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CASE REPORT

Pediatric Pulmonary Paragonimiasis in the Philippines: A Case Report

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ABSTRACT

Background: Paragonimiasis is a food-borne parasitic infection caused by *Paragonimus* species, usually transmitted through the ingestion of raw or undercooked freshwater crustaceans such as crabs and crayfish. Pulmonary paragonimiasis can closely resemble tuberculosis, often resulting in misdiagnosis and delayed treatment.

Case Presentation: A 16-year-old female from Metro Manila presented with chronic cough, hemoptysis, and weight loss. She had previously completed a six-month course of anti-tuberculosis therapy for a bacteriologically-confirmed, drug-sensitive pulmonary tuberculosis with only partial improvement. Three weeks prior to admission, 3 months after completion of treatment, her symptoms recurred. Further investigation through sputum examination using Ziehl–Neelsen staining revealed *Paragonimus* ova. She was treated with Praziquantel 25 mg/kg/dose every 8 hours for two days, which led to marked symptomatic improvement and cessation of hemoptysis. Although paragonimiasis is relatively rare in the pediatric population, it remains endemic in some parts of the Philippines. This case highlights the importance of obtaining a thorough travel and dietary history and maintaining a high index of suspicion for paragonimiasis among tuberculosis-like illnesses that do not respond to standard therapy. Early recognition often allows prompt management and avoids unnecessary prolonged anti-tuberculous treatment.

Conclusion: Pediatric pulmonary paragonimiasis should be considered in patients presenting with chronic cough and hemoptysis unresponsive to anti-tuberculous therapy. Early recognition and appropriate treatment often result in excellent outcomes.

KEYWORDS: paragonimiasis, pediatric, Philippines, tuberculosis mimic, praziquantel

INTRODUCTION

Paragonimiasis is a food-borne trematode infection most commonly caused by *Paragonimus westermani* and primarily affecting the lungs. Infection is often transmitted through ingestion of raw or undercooked freshwater crustaceans containing the infective metacercariae. After ingestion, the larvae migrate through the intestinal wall, diaphragm, and pleural cavity to reach the lungs, where they mature into adult flukes.[1]

Globally, paragonimiasis is estimated to affect 23 million people, with endemic foci in the East and Southeast Asia, Africa, and Latin America.[2] The greatest burdens were reported in China, Korea, Japan, Vietnam, Thailand, and the Philippines.[1]

In the Philippines, paragonimiasis remains endemic in Northern Luzon, Bicol Region, Samar, Leyte, and Mindanao, where *Paragonimus westermani* and *Paragonimus philippinensis* have been documented.[3]

In pediatric cases, pulmonary involvement in paragonimiasis usually manifests as chronic cough, hemoptysis, chest pain, and radiologic findings resembling tuberculosis or bacterial pneumonia. Because symptoms are often non-specific, pediatric cases are frequently underdiagnosed or misdiagnosed, particularly in endemic regions where tuberculosis is also common.[4] This report describes a pediatric case of

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pulmonary paragonimiasis initially treated as tuberculosis, emphasizing the need for high clinical suspicion in unresponsive cases.

CASE REPORT

A 16-year-old female from Taguig, Metro Manila, presented with a 3-week history of chronic cough, intermittent hemoptysis and weight loss.

Twelve months prior to admission, she developed cough, weight loss, undocumented fever, and night sweats. She self-medicated with an anti-tussive and paracetamol. During this period, she had progressive, unintentional weight loss of approximately 20%.

Eleven months prior to admission, she developed hemoptysis along with persistence of symptoms, prompting consult at a local health center. Chest radiograph revealed pulmonary tuberculosis, and a cartridge-based nucleic acid amplification test (Xpert MTB/Rif assay) of sputum sample detected *Mycobacterium tuberculosis*, with no rifampicin resistance detected. She was treated with a fixed-dose combination of rifampicin, isoniazid, pyrazinamide, and ethambutol (2 tablets once daily for 2 months), followed by rifampicin and isoniazid (2 tablets once daily for 4 months). She adhered well to treatment, with noted improvement in the cough and hemoptysis. Her weight increased, but she did not regain her pre-illness weight.

Three months prior to admission, she followed up at the local health center. Her TB treatment outcome was classified as "cured" based on clinical improvement and completed treatment duration, though a repeat chest radiograph or sputum testing was not done.

