EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 8
Issue: 2
38-44
Year: 2021

PREVALENCE OF INTESTINAL PARASITES AND POLYPARASITISM AMONG CHILDREN LESS THAN FIVE YEARS IN THE LOGBABA DISTRICT HOSPITAL IN DOUALA, CAMEROON

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Article Received on 01/12/2020 **Article Revised on 21/12/2020** **Article Accepted on 11/01/2021**

ABSTRACT
The prevalence of intestinal parasites and polyparasitism was studied among children less than five years in the Logbaba District Hospital from July to October 2020. Stool and blood samples were collected from 200 children consisting of 100 males and 100 females consulted at the hospital. Stool samples were processed using direct wet smear and Lugol stain method. Thick malaria blood smear and thin smear were prepared using blood collected from finger tips of children. Parasites detected in stool and blood samples were *Entamoeba histolytica*, *Ascaris lumbricoides*, *Fungi* and *Plasmodium falciparum*. The overall prevalence of parasitic infection in children was 80 (40%). From a total of 200 subjects studied, male children 44 (55%) were more infected than females 36 (45%). Children between 3 months to 1 year were the least infected 7 (28%). There was no significant difference between gender infection ($P > 0.05$). On the rate of occurrence of parasites in children, *P. falciparum* was the highest, 33 (41.25%). Parasitic infection was highest in childern who drank borehole water. High prevalence of *Fungi* was noticed in children 27 (57.44%). Polyparasitism was strongest between *E. histolytica* + *Fungi* 14 (31.11%) and least between *E. histolytica* + *A. lumbricoides* 2 (4.44%). Polyparasitism was highest among oldest subjects ($P < 0.05$). Impregnated mosquito nets greatly reduced malaria infection ($P < 0.05$). Intestinal parasite and polyparasitism represent a real public health problem among children in Douala. Health education, personal hygiene, proper sanitation, safe drinking water, clean environment and the use of mosquito nets should be encouraged in order to reduce the prevalence of parasitism.

KEYWORDS: intestinal parasites, polyparasitism, children, Logbaba District Hospital, Douala.

INTRODUCTION
Parasitic infections are still causing morbidity and mortality in various parts of the wold. In 2009, it was reported that more than 3 million persons were infected with intestinal parasites, from which a total of 450 million were seriously ill.[1] Many deaths are caused by parasitic diseases. Dianou *et al*.[2], reported that parasites were one of the major causes of morbidity and mortality. Endemicity of various parasites can be found in some areas of the world. In fact, there are widespread parasitic infections throughout the tropics and sud-tropics. Infection with multiparasite species is the norm rather than the expectation. Despite the ubiquity of polyparasitsm, its public health significance has been inadequately studied.[3] This is true especially in tropical zones where climatic conditions are favorable to parasitic development.[4] The absence of adequate hygienic measure, poor socio-economic conditions, waste disposal and congestion are some of the contributing factors for multiple parasite infections.[5] The health problems related to multiple infectional parasitosis are very common in African population and to other populations of the world and children are among the victims.[6] Many reasons are advocated by various authors concerning the hight prevalence of parasitc infections in children. Some of the reasons include a combination of hot humit climate, poor sanitation, personal hygiene and ignorance[7] and.[8]

Transmissible diseases by contaminated food or water along side illneses like HIV/AIDS and hepatitis constitude a serious public health problem. These diseases can lead to servere symptoms and eventually result to dead. For exemple *Entamoeba histolytica* is the second cause of mortality among protozoa.[9] The intensity and prevalence of parasitic diseases are specially higher in rural areas, peripheral milieu, in children less than 5 years and in subjects who are always in contact with dirty water and soil.[10] In children, parasitic diseases can be very severe and engender malnutrition, anemia, reduced resistance to infections and even augmentation in mortality.

In Cameroon, parasitic diseases in infants remain an important public health problem. Nkengazong et al.[11] reported that out of 420 infants studied, 178(42.5%) were infected with parasites. The study was done in Barombi, a village in South West of Cameroon.

