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Prevalence and Intensity of Gastro-Intestinal Helminthiasis Among School Age Children in Nkondjock, Littoral-Cameroon

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Abstract: Gastro-intestinal helminthiasis is an infection which affects at least one person in two in the world and mainly school age children. Our study was conducted with the objective of determining the prevalence and intensity of these infections among pupils in Nkondjock Sub-Division. So, 417 faecal specimens randomly collected from 185 (44.3%) boys and 232 (55.6%) girls were examined, following physical flotation method (Willis's technique) for qualitative analysis and the numeration method (Stoll's method) for quantitative analysis. An overall prevalence of 24.5% was observed in the entire population. Three species of gastro-intestinal helminths were identified, principally geohelminths (STH) such as *Ascaris lumbricoides* (12.0% and 975.00 ± 643.35 epg) which was the most common, followed by Hookworm (*Ancylostoma duodenale* or *Necator americanus*) (9.4% and 970.59 ± 578.81 epg) and lastly *Trichuris trichiura* (4.1% and 833.33 ± 452.82 epg). Multiple helminthic infection were recorded with *Ascaris lumbricoides* + *Trichuris trichiura* (0.50%) having the highest prevalence among the children. Gastro-Intestinal helminths were most predominant among children aged 16-20 years (44.2%) than those within age group 11-15 years (17.1%). Boys were more infected (27.0%) than girls (24.2%) without a difference statistically significant. This study shows that the prevalence of infection may not be influenced by age and sex and, education of the population on hygienic habits and periodic deworming programme should be done routinely as this would reduce prevalence and intensity of intestinal worm infection among school children.

Keywords: Prevalence, Intensity, Gastro-Intestinal Helminthiasis, School-Age Children, Geohelminths, Nkondjock, Littoral-Cameroon

1. Introduction

Gastro-intestinal helminthiasis represents one on the most common problem of the public health in the world "[6], [37]" and like lymphatic filariasis, they are integrated in the programme initiated by World Health Organization (WHO) to fight against neglected tropical diseases (NTD), principally in developing countries "[35]".

They are chronic diseases "[12]" that is, the primary manifestation hides their gravity. These infections affect individual of the two sexes (both boys and girls) and all age group, having a negative consequences on their productivity during the greatest period of activity "[12], [31]", principally school age children where they could induce susceptibility to other infection, backwardness, brain lost, morbidity and death "[7]". According to Phuong Nguyen *et al* (2006), more than 450 million school age children would be morbid and 155 000 would die every year in the world. It is estimated that in Latin America and the Caribbean at least 13.9 million preschool age and 35.4 million school age children are at risk of infections by soil-transmitted helminths "[29]" where they are *Ascaris lumbricoides, Trichuris trichiura* and hookworms "[18]".

Helminthic infections are generally encountered in the tropical regions where climatic conditions are favorable for the development of parasites, associated to poor hygienic habits, lack of water, multiplication of schools, demographic boom and low socio-economic level "[20], [34]" which are the main factors influencing the transmission of the gastro-intestinal helminths in Cameroon and over the world. Good examples for these are particularly poor population of Sub-Saharan Africa and rural zone of America, China and South-East Asia "[16], [35]". In fact, gastro-intestinal helminths are the indicators of hygienic levels and development, particularly in tropical countries "[37]".

This study was undertaken to identify, assess, evaluate the prevalence and intensity relating to gastro-intestinal helminthiasis and suggest ways by which the level of infection can be reduced in Nkondjock Sub-Division, Littoral Region of Cameroon.

2. Materials and Methods

STUDY AREA: The study was carried out between October 2012 and May 2013 in Nkondjock, Nkam Division and Littoral Region of Cameroon. It lies in altitude 600, latitude 4.87° East and longitude 10.24° North with precipitation of 3000 mm/year, population estimated at 50,000 individuals and a population density is 15 individuals per km² "[26]". It is located in the rain forest zone with distinct rainy (mid June to mid November) and dry (mid November to mid Mars) season. It is predominantly a rural setting with about thirty villages and several rivers "[4]". The economy is based on agriculture (cocoa, coffee, food-producing culture, palm tree, banana and plantain) and breeding (pig, goats, sheep and poultry).

STUDY POPULATION: This was 417 school children aged between 1- 25 years of eight privates and publics schools of four villages of the Sub-Division. Although most parents were informed, it was not all who volunteered to participate in the study by giving their stools.