Three weeks prior to admission, 3 months upon completion of TB treatment, she experienced recurrence of cough, undocumented fever, and unintentional weight loss, again associated with hemoptysis.

One day prior to admission, she developed dyspnea and consulted at a local hospital, where she was assessed as having presumptive multidrug-resistant (MDR) tuberculosis. She was advised to transfer to San Lazaro Hospital for admission.

On ancillary history, the patient had a history of travel to Camarines Sur approximately 1.5 years prior to the onset of symptoms. She also had close contact with a maternal aunt diagnosed with pulmonary tuberculosis, who likewise had chronic cough and recurrent hemoptysis. Nutritional assessment revealed that the patient was not a picky eater and generally consumed a balanced diet. She denied consuming raw food and was not fond of eating crustaceans or seafood.

At the emergency room, the patient was stretcher-bound, awake, conversant, and in moderate respiratory distress. She was afebrile, normotensive, tachycardic, tachypneic, and had oxygen desaturations as low as 92% on room air. The patient had a weight of 35 kg, height of 162 cm (z score 0), and a body mass index of 13.3 kg/m^2 (z score below -3); she was severely wasted. She appeared sallow, with pink conjunctivae, minimal alar flaring, and had no cervical lymphadenopathy. Chest expansion was symmetric; there were suprasternal, intercostal, and subcostal retractions, increased vocal and tactile fremiti at the right lower lobe, and crackles over the right lower lung field. Other physical examination findings were unremarkable.

She was initially managed as a case of severe pneumonia, to consider presumptive MDR tuberculosis, and was placed on 10 L/min oxygen via face mask. She was started on Penicillin G at 100,000 IU/kg/day divided into four doses for pneumonia, and tranexamic acid at 10 mg/kg/dose every 8 hours as needed. She was referred to a pediatric infectious disease specialist and a pediatric pulmonologist.

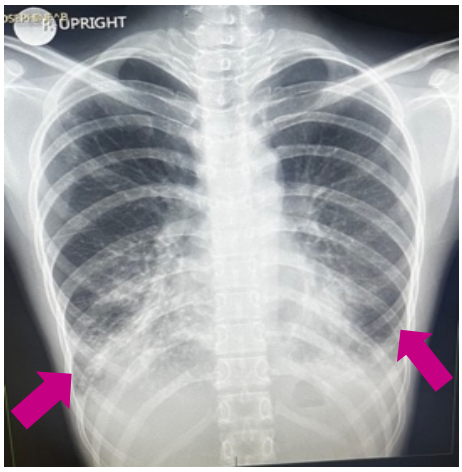

Figure 1. Chest radiograph of a 16-year-old female presenting with cough, hemoptysis, fever, and weight loss, taken on the day of admission (arrows: bilateral pleural effusion vs thickening)

A chest radiograph showed bilateral pleural effusion versus thickening, suggestive of pulmonary tuberculosis (Figure 1). A complete blood count revealed leukocytosis (13.9 ×10^9/L) with neutrophilic predominance (67%); there was no eosinophilia. A cartridge-based nucleic acid amplification test (Xpert MTB/Rif assay) of sputum sample was negative for *M. tuberculosis*, and HIV screening was non-reactive.

On hospital day 3, her respiratory effort improved, and oxygen support was gradually reduced to 1 L/min via

nasal cannula. However, she continued to experience post- tussive dyspnea and hemoptysis.

On hospital day 7, penicillin G was discontinued. She tolerated room air intermittently, but continued to have post-tussive dyspnea. As the patient still had cough and post-tussive dyspnea, and given her prior history of travel to an area known to be endemic for paragonimiasis, she was subsequently screened for pulmonary paragonimiasis through sputum microscopy.

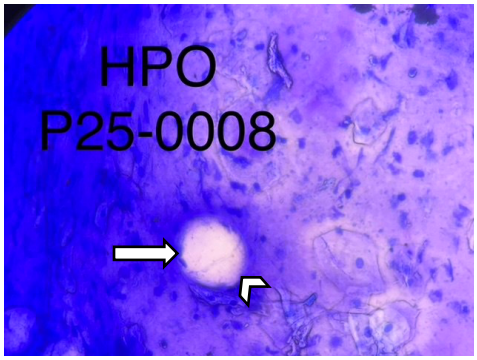

Figure 2. *Paragonimus* egg seen using the Ziehl-Neelsen stain (arrow: *Paragonimus* egg; arrowhead: operculum)

On hospital day 10, the smear returned positive for *Paragonimus* ova (Figure 2), confirmed by an expert at the College of Public Health, University of the Philippines Manila. She was treated with praziquantel at 25mg/kg/dose every 8 hours for 2 days.