Polyarasitism is defined as the co-existance of more than one or more species of parasites in one host or subject. Previous studies done in the city of Douala in Cameroon indicated that some of the patients consulted in various hospitals, harboured more than one species of parasites.[5] This is true in many tropical countries. Keiser et al.[12] in Ivory Coast, West Africa reported that two thirds of the population studied were infected with at least three species of parasites, at the same time. In Nigeria, West Africa Obiukwu et al.[13] reported several species of parasites in school children in Mbaukwu Anambra State. The study of polyparasitism is very important because it may lead to a better understanding of parasitism.

The present paper is designed to study the prevalence of intestinal parasites and polyparasitism in children less than 5 years in Logbaba District Hospital, Douala Cameroon. The existence or not of some factors that may favour polyparasitism and to determine the most frequent types of polyparasitism encountered.

MATERIALS AND METHODS

Study area and population

Permission for the study was sought and obtained from the Cameroon Ministry of Public Health in collaboration with the Logbaba District Hospital (LDH) in Douala, Cameroon. Douala is the economic capital of Cameroon located in Central Africa. This region is in tropical Africa. LDH is located in the 3rd district in the city of Douala between latitude 04˚ 02’ 18” N and longitude 09˚ 45’ 33” E (fig. 1). This is the unique public hospital that serves about 24000 inhabitants. Services offered include family planning, maternity, parasitology laboratory, serology, hematology, bacteriology and biochemistry. This hospital was chosen for our study because of its strategic suburban location and the frequent high attendance by patients.

