



Foci of enterobiasis and ascariasis in the Świętokrzyskie Province in 2005–2009

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ABSTRACT

Cosmopolitical pinworm (*Enterobius vermicularis*) and human ascaris (*Ascaris lumbricoides*) are the most often nematode parasitising in human gastrointestinal tract all over the world. Pinworm are more common in temperate climatic zones of developed countries of Europe and the United States, whereas human ascaris is the most often in developing countries of Central and South America, Africa and Asia. Taking into account the widespread occurrence of enterobiasis and ascariasis and their impact on human health, it is necessary to monitor the incidence of these infestations all over the world. The aim of our work was to present the incidence of parasitic diseases caused by *Enterobius vermicularis* and *Ascaris lumbricoides* in Central Poland in the years 2005-2009. The research was conducted in Świętokrzyskie Region, which is an agricultural region of Central Poland. The data concerning the incidence of enterobiasis and ascariasis were collected from Provincial Sanitary-Epidemiological Station in Kielce. Foci of parasitic invasion covered only these cases, when at least two people were affected at the same time and the same place. Taking into account the number and localization of foci of enterobiasis and ascariasis as well as socioeconomic data from Central Statistical Office in Kielce, epidemiologic analysis of parasitic infections in Świętokrzyskie Region was done. In the years 2005-2009 in Świętokrzyskie Region 21 foci of enterobiasis and 16 foci of ascariasis were registered. The most cases of enterobiasis were registered in the year 2005 (12 foci). In examined period, the highest number of ascariasis was noted in 2008 (4 house foci and 2 school foci). The high incidence of parasitic infections of digestive tract in Świętokrzyskie Region is a consequence of several factors – most of inhabitants are professionally connected with agricultural and forest environment, what makes higher the risk of soil-transmitted helminthiasis. Moreover, it can be also connected with low sanitary conditions and the lack of appropriate environmental security against soil and water contamination with feces.

Keywords: enterobiasis, ascariasis, parasitic infections of gastrointestinal tract

INTRODUCTION

The cosmopolitan pinworm (*Enterobius vermicularis*) and human roundworm (*Ascaris lumbricoides*) are the most common nematode parasites of the human gastrointestinal tract with a worldwide distribution [6, 17, 23, 24, 25, 26, 27]. The pinworm is more prevalent in the temperate and cold rather than hot climatic zones, and enterobiasis caused by this nematode is the most widespread parasitic disease in the developed countries of Europe and in the United States, although it has also been reported to be common in some Asian regions. Unlike the pinworm, the human roundworm is the most common in

the developing countries of Central and South America, Africa, and Asia; ascariasis is also endemic in developed countries.

E. vermicularis parasitizes the gastrointestinal tract [2, 21, 27], but it can also migrate to the peritoneal cavity, ovary, fallopian tube, endometrium, liver, lung, nasal mucosa [31], kidney and urinary tract [3, 7, 8, 10, 15, 28], and even to the eye [4], causing pathological lesions at the infection site.

The human roundworm has been localized in a variety of human organs. Adult forms inhabit the small intestine, whereas larvae hatched in the human host from invasive eggs migrate during their development via blood vessels through the liver to the lungs, enter the oral cavity with the sputum that is coughed up and then they are swallowed with the saliva and thus enter the gastrointestinal tract. Outside the intestine, adult forms can inhabit the biliary

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duct, which may cause acute jaundice, fever, cholangitis, and pancreatitis [8, 20], and pass through the urinary catheter into the urine collection bag [19]. In turn, roundworm larvae can cause eosinophilic pneumonia (Löfller's syndrome) [6]. The metabolites of both nematode species can be the cause of encephalopathy [22, 33] and/or skin lesions [9, 30].

The widespread distribution of *E. vermicularis* and *A. lumbricoides* as well as the detrimental effects in humans necessitate permanent monitoring of the incidence of enterobiasis and ascariasis in various regions. Reports of cases of the parasitic diseases facilitate defining the areas of the highest risk of invasion by these nematodes, which is important in terms of epidemiology. This information is also useful for launching intensive educational campaigns and dissemination of prevention principles in the areas of parasitic disease foci prevalence.

This paper presents data on the appearance of foci of parasitic diseases caused by *E. vermicularis* and *A. lumbricoides* in central Poland over a period of five years.

MATERIAL AND METHODS

The study was conducted in the years 2005-2009 in the Świętokrzyskie Province (central Poland), a typical agricultural region. Data concerning the foci of *A. lumbricoides* and *E. vermicularis* invasions was provided by the Provincial Sanitary-Epidemiological Station in Kielce. Registered cases of nematode infection occurring at the same time and in the same place in at least two patients were regarded as infection foci.

The information about the number of all registered ascariasis and enterobiasis patients in the Świętokrzyskie Province during the individual years of the study was obtained from the disease registry [11, 12, 13, 14]. The epidemiological analysis of the incidence of ascariasis and enterobiasis in the study region was performed on the basis of the number and localization of the foci of the parasitic diseases in question and the socio-economic data obtained from the Central Statistical Office in Kielce.

