



## A systematic review and meta-analysis of *Hymenolepis nana* in human and rodent hosts in Iran: A remaining public health concern

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### ARTICLE INFO

#### Keywords:

*Hymenolepis nana*

Human

Rodents

Systematic review

Meta-analysis

Iran

### ABSTRACT

*Hymenolepis nana*, as a neglected zoonotic helminth, naturally occurs in both humans and rodents. Herein, a systematic review and meta-analysis was carried out to estimate pooled prevalence of *H. nana* infection among human and rodent hosts for the first time in Iran. PubMed, Web of Science, Scopus, and Embase databases (English articles) and SID and Magiran databases (Persian articles) were systematically searched for relevant studies published from inception till May 24, 2020.  $\chi^2$  and  $I^2$  index were used to assess the heterogeneity of the included studies. Publication bias was assessed using Egger's intercept and visual inspection of the funnel plot. Pooled prevalence was estimated using random-effects model with 95 % confidence interval (CI) and depicted as a forest plot. STATA software was used for analysis. The overall pooled prevalence estimate of *H. nana* in humans included 1.2 % (95 % CI = 1.0–1.4%). Subgroup analysis revealed 2.2 % (95 % CI = 1.8–2.6%) and 0.5 % (95 % CI = 0.3 to 0.8 %) of *H. nana* infection among school children and food handlers, respectively. In terms of rodent hosts, the overall pooled prevalence of *H. nana* infection included 13 % (95 % CI = 9.3–16.6%). Subgroup analysis revealed the highest rate of the infection was in *Rattus* spp. (19.6 %; 95 % CI = 10.6–28.6%), a genus with synanthropic behavior. It seems, despite the advancement in sanitation infrastructure and hygiene status, the *H. nana* infection compares to other helminthic diseases remains a challenging public health problem in Iran.

### 1. Introduction

In 1851, Bilharz described a helminth infection in the small intestine of a boy in Cairo what would be named hymenolepiasis. The two species of *Hymenolepis* are infecting humans, namely *Hymenolepis nana* and *Hymenolepis diminuta*, which have a widespread distribution across the globe while *H. nana* is by far the more common of these two parasites [1]. *H. nana*, as a neglected zoonotic helminth, is naturally a parasite of rodents, which is commonly known as the dwarf tapeworm due to its small size, 2–4 cm long, and only 1 mm wide [2,3].

A direct transmission mode, and also a possibility of autoinfection has distinguished this helminth from other cestodes that infect human. Epidemiological evidence suggests that direct human-to-human transmission is the most common route of infection with *H. nana*, particularly

in environments where the frequency of such transmission is likely to be high due to poor hygiene and inadequate sanitation [4,5]. However, *H. nana* infection is still considered a zoonosis due to infected synanthropic rodents, including mice and rats, as a reservoir of infection [6,7].

In human-to-human transmission mode, humans can act as both definitive and intermediate hosts while in the zoonotic cycle, an arthropod, usually small beetles such as *Tribolium* (Coleoptera) that commonly contaminate flour or cereal, play the role of intermediate host. The accidental ingestion of infected beetles, usually with contaminated food, will lead to the development of the adult tapeworm in humans [2,8].

Hymenolepiasis is considered to be the most prevalent human cestodiasis in the world, with the highest prevalence and heaviest burden among children in crowded communities with poor sanitation [4]. The

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