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*Full Length Research Paper*

# Recent data on the prevalence of intestinal parasites in N'Djamena, Chad Republic

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**This cross sectional study assessed the prevalence of intestinal protozoan and helminth infections in N'Djamena, Chad Republic, and determined the main epidemiological transmission factors of these pathogens in order to develop efficient control strategies of intestinal parasites. Four hundred and sixty two randomly selected persons, from eight quarters (administrative districts), of age less than one year to seventy six years old of both sexes, were examined in N'Djamena town. Out of the 462 samples, 235 (51%) were found to harbour at least one parasite species. The prevalences of the eight (8) parasite species detected were: *Entamoeba histolytica* (30%), *Hymenolepis nana* (13%), *Ascaris lumbricoides* (10%), *Trichomonas hominis* (6%), *Giardia intestinalis* (3%), hookworm (0.5%), and *Schistosoma mansoni* (0.2%). These pathogens appeared mostly in single infections. The quarters with higher infection indices were those that experienced floods (Abena and Chagoua) and where people do not use latrines (Naga and Goudji). The population customs and the environmental conditions in N'Djamena still favour high faecal- oral transmission of intestinal parasites.**

**Key words:** Prevalence, Intestinal Parasites, Protozoans, Helminths, N'Djamena, Chad.

## INTRODUCTION

Compared to other diseases as HIV/ AIDS, malaria or other atypical pneumonias, less interest is accorded to intestinal parasitoses. In tropical zones these affections represent a major public health issue. They are favoured by climatic (temperature and moisture) and socio- economic factors, lack or insufficient sanitation and hygiene, bad alimentary customs (Laamrani et al., 1999). About 740 billion people are infected by intestinal parasites, particularly in tropical rural areas in sub-Saharan countries, Eastern Asia, and South and Central America (Organisation Mondiale Pour la Santé= OMS, 2006). In tropical countries, intestinal parasitoses represent about 40 percent of all diseases other than malaria (Dianou et al., 2004). Yearly, ascaris, hookworms and dysenteric amoeba should cause 195 thousand deaths in the world (OMS, 2000). In Chad for example, ankylostomiasis is commonest in poor rural zones, and affects 32.7% of all the Chadian rural population (Brooker et al*.,* 2002). In a retrospective analysis, Ndinaromtan (1999) found that in 1991, 1992 and 1998, protozooses (amoebiasis: 61.52%, giardiasis: 13.21%, trichomoniasis: 6.98%) were the most prevalent parasite diseases in N'Djamena, determination of the prevalence being done by a simple direct stool examination. At least ten years after this study, this transverse study aimed at assessing the current level of intestinal protozoan and helminth infections in the N'Djamena town and to determine the main epidemiological transmission factors of these pathogens.

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## MATERIALS AND METHODS

### Study area

The study was conducted in N'Djamena town (15°12'E, 12°42'N; altitude 294 to 298 m), which is the political capital of the Republic of Chad (Central Africa). The N'Djamena climate is tropical sahelian characterized by two seasons: one dry season (October to May) and one rainy season (June to September), with 200 to 500 mm rainfall. The daily temperature ranges from 14 to 33°C in December and from 23 to 42°C in April (Halaoui et al., 1994). The population of this town has grown from 600,000 inhabitants (Manichon and Muchnik, 1993), to 1,200,000 nowadays. With a demographic rate growth of 2.8% (Anonym, 2000) N'Djamena spatially stretches out with emergence of anarchical new quarters, most of them being built in swampy areas (Adibord, 1998). Situated on the right bank of

**Table 1.** Numbers of infected patients (n) and infection rates.

| Total % | | Parasite Species | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Protozoa | | | Nematoda | | Cestoda | Trematoda |
| | | ***E.h.*** | ***G.i.*** | ***T.i.*** | ***A.l.*** | ***H.w.*** | ***H.n.*** | ***S.m.*** |
| | | (140) | (16) | (28) | (46) | (2) | (62) | (1) |
| | | 30.30 | 3.46 | 6.06 | 9.96 | 0.43 | 13.42 | 0.22 |
| **Gender** | **Female** | (61) | (5) | (8) | (21) | (0) | (29) | (1) |
| | **%** | 29.47 | 2.42 | 3.86 | 10.14 | 0 | 14.01 | 0.48 |
| | **Male** | (79) | (11) | (20) | (25) | (2) | (33) | (0) |
| | **%** | 30.98 | 4.31 | 7.84 | 9.80 | 0.78 | 12.94 | 0 |