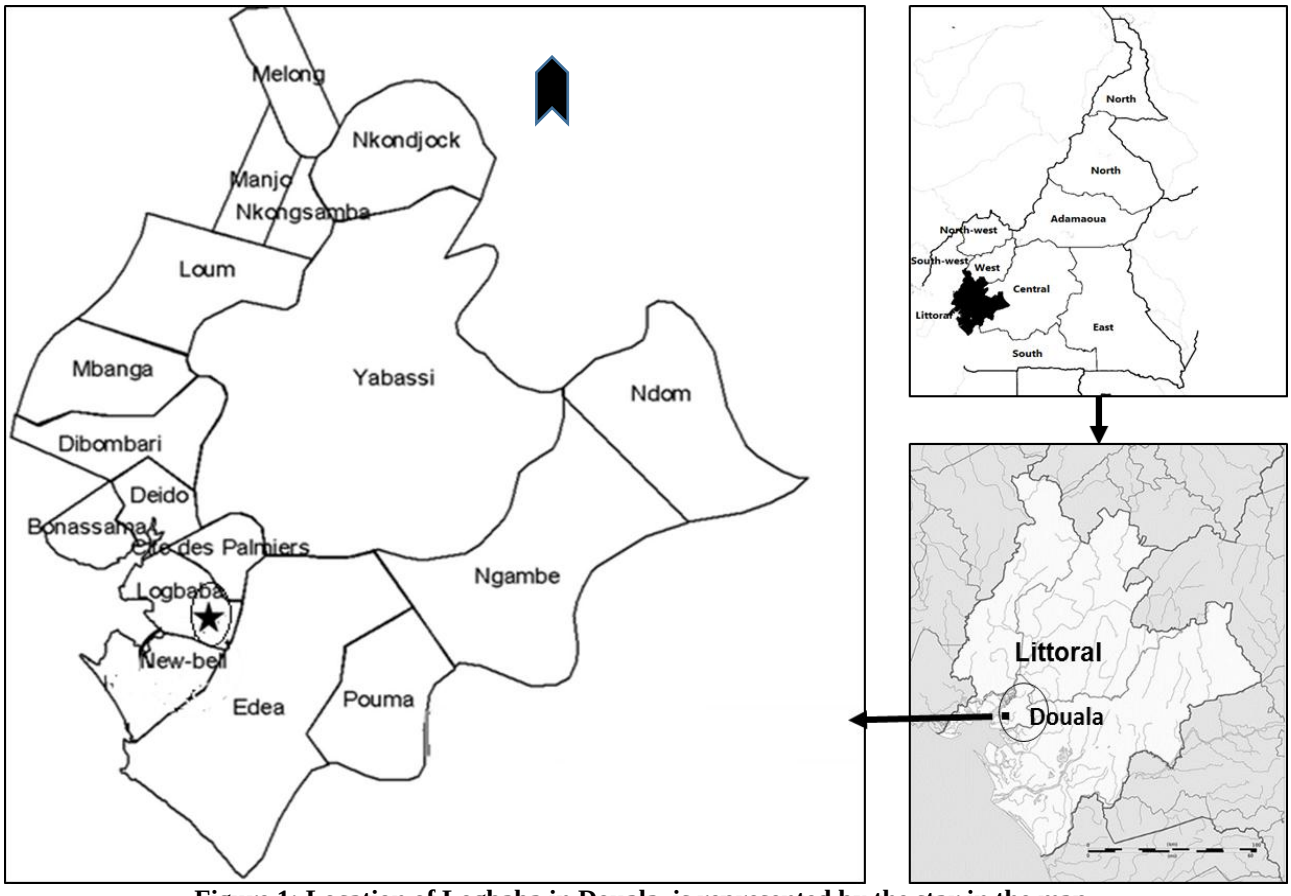

Figure 1: Location of Logbaba in Douala, is represented by the star in the map.

Criteria for acceptance or refusal of candidates

Parents who brought their children for medical consultation and willingly accepted to participate in our study were given free diagnosis and treatment. Those who refused to participate or whose children were more than five years old, were not included in our work. A total of 200 children consisting of 100 male and 100 female children less than 5 years old participated in our study.

Collection of each sample

Prior to the collection of stool and blood samples, a questionnaire sheet was given to each parent. The sheet contained questions related to our research and information on the children and their parents. Privacy and ethical measures were highly respected. The parents were instructed on the proper method of stool collection in order to avoid contamination. Labelled stool vials and spatulas were given to them for fresh stool collection from their children. The stool samples were collected in the morning and immediately processed in the hospital laboratory. Blood samples were collected from finger tips of patients by laboratory technicians and processed immediately.

Macroscopic and Microscopic Examination of Stool

Macroscopic examination was done by visual observation noting the consistency, appearance, color, the presence of glair, adult worms, mucus and blood. For microscopic examination of fresh stool, each of the samples was well mixed to obtain a homogeneous concentration. A pinch of each sample was put on a slide and mixed with a drop of physiological saline using an applicator stick. A coverslip placed on the preparation and examined. Observation of parasites was done using 10x and finally 40x under a light microscope. For microscopic examination after coloration with Lugol. A pinch of stool sample was mixed with a drop of Lugol on a slide and covered with a coverslip. Observation was done using 10x and 40x. A subject was considered parasitized when the stool examined revealed the presence of a minimum of an intestinal parasite or one form of resistance (eggs or cysts).

Microscopic Examination of Blood

Thick malaria blood smear was done and colored with Giemsa diluted to 1/10 concentration for 15 minutes. The slide containing the sample and Giemsa was rinsed, dried, immersion oil put on it and observed with 100x for the presence of malaria trophozoites. The second examination was concerned with thin blood smear. After preparing the smear on a slide it was allowed to dry at room temperature. May Grunwald was put on the smear, allowed to wait for 3 minutes. After which the same quantity of clean water was added to the preparation. The mixture was again left to react for 3 minutes and the supernatant was thrown away. Finally Giemsa diluted to 1/20 concentration was put on the smear and left at room temperature for 15 – 20 minutes. After this period the composite on the slide was rinsed and dried. Immersion oil was added to the preparation and observed using 100x for detection of malaria trophozoites.

