujiwara RT, Brooker S, Cundill B, Diemert DJ, et al. *Necator americanus* and helminth co-infections: Further down-modulation of hookworm-specific type 1 immune responses. PLoS Negl Trop Dis. 2011;5:e1280.
8. Howard SC, Donnelly CA, Chan MS. Methods for estimation of associations between multiple species parasite infections. Parasitology. 2001;122:233–51.
9. Booth M, Bundy DAP, Albonico M, Chwaya HM, Alawi KS, Savioli L. Associations among multiple geohelminth species infections in schoolchildren from Pemba Island. Parasitology. 1998;116:85–93.
10. Ngui R, Aziz S, Chua KH, Aidil RM, Lee SC, Tan TK, et al. Patterns and risk factors of soil-transmitted helminthiasis among orang asli subgroups in peninsular Malaysia. Am J Trop Med Hyg. 2015;93:361–70.
11. Pasaribu AP, Alam A, Sembiring K, Pasaribu S, Setiabudi D. Prevalence and risk factors of soil-transmitted helminthiasis among school children living in an agricultural area of North Sumatera, Indonesia. BMC Public Health. 2019;19:1–8.
12. Ezeamama AE, McGarvey ST, Acosta LP, Zierier S, Manalo DL, Wu HW, et al. The synergistic effect of concomitant schistosomiasis, hookworm, and trichuris infections on children's anemia burden. PLoS Negl Trop Dis. 2008;2:e245.
13. Robertson LJ, Crompton DWT, Sanjur D, Nesheim MC. Haemoglobin concentrations and concomitant infections of hookworm and *Trichuris trichiura* in panamanian primary schoolchildren. Trans R Soc Trop Med Hyg. 1992;86:654–6.
14. Sinhorin GH, Carneiro ACG, Farias BES, de Almeida P, Medeiros-Sousa AR, Melchior LAK, et al. Intestinal parasite infections associated with sociodemographic and seasonal factors in the Western Amazon. Parasitol Res. 2023;122:419–23.
15. Acosta S, Björck M. Mesenteric Venous Thrombosis. Rutherford's Vasc Surg Endovasc Ther Tenth Ed Vol 1-2. 2022;1–2:1799-1808.e2.
16. WHO. Guideline: preventive chemotherapy to control soil-transmitted helminths infections in at risk population groups. Geneva: World Health Organisation; 2017.