A.l.: Ascaris lumbricoides; E.h.: Entamoeba histolytica; G.i.: Giardia intestinalis; H.n.: Hymenolepis nana; H.w.: Hookworms (Necator americana or Ancylostoma duodenale); S.m.: Schistosoma mansoni; T.i.: Trichomonas intestinalis.

the Chari River, south to Lake Chad, N'Djamena always faces floods during the rainy season (Anonym, 1990). Living conditions remain precarious there, with ephemeral house (Klein, 1996). The town has particularly been destroyed in 1979 and 1980; its population, in majority Muslim, is mainly occupied by industrial, trade, agricultural and animal rearing activities (Anonym, 2000). N'Djamena is divided into eight (08) administrative districts.

### Study subjects

This transverse analysis was done from July to September 2006. Out of 750 subjects contacted, only 462 (255 males and 207 females), from zero (0) to 76 years old, participated in the survey, after the informed consent of adults or of children parents was obtained. Sixty seven (14.51%) were patients in the "National Reference General Hospital = NRGH" while the other 395 (85.49%) participants were randomly recruited from different quarters. The sample population was divided into 13 age groups of five (5) years interval.

### Methods

Fresh stool specimens in previously distributed small plastic containers were collected from participants between 7 and 09 a.m, and immediately transported to the Parasitology laboratory of the NRGH. After the direct examination (Gentillini, 1993) of each stool specimen, two concentration techniques, the Kato- Katz thick smear and the "Merthiolate- iodine- formaldehyde = MIF", were used for the identification of helminth eggs and protozoans respectively (Nozais and Datry, 2000; Golvan and Ambroise-Thomas, 1984; Leger et al., 1991; Katz et al., 1972). The statistical analysis was performed using the standard chi- square test to compare prevalences or infection rates, and the Spearman coefficient of correlation to evaluate the link between the household population size and the number of members affected by a determined pathogen. The level of statistical significance was at 5% probability ($P< 0.05$). The term prevalence is used after Margolis et al. (1982). All people found to be infected were treated using Metronidazole against *Entamoeba histolytica* and *Giardia intestinalis*, Niclosamide against *Hymenolepis nana*, Praziquantel against *Hymenolepis nana* and *Schistosoma mansoni*, Mebendazole against *Ascaris lumbricoides* and hookworms.

## RESULTS

Out of 750 subjects contacted, only 462 (255 males and 207 females) from zero (0) to 76 years old took part in the survey, giving a participation rate of 61.6%. Amongst the 462 participants, 235 (50.87%) harboured at least one intestinal parasite species. Four protozoan species (*Entamoeba histolytica*, *Trichomonas intestinalis*, *Giardia intestinalis*, and *Endolimax nana*), and four helminth species (Ascaris *lumbricoides*, hookworms (*Necator americanus* and/or *Ancylostoma duodenale*), *H. nana* and *S. mansoni*) were recorded. These parasites appeared in single (39.40% of the total number of stool specimens) or mixed (9.74% of double and 1.73% of triple) infections. As the status of *E. nana* is still uncertain, it was not considered in the further analysis.

Hookworms and *S. mansoni* were rare while *E. histolytica*, *H. nana*, and *A. lumbricoides* were the most prevalent parasite species in the examined population, with overall infection rates of 0.43, 0.22, 30.30, 13.42, and 9.96%, respectively (Table 1).

On a gender point of view, no difference was found in the infection between female and male ($P> 0.05$) neither for protozoans nor helminths identified.

