

Prevalence of nematode eggs in the urban area of the city of Shillong, India—a public health problem

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Summary: A study was undertaken to assess the contamination levels of nematode eggs in environmental objects located in Shillong (India). Of 98 soil samples collected from children's parks, house yards and places near piggeries, 63 (64.3%) were positive for the eggs or larvae of one or more nematode species. Contamination by *Ascaris* eggs was most frequent in all the localities surveyed; however, *Toxocara* and *Ancylostoma* spp. eggs were also significantly involved in soils of these localities. Of 72 vegetable samples examined, 53 (73.6%) contained one or more types of nematode eggs/larvae. Contamination of vegetables by *Ascaris* eggs was most frequent, followed in receding order of prevalence by the species of *Strongyloides*, *Toxocara*, *Ancylostoma* and *Enterobius*. The results obtained emphasize that as the region lacks extreme climatic conditions, the infective stages of nematodes may remain viable for relatively long periods and thus could pose a serious risk of infection to the inhabitants throughout most of the year. Attention should therefore be paid towards a mass health education programme, particularly on sanitary laws and hygiene in this area.

Introduction

Helminth parasites are a major cause of concern to human health in developing countries like India, where a humid tropical climate, an insanitary environment and unhygienic living habits of the lower socio-economic strata prevail. Most parasitic worms carry out their life cycle by the passage of eggs or larvae in the faeces of their hosts, and thus contaminate

the environment with many millions of their progeny. As a consequence, environmental objects like soil, water and vegetables act as transmitting media for parasitic infections.

Many reports deal with the investigations into the ways in which nematode infections thrive in society and in many of these, soil and vegetables in particular have been found to be the major media transmitting nemic infections in the area.^{1,2,3}

However, in India, apart from a report of Bhatia *et al.* (1978)⁴ that deals with parasitic contaminants on vegetables in Mathura (Uttar Pradesh), no study of this kind has been done so far elsewhere in the country. Since suffering with helminths is a common problem of the people of the city of Shillong, we undertook a screening of environmental objects for nemic eggs in and around the city, in order to ascertain the possible role of these objects in perpetuating infections to the population of the area.

Materials and methods

The studies were performed between February–June of 1988, and covered the urban limits of Shillong, the state headquarters of Meghalaya, India. The climate is mild because of its altitude (1500–1600 mASL); the mean maximum temperature during summer usually reaches 24°C, and rarely falls below 8°C in winter. The rains are heavy throughout most of the year, which results in a high relative humidity.

The town is mostly inhabited by tribal people. Use of open areas for defecating and use of paper, not water, for self cleaning are common practice among the people, in particular children, of low socio-economic groups. Pig raising is widely practised, cats and dogs are kept as pets and, the town also has a growing population of stray dogs.

A total of 98 soil samples were collected from children's parks, houseyards and places near piggeries in the area, since these places are likely to be important in transmitting infection. The collection of green vegetables in most cases was made directly from fields, and a few samples were also procured from local markets. A total of 72 vegetable samples which are commonly eaten raw (mainly salad vegetables like cabbage, lettuce, carrots and spinach) were collected. The samples were examined for nematode eggs and/or larvae

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Table 1. Prevalence of nematode eggs/larvae of significance to public health in soil samples ($n=98^*$) in urban Shillong

Eggs/larvae†	No. (%) of positive samples	No. (%) positive in children's parks ($n=31^*$)	No. (%) positive in house yards ($n=34^*$)	No. (%) positive in places near piggeries ($n=33^*$)
<i>Ascaris</i> sp.	36 (36.7)	7 (22.6)	12 (35.3)	17 (51.5)
<i>Toxocara</i> sp.	16 (16.3)	8 (25.8)	4 (11.8)	4 (12.1)
<i>Ancylostoma</i> sp.	14 (14.3)	6 (19.3)	4 (11.8)	4 (12.1)
<i>Enterobius</i> sp.	11 (11.2)	3 (9.7)	3 (8.8)	5 (15.1)
<i>Strongyloides</i> sp.†	10 (10.2)	3 (9.7)	1 (2.9)	6 (18.2)

* n = total no. of samples examined.

Table 2. Prevalence of nematode eggs/larvae of significance to public health in vegetable samples ($n=72^*$) in urban Shillong

Egg type/larvae†	No. of samples positive	Percentage of infection
<i>Ascaris</i> sp.	45	62.5
<i>Strongyloides</i> sp.†	12	16.7
<i>Toxocara</i> sp.	10	13.9
<i>Ancylostoma</i> sp.	8	11.1
<i>Enterobius</i> sp.	7	9.7

* n = total no. of samples examined.

using salt floatation techniques.⁵ The eggs and/or larvae were identified using morphological criteria.⁶

Results

The findings of our survey of soil and vegetables for nematode eggs/larvae are summarised in Tables 1 and 2.

