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Strongyloides Stercoralis Infection Presenting as Protein Losing Enteropathy

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losing;
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strongyloides;

Abstract

Strongyloides sterocoralis infection poses significant diagnostic challenges, particularly in resource-limited settings where the condition is most prevalent. We present a young male in South Africa who developed a protein-losing enteropathy secondary to Strongyloides hyperinfection, making the first reported presentation of this kind in South Africa. The broad spectrum of potential clinical manifestations complicates this treatable condition's prompt recognition and diagnosis. Despite its therapeutic simplicity, data indicates that the prevalence of Strongyloides infection is significantly overlooked and underreported, highlighting the need for increased clinical awareness and improved diagnostic capabilities in endemic regions.

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1 Introduction

Strongyloides is a rhabditid nematode commonly referred to as a roundworm. It is a soil-transmitted helminth that can complete its entire life cycle within the human host. It is found to be endemic to tropical and subtropical environments but holds global prevalence in many countries.

2 Case Report

We describe the case of a 23-year-old male, Mr M, who presented to Tshepong Hospital. He is a Lesotho national living in South Africa and working as an illegal miner. Mr M stayed in school until Grade 5 then was forced to hold his education to herd cattle for his family. He moved to South Africa in 2013 to make a living from the illegal mining operations occurring in Orkney, North West. The miners, commonly referred to as "Zama Zamas", spend an average of three months underground at a time. He reports that clean water and food are delivered periodically. There are no ablution facilities, and he does admit that they do tend to drink unpurified water found underground when deliveries are insufficient (Khan et al., 2022).

Mr. M presented to us in July as a referral from his local clinic with a one-month history of progressive lower limb oedema. He had just completed three months underground in May. Mr M had no other physical complaints. He also had no other comorbidities but was tested by the referring clinic to be HIV positive in June and was initiated on first-line antiretroviral therapy. His only clinical and biochemical reason to have developed the peripheral oedema was hypoalbuminemia of 16 g/l on the presentation that had progressively dropped to the lowest value of 9 g/l. After clearing his renal, hepatic, and cardiac function, a decision was made to perform a gastroscopy to investigate gastrointestinal protein losses.

Histology from gastroscopy confirmed Strongyloides stercoralis infection with rhabditidiform larvae identified within the mucosa and crypts with surface ulceration (Watts et al., 2016; Inês et al., 2011; Alam et al., 2024; Buonfrate et al., 2022). With the unavailability of Ivermectin within state practice, a course of Albendazole was started but with poor response after seven days. Ivermectin was subsequently acquired privately and the patient then showed good improvement with marked improvement of his serum albumin and resolution of his lower limb oedema. Upon discharge, the patient was, unfortunately, planning to return to his illegal mining operations and was counseled extensively on the risk of infections with the poor sanitation underground.

Table 1
The patient's blood and urine results

Date	13/07/23	17/07/23	21/07/23	25/07/23	05/08/23	18/08/23	24/08/23	06/12/23
WCC	7.94	6.84	8.17	3.92	6.01	6.79	5.24	5.12
HB	14.1	13.6	12.4	10.8	11.7	13.1	11.3	15.6
MCV	86.0	85.4	82.0	88.9	88.7	95.5	98.1	88.0
Platelet	525	522	331	411	287	569	546	258
CRP		3	210	47	3	13	3	
Na	123		117	135	127	132	136	137
K	4.2		4.3	3.5	5.0	4.8	4.6	4.3
Cl	95		92	97	99	98	100	99
CO2	17		20	25	21	19	24	26
Urea	3.7		3.7	3.4	3.8	2.1	3.4	2.0
Creat	72		57	64	61	57	69	78
eGFR	>60		>60	>60	>60	>60	>60	>60
UPCR	0.050		0.027	0.017			0.016	
T Prot	47	GK	43	60	47	67		88
ALB	**16**	**12**	**8**	**12**	**9**	**20**		**46**
T Bil	3	2	4	3	2	1		8
C Bil	-	1	2	2	1	1		2
ALT	41	43	43	53	35	71		30
AST	-	46	46	44	36	72		26
ALP	95	111	122	105	97	98		106
GGT	-	14	14	22	9	28		23
INR		1.59	1.79					
T Chol			1.62					
Trig			0.72					
HDL			0.54					
LDL			0.75					

