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Research Article

EPIDEMIOLOGICAL AND CLINICAL PROFILE OF STRONGYLOIDIASIS - EXPERIENCE FROM A TERTIARY CARE CENTRE

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ABSTRACT

Objectives: The objective of the study was to study the clinical presentations, predisposing factors, and underlying conditions associated with Strongyloidiasis.

Methods: A prospective observational study was conducted from 2018 to 2021on patients who presented with medical complaints in a tertiary care hospital, and 19 were diagnosed with strongyloidiasis by stool wet mount examination. Other relevant details were collected to analyze the risk factors.

Results: A total of 19 cases were found positive for strongyloidiasis. Males 13 (68.4%) were more and females 6 (31.6%), and most of them were above 50 years age group (73.7%). Among the cases, respiratory symptoms (42.1%) were predominantly observed, followed by gastrointestinal (31.6%). Multiple predisposing factors such as chronic obstructive pulmonary disease, corticosteroid usage, TB, diabetes, alcohol, and asthma have been identified in strongyloidiasis cases. Peripheral eosinophilia is a frequent finding in the complete blood picture.

Conclusions: Strongyloidiasis should be strongly suspected in every immune compromised patient presenting with gastrointestinal, respiratory manifestations, or peripheral eosinophilia, and asymptomatic immune competent patients with comorbid conditions.

Keywords: *Strongyloides stercoralis*, Epidemiology, Neglecteddisease, Parasite, Nematode, Helminth.

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INTRODUCTION

Strongyloidiasis is a worldwide disease caused by parasitic nematodes of the genus Strongyloides, with high frequency in the Caribbean, Latin America, Europe, Asia, and Sub-Saharan Africa [1]. Although it is underdiagnosed due to low parasite load and uncertain clinical symptoms, around 370 million people worldwide are found to be infected [2]. *Strongyloides stercoralis* is unique among the nematodes infectious for humans in that rhabditiform larva passed out in the faces can either become infective filariform larvae or a free-living generation of worms which, in turn, give rise to infective larvae or can persist in the host by autoinfection. This so-called heterogenic development process as an amplification mechanism allows for increased numbers of infective larvae in the external environment. Infection results when these free-living *S. stercoralis* in the soil enterhumans through intact skin penetration (e.g., occupational exposure to soil and walking barefoot) [3]. Various factors can influence the prevalence of *S. stercoralis* such as the immune status of the host, socioeconomic status, sanitary and hygiene practices of individuals, associated comorbid conditions, levels of endogenous corticoid, alcohol intake, and the level of heat and humidity, which affects parasite development in soil. The prevalence of strongyloidiasis in a population can be divided into three categories: sporadic (<1%), endemic (1–5%), and hyperendemic (>5%) [4]. The clinical manifestations in people infected with *Strongyloides stercoralis* range from asymptomatic to a potentially fatal disseminated infection [5].Chronic strongyloidiasis can progress to disseminated illness with a 70% fatality rate. When the immune system is compromised, *S. stercoralis* hyperinfection occurs, speeding up the pace of autoinfection. Disseminated strongyloidiasis occurs when larvae spread to various organs, including the liver, lungs, and central nervous system, due to hyperinfection. Gram-negative sepsis is prevalent, caused by enteric bacteria translocation when significant numbers of larvae migrate through the intestinal wall [6]. Strongyloidiasis is a major medical concern since it can lead to death in people who are immunosuppressed or immunocompromised due to steroid use, coinfection with human T-lymphotropic virus-1, HIV, or alcoholism [4,7]. Strongyloidiasis generally presents as diffuse, nonspecific gastrointestinal (mild abdominal pain, intermittent, or persistent diarrhea), respiratory (cough, wheezing and asthma, and chronic bronchitis), dermatologic symptoms (pruritus, rash), or systemic symptoms **(**weight loss and cachexia) leading to delayed treatment, medical complications, septicemia, and finally, death [3,8]. Misdiagnoses of strongyloidiasis in patients often lead to expensive, nonspecific, invasive diagnostic techniques, including endoscopy, barium swallow, cancer biopsies, chest X-rays, and computed tomography (CT) scans. Therefore, a high index of suspicion and thorough clinical and laboratory workup is required to diagnose and treat every case to prevent chronic and life-threatening forms. The present work was performed to study the various clinical presentations, predisposing factors, and underlying conditions associated with strongyloidiasis.

MATERIALS AND METHODS

A prospective observational study was done in a tertiary care hospital in Coastal Andhra Pradesh. The study was done from 2018 to 2021 on 1801 patients who underwent stool examination (wet mount preparation) for parasites, and 19 were diagnosed with strongyloidiasis. An informed written consent form was taken from all the study participants. Larvae were identified as strongyloides rhabditiform (~300 μm in length, short buccal cavity and double bulb esophagus

with a prominent genital primordium) or filariform (~500 μm in size, long esophagus, and a notched tail) stages of differentiating them from hookworm larvae [9,10]. Data were collected for details such as age, gender, presenting complaints, personal history, occupation, TLC, and absolute eosinophil count.

