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Status and perception of intestinal parasitosis among students of a health professional institution in N'Djamena, Chad

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Intestinal parasitic diseases remain an epidemiology a real problem in Chad, but little research has been done in this area. The purpose of the study is to determine the status of intestinal parasites infection among students in a health professional training institution and to assess their level of perception of this health problem. This prospective and descriptive study took place between June and July 2018. A total of 107 stool samples were collected from students in a health professional training institution in the city of N'Djamena. Direct examination and formalin-ether concentration methods were used to search for parasites. The results showed that the overall prevalence of intestinal parasites among the students was 64.5%. The parasite species identified were *Entamoeba histolytica, Giardia lamblia, Ascaris lumbricoides, Taenia solium* and *Strongyloides stercoralis* with respective percentages: 46.73, 13.08, 13.08, 1.87, and 0.93%. The rates of infestation according to the ethological factors were: - cooking water: 46.51 and 75.80% respectively for the national water company (SNE) and drilled water; feeding mode: 60 and 64.70% for respectively individual and collective; washing hands with soap before meals: 78.57 and 62.37% for respectively no and yes. To fight the diseases caused by parasitosis should involve a strategy on sanitation and health education.The species of parasites identified indicate that the fight against diseases caused by the above parasitosis should involve a strategy on sanitation and health education.

Key words: Parasite, students, N'Djamena, health professional institution, Chad.

INTRODUCTION

At the beginning of the 21 century, intestinal parasitosis are of little interest compared to diseases such as HIV/AIDS, avian influenza, malaria, tuberculosis, leprosy (Stepheson et al., 1993; Cheever and Yap, 1997; Sakti et

al., 1999) and Ebola fever. Yet these parasitic infections continue to pose real public health problem in many developing countries. In 2001 WHO estimated that, more than 2 billion people were infected with enteric parasites worldwide. A year later, in 2002 this number was close to 35 billion, in which 450 million were declared sick. Every year in sub-Saharan Africa, intestinal amoebiasis affects almost 180 million persons and from whom 40 000 to 110 000 die (Sousa-Figueiredo et al., 2008). Giardiasis which is responsible for frequent diarrhoea can negatively impact body growth and development; it touches almost 200 million people worldwide (Faye et al., 1997; Simsek et al., 2004; Mineno and Avery, 2003). Intestinal parasitosis is for the most part a direct reflection of the level of personal and collective hygiene of a population (Gentillini and Duflo, 1996). It is also known that intestinal helminthiasis exaggerates the transmission and severity of HIV/AIDS, malaria and tuberculosis ANOFEL, 2008; Mwangi et al., 2006).

The infected subjects suffer from frequent physical and intellectual attacks due to anaemia, which results in a deficit of attention and inability to assimilate knowledge. By their spoliative action, the intestinal parasites interfere with the nutrition of the infected persons; they contribute to other factors and result in a veritable malnutrition and also increase morbidity and mortality (Crompton and Savioli, 1993). The purpose of the current study is to determine the status of intestinal parasites infection among students in a health professional training institution and to assess their level of perception of this health problem.

MATERIALS AND METHODS

Study site

The institute chosen for this study is here named XX for ethical reasons. It is a model in the training of paramedics in Chad. It has two sections (French and Arabic). The French section has two cycles; its lower cycle teaches the following sectors: state-certified nurse (SCN), midwife, technical health assistant [THA]. Its higher cycle consists of the sectors of biomedical analysis and pharmacy (BM). The Arabic section is a replica of the francophone. This institute is equipped with a laboratory of medical analysis, nursing demonstration rooms, gyneco-obstetrics and a library.

Study population and sampling

Our sample consisted of 107 students who took and enrolled at institute XX for the 2017-2018 academic years. The cluster sampling technique (Combes, 1989; Fleiss, 1981) allowed us to select them within the establishment. The authorization to conduct this survey was solicited and obtained from the administration after studying our project, which was attached to the informed consent form. The day before the investigation, a visit was made in the classes in order to sensitize the students on the nature, importance, the necessity of this work and to get their membership in large numbers. A questionnaire developed on a survey sheet was designed to identify problems on general hygiene and nutrition of each participant. After mentioning his or her name on the card, each subject received an identification number on a labelled sterilized stool vial containing 2 ml of formalin diluted to 10% in order to fill it with a stool. The samples were quickly sent to the institute's laboratory for analysis.