Others: HepBSAg Neg; ANA Neg, Anti-Sm Neg, Anti-RNP Neg, ANCA Neg

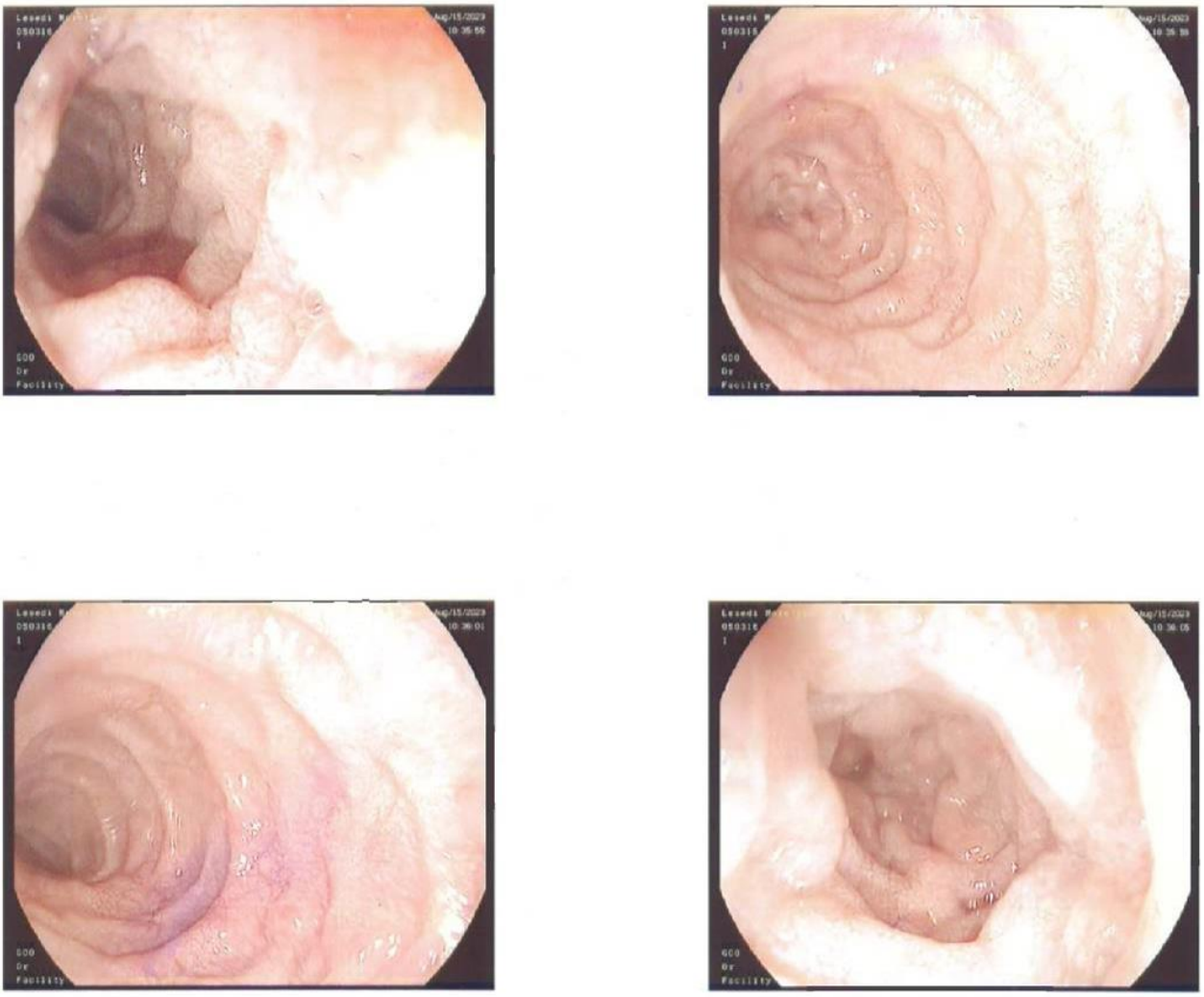

Figure 1. Gastroscopy shows duodenal oedematous mucosa

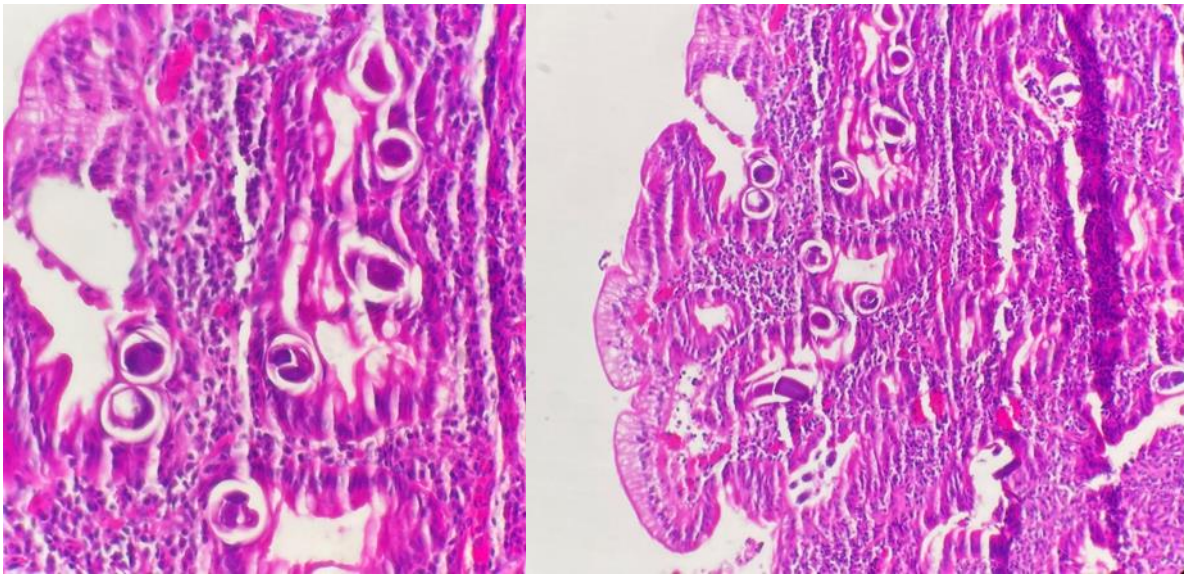

Figure 2,3. Histology from gastroscopy shows rhabditiform larvae

3 Literature Review and Discussions

Strongyloides stercoralis is a soil-transmitted helminth that causes strongyloidiasis. It is unique from other soil-transmitted helminths in that it can complete its entire life cycle within the human host and does not require exogenous reinfection (Page et al., 2018).

Strongyloidiasis is endemic to tropical and subtropical regions. Its true prevalence is not known due to low-sensitivity diagnostic methods. 90% of cases are estimated to occur in sub-Saharan Africa, Southeast Asia, Latin America, Oceanic countries, and the Caribbean Islands. Prevalence is related to poor sanitation and hygiene practices. Meta-analysis of studies has shown that the prevalence of *strongyloidiasis* is overlooked and ununderreported (Hailu et al., 2020). *S. Stercoralis* has also been the focus of very few studies, especially in South Africa (Schär et al., 2013). From the limited data available, some countries have >90% prevalence rates based on community surveys. These include Namibia, Papua New Guinea, Gabon, Israel and Dominica. South Africa's estimated prevalence sits at 27.5% (Schär et al., 2013).