RESULTS

A series of 19 cases of strongyloidiasis who presented with medical complaints were analyzed in the study. Thirteen males and six females aged 30–70 years with a mean age of 57.61±11.45 years. Most of the patients belong to the >50 years age group (Table 1). Most of them presented with (Table 2) respiratory symptoms such as cough, and shortness of breath, followed by gastrointestinal symptoms such as pain abdomen, diarrhea, vomiting, and anorexia. Few others were diagnosed in patients who presented with diverse symptoms.

In the present study, multiple predisposing and risk factors (Table 3) among the patients, such as alcohol use, diabetes, asthma, retroviral infection, and steroid use (for arthritis, myasthenia gravis, asthma, and chronic obstructive pulmonary disease [COPD]), led to immunosuppression have been identified, the frequent ones observed were the usage of steroids for acute exacerbation of COPD. Peripheral eosinophilia is frequent in complete blood pictures (Table 4) and Table 5 shows the conditions associated with strongyloidiasis in our cases and the % age of eosinophil count. The rhabditiform larvae of *S. stercoralis* were identified in an unstained wet mount of stool at 10× and 40× magnification depicted in Fig. 1a and b.

DISCUSSION

Most of the patients in this study were over the age of 50 years, and the majority took corticosteroids. Eosinophilia is more common in persons infected with S. stercoralis than in other parasite infections [11]. This condition is induced by parthenogenetic females residing in the intestinal submucosa rather than the lumen, resulting in a stronger eosinophilic response. The eosinophil-dependent mechanisms are also engaged in the death of Strongyloides by filarial larvae [12,13]. As a result, the absence of eosinophils is a poor predictor of *S. stercoralis* infection, especially in immunocompromised patients. In healthy adults, eosinophils make up only 2–5% of peripheral leukocytes. The eosinophil fraction in the blood increases with active helminthic infections like Strongyloides, ranging from 25–35% in acute cases to 6–8% in chronic cases. However, eosinophil counts are reduced in immunosuppressive situations like corticosteroid therapy, and their absence in patients signals a poor prognosis [14]. Most patients were immune compromised, on corticosteroid medication, or had Strongyloidiasis for various causes. Under rare circumstances, strongyloidiasis infection can develop into a lethal fulminant disease, compromising the host's immunological system. [10,15]. Assteroids predisposetoimmuno suppression in the host, female worms of *Strongyloides* produce more eggs in the host body. This further facilitates worm growth and development in the host [16]. It is an important helminthic disease due to its peculiar auto-infective cycles and risk of hyper infection syndrome in immunocompromised patients. However, strongyloidiasis is not always associated with immunocompromised states and occurs in an immunocompetent host, mostly remaining asymptomatic [17]. It stimulates the hypothalamic-pituitary-adrenal (HPA) axis to produce excessive endogenous cortisol levels that further aggravate the immunosuppression by inhibiting the Th2 response. Cortisol metabolites resemble the parasite hormone ecdysone, which regulates the fertility of parthenogenetic Strongyloides, causing the transformation of rhabditiform larva to filariform larva and, together with the presence of a steroid receptor on *S. stercoralis* further exacerbate the condition [4]. Therefore, alcoholics were at higher

Table 1: Age-wise distribution of cases

Age	Number and%age of cases
<30	1 (5.2%)
31–40	1 (5.2%)
41–50	3 (15.8%)
>50	14 (73.7%)

Table 2: Distribution of cases according to clinical manifestation at the time of presentation to the hospital

Presenting complaints	Number and%age of cases
Respiratory symptoms	8 (42.1%)
Gastrointestinal symptoms	6 (31.6%)
Co-incidental finding	5 (26.3%)

Table 3: Distribution of predisposing factors among the cases

Predisposing factor	Number of cases
Corticosteroid usage for:	
COPD	7
Asthma	1
Inflammatory arthritis	2
Myasthenia gravis	1
Diabetes	6
Alcohol	5
Old tuberculosis	2
HIV	1
Hepatitis B	1
Malignancy	1

COPD: Chronic obstructive pulmonary disease

Table 4: Distribution of absolute Eosinophil count among Strongyloidiasis patients

Absolute Eosinophil count	Number and%age of cases
<500/mm^3	6 (31.6%)
>500–1500/mm^3	5 (26.3%)
1500–5000/mm^3	5 (26.3%)
>5000/mm^3	3 (15.8%)

Table 5: Conditions associated with Strongyloidiasis in our cases and % age of Eosinophil count