Analysis of stool

Each sample of stool was examined macroscopically and direct microscopic examination was done, followed by the formalin-ether concentration technique (Golvan and Ambroise, 1984; Marti and Escher, 1990). A subject was considered parasitized if an adult worm, at least one cyst or one form of vegetative protozoa, an egg ore one helminth larvae was found.

Direct examination

Macroscopic examination

Macroscopic examination consists of noting the consistency, the colour, the appearance of the faeces, and the eventual presence of segments of cestodes, larvae, and adult worms of nematodes (Gentillini , 1993).

Microscopic examination

For the direct examination of stools in the fresh state, a drop of physiological water was put on a slide. One or two pinches of stool were stirred and a drop of 10% Lugol was added to the mixture. Then a cover slip was placed on it. The preparation was allowed on the bench for 5 to 10 mn at room temperature in the laboratory. This was proceeded by examination under the microscope. First using the objective of X10, then the objective of X40 to better observe the parasitic contrast (Gentillini, 1993; Utzinger et al., 2009).

Methods of formalin-ether concentration

For the methods of formalin-ether concentration, we used the Procedure of the following authors: Golvan and Ambroise (1984), Gentillini (1993) and Utzinger et al. (2009).

Data analysis

Data entry and processing was done using the following software:

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Table 1. Stool distribution according to their macroscopic appearance.

Appearance of stool	Number	(%)
Pasty	54	50.46
Soft	36	33.64
Soft molded	5	4.67
Semi hard	5	4.67
Mucous	3	2.80
Hard	2	1.86
Liquid	1	0.93
Bloodstained	1	0.93
Total	**107**	**100**

Legend: (%) = percentage.

Table 2. Rates of infection of subjects by at least one parasitic species and according to the field of education.

Field of education	No. (%)	Infected (%)	P value
THA	56 (52.34)	36 (64.29)	
SCN	25 (23.36)	20 (80)	χ^2 **= 5.72**
Midwife	16 (14.95)	9 (56.25)	**P=0.12**
BM	10 (9.35)	4(40)	
Total	**107 (100)**	**69 (64.5)**	

Legend : (%)= percentage ; THA= technical health assistant ; SCN= state-certified nurse ; BM= Biomedical Analysis and Pharmacy.

CSPro version 7 and SPSS version 25 Chi² (χ^2)test, sometimes with the correction of Fischer's exact test, which allowed us to compare the different proportions where possible (Combes, 1989; Fleiss,1981).

RESULTS AND DISCUSSION

During our research, most of the stools were pasty (50.46%) or soft (33.64%); the liquid and blood stained were the lowest (Table 1).This finding was also reported by Hamit et al. (2008). This is due to the nutrition of Chadians which is mainly cereals (Tidjani et al., 2006). A total of 64.5% of students harboured at least one species of intestinal parasite (Table 2). Our results are closed to other studies done in regions of Africa. In Tunisia for example, Thiers et al. (1976) found a global index of infection of 53.4% in a school establishment. However, differences between the two levels of infections may be attributed to the number of samples used in both researches, the methodology used in the laboratory, the climatic conditions and the socio-economic status. Equally, the educative status of the population being studied and their way of life may play an important role. The prevalence found in our study indicates the intensified promiscuity and a lack of collective and individual hygiene in the city of N'Djamena. Above all the participants had very little education on hygiene but the environmental conditions are favourable to the development of cysts of protozoa and eggs of helminths. The prevalence found in this study could be higher if specific research procedures were used for certain species of parasites, such as nematodes: *S. stercoralis* and *E. vermicularis* (OMS, 1983; Tchuem et al., 2012). The local conditions of our laboratory and the logistic constrain did not permit us to employ other technics; however, the methods utilized have the advantages of being simple, rapid, less costly and perfectly adapted for economically weak country (Tchuem et al., 2012).

