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Intestinal Parasites in a Remote Village in Nepal

E. G. ESTEVEZ,[1,2]* JUDITH A. LEVINE,[1] AND J. WARREN[2]

Clinical Microbiology Laboratories[1] and The School of Medicine,[2] Duke University Medical Center, Durham, North Carolina 27710

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Stool samples for parasitological examination were collected in a remote area of western Nepal. Of 40 specimens collected, 36 were positive for parasites as determined by examination of direct wet mounts and trichrome smears. All but one of the positive specimens contained several parasite species, averaging four species per specimen. Four negative specimens were found in infants under 1 year of age. The parasitic burden in this population appeared to be high, and the prevalence of parasitic infection approached 100%.

It is common knowledge that many inhabitants of third world areas may be heavily colonized with parasites. A recent expedition, sponsored by the Woodlands Institute and Johns-Hopkins University School of Hygiene and Public Health, to a remote district of Nepal explored the medical and public health needs of the region. Of 10 American medical students in the group, 1 (J.W.) attended Duke University School of Medicine, Durham, N.C. Three physicians, 1 dentist, 1 nurse, and native porters completed the group. The westernmost district of Nepal is an area in which no surveys of parasites have been made.

A temporary medical clinic was established in the village of Dhungar, which is located on the Seiti River. This area of western Nepal is semitropical and at an elevation of 2,500 ft (762 m); Dhungar has a population of 390, mostly Hindu. The local diet consists mainly of lentils and rice, combined with various other vegetables. All water is obtained from the Seiti River.

During medical examinations in the clinic, stool specimens were collected from patients with diarrhea or a history of abdominal pain or both. Each of the 45 specimens was placed in a small vial containing either 10% Formalin or polyvinyl alcohol fixative. These preservatives were provided, along with other laboratory materials, by our laboratory. Five of the specimens obtained were from expedition members and were not included in our data.

Field examination of stools was done with direct saline wet mounts and iodine wet mounts, which were examined with a MacArthur field microscope. Preserved specimens returned to our laboratory were examined independently by two persons. Because the area surveyed was inaccessible except after several days of travel on foot, severe load restrictions were observed for supplies and materials, and only very small samples (0.25 to 0.50 ml) could be brought back to our laboratory. Standard concentration methods are not suitable for such small samples and could not be used. Wet mounts for direct examination were prepared from the Formalin-preserved feces, and permanent mounts were prepared from the polyvinyl alcohol-preserved feces by the Wheatly trichrome method (2).

One stool sample from each of the 40 patients, approximately 10% of the population, was examined for parasites. Of the 40 specimens, 36 were positive for parasites; the 4 negative specimens were from infants under one year of age. Of the 36 positive specimens, 35 contained several parasite species, averaging four species per positive specimen. Distribution of parasites by patient age was as follows: of 5 patients under 1 year of age, only 1 yielded an organism; all 9 patients between 1 and 20 years of age yielded organisms, averaging 2.9 parasite species per patient; all 24 patients between 21 and 70 years of age also yielded organisms, averaging 4.7 parasite species per patient. Two patients of unknown age also yielded organisms, averaging 4.4 parasite species each. It is perhaps surprising that 90% of these samples were positive upon direct examination alone. This would indicate that the parasitic burden in infected individuals is high and that the infection rate in this population may approach 100%.

Epidemiologically, the parasites found (Table 1) could be divided into two large groups: waterborne protozoa, both commensals and pathogens, and soil-associated helminths commonly found in tropical and subtropical climates.

Due to lack of sanitary facilities, the adults of Dhungar defecate in or near the Seiti River. This practice is also common among others living along the Seiti River. As mentioned previously, the river is the only available source of water.

Hookworm, the most prevalent parasite in

TABLE 1. Rank order of parasites

Parasite	No.[a] (%) positive
Hookworm	30 (83.3)
Iodamoeba bütschlii	28 (77.8)
Entamoeba coli	27 (75.0)
Ascaris lumbricoides	19 (52.8)
Endolimax nana	17 (47.2)
Entamoeba hartmanni	9 (25.0)
Entamoeba histolytica	5 (13.9)
Giardia lamblia	4 (11.1)
Trichuris trichiura	2 (5.5)
Strongyloides stercoralis	2 (5.5)
Enterobius vermicularis	1 (2.8)

[a] Total number of specimens, 36.

this survey (Table 1), and *Strongyloides* spp. are helminths that infect by penetrating the skin. The villagers either have no footwear or wear thong-type sandals which afford poor protection against skin-penetrating parasites, especially in muddy conditions. In addition, children, dogs, and other domestic animals defecate randomly throughout the village. Dogs are known to serve as reservoirs of *Strongyloides* spp. and to aid in the dissemination of hookworm eggs by eating infected feces and passing the undigested eggs in their own feces (1). Transmission of other helminths is aided by generally poor hygiene and by the use of contaminated water. One of five specimens from patients under 1 year of age contained a parasite, *Giardia lamblia*. Infants may be exposed less to infection since Nepali women wean their offspring between the ages of 6-months and 1 year. There appears to be a rapid increase in the number of parasitic infections as the children become more mobile. An increase in parasitic multiplicity was also noted after age 20; however, no obvious cause could be determined for this effect.

Relatively simple measures could be instituted to reduce exposure to parasitic infections in this population. Safe drinking water could be obtained from wells or from boiling all water. Use of latrines would prevent contamination of soil and water supplies. Until these measures can be taken, improvement in footwear may decrease the transmission of skin-penetrating nematodes. Finally, education in sanitary practices is the key to the reduction of gross parasitism in areas where this problem exists.

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