Of the soil samples, 63 (64.3%) were found to contain one or more nematode eggs. The most prevalent contamination was by the eggs of *Ascaris*, followed in receding order of prevalence by the eggs of *Toxocara*, *Ancylostoma* and *Enterobius* and *Strongyloides* larvae. Among the various localities surveyed the prevalence of *Ascaris*, *Strongyloides* and *Enterobius* eggs and/or larvae was highest in soils of the places near piggeries, while *Toxocara* and *Ancylostoma* eggs were the most common contaminants in soils of children's parks.

Of the vegetable samples monitored, nematode eggs were detected in 73.6%. *Ascaris*

eggs were the most commonly occurring contaminant followed in receding order of prevalence by the species of *Strongyloides* (larvae), *Toxocara*, *Ancylostoma* and *Enterobius*.

Discussion

The data collected show that soils in places of frequent human exposure and vegetables of the area are potential sources of nematode infections to the inhabitants. It is a serious problem, as recent reports have shown that infections with intestinal parasites are common in the human population of several regions of India.^{7,8} The prevalence rate of eggs of various nematode species encountered in the present study is either comparable to or higher than that reported in different parts of the world. Silva (1984)⁹ found *Ascaris* eggs as the most common parasitic contaminant in 39% of the soil samples, followed by *Ancylostoma* and *Toxocara* (in 26% and 17% samples, respectively) collected from public squares in Rio de Janeiro (Brazil). In the area of our study also, *Ascaris*, the most common egg type, was present in 36.7% of the soil samples followed by *Toxocara* (16.3%) and *Ancylostoma* (14.3%). A considerably high prevalence of *Ascaris* eggs as indicated in the present data may be related to a high rate of ascariasis (51–67%) in domestic pigs of the region.¹⁰ Cross infection with the infective stages of *Ascaris* originating from swine seems a possibility. It is worth mentioning here that information collected from various medical agencies in the area revealed a high (80–100%) prevalence of ascariasis in human subjects. Of the various localities surveyed, the prevalence of *Toxocara* was highest

(25.8%) in soils of children's parks. However, Dada & Lindquist (1979)¹¹ and Paul *et al.* (1988)¹² found *Toxocara* eggs in 20.6% and 13.7% of soil samples collected from public places and parks, respectively, in the USA. A high prevalence of *Toxocara* eggs in soils of children's parks seems to be associated with a markedly high prevalence (64.0%) of this infection in stray dogs of the area (Yadav & Tandon, unpublished observations) and highlights the potential health hazards to which children are exposed. The population of stray and abandoned dogs coupled with the existence of cats in the society and the associated indiscriminate faecal pollution of the area by these animals may also account for the significant prevalence of *Ancylostoma* eggs as a soil contaminant. The ingestion of infective eggs of *Toxocara* spp. by children may lead to visceral larva migrans (VLM).¹³ The canine population is implicated to be a major cause of toxocariasis VLM in children of India.¹⁴ Similarly, the larvae of *Ancylostoma* spp. of animal origin are causative agents of cutaneous larva migrans⁶ in human beings. It is suggested that these animals play an important role in disseminating helminthozoonoses.

Of the vegetable samples examined in this study 76.3% were found to be positive for eggs of one or more nematode species. In contrast to this, Bhatia *et al.* (1978)⁴ reported 37.6% of vegetable samples as positive for parasitic eggs from a hot tropical climatic zone. *Ascaris* was the predominant egg type (62.5%) in vegetable samples examined in our study. Rude *et al.* (1984)¹⁵ observed only 2.0–5.0% prevalence of the same in green vegetables examined in the USA. The use of human night-soil is a common practice in vegetable farming of Shillong, and this probably explains the observed difference in the level of contamination in the mentioned localities. The nematode eggs of other species encountered in vegetable samples of the area are those that are reported as common contaminants of vegetables in several regions of the world with a prevalence high enough to pose a serious public health problem.^{1,4,16} The recovery of infective stages of parasites in vegetable samples indicates a distinct danger of infection to consumers, their transmission involving an ingestive mode. Therefore, the public should be instructed that vegetables to be

eaten raw must be thoroughly washed, scrubbed or peeled before use.

Conclusion

In the light of these findings it seems reasonable to suggest that the moderately high temperature and very high humidity prevailing throughout most of the year in Shillong are ideal for the development of nematode eggs and their survival for a long time, which in turn could pose a serious risk of infection to the inhabitants. There is an urgent need to stimulate an awareness, understanding and appreciation of the relationship between these bio-hazards and human health in the area.

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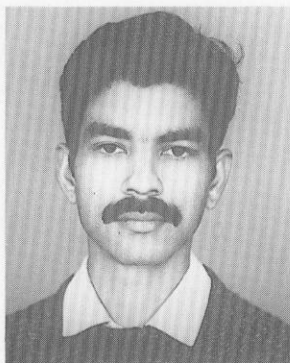
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