In the course of this survey, monoparasitism for each of the listed species concerned 53.27% of students and polyparasitism and precisely biparasitism 11 .21%. The difference is not significant (P>0.05 and χ^2=43.31) (Table 3). Between the six possible bispecific associations, only that of *T. solium /A. lumbricoides* was not seen. These double appearances are rare ($3\% \leq$ ba% $\leq 5\%$) or very rare (ba% $< 2\%$). Then the presence of parasitic associations indicates a low level of hygiene (faecal peril) and unfavourable living conditions. The predominance of monospecific infection by *E. histolytica*, *A. lumbricoides* and *G. lamblia* on one hand and on the other parts, their association (*E. histolytica* /

Table 3. Distribution of students and level of infection according to association of parasites.

Type of parasitism	Species of parasite	Number of carriers (%)	P-value
Monospecific	*Entamœba histolytica*	40 (37.38)	
	Ascaris lumbricoides	8 (7.47)	
	Giardia lamblia	8 (7.47)	
	Strongyloides stercoralis	1 (0.93)	
Subtotal		**57 (53.27)**	P= 0,0466 and χ^2 = 2,58
Bispecific	*Entamœba histolytica / Ascaris lumbricoides*	5(4.67)	
	Entamœba histolytica / Giardia lamblia	4 (3,74)	
	Ascaris lumbricoides / Giardia lamblia	1 (0.93)	
	Entamœba histolytica /Tænia solium	1 (0.93)	
	G.lamblia /T.solium	1 (0.93)	
Subtotal		**12 (11.21)**	

(%) = percentage.

Table 4. Distribution of students and rates of infection according to parasitic species and gender.

Gender	Parasitic species				
	***E.histolytica*,n(%)**	***A. lumbricoides*, n(%)**	***G. llamblia*, n (%)**	***T. solium*,n(%)**	***S. stercoralis*,n(%)**
Female (n=68)	27 (39.71%)	9 (13,24%)	8(11.76%)	1(1.47%)	1(1.47%)
Male (n=39)	23(58.97%)	5(12.82%)	6(15.38%)	1(2.56%)	0 (0)
Total (n=107)	50(46.73%)	14(13.08%)	14(13.08%)	2(1.87%)	1(0.93%)
P value	χ^2 = 3.69	χ^2 = 0.003	χ^2 = 0.28	χ^2 = 0.16	χ^2 = 0.57
	P = 0.054	P = 0.95	P = 0.59	P = 0.68	P = 0.44

(%) = percentage, n= number of subjects examined, n = number of carriers.

A. lumbricoides and *E. histolytica / G. lamblia*) can be explained by their infection mode that of the oral part way (NKengazong et al., 2010; Youssef et al., 2009).

The results Showed thad five parasitic taxa were identified: three species of helminths which were two nematodes *A. lumbricoides* (13.08%) and *S. stercoralis* (0.93%) and one cestode *T. solium* (1.87%); and two species of protozoa *E. histolytica* (46.73%) and *G. lamblia* (13.08%) (Table 4). There was no significant difference (P> 0.05) noted on the levels of infestation by the different species of parasites according to gender (Table 4).

The infection, although rare, by the transcutaneous nematode *S. stercoralis,* testifies a lack of sanitation in the living environment and especially unprotected contact with the soil. Indeed the parasitic species of *E. histolytica* and *G. lamblia* represent good indicators for bad individual and general hygiene in an unsanitary environment (Monjour et al., 1998), so their presence of 59.81% in our survey testifies to a certain Insalubrity of the different environments and negligence of hygienic rules. In this work, the two protozoa (*E.histolytica* and *G. lamblia*) and the nematode (*A. lumbricoides*) were principally responsible for parasitosis in our samples. To a larger extent, *A. lumbricoides* is more frequent in Cameroon (NKengazong et al., 2010; Brooker et al., 2000; Zephania and Fombutio, 2010), in South Africa (Saathoff et al., 2005), Zanzibar (Goodman et al., 2007) and N'Djamena (Hamit et al., 2008). Here in Chad, Bechir et al. (2012) showed the predominance of ancylostomiasis. At the world level, ascaridiasis is declared the first geohelminthiasis (Tchuem et al., 2001; Monjour et al., 1998; Montresor et al., 2002; Miguel and Kremer, 2002; De Silva et al., 2003; Champetier et al., 2005; Ajeagah et al., 2013). Both nurses and technical health agents presented the highest levels of infection, or 80 and 64.29% respectively (Table 2). The differences in the levels of infection among the groups may be caused by the elevated number of participants during our investigation (Table 2).