RESULTS AND DISCUSSION

In the years 2005-2009, a total of 21 ascariasis foci and 16 enterobiasis foci were registered in the Świętokrzyskie Province (Table 1). The largest number of enterobiasis foci (12) was reported in 2005. Additionally, the highest incidence of enterobiasis (129.2 cases per 100 thousand inhabitants) was reported in the same year in the entire Świętokrzyskie Province (Table 2). A total of 42 people were infested in the reported foci. Enterobiasis infections occurred among family members (21 patients infested in household foci) or people sharing the same out-of-home locations (21 patients infested in the school environment). In the study period, the greatest number of ascariasis foci

were reported in 2008 (4 household foci and 2 school foci); a slightly lower number was reported in 2006 (2 household foci and 2 school foci), but the number of patients infested by the human roundworm was identical. The data collected in the disease registry show that the Świętokrzyskie Province took the first place in terms of enterobiasis incidence in Poland. The ascariasis incidence rates persisted at a similarly high level almost throughout the study years, with the exception of 2007 and 2008, when the incidence was 62.9 and 51.9, respectively, which ranked the Świętokrzyskie Province in the second place after the Podlaskie Province with the incidence reaching 69.1 and 119.1, respectively. The prevalence of the foci of gastrointestinal infection with the parasitic nematodes in the Świętokrzyskie Province and the high incidence rates ranging from 51.9 to 108.2 in the years 2005-2008 indicate that the diseases constitute a substantial medical and social problem in the region. As demonstrated by analyses of data on the employment status of the population of the Province, the greatest percentage of people are employed in occupations related to agriculture and forestry. Humans staying in habitats of the dispersing stages of the parasites are faced with an elevated risk of infestations with geohelminths. The high incidence of parasitic gastrointestinal disease in the Świętokrzyskie Province may also be related to lack of effective protection of the environment against human waste contaminating the soil and water and by the low sanitary-epidemiological standards maintained in the region.

Our study emphasizes the prevalence of foci of soil-transmitted helminthiasis in school children. According to many authors [29, 32], soil-transmitted helminths are the major cause of children diseases worldwide, and in the developing countries in particular. For instance, in the Kashmir Valley (India), as many as 299 (78.27%) out of 382 examined children were infested by *A. lumbricoides*, *Trichuris trichiura*, or both these parasites [32]. The prevalence of *A. lumbricoides* in Tutoila (State of Maranhao, Brazil) between July and December 2008 was 53.6% [29]. Similarly, numerous cases of *E. vermicularis* invasions in children have been reported from European countries. In Norway, 18% out of 395 examined children were infested by this nematode. The highest prevalence (34%) was reported among children aged 6-11 [5].

In Poland, the prevalence of parasitic diseases in children has been poorly recognized; according to various authors, it is within wide ranges depending on the individual regions [34]. A high prevalence of parasitic nematodes has been found in the north-eastern regions of the country, where ascariasis is reported to be the most common parasitic disease in children. In the years 2008-2009, *A. lumbricoides* eggs were detected in the faeces of as many as 74.44% of the 90 children examined in the region. *E. ver-*

Table 1. Foci of enterobiasis and ascariasis in the Świętokrzyskie Province in 2005–2009

Years	Enterobiasis				Ascariasis			
	Foci*	Cases**	Family (foci /cases)	School (foci /cases)	Foci*	Cases**	Family (foci/ cases)	School (foci/ cases)
2005	12	42	8 / 21	4 / 21	4	16	3 / 12	1 / 4
2006	2	4	2 / 4	–	4	12	2 / 4	2 / 8
2007	4	8	4 / 8	–	1	2	–	1 / 2
2008	2	4	2 / 4	–	6	12	4 / 8	2 / 4
2009	1	2	1 / 2	–	1	2	1 / 2	–

* total number of foci, ** total number of cases

Table 2. The number of cases and incidence of ascariasis and enterobiasis in the Świętokrzyskie Province in 2005–2009

Year	Cases		Incidence*	
	Ascariasis	Enterobiasis	Ascariasis	Enterobiasis
2005	1392	1662	108.2	129.2
2006	913	1383	71.2	107.9
2007	803	1061	62.9	83.1
2008	661	1061	51.9	83.3

* per 100,000 inhabitants

micularis was identified in 4.44% of the children from this group.

A high 10–20% prevalence of soil-transmitted helminths was reported in a group of pre-school aged children out of 2 billion people infested by these parasites [1]. The high prevalence of enterobiasis and ascariasis in this age group may be caused by poor hygiene habits that facilitate transmission of the parasite between humans and self-infection with invasive eggs of the parasite transmitted by hands from the rectum to the oral cavity. In the case of enterobiasis, the possibility of spread of *E. vermicularis* eggs stuck to dust with a sticky surface substance [16] is of considerable epidemiological importance.

The enterobiasis and ascariasis occurrence foci are maintained thanks to the biological characteristics of *A. lumbricoides* and *E. vermicularis*, e.g. high fecundity and resistance of the dispersing stages to physico-chemical factors, as well as the mode of transmission of the parasites in nature, the faecal-oral route of human infection, human behaviour, and the sanitary-epidemiological conditions in the region.

The registered prevalence rate of ascariasis and enterobiasis in the Świętokrzyskie Province demonstrate the need for large-scale social campaigns for prevention of diseases caused by parasitic nematodes and creation of favourable conditions for early recognition of environmental threats. Additionally, the inhabitants should be provided with access to health centres.

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