SAMPLE COLLECTION: Samples were collected when the individuals sought the inform consent before the commencement of the exercise. Personal data of each participant such as age and sex were recorded using a questionnaire. The specimens were collected in tight fitting sterile bottles in the morning. These were immediately taken to the laboratory for examination or, conserved in the refrigerator at 2 to 8°C "[8]".

EXAMINATION: Four hundred and seventeen stools samples were examined in the Laboratory of Medical Analysis of the Integrated Health Centre of Ndock-Samba, using direct examination method "[22], [33]" and physical flotation method (Willis's technique) for qualitative analysis "[15]" and the numeration method (Stoll's method) for quantitative analysis (Golvan *et al,* 1978 cited by "[11]"). Identification was based on photography's board proposed by Thienpont *et al*, 2003.

Approximately 2g of faecal sample was put into a beaker containing 60 ml of floatation fluid (NaCl 400 g, water 1000 ml) and stirred thoroughly. The resulting faecal suspension was strained into another beaker and then poured into labelled test tubes arranged in a rack, ensuring that it was filled to the brim. A cover slip was placed over each tube for about 20 min, then lifted and immediately placed on a glass slide, after which it was examined under a microscope with objectives 10X and 40X.

For quantitative analysis, approximately 5g faecal sample was put into a beaker containing 50 ml of water and stirred thoroughly. The resulting faecal suspension was strained into another beaker and then poured into labelled test tube for about 30 seconds. Then, we took 4 drops of suspension, placed on a glass slide, added 2 or 4 drops of water, stirred thoroughly and a cover slip was placed and it was examined under a microscope. The number of eggs per gram of faeces is contained in 0.2 ml stools (Golvan *et al,* 1978 cited by "[11]").

STATISTICAL ANALYSIS: The data collected was recorded in Microsoft Excel 2007 and transferred to SPSS 19.0 where statistical analysis had been done. This was presented at 5% level of confidence and, we used Chi-square test to compare prevalence and intensity.

3. Results

The study revealed an overall prevalence of gastro-intestinal helminths infections of 24.5% (Table 1). Of the population sampled (N = 417; 185 boys and 232 girls), *Ascaris lumbricoides* accounted for 12.0%, *Trichuris trichiura* 4.1% and Hookworm 9.4% (Table 1).

According to age, the highest prevalence was recorded in children aged between 16-20 years and the lowest in those 11-15 years respectively 44.2% and 17.1% (Table 2). *Ascaris lumbricoides* and Hookworm were present in all age group while *Trichuris trichiura* was absent in children of 11-15 years. Prevalence specifically shows in Table 2 that, *Ascaris lumbricoides* was the most common in children aged between 16-20 years with 22.1%, *Trichuris trichiura* in those 11-15 years with 10.4% and Hookworm between children aged between 6-10 years with 18.2%. There were no significant differences in prevalence among all the age groups ($p > 0.05$).

A total of 48 boys and 54 girls were positive for the three geohelminths. *Ascaris lumbricoides* recorded the highest positive rates in girls and Hookworm in boys (Table 3). Generally, comparison of the sex shows that boys are slightly infected than girls with a respective prevalence of 27.0% and 24.2%. There were no significant differences in prevalence among the sex ($p > 0.05$).

About multiples infections, we have observed 23.5% of single infection with 24.9% in the boys and 22.4% in the girl. However, we have noted only 1.0% of double infection with 1.1% in boys and 0.9% in girls. The total number of double infection was then, 0.5% in the both sexes. The highest prevalence of multiple infections was association *Ascaris lumbricoides* + *Trichuris trichiura* with 0.5% (Table 4).

Table 5 shows that, of 417 school age children examined, 50 were infected by *Ascaris lumbricoides* with egg per gram

of faeces of 975.00 ± 643.35, 17 by *Trichuris trichiura* with 970.59 ± 578.81 and lastly 39 by Hookworm with 833.33 ± 452.82.

Table 1. *Overall and specific prevalence of soil-transmitted helminths at Nkondjock.*

	N° Examined	N° Infected	Prevalence (%)
	417	**102**	**24.5**
Parasites			
Ascaris lumbricoides	417	50	12.0
Trichuris trichiura	417	17	4.1
Hookworm	417	39	9.4

Table 2. *Age Stratified prevalence of soil-transmitted helminths at Nkondjock.*

	Age group				
Parasites	**[1-5] N=122**	**[6-10] N=55**	**[11-15] N=76**	**[16-20] N=77**	**[21-25] N=87**
Ascaris lumbricoides	12 (9.8%)	3 (5.5%)	7 (9.2%)	17 (22.1%)	11 (12.6%)
Trichuris trichiura	2 (1.6%)	3 (5.5%)	0 (0.0%)	8 (10.4%)	4 (4.6%)
Hookworm	8 (6.6%)	10 (18.2%)	6 (7.9%)	9 (11.7%)	6 (6.9%)
Total	22 (18.0%)	16 (29.1%)	13 (17.1%)	34 (44.2%)	21 (24.1%)

