



Prevalence of Intestinal Helminthiasis in Children of Silvercity, Linden (Guyana)

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Authors' contributions

This work was carried out in collaboration between both authors. Author JAM designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors JAM and AAA managed the analyses of the study. Author JAM managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

This study was conducted in the Silvercity area, Linden (Guyana) and endeavored to determine the prevalence of intestinal helminthiasis in children aged 5-15 and the level of awareness of these parasitic infections among community members. Questionnaires were distributed to 30 households and 26 children from the population aged 5-15 years were selected using a simple random sampling method and tested during the months of February-April 2017 using the fecal wet mount and formalin ether sedimentation method. The mean age was 8 years. The results showed that 15 of 26 children were infected by helminths within the Silvercity area. Among the parasites found, *Ascaris lumbricoides* were greater in number (n =10) followed by *Enterobius vermicularis* (n = 5), *Trichuris trichiura* (n = 4) and hookworm (n =1). Study also found that the level of awareness of transmission among community members was 40%.

Keywords: Helminth; Linden; children; diagnosis; age.

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1. INTRODUCTION

Parasitic helminthes are the most common infectious agents of humans in developing countries and usually belong to the class Nematoda, Cestoda and Trematoda. Among these, class Nematoda contains the most common intestinal parasitic helminthes worldwide. These include: the soil transmitted helminthes along with *Enterobius vermicularis* [1]. The soil transmitted helminthes alone account for 2 billion infections worldwide of which 880 million are children [2]. Intestinal parasitic infections affects human health especially among school going children in Africa followed by Asian, Latin American and Caribbean regions. Poor personal hygiene, sanitation and availability of clean water are main reason associated with distribution of intestinal parasitic infections [3,4]. A tremendous amount of research has been conducted in these areas on the prevalence of intestinal helminths, particularly in Africa and Asia and a few Latin American and Caribbean countries. It was found that prevalence in most of the Latin American and Caribbean countries studied is high and 35.4 million school age children are estimated to be at risk of infections by soil-transmitted helminths in these areas [5]. Prevalence rates for these countries include: Columbia, in which there is an 84% prevalence [6], 89.6% in Argentina [7], 93 % in Nicaragua [8] and 43.5% in Guyana [9]. The sole study conducted in Guyana is not enough to make an estimate on the national prevalence and it is therefore evident that further studies should be conducted since the prevalence rates for Guyana is expected to be high based on its climate and developing status [5]. The specific species prevalence rates for soil transmitted helminthes in Latin America and the Caribbean sees *Trichuris trichiura* being the most prevalent with an overall prevalence of 19% and approximately 100 million persons infected. This is followed closely by *Ascaris lumbricoides* with a prevalence of 16% infecting more than 80 million people and Hookworms with the lowest prevalence rate at 10% infecting about 50 million people [10].

The morbidity caused by intestinal helminthes is related to worm intensity and the global burden of its diseases exceeds that of malaria and tuberculosis [1]. Untreated helminthic infections can result in chronic inflammatory disorders that cause both concurrent and delayed onset pathology in the affected host [11,12]. These infections often lead to insidious persistent health

conditions such as anemia, stunted growth and reduced physical fitness, under-nutrition, fatigue and impaired cognitive development [13]. The subtle appearance of these morbidities causes them to be often overlooked and neglected. However, due to the rising prevalence of helminthic infections in rural areas where health impairment is greatly magnified in terms of deterioration of individual patient performance status, these diseases are of great importance [14]. Infections have been linked to social and economic development. Prevalence is often related to factors such as poverty, overcrowding, poor environmental conditions, lack of awareness and access to safe water [15]. Of these factors, poverty is the most commonly associated with infection. According to [16], helminthic infections are common in people who live on less than US \$2 per day in Asia, Sub-Saharan Africa and the Americas. This study aimed to determine the prevalence of intestinal helminthiasis in children and the level of awareness about the helminthiasis among community members.

2. MATERIALS AND METHODS

Linden (study area) is the second largest town in Guyana after Georgetown, and capital of the Upper Demerara-Berbice region, located at 6°0'0"N 58°18'0"W, altitude 48 metres (160 feet). It was declared as a town in 1970, and includes the communities of MacKenzie and Wismar. It lies on the Demerara River and has a population of roughly 29,298 [17]. There are regular deworming programs for children at school regulated by Ministry of Health through WHO and Pan American Health Organization. Various health regulated awareness programs are conducted some times on sanitation practices and provision of safe drinking water. But still there are short coming in follow-up and continuous monitoring.

This study was conducted during January-April, 2017. Phase one which included the distribution of questionnaires and the collection of stool samples was conducted during the 23rd to 29th of January 2017 in Silvercity, Linden. Members from thirty households with children aged 5-15 years were asked to complete a questionnaire in order to determine their level of awareness of the transmission of intestinal parasites and to collect the baseline data (Questions were on awareness of helminthiasis transmission, personal hygiene, sanitation and safe drinking water). Twenty-six children aged 5-15 years were then randomly for

screening of intestinal helminths. Signed consent was received from each parent for the collection of samples. Each container was labeled with the age and gender of the child. Collected samples were preserved in 10% formalin and stored in a dry, cool place until they were ready to be transported to the University of Guyana laboratory for screening. Two methods were employed for the laboratory detection of intestinal helminthes: the formalin ether sedimentation method and the fecal wet mount method. Both methods were done in triplicates to ensure accuracy and consistency. The laboratory procedure for the formalin ether sedimentation method as directed by the [18]. During observation, pictures were taken of helminthes identified along with size recordings which were be used to identify them using lab manuals [18]. Data was analyzed using the Fisher Exact test and Chi-square test (Microsoft Excel 2016).