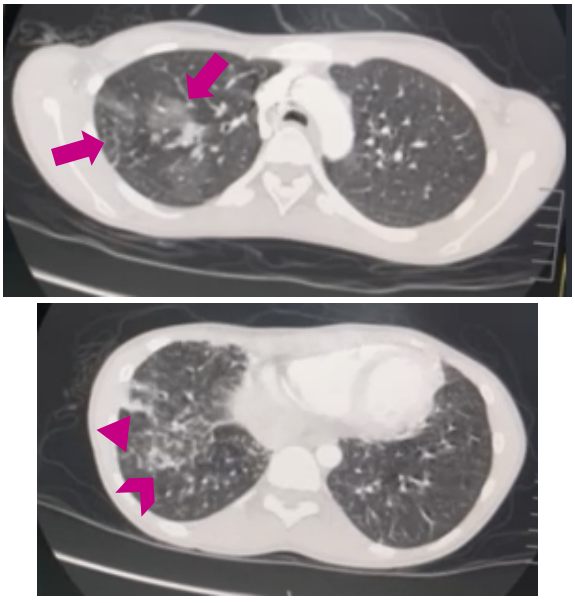

Figure 3. Chest computed tomography scan of a 16-year-old female diagnosed with pulmonary paragonimiasis, A) upper lobes; B) lower lobes (arrows: ground glass opacities; arrowhead: reticulonodular densities; triangle: worm tract sign)

By hospital day 14, the hemoptysis had resolved, and the cough had slightly improved. A chest computed tomography (CT) scan revealed ill-defined reticulonodular densities in the right upper, middle, and both lower lobes (more on the right), with scattered ground glass opacities and a worm tract sign.
On hospital day 17, after showing progressive clinical improvement, the patient was discharged.

The family members were advised to obtain a baseline chest radiograph and monitor symptoms. At the 2-week follow-up, the patient showed marked clinical improvement. Radiographic findings (Figure 4) showed significant resolution after 1 month. At 3 months post-treatment, sputum testing remained positive for *Paragonimus* ova and she was retreated with praziquantel at the same dosage. Continued monitoring and repeat testing after 3 months were advised.

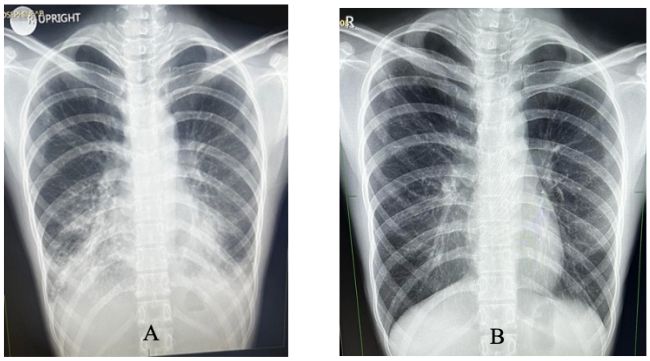

Figure 4. Chest x-ray of a 16-year-old female with pulmonary paragonimiasis; A) before and B) 1 month after praziquantel treatment