The most common mode of transmission is through skin contact with contaminated soil. Fecal-oral transmission or person-to-person transmission (contact with feces contaminated with larvae-bearing fomites or sexual contact) less frequently occurs (Krolewiecki & Nutman, 2019; Guillamet et al., 2017).

S. stercoralis has an early larvae state, the rhabditiform larvae, as well as an infective larvae state, the filariform larvae. Its life cycle begins when filariform larvae, which can be found in soil and other materials contaminated with human feces, contact the human skin (Page et al., 2018). The larvae penetrate the skin and spread via the bloodstream and lymphatics to the lung, where they infiltrate into the alveolar air sacs. However, alternative routes to the lung through the abdominal viscera or connective tissue also appear possible. From there they are coughed up/ascend into the tracheobronchial tree and swallowed. Maturation into adult female worms occurs, which can live up to 5 years (Page et al., 2018; Krolewiecki & Nutman, 2019). Parasitic males do not exist. These adult worms embed in the submucosa of the small intestine and produce eggs via pathogenesis, which yields rhabditiform larvae. These larvae are excreted in the stool or can mature into filariform larvae within the gastrointestinal tract and cause autoinfection. This parasitic cycle usually takes 3-4 weeks. Filariform larvae can cause reinfection as per the cycle described above and are responsible for the development of persistent infection (El Hajj et al., 2016; Page et al., 2018).

