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Prevalence of *Toxocara* spp. eggs in soil of public areas in Iran: A systematic review and meta-analysis

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ABSTRACT

Toxocariasis is a zoonotic and widespread infection which manifest as a spectrum of syndromes in humans such as visceral, neural, ocular, covert and asymptomatic. Herein we aimed to design a systematic review and meta-analysis to determine the prevalence of *Toxocara* spp. eggs in soil depositories in Iran. English (PubMed, Scopus, Google Scholar, Web of Science, Science Direct, EBSCO, and Ovid) and Persian (Scientific Information Database and Magiran) databases were explored. This review resulted in a total of 14 publications meeting the inclusion criteria during January 2000–November 2016. Altogether, 3031 soil samples were examined among which 470 were positive in terms of *Toxocara* spp. The weighted overall prevalence of *Toxocara* spp. in soil samples was 16% (95% CI = 11–21%), and Tehran and Qazvin provinces had the highest and lowest prevalence rates, respectively. Meta-regression analysis showed that the correlation between prevalence of *Toxocara* eggs in soil with sample size ($P = 0.45$) and year of study ($P = 0.42$) were not statistically significant. Further studies are highly recommended to enlighten different aspects of toxocariasis in Iran.

Contents

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1. Introduction

The enigmatic ascarid roundworms, *Toxocara canis* (*T. canis*) and *Toxocara cati* (*T. cati*), are envisaged as one of the striking neglected tropical diseases, being able to ignite serious complications such as visceral larva migrans (VLM) syndrome and toxocariasis.[1,2] Feline and canine feces act as the significant depot of unembryonated eggs, and become larvated in optimum soil and environmental conditions.[3,4] Humans are considered as the paratentic hosts and infection would occur via ingestion of undercooked meat of infected paratentic hosts (chickens, pigs and ruminants), polluted water, contaminated soil (playgrounds, parks, gardens, lake beaches and sandpits) and close contact with pet animals.[4–10] Ingested eggs penetrate the intestinal mucosa, disseminate in human body through blood stream and encyst in several tissues.[5] Four major manifestations of toxocariasis are as follows: (1) VLM, frequently taking place in young children, is evinced by *Toxocara* larva wandering in body organs enclosing liver, lungs and brain, provoking symptoms such as hepatitis, pneumonitis, meningo-encephalitis, headache, abdominal cramps, eosinophilia, behavioral and cognitive perturbations; (2) the so-called ocular larva migrans (OLM) is permanent loss of sight due to retinal damage and detachment which is typical in older children; (3) long time subjection to infection in children may increase a hidden, hardly diagnosed form called covert toxocariasis which emerges as asthma-like symptoms or eosinophilia with sleep and intellectual disorders; and (4) common toxocariasis usually in adults with rash, pruritus, dyspnea and abdominal pain.[1] One of the most noted outcomes of infection is dysfunction of cognitive practices in youngsters, where infected individuals show decreased ability in reading, math operations and block design.[11] On the other hand, toxocariasis is believed to be a possible reason of blindness, a potential cause of asthma and has been linked to seizures and epilepsy. Furthermore, a rare but likely life-threatening disorder caused by toxocariasis is cardiac involvement that evokes inflammation of heart tissues, tamponade and heart failure.[12–15]

Infection with *Toxocara* species has global distribution and is taken into account as one of the most frequent helminthiases in humans, according to seroprevalence reports.[1,8] Histopathological examinations as well as several medical imaging techniques, e.g. computed tomography (CT), ultrasound and magnetic resonance imaging (MRI) have been employed to discern injuries of creeping parasites in human body.[16–19] Although serological tests such as enzyme-linked immunosorbent assay (ELISA) with *Toxocara* excretory-secretory antigens and western blotting are the regular methods of diagnosis for toxocariasis, it is not very specific as the cross reactions may occur.[20–22] As far as we know, there is lack of a systematic and quantitative analysis of obtained data in terms of prevalence of *Toxocara* species in soil depots in Iran. So, herein we designed a systematic review and meta-analysis study in order to shed light on the prevalence of these common ascarids in Iran.

2. Methods

2.1. Search strategy

To unravel part of the prevalence of *Toxocara* spp. eggs in soil in Iran, we planned a systematic review and meta-analysis according to online literature screening of English (Pubmed, Scopus, Google Scholar, Web of Science, Science Direct, EBSCO, and Ovid) and Persian (Scientific Information Database and Magiran) databases for published papers from January 2000 – November 2016. We applied

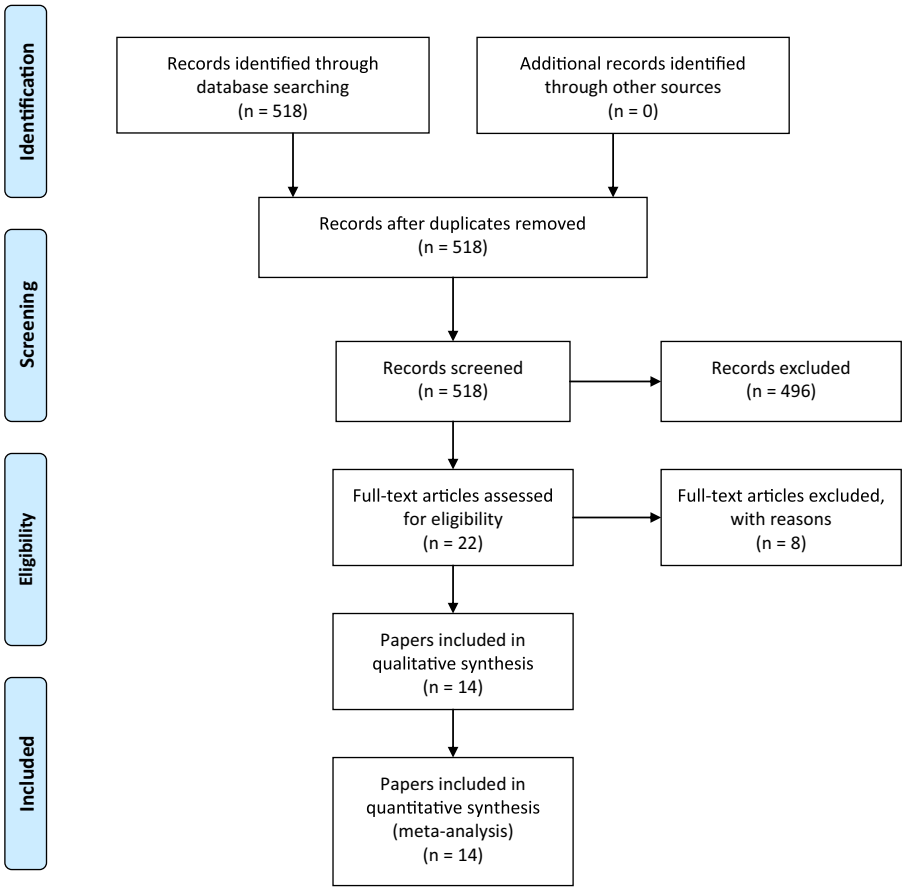

Fig. 1. PRISMA flow diagram.