3. RESULTS

The results in the present research showed that 15 out of 26 children tested had intestinal helminthiasis. Male infections rates were slightly higher (n = 8) than females (n = 7) however Fisher Exact test (p=0.4527) revealed that there was no statistical significance (Table 1).

Table 1. Frequency of helminthiasis according to gender within the study area

Gender	Number infected
Male	8
Female	7
Total	15

Ascaris lumbricoides accounted for 10 cases out of the total infections followed by *Enterobius vermicularis* (5 cases), *Trichuris trichiura* (4 cases) and hookworm (1 case) which is statistically significant (p=0.0384). These are the most prevalent species in Guyana.

The gender distinction showed that frequency in male was slightly higher (n = 3) than females (n = 2) as seen in Table 2, but Fisher Exact test revealed that there was no statistical significance (p=0.6348). It was also observed that 5 of the children tested had a double infection. The combination of *Ascaris lumbricoides* and *Enterobius vermicularis* was the most prevalent accounting with 3 cases. Other double parasitism included *Ascaris lumbricoides* + *Trichuris trichiura* and *Trichuris trichiura*+ hookworm which was similar with 1 case for each.

Table 2. Distribution of double infections among males and females

Gender	Number infected with double infection
Male	3
Female	2
Total	5

The difference in the frequency among different age groups in the study population which was found to be the statistically not significant (p=0.5981). Younger age group (5-7) had the highest prevalence (n = 8) followed by the 8-10 (n = 4) and 11-15 (n = 3). Questionnaire data revealed that only 40% (18 out of 30) of the community members interviewed were aware of intestinal helminthiasis.

4. DISCUSSION

This cross sectional study was the first of its kind to be conducted in the Silvercity area, Linden and the second to be conducted in Guyana to the knowledge of the researcher. The results showed that 15/26 (57.6%) of the children tested were infected with at least one helminths and 5/26 (19%) had double infections. This is similar to results obtained from a similar study conducted by [9]. In this study, *Ascaris lumbricoides* was found to be the most prevalent parasite. Despite the fact that male prevalence rates were slightly higher than females, there was no statistical significance. The same trend was observed for double infections. This was expected due to the likelihood of both males and females being engaged in the same activities and exposed to the same risk factors. Studies conducted by [9] and [19] produced similar results.

Statistical analysis showed that the prevalence of each of the different helminthes across the study population is significantly different (p=0.0384). *Ascaris lumbricoides* was the most prevalent followed by *Enterobius vermicularis*, *Trichuris trichiura* and hookworm the least. This could be because of poor sanitation practices including personal hygiene inspite of programmes conducted by Ministry of Health from time to time. Probably more thrust is required at awareness, implementation and follow up of various programmes. Intestinal worm infections specially soil transmitted helminth affect two billion people worldwide in tropics and subtropics including Guyana. Main species are *Ascaris lumbricoides*, *Trichuris trichiura* and Hookworms. However maximum cases reported are due to

Acariasis [20]. This result contrasts with a similar study conducted by [9] in which hookworm was the most prevalent species. This may be as a result of a difference in environmental conditions. It has also been observed by [21], that hookworm infections are more prevalent in adults than in children. This may also explain why the prevalence in this study was so low. The prevalence of *Enterobius vermicularis* found in this study cannot be accurately stated because only a small portion of patients stool shows the presence of eggs in the stool [22].

Statistical analysis also revealed that there is an age dependent relationship as prevalence decreased as age increased. It was found that greater prevalence was found in the youngest age group and prevalence gradually decreased as age increased. A similar relationship was also found by [23]. This is supported by earlier studies that young children are vulnerable to helminth infections as they can harbor heavy infections due to smaller body size and are less able to handle the worm burden. They are also exposed to higher risk factors of anemia and malnutrition. The conditions in tropical climate with warm and moist climate with added pressure of cluster sanitation and health hygiene practices compound the problems further [9].

Questionnaire data showed that only 40% of community members in this study were aware of the transmission of intestinal helminthes. [24] found that a low rate of awareness coupled with lack of healthcare and diagnostic facilities makes those in poor communities more susceptible to disease and illnesses caused by helminth infections. This study highlighted the fact the intestinal parasitic helminths are present in children of the Silvercity community and the knowledge of transmission is low which may be a contributing factor to infection. It is essential for young children to be in optimal health so as facilitate the development of healthy bodies and minds. Therefore it is necessary to combat these infections through the combined efforts of government and the community by increasing education, improving sanitation and regular deworming.

5. CONCLUSION

From the above study it can be concluded that majority of intestinal infections are related to *Ascaris lumbricoides* rather than *Enterobius vermicularis*, and *Trichuris trichiura*. Though various types of experiments are followed in this

regard but still it cannot be judged whether the affected people have enough awareness about these helminthic infections. Poor level of awareness sometimes hinder the concern about the preventive measures of infections.

6. LIMITATION

The following cross sectional study was done with only 15 samples as the matter of prospect is very integrative in nature and need more time to avail. So in this particular study 15 sample sources are taken to ensure the objective of the research.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

DISCLAIMER

This manuscript was presented in the conference name "UG represented at the McNair Scholars Research Conference" available link is "<https://www.kaieteurnewsonline.com/2017/10/21/ug-represented-at-the-mcnair-scholars-research-conference/or> <http://www.uog.edu.gy/tags/research> "Date Oct 19, 2017- Oct 21, 2017", "University of Guyana".

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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