PREVALENCE OF INTESTINAL WORM INFECTIONS AMONG PRIMARY SCHOOL CHILDREN IN NAIROBI CITY, KENYA

Mutuku A. Mwanthi¹, Mary K. Kinoti¹, Annah W. Wamae¹, Maryann Ndonga², Prescilla S. Migiro³

Abstract

Objective: The main objective of the study was to determine the prevalence of total, single and multiple intestinal worm infections among the primary school children in Nairobi City.

Methods: A cross-sectional descriptive study was used to determine the status of intestinal worm infections whose subjects were drawn from eight city administrative divisions. Proportional random sampling method to select forty five (45) schools out of 320 public, private and non-formal schools was used. Using the school enrolment register for standard 3 and 4, fifty (50) pupils per school were selected to participate in the study. Quantitative data from the study subjects were collected by use of a structured questionnaire. In addition, stool specimens were collected from each study subject and examined by Kato-Katz laboratory method.

Results: The four intestinal worms investigated constituted a total prevalence of 12.9%. This prevalence was found to be lower than that in two other previous studies. A. lumbricoides had the highest prevalence and S. mansoni had the lowest. Prevalence of single worm infections constituted 8.6% of the total prevalence. Differences in prevalence between males and females were observed only with respect to T. trichiura and hookworm species. Fourteen to sixteen (14-16) and 11-13 years of age groups had the highest total prevalence of 47% and 36.6% respectively. Differences in prevalence were not found among the school categories with exception of T. trichiura infections.

Conclusion: Prevalence of total, single and multiple infections showed a downward trend when compared to the previous studies with Ascaris lumbricoides persisting with the highest prevalence.

Key Words: Intestinal worms, infections, school children, Nairobi City

Introduction

The burden of disease caused by soil-transmitted intestinal worms is a major public health problem. The worms comprise Ascaris lumbricoides (A. lumbricoides), Trichuris trichiura (T. trichiura) and Hookworm species (spp) among others (1). Unfortunately, more than one third of the world’s population and particularly children have the highest rates of intestinal worm infections (2).

Indeed, it has been estimated that children aged 5-14 years in low income countries, intestinal worms infections account for 12% of the total disease burden(3). About 20% of disability adjusted life years (DALY’s) lost due to communicable disease among school children are a direct result of intestinal nematodes. In 1999, World Health Organization estimated that these infections represented more than 40% of the disease burden from all tropical diseases excluding malaria (4).

Most of the worms spend part of their life cycles in either animals, rodents or human beings and cause infections. These types of worm infections, if untreated or controlled adversely affect the children’s cognitive development, learning abilities, nutritional status and result into other health problems (5, 2).

The City Council of Nairobi, school health programme aims at meeting the WHO’s target of delivering regular anti-helminthic treatment to at least 75% of school-age children by the year 2010 (2). The Council’s de-worming school health programme appears unlikely to meet the target because it is neither co-ordinated nor comprehensive enough. Secondly, the school health programme does not seem to target all the environmental and behavioural risk factors.

Indeed, interventions which take into account all the relevant multi-factors that contribute to transmission of the worms are likely to reduce the prevalence of worms among the school children and communities at large. The overall objective of the study was to determine the prevalence of the intestinal worm infections among the primary school children in Nairobi City.

Methodology

Study design

This was a cross-sectional involving of the primary school children population in the City of Nairobi.

Study area and population

Study subjects were recruited from the eight administrative divisions in the City of Nairobi. The study subjects were standard 3 and 4 pupils randomly selected from a total population of 63,200 primary school children.

Sample size

Assuming that the prevalence of soil transmitted intestinal worm infections to be 30%, the EPIINFO statistical programme was used to calculate the sample size of 2,250 pupils from the 320 primary schools in the city of which 216 were public, 58 private and 66 non formal.

Ethical Considerations

About a month before commencement of the study, a stakeholders meeting was held. The major stakeholders represented in the meeting were Ministry of Health, researchers and both the Education and Health Departments of the City Council of Nairobi. In addition, a
day before data collection, each pupil recruited in the study was issued with a consent letter to take to her or his parent requesting for the parent’s consent. The parents who consented were required to confirm by signing the letter.