Diagnosis	Percentage of Eosinophil count
Anaemia with COPD	52
Rheumatoid arthritis with ILD with old Pulmonary Koch's	49
Gastroduodenal ulcer, chronic hepatitis-B, UTI	22
COPD, CAD, seronegative arthritis	20
Anemia with hypothyroidism with T2DM	17
Acute exacerbation of COPD	16
COPD with pneumonia	10
Carcinoma of stomach	5
Cerebrovascular accident, hypertension, cellulitis, type II diabetes	5
CLD with varicella with T2DM	5
Ulcerative colitis with T2DM	4
Hypertension with anemia with pneumonia	3
Acute exacerbation of COPD with Cor Pulmonale	3
Myasthenia Gravis, Thymoma, Acute Gastroenteritis	2
Pneumonia with T2DM with HIV	2
COPD with LRTI, Mild Anemia	1
Old Pulmonary Koch's with COPD	1
Bronchial Asthma with Anemia	1
Anemia with T2DM	1

COPD: Chronic obstructive pulmonary disease, T2DM: Type II diabetes mellitus, HIV: Human immunodeficiency virus, ILD: Interstitial lung disease

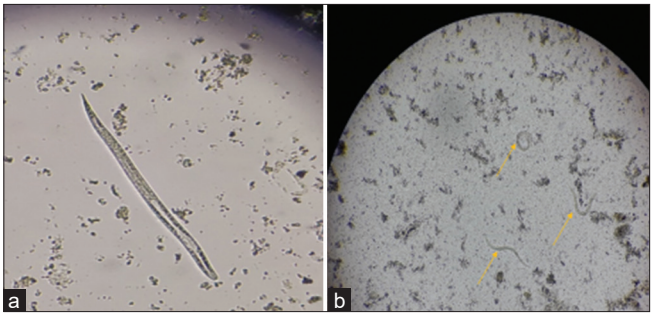

Fig. 1: *Strongyloides stercoralis*. (a) A single rhabditiform larve of *S. stercoralis* in unstained wet mount of stool (40× magnification). (b) A single rhabditiform larve of *S. stercoralis* in unstained wet mount of stool (10× magnification)

risk of autoinfection due to invasion of the intestinal mucosa by the helminth larvae and, if untreated, would progress to hyper infection and dissemination syndrome [18]. In most case scenarios, gastrointestinal and pulmonary symptoms exacerbate because of immunocompromised states, leading to increased detection of the number of larvae in stool and sputum. Patients may present with increasing cough, dyspnea, or wheezing mimicking COPD exacerbation [19,20]. In the present study, all the cases were treated with Ivermectin, which is currently the gold standard for treating Strongyloidiasis, affecting both adults and larvae [21]. Around 42% of the cases presented with respiratory complaints. In patients presenting with COPD exacerbation with peripheral eosinophilia, strongyloidiasis should be ruled out before starting treatment with steroids, and stool specimens should be sent to examine eggs and larvae in current clinical settings. According to a systematic review conducted [22] on published Strongyloides infection rates and considering the sensitivity of the used diagnostic methods, the prevalence of Strongyloides in Africa varied from 0.1% in the Central African Republic to up to 91.8% in Gabon. In South America and Central America, Haiti reported a prevalence of 1.0%, while in Peru, the infection rate was as high as 75.3%. Several countries reported infection rates within a comparably small range in South-East Asia. The infection rate in Cambodia, Thailand, and Lao PDR is 17.5%, 23.7%, and 26.2%. According to community-based surveys, the infection rate in India was 6.6%, and hospital-based surveys were 11.2% [22]. The authors observed the infection rate in the present study as 1.05%. Most of the information available over the internet regarding the parasite *S. stercoralis* was either discussed with other soil-transmitted helminths [23-25] or as case reports [26,27]. Very few studies across the globe have focused exclusively on *S. stercoralis* epidemiology and risk factors for acquisition [3,22], infection rates [22,28], and clinical presentation [10,18,29]. The present study includes the rate, clinical presentations, predisposing factors, and underlying conditions associated with Strongyloidiasis in our clinical settings.

CONCLUSION

Our findings show a high infection prevalence rate in risk groups. Strongyloidiasis should be strongly suspected in every immune compromised patient presenting with gastrointestinal, respiratory manifestations, peripheral eosinophilia, and asymptomatic immune competent patients with comorbid conditions.

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AUTHORS' CONTRIBUTION

Ratna Harika Dusi: Contributed conceptual design, literature collection, data collection, data analysis, and drafted the manuscript. Subbarayudu Boda: Contributed conceptual design, guided the work, literature collection and drafted the manuscript. Nitin Mohan collected the literature, data collection, data analysis and corrected the manuscript. Rajyalakshmi C: Contributed to the data collection, data analysis and corrected the manuscript. I. Jyothi Padmaja: Guided the work, literature collection and corrected the manuscript.

CONFLICTS OF INTERESTS

The authors declared, "No conflict of interest."

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