Statical Analysis

Statistical analysis was performed using Excel and SPSS version 18.0. The Chi-2 test was used to search for associations between the parasites and the socio-demographic characteristics of the children studied. A difference was considered statistically significant (p-value < 0.05).

RESULTS

Table 1: Prevalence of parasites according to age range.

Parasites	Age range (N=200)									
	3 months–1year (N= 25)		1–2 years (N=30)		2- 3 years (N=40)		3- 4 years (N=50)		4-5 years (N=55)	
	n	%	n	%	n	%	n	%	n	%
P.falciparum	3	12	4	13.3	6	15	8	16	12	21.8
E. histolytica	2	8	3	10	1	2.5	2	4	3	5.4
A.lumbricoides	1	4	2	6.6	2	5	3	6	1	1.8
Fungi	1	4	2	6.6	6	15	7	14	11	20
Total	7	28	11	36.6	15	37.5	20	40	27	49.1

N= number of subjects studied ; n = number of infected patients

The above table indicates that out of the 200 children investigated 80(40%) were infected. From the 25 children between 3 months - 1 year studied 7(28%) were infected, followed by 1-2 years 11(36.6%), 2-3 years 15(37.5%), 3-4 years 20(40%) and 4-5 years 27(49.1%) infected respectively in accordance to the N number studied. The youngest children, age range between 3 month - 1 year had the lowest prevalence of parasitic infection, while the oldest children 4-5 years had the highest prevalence (P>0.05).

Table 2: Prevalence of parasites according to gender.

Parasites	Gender			
	Male N= 100		Female N=100	
	n	%	n	%
P.falciparum	18	40.90	15	41.66
E. histolytica	5	11.36	6	16.66
A.lumbricoides	5	11.36	4	11.11
Fungi	16	36.36	11	30.55
Total	44	100	36	100

N= number of children studied; n= number of children infected

Parasitic prevalence according to gender does not seem to present a significant difference as observed in table 2. Male and female sexes were infected by the four parasites. However the total number of infected males 44(55%) was slightly higher than of females 36 (45%) (P>0.05).

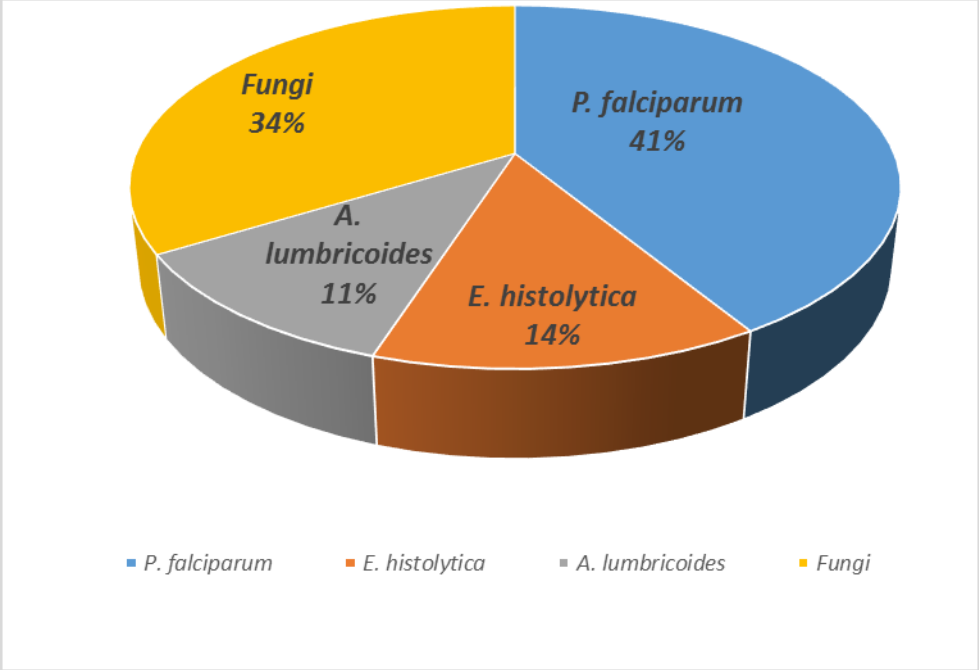

Figure 2: Rate of occurrence of parasites in children less than 5 years.