**Data collection**

A pilot–tested questionnaire was used to collect socio-demographic data and school categories of the study subjects. Stool specimens were collected from the study subjects and analysed by the recommended laboratory methods (6, 7, 8).

**Data analysis**

Statistical Package for Social Sciences (SPSS) was used for data analysis. Cross-tabulations, frequencies and chi-squared tests were performed on the data to determine prevalence of total, single and multiple worm infections. Chi-squared tests were performed to determine whether the differences between divisions, school category, age and gender were statistically significant.

**Results**

Although 45 primary schools had been selected for the study, only 39 schools participated with 32, 5 and 2 from the public, private and informal categories respectively. The study targeted a sample of 2,250 subjects, however, only 1632 study subjects had complete data. This represented a 72.5% response rate.

**Socio-demographic characteristics of the study population**

Majority (80%) of the study participants were in 8 – 10 years age group with a mean age of 9.3 years. About 48.5% were males while 51.5% were females. Those in public schools constituted 78.1% while 16.3% and 5.6% were in private and non-formal schools respectively.

**Intestinal worm prevalence**

Total prevalence of intestinal worm infections in the City of Nairobi was found to be lower than that in two other previous studies in the city (9, 10). This declining trend is not a common feature in all African urban areas because similar urban studies conducted in Nigeria, Sudan, and Uganda demonstrated higher prevalence (11, 12). The four intestinal worms investigated constituted a total prevalence of 12.9% of which *A. lumbricoides* was the most prevalent followed by *T. trichiura* (Table 1). Similarly, among the public schools, pupils with *A. lumbricoides* represented 6.4% as the highest prevalence compared to *T. trichiura*, Hookworm spp and *S. mansoni* whose prevalence were 4.6%, 0.1% and 0.4% respectively (Table 1). The trend of prevalence of infections in private and non-formal schools was similar to that in public schools. Although, the prevalence of *A. lumbricoides* was notably high (9.0%) in the non-formal schools, it was also noted that the non-informal schools had the highest prevalence of *T. trichiura* and *A. lumbricoides* but that was not the case with Hookworm spp and *S. mansoni* (Table 1). Statistically, there was a significant difference in *T. trichiura* prevalence among the school categories (p=0.004). However, prevalence in *A. lumbricoides* (p=0.081), Hookworm spp (p= 0.094) and *S. mansoni* were not statistically significance.

Overall, among the four types of worm infections, *A. lumbricoides* represented the highest (6.5%) total prevalence in all age strata while *T. trichiura* represented the second highest (5%) total prevalence across the age strata. There were only 6 cases of *S. mansoni* out of the 1627 specimens and that translated into the lowest total prevalence (0.4%) among the types of worms and the age strata (Table 2). From the same table 2, the 14 – 16 years age stratum had the highest (26.3%) prevalence of *A. lumbricoides* while 11-13 age stratum had the highest prevalence (14.1%) of *T. trichiura*. The 14-16 age strum had the highest prevalence of Hookworm spp, although in the more than 16 years stratum, there was only one case with Hookworm spp while the other one was negative resulting into a prevalence of 50%. Among the all the age groups and types of worm infections, cases of *S. mansoni* were the least, with a prevalence of 0.8% and 0.3% in 11-13 and 8-10 age strata respectively.

Out of 178 pupils with intestinal infections, 140 (78.7%) had single infections with the prevalence among the males being about one and half times higher than among the females. Similarly, males had almost twice the prevalence rate of the females for 2 and 3 infections (Figure 1).

<table>
<thead>
<tr>
<th>School Category</th>
<th>A. lumbricoides</th>
<th>T. trichiura</th>
<th>Hookworm spp</th>
<th>S. mansoni</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-ve</td>
<td>+ve</td>
<td>% +ve</td>
<td>-ve</td>
<td>+ve</td>
</tr>
<tr>
<td>Public N = 1271</td>
<td>1190</td>
<td>81</td>
<td>6.4</td>
<td>1127</td>
<td>58</td>
</tr>
<tr>
<td>Private N = 266</td>
<td>256</td>
<td>10</td>
<td>3.8</td>
<td>257</td>
<td>9</td>
</tr>
<tr>
<td>Informal (n=91)</td>
<td>82</td>
<td>9</td>
<td>9.0</td>
<td>79</td>
<td>12</td>
</tr>
<tr>
<td>Total (n=1632)</td>
<td>1528</td>
<td>100</td>
<td>6.5</td>
<td>1553</td>
<td>79</td>
</tr>
</tbody>
</table>
Table 2: Prevalence by Age Strata and Type of Worm Infections (n=1627)

