

ABSTRACT

Studies of the epidemiology of intestinal parasitic infections in a Jamaican community

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The majority of intestinal helminthic infections are attributed to *Trichuris trichiura*, *Ascaris lumbricoides*, hookworms and to some extent, *Strongyloides stercoralis*. They are found mostly in tropical communities and are responsible for significant morbidity and mortality in the Caribbean. Also of increasing interest and importance is the bacterium, *Helicobacter pylori*, which has been found to be associated with both duodenal and gastric ulcers disease. Various modes of transmission have been reported, the two main ones being faecal-oral and oral-oral.

The epidemiology of the 5 intestinal infections was studied from a random sample of yards. A total of 41 yards were selected which accommodated 62 households. Of the 346 individuals contacted, 228 gave either a blood or stool sample; 202 (88.6%) gave a stool sample and 219(96.1%) gave blood. Of the 214 fully compliant individuals, more than 50% of the population was less than 20 years old and the ratio of males to females was 1:1.4.

Individuals were studied by examination of a single stool sample (formol-ether concentration) for eggs of *T. trichiura* and *A. lumbricoides* and larvae of hookworms

and *S. stercoralis*. Enzyme-linked Immunosorbent Assays for *S. stercoralis*-specific IgG and *H. pylori*-specific IgG was also carried out. In addition, environmental factors of households and personal data of individuals in households were collected by questionnaire.

The prevalence of *T. trichiura*, *A. lumbricoides* and hookworms based on stool examination was 20.8%, 5.0% and 1.0% (n=202), respectively. Larvae for *S. stercoralis* was found in only one individual who was also serologically positive. The seroprevalence of *S. stercoralis* and *H. pylori* was 17.8% and 69.9% (n=219), respectively.

There was a significant difference in the age of persons who were passing eggs of *T. trichiura* (ANOVA, F-ratio=18.47; P<0.0001) but not statistically significant in *A. lumbricoides* (ANOVA, F-ratio=2.59; P=0.11) and hookworms (ANOVA, F-ratio=0.37; P=0.55). The relationship between the prevalence plot for *S. stercoralis* based on ELISA was not statistically significant with age (ANOVA, F-ratio=1.13, P=0.29) however, the relationship between prevalence of *H. pylori* was found to be statistically significant with age (ANOVA, F-ratio=5.13; P=0.025).

The prevalence of all 5 parasitic infections was not sex-related (after Yate's correction): *T. trichiura* ($\chi^2=1.16$; P=0.28), *A. lumbricoides* ($\chi^2=0.028$; P=0.87), hookworms ($\chi^2=0.00$; P=1.00), *S. stercoralis* ($\chi^2=0.012$; P=0.912) and *H. pylori*

($\chi^2=0.107$; $P=0.74$).

ANOVA of the full regression revealed that the relationship between the age and the intensity of the parasitic infection was not found to be significant with all five parasite species except *H. pylori*. In the case of *T. trichiura* ($R^2=5.23 \times 10^{-4}$; F-ratio=0.095; $P=0.76$), *A. lumbricoides* ($R^2=1.03 \times 10^{-3}$; F-ratio=0.19; $P=0.67$) and hookworm ($R^2=1.94 \times 10^{-3}$; F-ratio=0.36; $P=0.55$), the intensity of infection was measured indirectly by counting the number of eggs present per gram of stool sample examined. In the case of *H. pylori* ($R^2=0.099$; F-ratio=23.17; $P<0.0001$) and *S. stercoralis* ($R^2=0.014$; F-ratio=3.03; $P=0.083$), the intensity of infection was based on the optical density (OD) values obtained from the ELISA.

Univariate (ANOVA) analysis revealed household use of an outside water supply (F-ratio=7.28; $P=0.01$), use of a non-functioning/ pit toilet (F-ratio=4.16; $P=0.048$), the presence of goats (F-ratio=6.13; $P=0.018$), and a high household prevalence of finger sucking ($R^2=0.28$; F-ratio=16.06; $P=0.0003$) and, surprisingly, a high household prevalence of fits ($R^2=0.111$; F-ratio=5.102; $P=0.029$) as potential risk factors for infection with *T. trichiura*.

Associations between the high household prevalence of *A. lumbricoides* and the presence of goats (F-ratio=10.00; $P=0.003$) and the high prevalence of finger sucking in households ($R^2=0.19$; F-ratio=9.86; $P=0.003$) were found to be statistically

significant.

On the other hand, no associations were found between the high household prevalence of hookworm and the various environmental, demographic and personal data.

ANOVA revealed statistically significant associations between *H. pylori* seroprevalence in households and use of an outside water supply (F-ratio=11.41; $P=0.0016$), use of a non-functioning/pit toilet (F-ratio=4.25; $P=0.046$), ownership of cats (F-ratio=7.21; $P=0.01$), and a high household prevalence of wheezing ($R^2=0.131$; F-ratio=6.16; $P=0.017$) and asthma ($R^2=0.122$; F-ratio=5.68; $P=0.022$).

In comparison, a strong association was found between only an increase in the number of persons per bedroom (F-ratio=11.802; $P=0.0014$) and the high household prevalence of *S. stercoralis*.

Multiple Regression Analysis (MRA) revealed that a high percentage prevalence of *T. trichiura* in households and also *A. lumbricoides* were independently associated with a high household prevalence of finger-sucking - $R^2=0.174$; $t=4.008$; $P=0.0003$ and $R^2=0.174$; $t=3.141$; $P=0.0031$, respectively. A high percentage prevalence of *S. stercoralis* was independently associated with an increase in household crowding ($R^2=0.48$; $t=4.668$; $P<0.0001$), the absence of a fence ($R^2=0.48$; $t=2.691$; $P=0.011$),

and was surprisingly, negatively associated with the presence of cats in households ($t=-2.387$; $P=0.022$) and the high percentage of unwashed hands in households ($t=-3.994$; $P=0.0003$). Significant associations were also found between high household seroprevalence of *H. pylori* and the ownership of cats ($R^2=0.446$; $t=2.78$; $P=0.0084$), having an outdoor water supply ($t=3.225$; $P=0.0026$), and the high percentage prevalence of wheezing in households ($t=3.119$; $P=0.0035$). Although not found to be statistically significant, the relationship between the high household prevalence of *H. pylori* tended towards a high prevalence of males in households.

Canonical Correspondence Analysis (CCA) revealed strong associations between poor sanitation, ownership of animals and household prevalence of *T. trichiura*, *A. lumbricoides* and hookworms and less strongly with *S. stercoralis* and *H. pylori*. A strong correspondence also occurred between a high prevalence of *T. trichiura*, *A. lumbricoides* and hookworms and being of a younger age. Prevalence of *S. stercoralis* strongly corresponded with household crowding while *H. pylori* was strongly associated with certain clinical symptoms such as an unexplainable bellyache.

Therefore, the analysis show that transmission of *T. trichiura* and *A. lumbricoides* in Jamaica, is likely through poor sanitation and hygiene, for *S. stercoralis* by the increase in close person-person contact and for *H. pylori*, the possibility exists that transmission is mainly through the faecal-oral route and environmental and zoonotic reservoirs may play a role in spread of infections at the community level.