On the rate of the occurrence of parasitic infection, *P. falciparum* had the highest infection rates in children 33 (41.25%). The second infection registed was that of *fungi*, 27 (33.75%), the third was *E. histolytica* 11 (13.75%) and *A. lumbricoides* 9 (11.25%) (figure 2).

Table 3: Prevalence of parasitic infection according to water supply sources.

Parasites	Borehole N=50		Tap water N=50		Minerale N=50		Borehole/spring N=50		Proportion infected	
	n	%	n	%	n	%	n	%	n	%
E. histolytica	6	20.68	3	27.27	0	0	2	33.33	11	23.40
A.lumbricoides	5	17.24	3	27.27	0	0	1	16.66	9	19.14
Fungi	18	62.06	5	45.45	1	100	3	50	27	57.44
Total	29	100	11	100	1	100	6	100	47	100

N= number of children studied; n= number of children infected

Distribution of parasites according to water supply showed the following findings (table 3): the biggest number of infected children, 29 of them who drank borehole water regularly, followed by 11 infected children who drank tap water. Those children who sometimes drank water from boreole or spring water had lower contamination (6 of them) and the least contaminated (1 child) regularly drank mineral water.

Table 4: Prevalence of polyparasitism according to age range.

polyparasites	Age range										Proportion of children with polyparasitism	
	3 Months-1 Year (N= 25)		1-2 (N=30)		2-3 (N=40)		3-4 (N=50)		4-5 (N=55)			
	n	%	n	%	n	%	n	%	n	%	n	%
P. falciparum + E. histolytica	1	4	2	6.66	2	5	3	6	3	5.45	11	24.44
P. falciparum + A.lumbricoides	1	4	1	3.33	2	5	3	6	3	5.45	10	22.22
A.lumbricoides + Fungi	0	0	1	3.33	1	2.50	2	4	4	7.27	8	17.77
E. histolytica + Fungi	0	0	1	3.33	3	7.50	4	8	6	10.90	14	31.11
E. histolytica + A.lumbricoides	0	0	0	0	0	0	1	2	1	1.81	2	4.44
Total	2	8	5	16.66	8	20	13	26	17	30.90	45	100

N= number of children studied; n= number of children infected

Polyparasitism was detected between *fungi + E. histolytica* 14(31.11%). This was the greatest number of co-infection observed. The second number of polyinfection was between *P. falciparum + E. histolytica* 11(24.44%). The third was between *P. falciparum + A. lumbricoides* 10(22.22%). The fourth was between *A.lumbricoides + Fungi* 8(17.77%) and *E. histolytica + A. lumbricoides* 2(4.44%) was the least. Polyparasitism was highest in oldest children, (P>0.05).

Table 5: Prevalence of malaria according to the usage or not of impregnated mosquito net.

Characteristics	Number of subjects studied		Positive		Negative	
	N	(%)	n+	(%)	n-	(%)
Utilisation	100	50	2	6.06	98	58.68
Non Utilisation	100	50	31	93.93	69	41.31
Total	200	100	33	100	167	100

Legand: N= number of subjects studied ; n+ = number of positive patients; n- = number of negative subjects.

Utilisation of mosquito net greatly reduced malaria infection, only 2(6.06 %) infected as compared to those who did not frequently use mosquito net 31(93.93%) (P < 0.05). (Table 5).