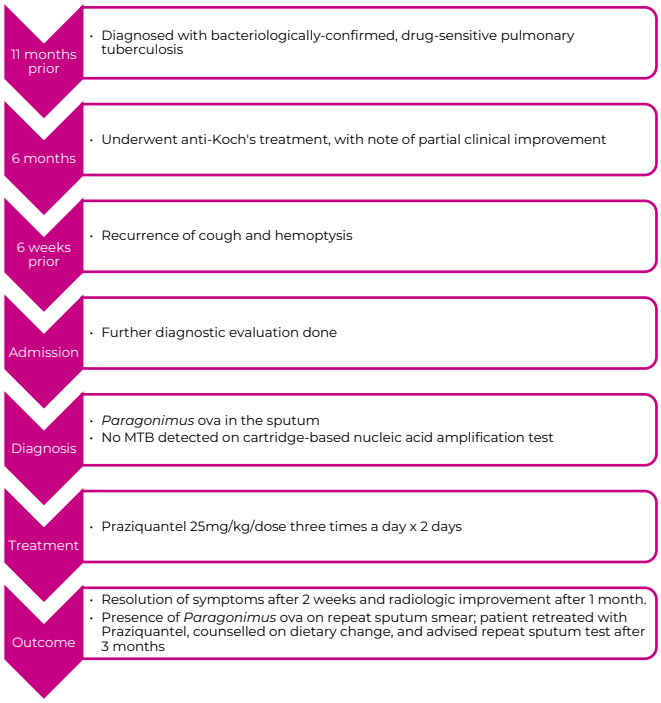

Figure 5. Timeline of the patient's clinical course

DISCUSSION

This report documents one of the very few pediatric cases of paragonimiasis in the Philippines.[5] Paragonimiasis is a food-borne trematode infection, primarily caused by *Paragonimus westermani* and related species. The disease remains endemic in several Asian countries, including the Philippines, where freshwater crabs serve as the secondary intermediate host.[4,6] Although paragonimiasis mostly affects adults, pediatric cases do occur, particularly among adolescents exposed through dietary habits or environmental exposure in endemic regions.[6] There are currently no reported pediatric cases recorded in the Philippine Pediatric Society registry.[7]

Transmission occurs through the ingestion of raw or undercooked freshwater crabs or crayfish harboring the infective metacercariae. After ingestion, the larvae excyst in the duodenum, penetrate the intestinal wall, and eventually migrate through the peritoneal cavity, diaphragm, and pleural space before localizing in the lungs.[6] Within the lung parenchyma, the parasites mature into adult flukes and encapsulate within cystic cavities, where they lay eggs. Egg release into the bronchioles triggers chronic inflammatory reactions, leading to the formation of granulomatous lesions, fibrosis, and cystic cavities. This inflammatory process accounts for the patient's hemoptysis, chronic cough, and reticulonodular lesions on the chest CT scan.[8,9] The diagnosis was further supported by a sputum smear stained using the Ziehl-Neelsen technique, which revealed an egg with a thick, unstained shell and a distinct operculum, characteristic of *Paragonimus*.

Although the patient is a native of Metro Manila, where paragonimiasis is not endemic, a detailed travel history revealed prior travel to Camarines Sur (a province in the Bicol region with known paragonimiasis endemicity). Though she denied ingestion of raw freshwater crustaceans, which is classically associated with pulmonary paragonimiasis, absence of a clear exposure history does not exclude infection. Several studies have demonstrated that pediatric patients frequently fail to recall or recognize prior exposure, particularly when ingestion involves inadequately cooked, pickled, salted, or cross-contaminated food products.[10,11] Additionally, prolonged incubation periods and indirect exposure during food preparation may contribute to underrecognition of the source of infection. These findings emphasize the importance of maintaining clinical suspicion for paragonimiasis even in the absence of a definite dietary history.

The typical incubation period of paragonimiasis ranges from 2 to 16 weeks but may extend to several months, as observed in this case. After ingestion of infective metacercariae, the larvae excyst in the duodenum and migrate through the peritoneal cavity, diaphragm, and pleura, reaching the lungs within one to two weeks. Egg production by adult flukes begins at approximately 6 to 10 weeks after infection.[6] Clinical symptoms generally appear within two to three months after exposure,[8,12] but in chronic cases, they may persist for years if left untreated, due to the long lifespan (up to 20 years) of adult flukes within pulmonary cysts.[9]

Misdiagnosis as pulmonary TB is common because of the significant overlap in clinical manifestations and radiologic findings between TB and paragonimiasis, including chronic cough, hemoptysis, weight loss, pleural disease, and cavitary or reticulonodular pulmonary lesions. This diagnostic challenge is further compounded in pediatric patients, who are often paucibacillary and may therefore have negative TB microbiologic studies despite clinical suspicion of TB, leading to difficulty in distinguishing the two diseases and increasing the risk of delayed or missed diagnosis of pulmonary paragonimiasis.