Among participants, three patients could not determine their age while 15 had more than 50 years old. The interest people showed in this work diminished as age increased. *E. histolytica* and *T. intestinalis* were found in all age groups, except in age classes 51- 55 years old for the former, and 26-30, 51- 55, and above 60 years old for the latter. Patients of 16 to 25 and 36 to 45 years old were particularly affected by *E. histolytica* and *T. intestinalis* , respectively (Table 2).

*H. nana* was only found in children (from 0 to 20 years old) and the prevalence decreased with age. *Ascaris lumbricoides* parasitized all the age groups, and seemed to be more prevalent in adults. For all the above parasite species, the infection rates between age groups were only significant for *A. lumbricoides* and *H. nana* ($P< 0.05$).

**Table 2.** Infection rate as a function of age groups.

| Parasite species | Age classes (years) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65 |
| | n= 97 | n=100 | n= 66 | n= 59 | n= 29 | n=29 | n=15 | n=19 | n=17 | n=13 | n=4 | n= 8 | n= 3 |
| E. h. | 21.6 | 30.0 | 27.27 | 47.46 | 44.83 | 17.24 | 40 | 31.58 | 35.29 | 23.08 | 0 | 37.50 | 33.33 |
| G.i. | 0 | 6.00 | 6,06 | 3,39 | 3,44 | 0 | 0 | 5,26 | 5,88 | 0 | 25 | 0 | 0 |
| T.i. | 4.12 | 5.00 | 6.06 | 6.78 | 6.90 | 0 | 6,67 | 15.79 | 17.65 | 7.69 | 0 | 12.50 | 0 |
| A.l. | 5.15 | 8.00 | 1.52 | 15.25 | 13.79 | 10.34 | 13.33 | 5.26 | 23.53 | 15.38 | 50.00 | 25.00 | 66.67 |
| H.n | 34.02 | 20.00 | 12.12 | 1.69 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

n: number of patients in an age group.

**Table 3.** Number of examined persons (n) and infection rate per parasite species.

| Parasite Species | Quarter | | | | | | |
|---|---|---|---|---|---|---|---|
| | Gou. (21) | Mar. (27) | Nag. (14) | Mou. (24) | Abe. (70) | Cha. (70) | Dig. (192) |
| E.h. | 42.86 | 11.11 | 28.57 | 33.33 | 31.43 | 21.43 | 29.17 |
| G.i. | 0 | 3.70 | 0 | 0 | 1.43 | 4.29 | 3 .13 |
| T.i. | 0 | 0 | 7.14 | 0 | 4.29 | 5.71 | 5.73 |
| A.l. | 0 | 0 | 7.14 | 16.67 | 20.00 | 10.00 | 6.77 |
| H.n. | 4.76 | 3.70 | 14.29 | 4.17 | 10.00 | 12.86 | 18.23 |

Abe: Abena; Cha: Chagoua; Dig: Diguel; Gou: Goudji; Mar: Mardjandaffack; Mou: Moundou; Nag: Naga.

**Table 4.** Spearman correlation coefficient value.

| Parasite Species | E.h. | G.i. | T i. | A.l. | H.n. |
|---|---|---|---|---|---|
| r | + 0.86 | + 0.74 | + 0.61 | + 0.70 | + 0.73 |
| P | | | < 0.01 | | |

At the level of different quarters, only those (7) which had at less 14 persons examined are considered here. *E. histolytica* and *H. nana* were found in all these seven administrative zones (Table 3). No significant difference (P> 0.05) was observed amongst quarter infection rates of any protozoan or helminth, except for *A. lumbricoides* (P< 0.05).

Inhabitants of 25 households participated in this work, each household logging 6 to 35 people. A positive and significant correlation was observed between the number of inhabitants in a determined household and that of those who were infected irrespective of the pathogen (Table 4).