An intact immune system largely limits autoinfection but may still allow for low levels of autoinfection that can become symptomatic decades after the initial infection (Krolewiecki & Nutman, 2019; Guillamet et al., 2017). However, in immunocompromised individuals, rapid autoinfection referred to as hyperinflation can

occur leading to disseminated disease. HTLV-1 infection, steroid use, and chronic alcohol use are the most well-established risk factors for strongyloidiasis (Guillamet et al., 2017).

Acute disease can cause irritation where the helminth has penetrated the skin and a possible dry cough one week later. Gastrointestinal symptoms, including abdominal pain, diarrhea, constipation, and anorexia occur as early as three weeks after the initial infection (Freedman, 1991; Khieu et al., 2013).

Chronic infection usually comprises of ongoing gastrointestinal symptoms, dermatological manifestations, and respiratory symptoms. Larva currents, resulting from migrating larvae through the subcutaneous tissue, leave pruritic, raised, pink streaks on the skin that fade and disappear within 48 hours (Arthur & Shelley, 1958). Respiratory symptoms include wheezing, throat irritation, dry cough, and dyspnoea. Paradoxically worsening asthma with corticosteroid use may also occur (Freedman, 1991; Khieu et al., 2013).

Spread to the liver, gallbladder, pancreas, kidneys, ovaries, mesenteric lymph nodes, diaphragm, heart, brain, and skeletal muscle may occur with hyperinfection syndrome. Peripheral eosinophilia is usually absent in these cases (Geri et al., 2015).

As the commonly used diagnostic methods of soil-transmitted helminths, such as direct fecal smear, have a low sensitivity for *S. Stercoralis* it is termed one of the most overlooked helminths (Santiago & Leitão, 2009; Basile et al., 2010). The diagnosis can be made through skin biopsy in patients with dermatological manifestations, serological testing, stool testing (PCR preferably or agar plate culture), or pleural, ascitic, or CSF analysis if clinically indicated (Hailu et al., 2020). The WHO recommends that serological assessment is the best option, even though no perfect serological test is available. NIE ELISA is considered the best available serological test. This should ideally be used in combination with a Baermann or agar-plate method. Results should however be reported separately to facilitate comparability to other methods for research purposes (World Health Organization, 2020).

Endoscopy is not routinely recommended for the diagnosis of *strongyloides* but in our case and most previously described protein-losing enteropathies secondary to *strongyloidiasis* it facilitated the diagnosis. Features suggestive of endoscopy of *strongyloidiasis* include:

- **Duodenal** oedema, brown mucosal discoloration, erythematous spots, subepithelial haemorrhages, and megaduodenum
- **Colonic** oedema, loss of vascular pattern, aphthous ulcers, erosions, xanthoma-like lesions
- **Gastric** folds that are thickened and/or have mucosal erosions (Rivasi et al., 2006; Overstreet et al., 2003)

Very few cases have been documented in which strongyloidiasis caused a protein-losing enteropathy, and none have to our knowledge previously been documented in South Africa. In other described presentations of this rare cause of protein-losing enteropathy prominent gastrointestinal symptoms were also reported, which is not the case with our patient (Cello & Day, 2009; Zanini et al., 2013).

The documented cases include an elderly gentleman 77 years old in Lebanon who presented with lower limb oedema, diarrhoea, and abdominal pain. The diagnosis was made based on serology and endoscopic biopsy findings after two hospitalizations (El Hajj et al., 2016). Another 56-year-old gentleman in China with a low BMI, diabetes mellitus, and chronic steroid use was also diagnosed based on a biopsy taken during endoscopy after extensive other tests and treatment methods had failed to lead to a diagnosis of his vomiting, diarrhoea and abdominal distension (Wang & Zhang, 2023). A further two cases were described in patients without identifiable immunocompromised states. One in Egypt of a 62-year-old female with a 6-week history of vomiting, diarrhoea, abdominal distension, and weight loss, and a 26-year-old male in India with diarrhoea, weight loss, and pedal oedema. Both of these cases were also diagnosed after endoscopy and biopsy were performed (Elshamy et al., 2021; Lakshmanan et al., 2017). All cases appear to have responded well to Ivermectin after the diagnosis was made.