Amoebiasis affects 10% of the populations of the world; among them 90% are healthy carriers. In certain tropical zones, the prevalence is more than 50% (Beyls, 2011).

Table 5. Distribution and rates of infection of students according to ethological factors.

Ethiological factors	Number of subjects	in category	No (%)
Cooking water	SNE	43	20 (46.51 %)
	Drilling water	62	47 (75.80%)
	Well water	2	0 (0)
χ^2 = 12.72 with df = 2 and P= 0,001 (p < 0.05)			
Home water Storage mode	Canaries	49	34 (69,38)
	Gallons	28	17 (60,71)
	Barrels	5	2 (40)
	Bottles	25	11(44)
χ^2 = 5. 29 with df= 3 and p= 0. 15 (p> 0. 05)			
Eating method with a hand	Individual	5	3 (60)
	Collective	102	66 (64,70)
χ^2 = 0,04 and p= 0.83 (P > 0.05)			
Hand washing with soap before meals	No	14	11 (78,57)
	Yes	93	58 (62,36)
χ^2 = 1,39 and p=0.23 (P> 0.05)			
Use of toilet paper in latrins	No	60	37 (61,67)
	Yes	47	32 (68,09)
χ^2 =0,47 and P=0.49 (P> 0.05)			
Utilization of plastic kettle	No	27	10 (37,04)
	Yes	80	59 (73,75)
χ^2 = 11,88 and P=0.005 (P < 0.05)			

(%) = percentage.

Our study confirmed that amoebiasis, a neglected tropical disease remains a serious public health problem in countries that are south of the Sahara because it is responsible for almost 100.000 deaths yearly (Bourée, 2010; Bastie, 2013; Moustapha, 2016). This finding dose explains not only the important genetic polymorphisms of amoeba (Wendpagnande, 2015) but equally the solid links in the mode of faecal oral transmission and the existence of many healthy asymptomatic carriers. It can be noted that flooding during the rainy season in certain quarters in the city of N'Djamena is favourable to the dissemination of cysts (Hamit et al., 2008); on the other hand, the anarchical dumping of garbage frequently favours contamination of drilling water and well water. The hot climates also permits the rapid and abundant development of flies, the mechanical vectors for the dissemination of cysts.

In Chad, water is generally stocked in canaries, because these containers keep the water cool. This system of storage does not reduce the dissemination of parasites due to poor maintenance and bad utilization. In this study 69.38% of the users of water from canaries were infected. In our study, 93 students declared that they always washed their hands with soap before eating but from the 93 students, 58 or 62.36% of them were parasitized (Table 5). This result can be attributed to the lack of proper technics in washing hands with soap. In fact the importance of the technic of washing hands with

water has been signalled by Tidjani et al. (2013, 2016). Plastics kettles are systematically used by the Chadian population for their toilets in latrines. This study shows that these materials should be strictly hygienic (73.75%, Table 5). Table 5 shows that toilet papers are poorly used by the students. Generally, in Chad, eating of meals is done collectively and also washing of hands by every individual is necessary or primordial (Hamit et al., 2008).

Conclusion

From the 107 students examined, 69 (64.5%) harboured one or more species of intestinal parasites. Five species of parasites were identified: *E. histolytica, G. lamblia, A. lumbricoides, T. solium* and *S. stercoralis* . *E. histolytica* is the dominant specie among the students. These data are not encouraging for future Chadian health officers. There is therefore, an urgent need to enforce individual and collective hygiene.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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