Concomitant pulmonary TB and paragonimiasis may occur, as postulated in this patient, with tuberculosis being recognized and treated first because of the strong clinical and radiologic suspicion for TB. Although there was partial improvement following anti-tuberculosis therapy, the persistence and subsequent recurrence of respiratory symptoms suggested the presence of an additional underlying disease process. Further evaluation eventually demonstrated *Paragonimus* ova on sputum microscopy, after which the patient showed significant clinical improvement following praziquantel therapy, supporting pulmonary paragonimiasis as a major contributor to the persistent symptoms. Multidrug-resistant tuberculosis was considered unlikely because repeat microbiologic studies, including a cartridge-based nucleic acid amplification test (Xpert MTB/Rif assay), did not detect *Mycobacterium tuberculosis*.

Several studies and case reports in the Philippines emphasize that patients presenting with a "tuberculosis-like illness" who do not respond to anti-tuberculosis therapy should prompt consideration of paragonimiasis, particularly in endemic or rural areas where consumption of freshwater crustaceans is common.[13,14] Laboratory confirmation is typically achieved by identifying *Paragonimus* eggs in sputum or

stool samples, while imaging studies further support the diagnosis and aid in monitoring treatment response.

Computed tomography provides a detailed assessment of parenchymal, pleural, and bronchial involvement, helping differentiate paragonimiasis from tuberculosis and determine the stage of infection. In the early (migration) stages, CT scans often reveal patchy or ground-glass opacities and subpleural linear densities, reflecting the inflammatory reactions along larval migration pathways. These findings correspond to tissue injury and hemorrhage as larvae migrate through the pleura and into the lungs.[15] In this patient, scattered ground-glass opacities were noted on both lung lobes.

As the infection progresses, CT imaging may demonstrate cystic or ring-shaped lesions, often in the lower lobes. A classic radiologic finding -- the "worm tract sign," described as a linear or curvilinear opacity extending from the pleura into deeper lung tissue -- was observed in the lower left lung lobe, representing the migration tract of the adult flukes.[8,16] In the chronic stage, CT findings may include fibrotic reticulonodular strands, as seen in the right upper, middle, and both lower lobes of the patient. These represent sequelae of chronic inflammation and tissue repair following parasite death.[15] Based on these imaging findings, the patient is in the late (chronic) phase of pulmonary paragonimiasis.

Early recognition in pediatric patients is essential to prevent unnecessary prolonged anti-tuberculosis therapy and irreversible pulmonary fibrosis. Maintaining a high index of suspicion is critical for timely diagnosis, as paragonimiasis is curable with praziquantel 25 mg/kg/dose three times daily for two days.[17] Praziquantel increases the permeability of the parasite's tegument to calcium ions, leading to rapid influx of calcium and eventual spastic paralysis. Praziquantel also induces structural damage to the tegument, exposing the parasite's antigen and making the parasite susceptible to the host immune system.[17] Following treatment, patients may experience transient worsening of cough or low-grade fever during the first week due to inflammatory reactions from dying flukes.[6] By the second week, symptoms such as cough, hemoptysis, and fatigue typically begin to improve, along with recovery of appetite and overall well-being.[17] Significant clinical improvement is usually observed within 2 to 4 weeks, while radiologic resolution occurs over 1 to 2 months.[8] Pediatric patients, as in this case, may recover more rapidly due to generally lower worm burden and faster inflammatory resolution and tissue repair compared to adults.[6,8]

Persistence of symptoms or radiographic findings after adequate treatment should raise concern for reinfection, incomplete response, or alternative diagnoses such as tuberculosis. Overall, when pediatric lung paragonimiasis is recognized and treated promptly and adequately, the prognosis is often favorable.[17]

CONCLUSION

Pediatric lung paragonimiasis, while rare, should be considered a significant differential diagnosis for chronic cough, weight loss, and hemoptysis, especially when patients do not respond to anti-tuberculosis therapy. This case highlights the importance of maintaining a high index of suspicion for paragonimiasis, particularly in individuals who have lived in or traveled to regions where consuming raw or undercooked freshwater crustaceans is common. Early recognition is crucial, as timely treatment with praziquantel typically results in rapid clinical improvement and excellent outcomes.

PATIENT'S PERSPECTIVE

The patient reported significant relief of symptoms after treatment and expressed reassurance after receiving a definitive diagnosis following weeks of persistent respiratory symptoms.

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Conflicts of Interest

None declared.

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