

## Case Report

# Human infection with *Hymenolepis diminuta*: case report of a child in rural Vietnam

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### Abstract

**Introduction:** Cases of human infection with *Hymenolepis diminuta* are very rare, and only a few hundred cases have been described. We report a rare case of *H. diminuta* infection in a 16-month-old boy living in a rural area of Bac Giang province, Vietnam.

**Case presentation:** The patient was admitted to the hospital with mild diarrhea, abdominal pain, and several tapeworm segments in his stool, and no other symptoms. The worm was identified as *H. diminuta* by morphological examination of eggs in a concentrated stool specimen and genetic sequencing of the 18S rRNA gene of the worm. The patient was successfully treated with single oral dose of praziquantel, and he fully recovered.

**Conclusions:** This report presents a rare case of human infection with *H. diminuta* in Vietnam; and contributes to enhancing our understanding of the epidemiology, clinical manifestation, and treatment protocols of human hymenolepiasis.

**Key words:** *Hymenolepis diminuta*; human; Vietnam.

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### Introduction

*Hymenolepis diminuta* (Rodolphi, 1819), also known as rat tapeworm, is a rare zoonotic cestode species belonging to the family Hymenolepididae [1,2]. It is transmitted to humans via the incidental ingestion of infected insects containing tapeworm cysticercoids within their bodies [1]. Several rodent species such as *Rattus norvegicus* and *R. rattus* have been confirmed as the principal definitive hosts, and insects of orders Coleoptera, Siphonaptera, and Lepidoptera as the intermediate hosts [1]. *H. diminuta* infection is very rare in humans and mostly reported in rural areas with poor sanitation [3–5].

Previously, human infections with *H. diminuta* have been also reported in many countries such as Iran [6], India [7], Malaysia [8], and Thailand [9]; but reports of human hymenolepiasis from Vietnam have been rare. We report a case of human infection with *H. diminuta* in Vietnam which was identified by morphological and genetic analysis of its eggs.

### Case report

A 16-month-old boy, who lived in a rural area of Bac Giang province, Vietnam, was admitted to the National Institute of Malaria, Parasitology and Entomology (NIMPE, Nam Tu Liem district, Hanoi, Vietnam) on 24 January 2022 due to mild diarrhea, abdominal pain, and the presence of worm segments, ranging from 1–3 cm, in his stool (Figure 1), and no other symptoms. Incidentally, this rural area was infested with rats. The results of clinical examination were normal. Complete blood count, liver function, and urine tests were performed, and all were in the normal range. The examination of concentrated stool samples revealed bile-stained spherical thick-shelled eggs of diameter ranging from 70–80 µm (Figure 2), including six central hooklets but lacked polar filaments. These eggs were identified as belonging to *H. diminuta* and were different from *H. nana* eggs. Despite their similar appearance, *H. nana* eggs are smaller and have two obvious polar thickenings, from each of which arise 4–8 polar filaments.

Total DNA of the worm was extracted using the QIAamp Mini Kit (Qiagen, Hilden, Germany) and the 18S rRNA gene was amplified using the wormA (5'-GCG AAT GGC TCA TTA AAT CAG-3') and wormB (5'-CTT GTT ACG ACT TTT ACT TCC-3') primers as described previously [10]. The polymerase chain reaction (PCR) product was sequenced using the Sanger dideoxy method (First BASE Laboratories Sdn Bhd service, Kembangan 43300, Selangor, Malaysia) with the same primers that were used in the PCR. The obtained sequence was identified using the Basic Local Alignment Search Tool (BLAST) guidelines (<http://blast.ncbi.nlm.nih.gov/Blast.cgi>) and deposited in GenBank. The BLAST results indicated a 99.85% identity with the 18S rRNA gene of *H. diminuta* from Poland (JX310720.1). The sequence was assigned the accession number OR288095.1 in GenBank. The child was treated with a single 15 mg/kg oral dose of praziquantel (Distocide, Shinpoong Daewoo Pharma, Dong Nai province, Vietnam). Parasitological stool examinations were performed on days 7, 15 and 30 after treatment, and no presence of *H. diminuta* eggs was observed.