DISCUSSIONS AND CONCLUSION

Our study was concerned with the prevalence of intestinal parasites and polyparasitisms in children less than 5 years. Patients consisting of 100 male and 100 female children were studied. Parasites detected in infected patients were: *P. falciparum*, *E. histolytica*, *A.lumbricoides* and *fungi*. Out of a total of 200 children investigated, 80(40%) were infected with parasites. Infected males, 44(55%) were higher than infected females 36(45%). Our finding is in accord with those of other authors[6], who indicated that the prevalence of infection was generally higher in male (57.6%) than female (42.40%) children in the River States of Nigeria. In a recent study conducted in a hospital in N'Djamena, Chad by Fombotioh et al.[14], highlighted similar results showing that the prevalence of parasitic infection was higher in male than female children. This may be justified by the fact that boys love playing more than girls do and sometimes roll themselves on the ground during their games. Concerning the distribution of parasitic infection according to the age range, it was discovered that infectivity increased with age range. Children between 3 month to 1 year had lowest number of infection, 7(28%) as compared to 4-5 years who had highest cases, 27(49.1%). Our results are closely similar to those obtained by other investigated[15] who reported that children above two years had higher prevalence of parasitic infestation than those between 1-2 years old. Children from 4-5 years are more active than those between 1-2 years. Being more active may imply that they play a lot even in dirty ground and could eat food that is contaminated due to ignorance. Some children also love sucking their fingers and this may contribute to parasitic infection.

Parasitic infection was highest in subjects who drank borehole water. This was followed by tap water and borehole/ spring water respectively. Mineral water presented the best option. High prevalence of *Fungi* 27(57.44%), *E. histolytica* 11 (23.40%) and *A.lumbricoides* 9 (19.14%) was noticed. Water is an essential commodity for human survival. The above results suggest that contamination might have occored on some of the sources of water supply. During the raining season, flooding may contaminate boreholes, tap water and even some spring water. Our work was carried out during this season which is prone to flooding, conducive to parasitic development and dissemination. Other authors[16] reported that significant negatif association was obseved between use of tap water and high prevalence of *E. histolytica* infection. Contrally, our results showed that those who used tap water were not only infected by *E. histolytica* but by *A.lumbricoides* and *fungi*. Hence cofirming our suggestion of possible flood contamination. On the prevalence of polyparasitism in accordance with age range, the association with *E. histolytica + Fungi* was dominant, 14(31.11%). Polyparasitism involving *P. falciparum* and *E. histolytica*

was the second with a prevalence of 11(24.44%), the third was *P. falciparum* + *A.lumbricoides* 10(22.22%). The fourth was between *A.lumbricoides* + *Fungi* 8(17.77%) and *E. histolytica* + *A. lumbricoides* 2(4.44%) was the least. The highest number of infected children with polyparasitism were those within the ages of 4-5 years ($P < 0.05$). Polyparasitism with malaria in children was also reported in Nigeria.[17] The authors found a very high associassion between *P. falciparum* and *A.lumbricoides* in children. Our work showed that the association between *P.falciparum* and *A.lumbricoides* infection occupied the second position. In fact the differences between our work and that of the above authors are slim because polyparasitism between *P. falciparum* and other intestinal parasites were confirmed by both findings. Impregnated mosquito nets reduced mosquitoes.[18] The impact of mosquito net use on malaria prevension was also highlited by many authors.[19, 20, and 21]

The utilisation of mosquito nets is crucial in the fight against mosquito bites. It was discovered that the children who used mosquito nets were significantly less infected with malaria than those who did not ($P<0.05$). Our finding are in accord with those of the above authors.

CONCLUSION

Our work indicates that intestinal parasites and polyparasitism are real in children less than 5 years in the city of Douala. The prevalence of *P. falciparum*, *fungi*, *E. histolytica* and *A. lumbricoides* represent a public health problem. The use of mosquito nets should be reinforced. More study is needed especially concerning *fungi* infection because this protozoa has long been neglected. Polyparasitism may be caused by a combination of multiple hygienic factors: unclean drinking water, poor sociocultural and economic conditions, environemental problems and ignorance. Health education is necessary to all children and parents. Children should regularly be diagnosed and treated against parasitic infections in order to ascertain their smooth health development.

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