Our patient's hyperinfective syndrome was manifested clinically by oedema from the protein-losing enteropathy without any chronic gastrointestinal symptoms being reported. The absence of other symptoms or signs of strongyloidiasis and such few previously described cases of it presenting as a protein-losing enteropathy, also lack of sensitive diagnostic tests in our facility made this a challenging diagnosis (Rychik & Spray, 2002; Ostrow et al., 2006).

4 Conclusion

This case highlights that *Stongyloides Stercoralis* should not be forgotten as the possible causative organism of protein-losing enteropathy, even in areas without marked prevalence. Detailed history taking and understanding of the patient's environment must be used to develop a differential diagnosis, and this case focuses attention on the necessity of an anti-strongyloides ELISA test in our hospital where HIV endemic and mining industries are major risk factors for hyperinfection syndrome.

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References

Alam, A. M., Ozdemir, C., & Reza, N. (2024). Strongyloides stercoralis infection in the United Kingdom: a systematic review and meta-analysis of published cases. *Clinical Medicine*, 100227. https://doi.org/10.1016/j.clinme.2024.100227

Arthur, R. P., & Shelley, W. B. (1958). Larva currens: a distinctive variant of cutaneous larva migrans due to Strongyloides stercoralis. *AMA Archives of Dermatology*, *78*(2), 186-190.

Basile, A., Simzar, S., Bentow, J., Antelo, F., Shitabata, P., Peng, S. K., & Craft, N. (2010). Disseminated Strongyloides stercoralis: hyperinfection during medical immunosuppression. *Journal of the American Academy of Dermatology*, *63*(5), 896-902. https://doi.org/10.1016/j.jaad.2009.09.037

Buonfrate, D., Tamarozzi, F., Paradies, P., Watts, M. R., Bradbury, R. S., & Bisoffi, Z. (2022). The diagnosis of human and companion animal Strongyloides stercoralis infection: challenges and solutions. A scoping review. *Advances in parasitology*, *118*, 1-84. https://doi.org/10.1016/bs.apar.2022.07.001

Cello, J. P., & Day, L. W. (2009). Idiopathic AIDS enteropathy and treatment of gastrointestinal opportunistic pathogens. *Gastroenterology*, *136*(6), 1952-1965. https://doi.org/10.1053/j.gastro.2008.12.073

El Hajj, W., Nakad, G., & Abou Rached, A. (2016). Protein loosing enteropathy secondary to strongyloidiasis: case report and review of the literature. *Case Reports in Gastrointestinal Medicine*, *2016*(1), 6831854.

Elshamy, M. H., Mahmoud, T. M., & Ayesh Othman, M. M. (2021). Strongyloidiasis as a Hidden Cause of Protein Losing Enteropathy. *Afro-Egyptian Journal of Infectious and Endemic Diseases*, *11*(3), 314-317.

Freedman, D. O. (1991). Experimental infection of human subjects with Strongyloides species. *Reviews of infectious diseases*, *13*(6), 1221-1226.

Geri, G., Rabbat, A., Mayaux, J., Zafrani, L., Chalumeau-Lemoine, L., Guidet, B., ... & Pène, F. (2015). Strongyloides stercoralis hyperinfection syndrome: a case series and a review of the literature. *Infection*, *43*, 691-698.

Guillamet, L. J. V., Saul, Z., Miljkovic, G., Vilchez, G. A., Mendonca, N., Gourineni, V., ... & Gangcuangco, L. M. (2017). Strongyloides stercoralis infection among human immunodeficiency virus (HIV)-infected patients in the United States of America: a case report and review of literature. *The American Journal of Case Reports*, *18*, 339.

Hailu, T., Nibret, E., Amor, A., & Munshea, A. (2020). Strongyloidiasis in Africa: Systematic Review and Meta-Analysis on Prevalence, Diagnostic Methods, and Study Settings. *BioMed Research International*, *2020*(1), 2868564.