**Discussion**

Human beings are accidental hosts of the cestode *H. diminuta* which enters the body by ingestion of infected intermediate hosts [1]. Therefore, human infections with *H. diminuta* are uncommon, mainly occurring as clinical case reports [11]. Only a few hundred clinical

cases have been described from countries around the world; most cases have been reported in children [1,6,11] and reports in adults are rare [8,9,11]. Until now, *H. diminuta* infection in humans have been reported in about 80 countries worldwide [1]. The cases were mainly documented in the Americas, Southeast Asia, and the Eastern Mediterranean regions [1,12,13].

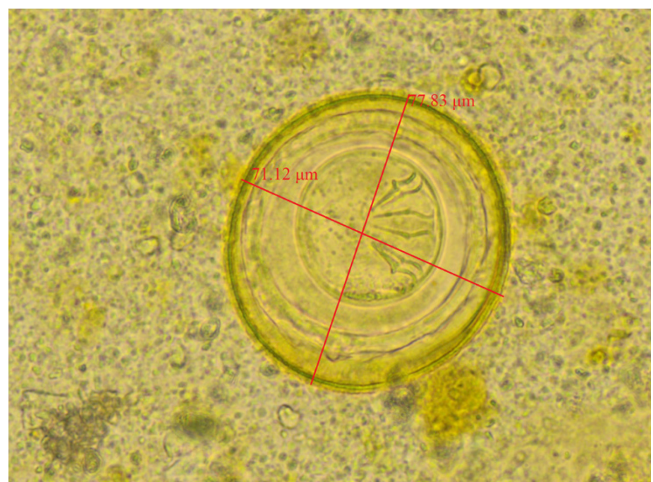
*H. diminuta* infection in humans are most often asymptomatic and extremely rare in Vietnam. To the best of our knowledge, only two cases in children have been reported until 2005 in Ha Noi, in the northern region of Vietnam [14]. The patient in the current study lived in a rural area of Bac Giang province (Northern Vietnam). The worm isolated from the patient was identified as *H. diminuta* using morphological examination of eggs and sequence comparison of the 18S rRNA gene. The results are highly consistent between the morphological and molecular methods. Notably, in this case, tapeworm proglottids were found in his stool. These were slightly different from previous reports worldwide.

The patient’s house and its surroundings were inspected, and evidence of the presence of rodents was found. However, consumption of insects is not common among local people. We were also unable to find information that he had ever eaten insects before. Thus, there is no solid evidence that an insect was the source of the infection. The infection in the patient was probably due to accidental ingestion. In our case, the patient was successfully treated with praziquantel, which is a drug of choice for treatment of *H. diminuta* infection [1,13]; even though the safety profile of this drug is not well established in children [11].

**Figure 1.** Proglottids of *Hymenolepis diminuta* found in the patient’s stool.



**Figure 2.** Egg of *Hymenolepis diminuta* found in the patient’s stool (400x magnification). The egg presents six central hooklets and the polar fragments are absent.



Vietnam and neighboring countries witness a large number of helminth diseases related to eating habits [15]. The lack of access to safe water sources, along with poor sanitation and hygiene practices, constitutes a leading risk factor for infectious diseases, including parasitic infections. Therefore, Vietnam is a favorable environment for various parasitological diseases [16]. Although Vietnam is considered an advantageous area for hymenolepiasis, very limited data on *H. diminuta* infection exists. This is a rare case of human infections with *H. diminuta* in Vietnam.

## Conclusions

Hymenolepiasis caused by *H. diminuta* is rare in humans. It is recommended that additional description of *H. diminuta* infection is necessary to enhance our understanding of infections caused by this agent.

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## Ethics approval and consent to participate

The study was approved by the Ethics Committee of NIMPE, Vietnam (30/HĐĐĐ). Written informed consent was obtained from the patient's parents for the publication of this case report and any accompanying images.

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