Table 3. *Prevalence of soil-transmitted helminths according to sex at Nkondjock.*

	Parasites			
Sex	***Ascaris lumbricoides***	***Trichuris trichiura***	**Hookworm**	**Total**
Boys N=185	19 (10.3%)	11 (5.9%)	20 (10.8%)	50 (27.0%)
Girls N=232	31 (13.4%)	6 (2.6%)	19 (8.2%)	56 (24.2%)

Table 4. *Prevalence of multiples infections.*

	Boys N=185	Girls N=232	Total N=417
Total number of children infected	48 (26.0%)	54 (23.3%)	102 (24.5%)
Single infection	46 (24.9%)	52 (22.4%)	98 (23.5%)
Double infection	2 (1.1%)	2 (0.9%)	4 (1.0%)
Ascaris lumbricoides + *Trichuris trichiura*	2 (0.5%)	0 (0.0%)	2 (0.5%)
Ascaris lumbricoides + Hookworm	0 (0.0%)	1 (0.25%)	1 (0.25%)
Trichuris trichiura + Hookworm	0 (0.0%)	1 (0.25%)	1 (0.25%)
Total of associations	2 (0.5%)	2 (0.5%)	4 (1.0%)

Table 5. *Intensity of soil-transmitted helminths at Nkondjock.*

Parasites	**Number of children**		**Intensity (EPG)**
	Examined	**Infected**	
Ascaris lumbricoides	417	50	975.00 ± 643.35
Trichuris trichiura		17	970.59 ± 578.81
Hookworm		39	833.33 ± 452.82

4. Discussion

The high prevalence of soil transmitted helminthiasis in Nkondjock Sub-Division and the presence of the common triad *Ascaris lumbricoides*, *Trichuris trichiura* and Hookworm is comparable with previous reports of some studies in several countries "[21], [30]". The prevalence of ascariasis as the most common infection in this study as other has been observed "[10]". *Ascaris lumbricoides* eggs are very resistant to harsh environmental conditions and air-borne. They may account for the ubiquitous nature of egg distributions and hence present in all the age groups and sex. Hookworm infection was the second most prevalent STH in this study with a value of 9.4%. In a related study, specific prevalence reported by several authors are different and these differences would be due to different climatic conditions and risk factors which favoured and influence development and distribution of the eggs and larva of the helminths "[5]". These factors could vary from one site to another, within the same region or the same country "[9], [19]". In the entire population, children aged 16-20 years had the highest prevalence. These observations are similar to those obtained by Okonkwo *et al* (2011) in Nigeria. These similarities could explain the hypothesis of Rouamba *et al* (1997) who think that, children of this age group do not respect general and personal practice of good hygiene. However, this prevalence decreases with the age and, would be due to the maturity of children "[30]" and certainly because of immunity against infections due to gastro-intestinal helminths which increase with age "[32]". According to the sex, the results show that boys are most infected than girls though none differences

statistically significant was observed. These results corroborate those of Egwunyenga *et al* (2005) in Nigeria who think that, traditional education in Africa gives to boys and girls different activities permitting to the girls to be more responsible than boys who are free and play everywhere carrying parasites. The results are shown cases of multiple infections and specially biparasitism with a low parasitic implication. This prevalence was close to those of Ragunathan *et al* (2008). The most prevalent association was the one between *Ascaris lumbricoides* and *Trichuris trichiura* and would be probably due to similitude between both their mode of transmission and the site they occupy in the intestinal tract "[2]". The parasitic load (intensity of infection) was low. These observations corroborate those of Andrade *et al* (2001) in Ecuador and Adefioye *et al* (2011) in Nigeria. According to Andrade *et al* (2001) the lowest rate of intensity would be due to administration of antihelminthic drugs to children. These results obtained would explain absence of clinical signs and would confirm gastro-intestinal helminthiasis like asymptomatic infections "[24]".

5. Conclusion

According to Emana *et al* (2015), prevalence of STHs in the study area was quite high and calls for at least annual mass drug administration in addition to prompting preventive actions like health education, personal hygiene and provision of clean water in the study area. Identifying risk factors and dynamics of transmission in vulnerable groups can help to plan for effective prevention strategies "[17]".

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