Inês, E. D. J., Souza, J. N., Santos, R. C., Souza, E. S., Santos, F. L., Silva, M. L., ... & Soares, N. M. (2011). Efficacy of parasitological methods for the diagnosis of Strongyloides stercoralis and hookworm in faecal specimens. *Acta tropica*, *120*(3), 206-210. https://doi.org/10.1016/j.actatropica.2011.08.010

Khan, U., Tchomobe, G., Vakharia, S., Suryadevara, M., & Nagarakanti, S. (2022). A case of Strongyloides Stercoralis induced duodenitis and pancreatitis. *IDCases*, *27*, e01442. https://doi.org/10.1016/j.idcr.2022.e01442

Khieu, V., Srey, S., Schär, F., Muth, S., Marti, H., & Odermatt, P. (2013). Strongyloides stercoralis is a cause of abdominal pain, diarrhea and urticaria in rural Cambodia. *BMC research notes*, *6*, 1-4.

Krolewiecki, A., & Nutman, T. B. (2019). Strongyloidiasis: a neglected tropical disease. *Infectious Disease Clinics*, *33*(1), 135-151.

Lakshmanan, I., Krishnamurthy, V., Kumar, P., & Ali, M. (2017). Strongyloides hyperinfection presenting as proteinlosing enteropathy. *Journal of Digestive Endoscopy*, *8*(01), 36-38.

Ostrow, A. M., Freeze, H., & Rychik, J. (2006). Protein-losing enteropathy after Fontan operation: investigations into possible pathophysiologic mechanisms. *The Annals of thoracic surgery*, *82*(2), 695-700. https://doi.org/10.1016/j.athoracsur.2006.02.048

Overstreet, K., Chen, J., Rodriguez, J. W., & Wiener, G. (2003). Endoscopic and histopathologic findings of Strongyloides stercoralis infection in a patient with AIDS. *Gastrointestinal endoscopy*, *58*(6), 928-931.

Page, W., Judd, J. A., & Bradbury, R. S. (2018). The unique life cycle of Strongyloides stercoralis and implications for public health action. *Tropical medicine and infectious disease*, *3*(2), 53.

Rivasi, F., Pampiglione, S., Boldorini, R., & Cardinale, L. (2006). Histopathology of gastric and duodenal Strongyloides stercoralis locations in fifteen immunocompromised subjects. *Archives of pathology & laboratory medicine*, *130*(12), 1792-1798.

Rychik, J., & Spray, T. L. (2002). Strategies to treat protein-losing enteropathy. In *Seminars in Thoracic and Cardiovascular Surgery: Pediatric Cardiac Surgery Annual* (Vol. 5, No. 1, pp. 3-11). WB Saunders. https://doi.org/10.1053/pcsu.2002.31498

Santiago, M., & Leitão, B. (2009). Prevention of strongyloides hyperinfection syndrome: a rheumatological point of view. *European Journal of Internal Medicine*, *20*(8), 744-748. https://doi.org/10.1016/j.ejim.2009.09.001

Schär, F., Trostdorf, U., Giardina, F., Khieu, V., Muth, S., Marti, H., ... & Odermatt, P. (2013). Strongyloides stercoralis: global distribution and risk factors. *PLoS neglected tropical diseases*, *7*(7), e2288.

Wang, Y., & Zhang, X. (2023). Gastroduodenal strongyloidiasis infection causing protein-losing enteropathy: A case report and review of the literature. *Heliyon*, *9*(7).

Watts, M. R., Robertson, G., & Bradbury, R. S. (2016). The laboratory diagnosis of Strongyloides stercoralis. *Microbiology Australia*, *37*(1), 4-9.

World Health Organization. (2020). *Diagnostic methods for the control of strongyloidiasis: virtual meeting, 29 September 2020*. World Health Organization.

Zanini, B., Caselani, F., Magni, A., Turini, D., Ferraresi, A., Lanzarotto, F., ... & Lanzini, A. (2013). Celiac disease with mild enteropathy is not mild disease. *Clinical Gastroenterology and Hepatology*, *11*(3), 253-258. https://doi.org/10.1016/j.cgh.2012.09.027

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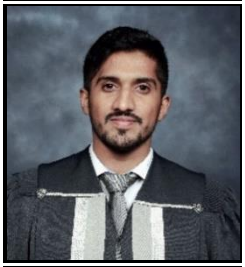

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