<table>
<thead>
<tr>
<th>Age</th>
<th>A. lumbricoides</th>
<th>T. trichiura</th>
<th>Hookworm spp</th>
<th>S. mansoni</th>
<th>Total Prev%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;8 yrs</td>
<td>86 (+5.5%)</td>
<td>90 (11.1%)</td>
<td>90 (11.1%)</td>
<td>91 (0%)</td>
<td>7.7%</td>
</tr>
<tr>
<td>8-10 yrs</td>
<td>1206 (4.8%)</td>
<td>1230 (3.2%)</td>
<td>1260 (0.3%)</td>
<td>1263 (0.3%)</td>
<td>9.2%</td>
</tr>
<tr>
<td>11-13 yrs</td>
<td>219 (11.7%)</td>
<td>213 (14.1%)</td>
<td>238 (4.6%)</td>
<td>246 (0.8%)</td>
<td>38.6%</td>
</tr>
<tr>
<td>14-16 yrs</td>
<td>14 (26.3%)</td>
<td>17 (10.5%)</td>
<td>19 (0%)</td>
<td>0 (0%)</td>
<td>47.3%</td>
</tr>
<tr>
<td>&gt;16 yrs</td>
<td>2 (0%)</td>
<td>1 (50%)</td>
<td>2 (0%)</td>
<td>0 (0%)</td>
<td>50%</td>
</tr>
<tr>
<td>Total</td>
<td>1627 (10%)</td>
<td>1552 (77%)</td>
<td>1622 (10%)</td>
<td>1642 (6%)</td>
<td>12.9%</td>
</tr>
</tbody>
</table>

Footnote: ( ) Values in parenthesis mean prevalence (percentage)

Figure 1: Prevalence of Single and Multiple Infections by Sex (n=178)

The findings of this study were compared with two other studies previously carried out 1972 (9) and 1986 (10) respectively (Figure 2). The results demonstrate a decreasing trend in each type of intestinal worm infection.

Discussion

The low prevalence in the City of Nairobi suggests that there were activities targeting control or reduction of intestinal worm infections among school children. Obviously the NCC de-worming programme and possibly the parents’ efforts.

Although the total prevalence showed a declining trend, it did not appear to be the case with the single infections which indicated that *A. lumbricoides* had the highest prevalence (6.1%). This was contrary to the sub-Saharan Africa data which indicated that Hookworm *spp* had the highest (46.9%) prevalence. However, low prevalence (1.5%) of Hookworm *spp* in the City of Nairobi concurs with the Kampala City study (12.9%), (12).

In Nairobi 8-10 years age group had the highest prevalence of intestinal worm infections contrary to the sub-Saharan prevalence data where the highest (46.9%) infection prevalence among children above 15 years of age.
Conclusions

Although there is a high prevalence of infections in the 14-16 age stratum, this represents only a small (1.2%) proportion of the study population. Overall, the burden of whether single or multiple intestinal worm infections in Nairobi City primary school children demonstrates a continual declining trend since 1972. The declining trend appears to be due to the de-worming and socio-economic status factors.

Coverage and periodicity of the de-worming programme need to be comprehensive and intensified particularly among public and informal schools where the infections were demonstrated to be higher than in the private schools.

Recommendations

The City Council of Nairobi in conjunction with all the other stakeholders should scale up and continue with the de-worming programme and incorporate monitoring. The City Council should target more on pupils who are in public and non-formal schools where the prevalence of intestinal infections were found to be highest paying special attention to the latter categories of schools.

In addition, there is need for integrated approach in the improvement of water supply and sanitation with a view to reducing transmission and the incidence of intestinal worm infections. Education on personal hygiene practices in primary schools should take a centre stage as a long term solution to this public health problem.

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Reference


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