## DISCUSSION

The abstention rate was quite high (38.40%) because donating stool samples is regarded as a taboo, especially in the adult Muslim population. In total, 50.87% of the samples harboured at least one intestinal parasite species. *E. nana* is not considered in this discussion be

cause its pathogenic status is still uncertain; it is known as non pathogenic (Brumpt and Brumpt, 1967; Wéry, 1983), with no or limited pathogenic effect (O'fel, 1990), or pathogenic by accumulation (Ripert, 1996). The overall infection rate observed in our study (50.87%) is quite similar to 51.6, 52.62, 57.70, and 4 6.5% found in Benin, Senegal, Chad, and Burkina Faso (Alonzo et al., 1993; N'dir et al., 2002; Kostoingue et al., 2002; and Dianou et al., 2004), respectively. On the other hand, it differs from 30.6 and 79.35% found in Senegal and Chad (Faye et al., 1998 and Ndinaromtan, 1999), respectively. Although the number of participants was less than that of Ndinaromtan (1999), the techniques used (Kato Katz and M.I.F.) were appropriate to assess the exact level of intestinal protozoan and helminth infections in the sample examined. In a cumulative data of 1991, 1992, and 1998 obtained in N'Djamena, more intestinal parasite species were identified including *Trichurus trichura*, *Strongyloides* sp., *Enterobius vermicularis*, and *Taenia saginata*, although with very low infection rates (< 3%). The failure to observe *E. vermicularis* and *Strongyloides* sp. was certainly due to their absence as they could have been detected by the M.I.F. technique. This author also revealed that, single infections prevailed (58.89%) over double ones (19.91%), and triple infections were rare (0.56%). In a general point of view, the infection rates are lower in our work, except those of *A. lumbricoides* and *H. nana* which are higher. This decrease could be due to a general slight improvement of the health status of these populations, compared to the 1990's, when there was no security due to numerous successive wars in Chad. The most prevalent parasite species (*E. histolytica*, *H. nana*, and *A. lumbricoides)* in N'Djamena are those mainly transmitted by the faecal- oral route, dirty hands, and contaminated foods (OMS, 2006). Since young males traditionally spend a lot of free time outside in games, they seemed more parasitized than females, although the difference was not significant. Similar observations were reported in a related study in Côte d'Ivoire (Menan et al., 1997). At least for *G. intestinalis* and *T. intestinalis* the infection rates increased with the patient age, although the number of stools examined for patients over 50 years was low. The profile of *T. intestinalis* differs from that observed in other areas or countries, where this parasite was more prevalent among young people (Ripert, 1996). High prevalence of helminths in young is due to their propensity to geophagy. The presence of *E. histolytica* and *A. lumbricoides* in all age classes suggest that, people still live in bad hygiene conditions. *H. nana* has not been found in patients older than 20 years; in fact it is a parasite of young (Raccurt et al., 1987). Moundou, Abena, Chagoua, and Diguel were the most affected quarters because they are swampy areas, and it is known that standing water favours the dissemination of intestinal parasites (Golvan and Ambroise-Thomas, 1984; Gentillini and Duflo, 1996; OMS, 2003). Furthermore, in most of the N'Djamena districts, people defecate everywhere, even though they possess latrines and potable water. Therefore, flooding, absence of latrines and improvement drainage of water, insalubrities, bad condition of existing latrines, poverty, and animal meanderings are amongst the risk factors of parasite transmission (Gentillini and Duflo, 1996). The positive and significant correlations calculated between the number of inhabitants in household and that of those who were infected is justified by the fact that, the meal is shared by all members of the family (male, female adults and children separately) who eat in the same dish with fingers not washed with soap and tap water before eating in 95% cases.

In this work most intestinal parasites detected are transmitted by the faecal- oral route, and the protozoans (*Entamoeba histolytica*, *Trichomonas intestinalis*) still prevail. Helminths (*Hymenolepis nana* and *Ascaris lumbricoides*) also are prevalent. These pathogens appeared mostly in single infections in N'Djamena. The environmental conditions in this town favour the creation of different endemiotopes. Chadian health authorities still have a lot to educate, sensitize, and build minimum infrastructures to reduce the national expenditure caused by digestive parasitoses. More studies are needed with appropriate technical tools to have good databases on intestinal protozoans, helminths, fungi as well in Chad.

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