A STUDY ON THE STATUS OF HOOKWORM INFECTIONS IN HUMAN POPULATIONS IN MEGHALAYA (INDIA)

ABSTRACT

by

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SUBMITTED
in
FULFILMENT OF THE REQUIREMENT OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN ZOOLOGY

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Abstract

The present work incorporates a study on the status and epidemiology of hookworm infection in human populations of Meghalaya (North east India). The study aimed at (1) investigating the species composition of hookworm infections in human population in different climatic regions of Meghalaya, (2) evaluating the role of prevalent climatic and socio-economic factors and socio-cultural practices in transmission and dissemination of hookworm infections in the region and (3) ascertaining the anthelmintic efficacy of some indigenous traditional medicinal plants used by the natives for curing hookworm infections.

1. The prevalence of hookworm was ascertained in the rural areas of Nongkya, Sutnga and Williamnagar that are represented by the three tribal populations, the Khasis, the Jaintias and the Garos, respectively at different periods of the year, i.e., pre-monsoon (March - June), monsoon (July - October) and post-monsoon (November - February) period that relate to different climatic conditions prevailing through the year. While the inhabitants of Nongkya and Williamnagar mainly practice agriculture, those of Sutnga are involved in coal mining.

Direct smear and Kato-Katz thick smear methods were used for stool examination. Using a modified Harada-Mori filter paper strip culture method, the adult hookworms and all the infective larvae (L₃) retrieved from cultures of the positive samples of infected individuals were identified as belonging to Necator americanus.

The prevalence of hookworm infection in Nongkya was 7.29%, 8.94% and 9.17%; in Sutnga it was 38.14%, 39.85% and 40.14% and in Williamnagar it was 25.36%, 42.27% and 46.86% respectively during the three periods.
Between the two sexes, the prevalence was found higher among the females than the males in most of the cases. There showed no trend in the prevalence with regard to age, since in Nongkya the prevalence was highest (4%) in the age group 5-9 years in the monsoon period, Sutnga and Williamnagar showed highest (15.14% and 15.28% respectively) in the age group 10-14 years in the post-monsoon period respectively.

The infected individuals in all the three study sites were treated with mebendazole in the post-monsoon time. Three weeks post treatment the infection rate among them lowered down to 1.17%, 4.93% and 4.57% in all the three study areas respectively; however 5-7 months later it again showed an upsurge with prevalence being 4.23%, 6.97% and 8.41% among the three populations, respectively, and continued to be at the same or at slightly higher level during the next post-monsoon season.

Among the hookworm-infected subjects those individuals who defecated on public places and had no access to common water taps were more infected than those who possessed own latrines and had access to common water supply in all the three study areas and in all the three periods of study. Individuals of Nongkya working in agriculture showed higher prevalence than those working in animal farms but the trend was reversed in Williamnagar. However in Sutnga, the infected individuals were mostly those working in coal mines.

Among the environmental factors (soil, water, vegetables), soil was found to be the transmitting medium for hookworm infection in human population in all the three study areas.

2. Freshly passed out hookworm eggs from faeces of infected subjects were collected and cultured, following modified Harada-Mori filter paper strip and Charcoal culture methods in a BOD incubator at various temperatures (between 2 and 40°C) with relative humidity
(RH) of 55-60, 65-70, 80-85 and 85-90% (corresponding to the ambient climatic conditions in the study areas).

The optimal periods of development and hatching of eggs and development of L₃ larvae of human hookworm seemed to occur at warmer temperatures (22-28°C) and high humidity (RHI > 80%) which also favoured a longer period of survival of L₃ larvae. The present study suggests that the ambient climatic conditions of summer months in the rural sub-tropical, high rainfall area of Meghalaya are better suited for transmission and recruitment of infection as compared to cold winter months, when no development of eggs and hence no infective larvae would occur.

3. To ascertain the anthelmintic efficacy of putative medicinal plants used in traditional medicinal system in the region, Flemingia vestita, Stephania glabra and Trichisanthes multiloba were chosen, they being the most commonly used ones for the purpose. The crude extracts of the usable plant parts were tested on the hookworm model Ancylostoma ceylanicum.

Live A. ceylanicum from golden hamsters (Mesocricetus auratus) were collected in 0.9% phosphate buffered saline (PBS) and maintained at 37±1°C. The worms were exposed to various concentrations of the plant test materials, synthetic compound and nematocidal drug. Loss of motility, onset of paralysis and death time was taken as parameters. In-vitro treatment of the parasite (100 mg/ml) with the crude root extract of T. multiloba, rhizome pulp of S. glabra, rhizome peel of S. glabra, mixture of the crude extract of rhizome pulp of S. glabra and crude root extract of T. multiloba (1:1) and root tuber peel extract of F. vestita in PBS revealed complete immobilization of the parasite in about 7.46 h, 4.55 h, 4.13 h, 4.31 h and 8.31 h, respectively. Exposure of the parasite to genistein, the active principle of root tuber peel of F. vestita, at a concentration of 10 mg/ml caused spontaneous loss of movement (paralysis) in 0.56 h, which was faster than the time required for mebendazole, the reference nematocide.
Scanning electron microscopic observations revealed no seemingly visible changes in the surface cuticle features of worms treated with these extracts compared to the controls.

Of the plant tested in the present study, *S. glabra* rhizome peel, the root tuber peel of *F. vestita*, and concoction of extracts from *S. glabra* rhizome pulp and *T. multiloba* root showed a relatively quicker paralyzing effect on *A. ceylanicum*. Phytochemicals of these plants/ plant parts may thus be suggested to have a vermifugal (if not vermicidal) effect in respect of hookworms. The active principles of *S. glabra* rhizome pulp and *T. multiloba* roots needs to be analysed.

4. The observations made in the present study are supported by one figure of the map, eleven photo plates of light and scanning electron micrographs, and eight graphical bar figures (Figs. 1a-1b, 2a-2b, 3a-3b, 4 and 5). 235 references are cited.